Biology 9th - Detailed Question Answers

INTRODUCTION TO BIOLOGY

CHAPTER# 01

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Name and define the main divisions of Biology.

Ans: **Division of Biology**: There are three major divisions of biology:

(i) **Zoology**: The word Zoology is derived from Greek language, "Zoon" meaning animals and "Logos" meaning "study of knowledge". It deals with the study of animals.

(ii) **Botany**: The word Botany is taken from Greek language, "Butane" meaning plants and "Logos" meaning "study or knowledge". It deals with the study of plants.

(iii) **Microbiology**: It deals with the study of microscopic organisms such as bacteria etc. which can be seen only with the help of microscope.

Q.2: Name and define the branches of Biology.

Ans: **Branches of Biology**: Modern biology deals with the structure, function and many other descriptions of living things. Advance research during the 20th century has led to the division of biology into specialized branches. Some important branches are defined below:

(i) **Morphology**: It is the study of external form and structure of organisms.

(ii) **Anatomy**: It is the study of internal parts of body of living organisms.

(iii) **Cell Biology**: It is the study of cell and its organelle.

(iv) **Histology**: It is the study about structure of tissues of plant and animals.

(v) **Physiology**: It is the study about functions of different parts of living organisms.

(vi) **Taxonomy**: It is the study of the rules, principles, grouping and naming the living organisms.

(vii) **Genetics**: It is the study of heredity that is transferring of characters from parents to offspring.

(viii) **Developmental Biology**: It is the study of formation and development of embryo.

(ix) **Environmental Biology**: It is the study of relationship between living organisms and nonliving factors of environment and their effects on each other.

(x) **Paleontology**: It is the study of remote past organic life, with the help of fossils.

(xi) **Biotechnology**: The study about techniques for manipulation of gene to bring the changes in structure and location of genes to achieve desirable characters is called biotechnology.

(xii) **Socio-biology**: It is the study of social behavior of living organisms. i.e. interaction between themselves.

(xiii) **Parasitology**: It is the study of parasites.

(xiv) **Pharmacology**: It is the study of action and effects of drugs.

(xv) **Molecular Biology**: It is the study of organic molecules which constitute cell and its organelles.

Q.3 : Describe the relationships of biology to other sciences.

Ans: **Relationship of Biology with Other Sciences**: Biology is a multidimensional subject and linked with other sciences. Biology is considered as interdisciplinary science, which is related with other sciences. Some of these are mentioned below:

Biophysics: It is a branch of physics, in which laws and techniques of physics are applied to explain the processes of life.

Examples:

(i) In radio-physics branch radioactive isotopes are used to trace the translocation of different materials within the organisms.

(ii) Radio-labeling and, carbon-dating also show some uses of radioactive isotopes in determining the age of fossils.

(iii) Uses of sound waves as ultrasound and laser technology show relation of physics with biology.

• **Biomathematics / Biometry**: The branch of mathematics which collects data of living organisms. It plays very important role in research.

• **Biochemistry**: It is branch of biology which deals with the study of molecules which form living organisms or cell and requires authentic knowledge about biology and chemistry to explain the synthesis of bio-molecules and function of different molecules in the body of an organism.

• **Biogeography**: It deals with the distribution of different living organisms in different geographical regions of the world. Many living organisms are restricted to particular geographical regions due to environmental conditions.

• **Bio-economics**: This deals with the economically important organisms involved in production, e.g. meat production, etc. are calculated for cost value and profit value.

Q.4: Describe the careers that the students, who have chosen biology, can plan to adopt.

Ans: **Careers in Biology**: The students, who have chosen the biology, can plan to adopt some as a career in following fields:

(i) **Medicine and Surgery**: Medicine deals with diagnosis and treatment of diseases and surgery deals with repair, replacement or removal the affected organ.

(ii) **Agriculture**: This deals with production of varieties of crops, fruit, vegetables, dairy products, etc. Pakistan being an agricultural country, it can play very important role.

(iii) **Horticulture**: This is also part of agriculture, in which work is carried out for the development of new varieties of plants and their products.

(iv) **Forestry**: Forests are the source of biodiversity of plants and animals of many kinds which live there. It is important in development of new forests as well as preservation of existing ones.

(v) **Farming**: In this profession, the development of different kinds of farms takes place, such as fish farm, cattle farm, poultry farm, etc. New technologies are used for the production of animals as source of meat and milk, leather, wool, etc.

(vi) **Animal Husbandry**: This profession is part of agriculture sciences. It deals with the care and breeding of animals which are beneficial for man.

(vii) **Fisheries**: This profession deals with the increased quantity and quality of fish production. Fish is one of the best sources of protein.

(viii) **Biotechnology**: This is very important and sensitive profession. It deals with manipulation of gene to produce valuable chemical products, such as insulin, growth hormones, interferon, etc. from bacteria as well as others.

Q.5: Write translation of Quranic verses which points the Islamic view about the origin of life.

Ans: The Almighty Allah has conveyed a great knowledge about the 0rigin and characteristics of animals and plants through our Holy Book, the Quran. Allah Says;

"We made every living thing from water" **(Surah: Ambia, Verse: 30)**

"And Allah has created every animal from water of them there are some that creep on their bellies, some that walk on two legs; and some that walk on four. Allah creates what He will Lo! Allah is able to do all things". **(Surah: Al-Nur, Verse: 45)**

Here water is symbolized with the protoplasm as the basis of life and the vital Power of protoplasm seems to depend on the constant presence of water.

Q.6 Write the translation of Quranic verse which is about plant growth and development.

Ans: "And in the earth are neighboring tracks, vineyards and ploughed lands, and date-palms, like and unlike which are watered with one water. And we have made some of them to excel others in fruit. Lo! Here in verily are portents for people who have sense". **(Surah: Al-Ra'd, Verse: 4)**

Here Allah has revealed some facts about plant growth and development.

Q.7 Describe the role of Muslim scientists in the field of biology.

Ans: Contribution of Muslim Scientists: The Muslim scientists have played great role in the development of biological science. They began experiments and observations from the first century of Hijra. Following are some details about the important Muslim scientists, who made significant contribution towards the development of biology.

(i) **Jabir Bin Hayan (722-817 A.D)**: He was born in Iran. He worked in the field of chemistry but he also wrote a number of books on plants and animals. "Al-Nabatiat" and "Al-Haywan" are his two famous books on plants and animals, respectively.

(ii) **Abdul Malik Asmai (741-828 A.D)**: He was great zoologist and wrote many books on animals "Al-Kheil" on horses, "Al-Ibil" on camels, "Al-Shat" on sheep, "Al-Wahoosh" on wild animals and "Khalqul Insan" on the different parts of human body and their functions.

(iii) **Bu Ali Sina (980-1037 A.D):** He was greatest of all the Muslim scientists and considered as the founder of medicine. He is called as Avicenna in the west. He identified many diseases like tuberculosis, meningitis and other such inflammations. He also worked in the field of mathematics, astronomy, physics, paleontology and music. He wrote books like "Al-Qanoon" and "Fil Tib Al-Shafa".

Q.8: Describe the level of organization.

Ans: <u>**The Level of Organization**</u>: The levels of organization in living world are based on chemical foundation. All the living organisms are made up of cells and the protoplasm of cell is the physical as well as chemical basis of life. These levels are as follow:

Atom

↓ Oxygen (O)

Molecule

↓ Dioxide (O_2)

Macromolecule

↓ Phospholipid

Cell

↓ Clara Cell

Tissue

↓ Epithelial tissue

Organ

↓ Lung

Organ system

↓ Respiratory System

Organism

↓ Panthera leo (Lion)

Population

↓ Pride of Lions

Community

↓ Lions and Zebras

Eco System

↓ Lions, Zebras, and the Environment

Biosphere

↓ Life on Earth

JOIN FOR MORE!!!

1. **Atomic Level of Organization:** All the matter is made up of elements, which is composed of atom. Each atom is made up of sub-atomic particles, such as electrons, protons and neutrons. In nature, there are more than 100 kinds of elements and among these 16 elements are called as bio-elements, which are vital for life. Only six elements such as C, H, O, N, S and Pare called basic elements of life.

2. **Molecular Level of Organization:** Molecules are formed by the binding of atoms. These organic molecules of cells are called as bio-molecules. These are constructed in great variety and complexity. They are classified as micro-molecules and macro-molecules. Glucose, amino acid and fatty acids are micro-molecules, whereas carbohydrates, proteins and lipids are macro-molecules. The units of micro-molecules combine together to form macro-molecules.

3. **Cellular Level of Organization:** The biomolecules when work together in the form of suspension, it is called Protoplasm. Protoplasm is the combination of organic and specific inorganic substances. When protoplasm works in the form of a unit, this is called cell. Cell is the basic unit of living organisms. When similar types of cells organize together in group, they are called tissues. The different types of tissues arranged in a particular manner to work together are called organs.
Organs of different types work in a coordinated manner to perform a function which is called organ-system. When different organ-systems function in co-ordination as a unit, they form a body or Multicellular Organism.

4. **Taxonomic Level:** There is another level of organization which is related with living organisms. The species is the smallest unit of taxonomic level of organization, which includes morphologically similar living organisms which inter-breed and produce fertile offspring.

5. **Population Level:** All the members of a species, living in specific habitat are called Population. A group of parrots living on tree, is called parrot population.

6. **Community Level:** The members of different species living in specific habitat are called as Community. A group of different kinds of birds, living on tree, is called as birds, living on tree, is called as bird community.

7. Ecological System: Communities always depends upon their non-living environment is a reciprocal interaction for their survival. For example oxygen for respiration is obtained environment and in turn for respiration is obtained from environment and in turn given out CO_2. This interaction is called Ecosystem or Ecological system.

8. Biosphere Level: The part of earth where life exists is called biosphere. It consists of different kinds of eco systems.

Q.9 : Define the following :

(i) Unicellular Organization

(ii) Colonial Organization

(iii) Multi-cellular Organization

(i) **Unicellular Organization** : All single cell organisms carry out all activities of life. They digest the food, respire, excrete, move etc. on the cellular base by simple methods. Bacteria, Amoeba, Paramecium and Euglena are common examples of unicellular organisms.

(ii) Colonial Organization : Many unicellular organisms live together by forming colonies but do not have any division of labor among them. In colonial type of cellular organization, each unicellular organism lives its own life, they are not dependent on each other and never form any multicellular structure, Volvox is a green alga is an example of colonial form of organization.

(iii) Multi-cellular Organization : The organism formed by many cells is called as multicellular organism. Frog and mustard plant are examples of multicellular organization.

Q.10: Write a short note on Mustard plant.

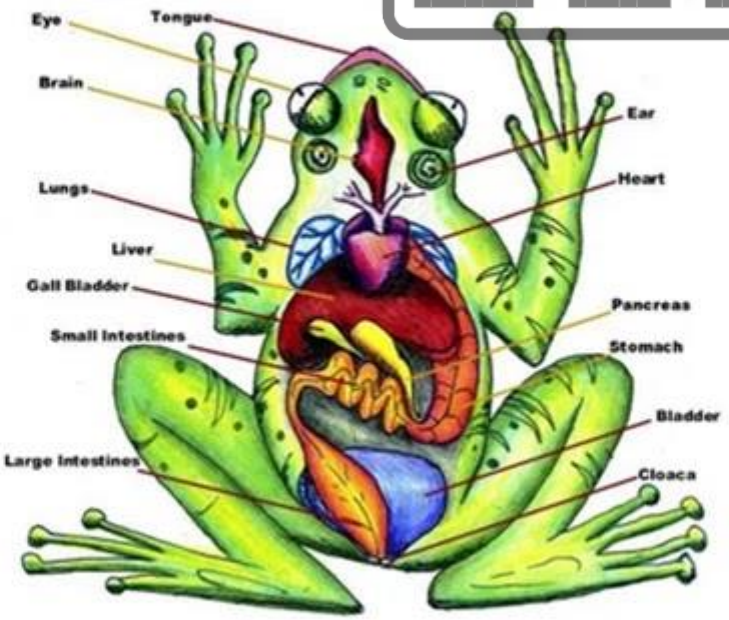
Ans: **Mustard plant:** Brassica campestris is commonly known as mustard plant and locally it is called "Sarsoon". It is multicellular and cultivated in winter season. The leaves of this plant are used as vegetable while seeds are used for oil extraction. The length of this plant is 1 to 1.5 meter.

Brassica campestris

This plant has two parts, the vegetative part, which consists of root, stem and leaves and reproductive part which consists of flowers. Each flowers is yellowish in color and produce seeds.

Q.11: Draw a labeled diagram of dissected frog.

Ans :



Dissected Frog

Q.12: Write a short note on frog.

Ans: **Frog:** Rana tigrina is the scientific name of spotted frog found commonly in our region. It is multicellular animal. It lives in both water as well as on land. Its body is divided into head and trunk. There is no neck. Its body is made of organ system with different organs. All organs are made of different tissues such as epithelial, glandular, muscular, nervous etc. Frog lives near ditches, pools, ponds, stagnant stream and slow moving rivers. It feeds on small insects.

Activity: Identification of organs and organ-system in dissected frog.

Material Required:

- Preserved frog
- dissecting tray
- dissection
- box pins

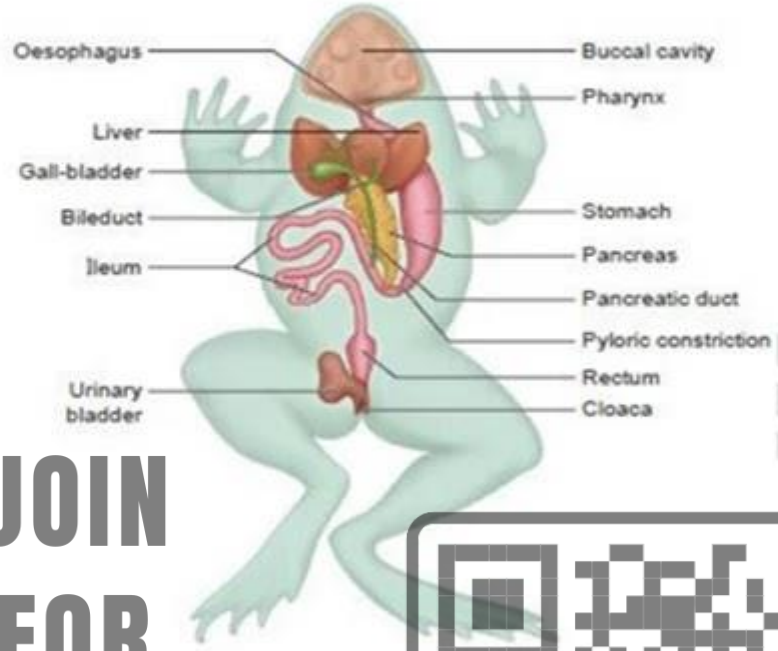
Procedure : Place the preserved frog on a dissecting tray on its back, as all vertebrates are dissected ventrally, pin down the fore limbs and hind limbs. Take scissors to cut the abdomen ventrally, from cloaca to the mouth. Again cut down the skin of limbs from each side and pin down. Expose the visceral organs clearly and make observation with the help of diagram. Locate the organs and identify them as below:-

Table showing different organs with the relative organ system

Organs	Organ System
Mouth, buccal cavity, pharynx, esophagus, stomach, small intestine, large intestine, cloaca, liver, gall, bladder, pancreas.	Digestive System
Heart, atria ventricle, Aortae, Vena cavae	Circulatory system
Lungs, trachea, nostrils	Respiratory System
Kidneys, Ureter, Urinary Bladder	Excretory System
Testes, vasa efferentia, Ovaries, Oviduct, Ovisac	Reproductive System
Brain, Spinal Cord, Nerves	Nervous System

Q.13: Draw a labeled diagram of frog's digestive system.

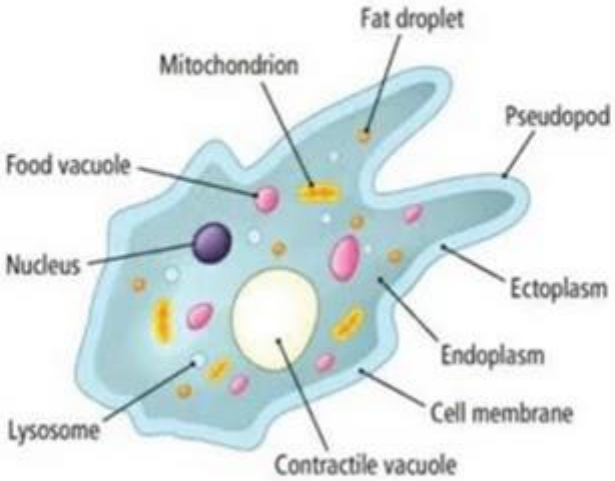
Ans :



Frog Digestive System

Q.14: What do you know about amoeba?

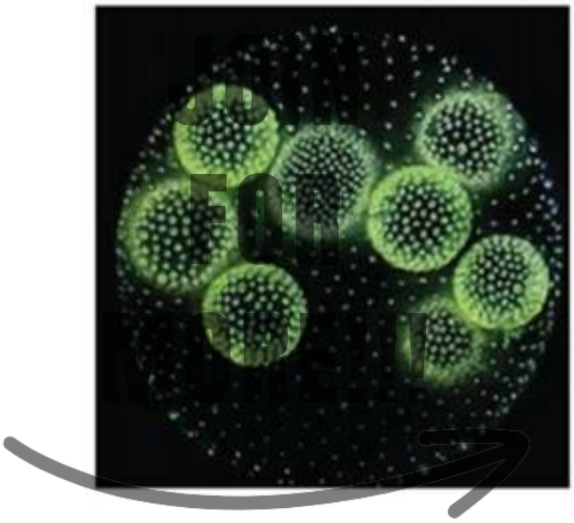
Ans: **Amoeba** : Amoeba is a unicellular organism found in the mud of shallow pond, pools and at any stagnant water. Its size is about 0.25mm. Amoeba has an irregular shape. It has a cell membrane which helps in movement of molecules and protects cytoplasm. The outer part of cytoplasm is clear and transparent, called ectoplasm (gel) and inner part is called endoplasm (sol). The cytoplasm contains nucleus, food vacuoles, mitochondria etc. Amoeba moves by false food, called pseudopodia.

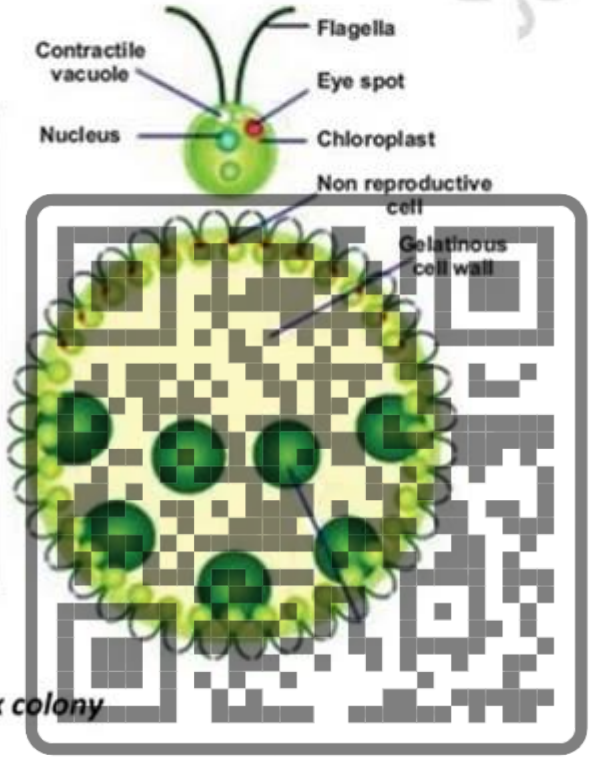


Amoeba

Q.15: Write a short note on volvox.

Ans: **Volvox** : Volvox is a polyphyletic (many ancestors) genus of chlorophyte green algae in the family Volvocaceae. It forms spherical colonies of upto 50,000 cells. They live in a variety of fresh water habitats and were first reported by Antonie Van Leeuwen Hoek in 1700. Volvoxonce once called algae that live together in a colony. Each Volvox cell has two flagella. The flagella beat together to roll the body in water. Volvex cells have chlorophyll and make their own food by photosynthesis. These photosynthesis organisms are an important part of many aquatic eco-system. Volvox are not harmful to humans because they do not produce any toxic substance.





Volvox colony

Biology 9th - Short Question Answers

INTRODUCTION TO BIOLOGY

CHAPTER# 01

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: What is Biology?

Ans: Biology is a branch of natural sciences which deals with the study of living beings. It provides the knowledge about living organisms. The word biology comes from Greek language "Bios" meaning "live" and "Logos" meaning "thought or reasoning". Thus biology means study of Life.

Q.2: What is Life?

Ans: Life cannot be defined properly, but on the basis of life processes, it can be identified through following functions of living organisms.

(i) Digestion	(ii) Respiration	(iii) Metabolism
(iv) Movement	(v) Growth	(vi) Development
(vii) Excretion	(viii) Irritability	(ix) Reproduction

Q.3 : Why subject biology is named as multidimensional subject?

Ans: Biology is a multidimensional subject and linked with other sciences. For example, the movement of animals follows the laws of motion in physics. Biology is considered as interdisciplinary science, which is related with other sciences.

Q.4: How farming profession helps mankind?

Ans: Farming is the science of developing and maintaining farm. With the advancement of farming techniques, man improves the quality and yield of the existing varieties and produces certain new varieties of crops. This helps to overcome the problem of food shortage, incidence of famine declines and economic conditions of mankind are improving.

Q.5: How new varieties of plant are produced?

Ans: The new plant varieties are produced by selection and hybridization. Selection is a non-random process which leads to individuals of different genotypes being represented unequally in their progeny in later generations of a population of self-propagating units. Selection can be natural or artificial. Hybridization is the crossing of two varieties, species or genera having desired genes by bringing together the useful characters of these into one progeny. Both these processes produce new plant varieties.

Q.6: Why species is called as smallest taxonomic level?

Ans: Species is called as smallest taxonomic level because it is the smallest and basic unit of classification. Taxonomic studies consider a group of individual organisms with fundamental similarities as a species. Thus all the individual members belonging to particular species show all similar characters and can breed among themselves to produce a similar type of organism.

Q.7 : How population is different from community?

Ans:

Population	Community
All the members of a species, living in specific habitat are called Population.	The members of different species living in specific habitat are called as Community.
A group of parrots living on tree, is called parrot population.	A group of different kinds of birds, living on tree, is called as birds, living on tree, is called as bird community.

Q.8: Differentiate between Colonial organization and multicellular organization:

Ans:

Colonial Organization	Multicellular Organization
The individual organisms that form a colony can, if separated, survive on their own	Cells from a multicellular organism (e.g., liver cells), if separated, cannot survive on their own.
If all members of an aggregation can perform all the basic functions of life for themselves, so none of them depends on others to do things they cannot, then the aggregation is a colony.	If some members of the aggregation carry out functions that others cannot, so their respective contributory functions are each necessary to the survival of the whole, then it is a multicellular organism.

Q.9: Differentiate between Agriculture and Horticulture

Ans:

Agriculture	Horticulture
A branch or sub category of agriculture.	A broad term that covers forestry, agronomy, animal husbandry, aquaculture, and, horticulture.
Focuses on cultivating, marketing, improving, and technology of plants for food and other human necessities	Covers cultivating plants and raising animals for food and other human necessities
Sometimes called "gardening".	Sometimes called "farming"

Biology 9th - Detailed Question Answers

SOLVING A BIOLOGICAL PROBLEM

CHAPTER# 02

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: What is science and scientific method?

Ans: **Science:** Science is the systematic study of nature and how it affects us and the environment. It is a body of knowledge that is constantly changing through the use of better and more accurate tools for investigation.

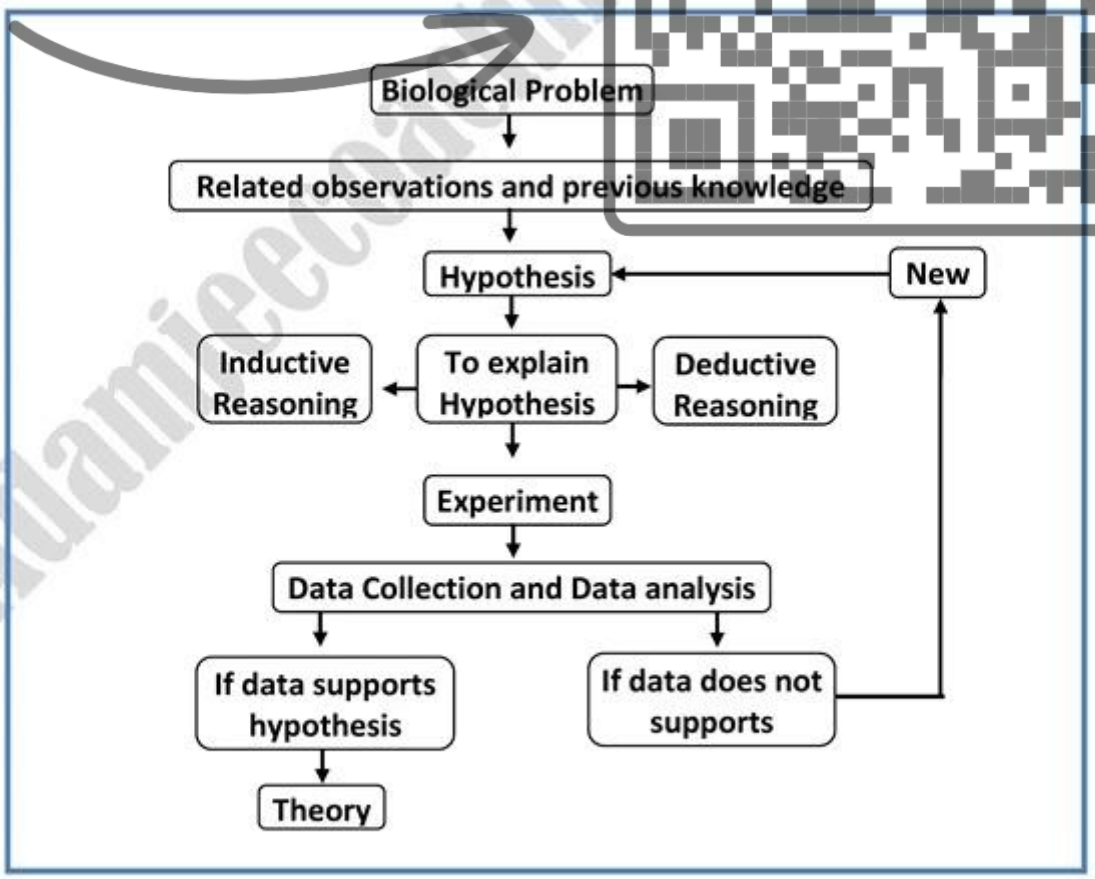
Scientific Method: At the core of biology and other science lies a problem-solving approach called the scientific method. The scientific method is a series of steps followed by scientific investigators to answer specific questions about the natural world.

Q.2: Explain the steps of biological method in detail.

Ans: **Steps of Biological Method** : Biological method consists of the following steps :

1. Observation 2. Hypothesis 3. Reasoning 4. Experiment
5. Result 6. Conclusion

Chart to show the steps of Biological Method:



(i) Observation: The first step is to identify the reason of the problem followed by the formulation of a question about what has been observed. The solution of biological problem starts with observation. An observation is a statement of knowledge gained through the senses (quantitative) or through the use of scientific equipment (quantitative).

In 1880, a French physician, Laveran, studied the blood sample of malaria patient under microscope and observed tiny creatures in it and named as Plasmodium. So the observation was made that Plasmodium is present in the blood of malaria patients.

(ii) Hypothesis: Hypothesis is a key component of the scientific process. It is defined as "the intelligent guess made by a scientist in the form of statement". A hypothesis must be testable through experimentation. Hypothesis must either be supported or falsified by experiment.

For Example: In malaria case, an intelligent guess is made after observation that Plasmodium is the cause of malaria.

(iii) Reasoning: Biologists collect information about the problem and formulate the hypothesis by using a reasoning process i.e. "inductive reasoning and deductive reasoning".

Inductive reasoning moves from specific to general e.g. shark is a fish. All fishes have scales therefore sharks also have scales.

Deductive reasoning moves from general to specific. It is based on "if-then" statement.

Deductive reasoning can be tested and verified by experiments. In malaria case, the following deduction is made:

"If Plasmodium is the cause of malaria, that all the malaria patient should have Plasmodium in their blood".

(iv) Experiment: Once a problem has been observed and a hypothesis is suggested, the next step in the scientific method is to design an experiment based on reasoning. Experiment is a practical performance of a scientist to identify the real cause of a problem based on inductive and or deductive reasoning. A key assumption is that the experiment will be repeated many times by other scientists. Scientist performs two types of test i.e. control group and experimental group. To find out the cause of malaria, blood samples of 100 malaria patients (experimental group) and the blood samples of 100 healthy persons (control group) were examined under microscope.

(v) Result: The results are where we report what happened in the experiment. That includes detailing all observations and data made during experiment. Result verifies the hypothesis. In the case of malaria, it was found that all the malaria patients (experimental group) had Plasmodium in their blood whereas the blood samples of healthy persons (control group) were free from Plasmodium,

(vi) Conclusion: The final step of the scientific method is developing conclusion. This is where all the results from the experiment are analyzed and a determination is reached about the hypothesis. If our hypothesis was supported, it's great. If not, we repeat the experiment or think of other ways to improve our procedure.

Example: Conclusion is made that "Plasmodium is the cause of malaria".

Q.3: Explain theory, law and principle.

Ans: **Theory**: As more and more evidences come to hand in the favour of hypothesis, the hypothesis gains increasing acceptance and eventually is promoted to the rank of a theory. A theory is a set of scientific assumptions consistent with one another and supported by evidence, but not fully proved. Scientific theories are well-tested and highly reliable scientific explanations of natural phenomena. They unify many repeated observations and data collected from lots of experiments. For example, theory of evolution

Law: A scientific law is a uniform or constant fact of nature. It is virtually an irrefutable theory. Biology is short in laws due to puzzling nature of life.

Principle: When a theory can explain many natural phenomena and is consistently supported by experiment and also universally accepted by the scientist it becomes a scientific principle.

Q.4: Distinguish between the following in tabulated form.

(i) Theory and Law (ii) Inductive reasoning and deductive reasoning

Ans: (i) Difference between theory and law

	Law	Theory
1.	A law is an observation	A theory is the explanation of that observation
2.	A law does not require experimentation	A theory requires experimentation under various conditions.
3.	A law does not become obsolete with time.	A theory may become obsolete with time.
4.	A law cannot be replaced or changed	A theory can be replaced by another Theory
5.	A law is a universally observable fact.	A theory may be strong or weak according to the amount of evidence available.

(ii) Difference between Inductive and Deductive reasoning

	Inductive Reasoning	Deductive Reasoning
1.	It is the form of valid reasoning, to deduce new information or conclusion from known related facts and information.	It arrives at a conclusion by the process of generalization using specific facts or data.
2.	Deductive reasoning follows a top-down approach.	Inductive reasoning follows a bottom-up approach.
3.	Deductive reasoning starts from Premises.	Inductive reasoning starts from the Conclusion.
4.	Use of deductive reasoning is difficult, as we need facts which must be true.	Use of inductive reasoning is fast and easy, as we need evidence instead of true facts. We often use it in our daily life.
5.	In deductive reasoning, arguments may be valid or invalid.	In inductive reasoning, arguments may be weak or strong.
6.	Deductive reasoning reaches from general facts to specific facts.	Inductive reasoning reaches from specific facts to general facts.

Q.5: Why experiment is necessary for theory?

Ans: Natural science is a reasonable enterprise based on valid experimental evidence, criticism, and rational discussion. It provides us with knowledge of the natural world, and it is experiment that provides the evidence that grounds this knowledge. Experiment plays many roles in science. One of its important roles is to test theories and to provide the basis for scientific knowledge. It can also call for a new theory, either by showing that an accepted theory is incorrect, or by exhibiting a new phenomenon that is in need of explanation. Experiment can provide hints toward the structure or mathematical form of a theory and it can provide evidence for the existence of the entities involved in our theories. Finally, it may also have a life of its own, independent of theory. Scientists may investigate a phenomenon just because it looks interesting. Such experiments may provide evidence for a future theory to explain.

Q.6: Describe data organization and data analysis.

Ans: For data organization we will prepare a table or graph of the data. We shouldn't throw out data points we think are bad or that don't support our predictions. Some of the most incredible discoveries in science were made because the data looked wrong! Once we have recorded the data, we may need to perform a mathematical analysis to support or refuse our hypothesis.

In data analysis, the statistical methods (ratio and proportion) are applied.

Ratio: It is a comparison of two values expressed as a quotient (1st/2nd).

Example: A flower has 4 sepals and 12 petals. The ratio of sepals to petals is 4:12. This ratio can also be expressed as an equivalent fraction 1:3.

Proportion: It is an equation stating that two ratios are equal.

Example: 4:12::1:3.

Q.7 Why mathematics is an integral part of the scientific process.

Ans: For example, if a biologist is studying the insect population. He goes into the field and counts the population sample in a specific region, then compares his sample with other regions to get population estimated. At every step of this process, he depends upon mathematics to measure, predict, and understand natural phenomena. One key role of mathematics in biology is the creation of mathematical models. There are equations or formulas that can predict or describe natural occurrences, such as organism behavior patterns, population changes over time, structure of protein, height of living organisms, population of an endangered species, bacterial growth and so on. We can say that mathematics plays a critical role in better understanding the natural world.

Q.8: Why table or graph is necessary for data organization?

Ans: Table and graph is necessary for visual representation of results. Before conducting a meaningful investigation, it's important to organize the data we collected. By organizing data, a scientist can more easily interpret what has been observed. Since most of the data scientist collect is quantitative, data tables and charts are usually used to organize the information.

They allow the investigator to get a visual image of the observations, which simplifies interpretation and drawing conclusions. Valid conclusions depend on organization and clear interpretation of data.

Biology 9th - Short Question Answers

SOLVING A BIOLOGICAL PROBLEM

CHAPTER# 02

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: What is biological method?

Ans: The system of advancing knowledge by formulating a question, collecting data bout it through observation and experiment, and testing a hypothetical answer about Living things is called biological method.

Q.2: Define biological problem.

Ans: Biological problem is a set of questions to be solved, about the natural world. These problems can be environmental, ecological, health related, etc. No matter what types of problems are being studied, scientists use the same problems-solving method to find answers that the logical and supported by evidence.

Q.3: Mention the steps of Biological method.

Ans: **Steps of Biological Method** : The steps of biological method are as follows:

1. Observation
2. Hypothesis
3. Reasoning
4. Experiment
5. Result
6. Conclusion

Q.4: What is mathematical biology?

Ans: **Mathematical Biology**: It is a field of research that examines mathematical representations of biological systems.

Q.5: Why biological sciences need mathematical models?

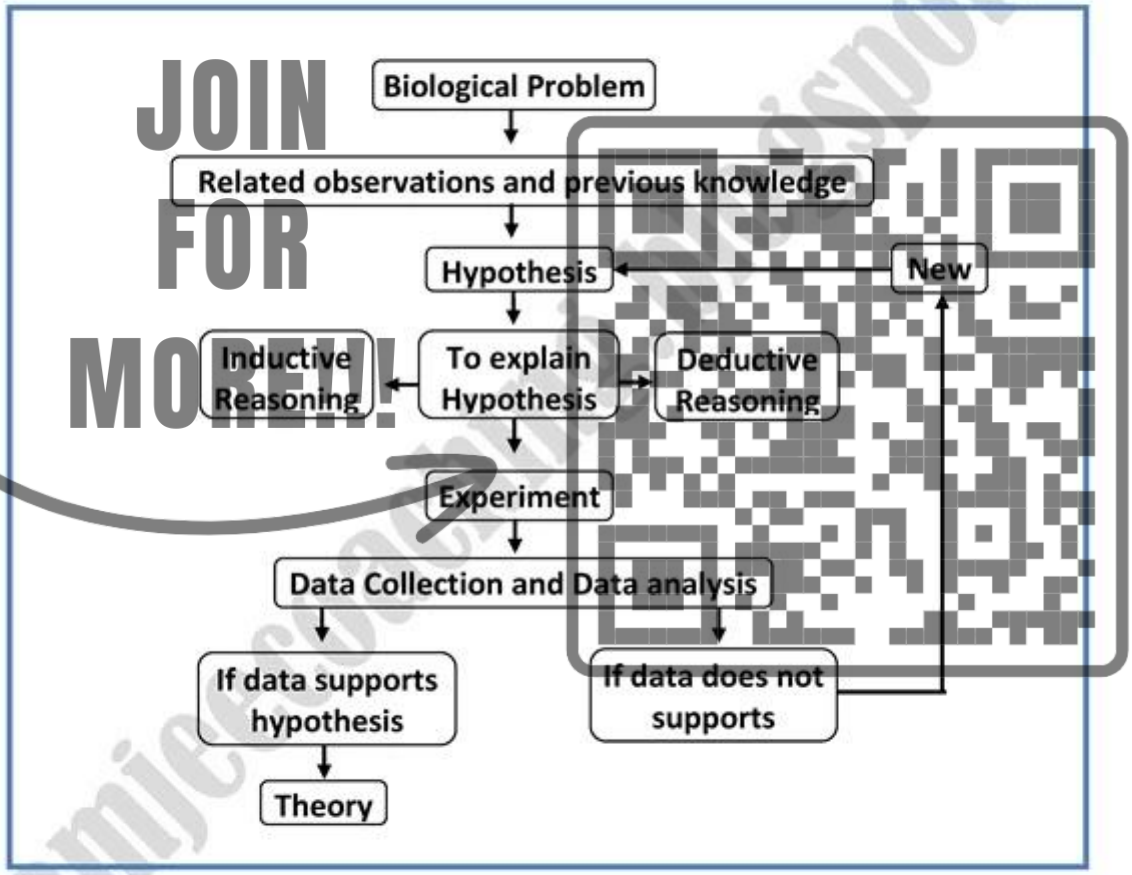
Ans: One key role of mathematics in biology is the creation of mathematical models. There are equations or formulas that can predict or describe natural occurrences, such as organism behavior patterns, population changes over time, structure of protein, height of living organisms, population of an endangered species, bacterial growth and so on.

Q.6: Theory is highly reliable scientific explanations, why?

Ans: As more and more evidences come to hand in the favour of hypothesis, the hypothesis gains increasing acceptance and eventually is promoted to the rank of a theory. A theory is a set of scientific assumptions consistent with one another and supported by evidence, but not fully proved. Scientific theories are well-tested and highly reliable scientific explanations of natural phenomena. They unify many repeated observations and data collected from lots of experiments.

Q.7: Draw a chart showing steps involved in biological methods.

Ans: Chart to show the steps of Biological Method:



Q.8: Why table or graph is necessary for data organization?

Ans: Table and graph is necessary for visual representation of results. Before conducting a meaningful investigation, it's important to organize the data we collected. By organizing data, a scientist can more easily interpret what has been observed. Since most of the data scientist collect is quantitative, data tables and charts are usually used to organize the information.

Q.9: Why experiment is necessary for theory?

Ans: Experiment can provide hints toward the structure or mathematical form of a theory and it can provide evidence for the existence of the entities involved in our theories. Finally, it may also have a life of its own, independent of theory. Scientists may investigate a phenomenon just because it looks interesting. Such experiments may provide evidence for a future theory to explain.

Biology 9th- Detailed Question Answers

➔ BIODIVERSITY

CHAPTER# 03

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define and explain 'Classification'.

Ans: **Classification**: Biologists mapped the whole diversity of organisms exist on earth, into simple group. To understand about the characteristics of specific organisms individually, is simply called classification. Classification is actually based on the similar and dissimilar characteristics what organisms shared with each other and by this biologists can easily study and identify the organisms.

Q.2: What is biodiversity?

Ans: **Biodiversity**: Biodiversity is the combination of two words; Bio (life), diversity (variation) thus it is defined as, "The biodiversity or biological diversity is the degree of variation within or among the species exist on different regions of the earth". It is comprised of different organisms such as bacteria, protozoans, algae, fungi, animals and plants.

Q.3: Describe the importance of biodiversity.

Ans. **Importance of Biodiversity**: Biodiversity provides many beneficial products which include fiber, oil, dyes, rubber, water, timber, paper and food. It also stabilizes the ecosystem by recycling the nutrients, reduces the amount of pollution by means of forest. Biodiversity also plays an important role in drug discovery and medicinal resources. Medicines from nature account for usage by 80% of the world's population. It also beautifies the nature with lots of trees and animals found in different regions which enhances the tourism.

Q.4: Describe the principles of classification.

Ans: A system of classification is necessary because of the abundance of the variety of life on earth. There are currently around 1.5 million species that have been described and have been given scientific names. In future, more can be identified if they are found.

To study such a diverse pack of organisms exist on earth, biologists classified the Organisms into groups and sub groups. This grouping of organisms is called biological classification.

Principles of Classification: Some organisms share similar fundamental characteristics or functions. It is further explained by means of Morphology (external features of an Organism) in which we study the organisms on the basis of their Homologous and Analogous.

Homologous: In biology, it means similar in structure and have different functions. In other words it means a similarity in internal or chromosomal structures. With internal structures, homology indicates organs that have similar positions, structures, or evolutionary origins. Organs do not have to have the same function to be homologous.

Analogous: In biology, analogous means different in structure and have same functions. Analogous structures are similar structures that evolved independently in two living organisms to serve the same purpose.

Sometimes it is impossible to classify organisms using morphological characters, therefore scientists use other characteristics to classify organisms which include; Cytology and genetics in which organisms are classified on the basis of cellular study, genetic constitution and their development pattern. Biochemistry is also employed in which the chemical substances of the organisms are compared.

Taxonomic Hierarchy: The groups into which organisms are classified are known as taxonomic categories or taxa (singular taxon). The taxa are arranged in ascending order and form a ladder, called taxonomic hierarchy. All organisms are classified into five kingdoms, so, the kingdom is the highest taxon of classification. On the basis of similarities, each kingdom is further divided into smaller taxa in the following ways:

Kingdom → Phylum → Class → Order → Family → Genus → Species

Units of classification: The smallest and basic unit of classification is species. Taxonomic studies consider a group of individual organisms with the fundamental similarities as a species. Thus all the members of the particular species share the similar characteristics and can naturally interbreed to produce a fertile offspring. Closely related species are grouped. together into genera (singular-genus). Similar genera are grouped together into families, families into orders, orders into classes, classes into phyla or division and phyla or division into kingdoms.

Simple classification of two Organisms		
Taxa	**Human**	**Pea**
Kingdom	Animalia	Plantae
Phylum	Chordate	Magnoliophyta
Class	Mammalian	Magnoliopside
Order	Primates	Fabales
Genus	Homo	Pisum
Species	Sapiens	Sativum
Scientific name	Homo sapiens	Pisum sativum

Q.5: Define taxonomy.

Ans: **Taxonomy**: Biologists classified the organisms in order to make them study easily, so the science of classification is called Taxonomy. (Tazm=group, Nomy=naming)

Q.6: Explain the units of classification.

Ans: **Units of Classification:**

1. **Species:** Species is a group of organisms which can interbreed and produce fertile offspring.
2. **Genus**: Group of closely related species is called genus.
3. **Family**: Group of closely related genera is called family.
4. **Order**: Group of closely related families is called order.
5. **Class**: Group of closely related order is called class.
6. **Phylum**: Group of closely related classes is called phylum.
7. **Kingdom**: Group of closely related phyla is placed together in Kingdom.

Q.7: Explain the aims of classification.

Ans: **Aims of Classification**: The main aims of classification are:

(i) To determine similarities and dissimilarities among organisms so that they can be studied easily.

(ii) To find the evolutionary relationship among organisms.

Q.8: Briefly describe the history of classification.

Ans: **History of Classification**: The system that we still use today for giving scientific names to plants and animals has many founders, from the Greek philosopher Aristotle to the Swedish physician and botanist Carolus Linnaeus.

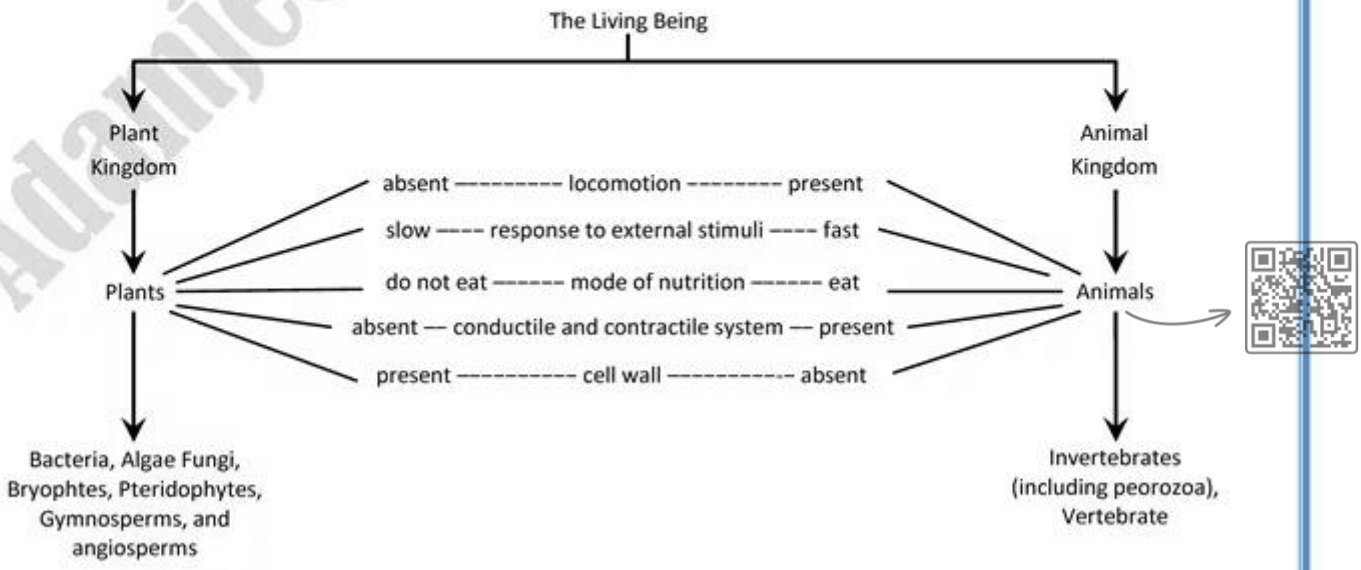
Aristotle: Taxonomy's first father was the philosopher Aristotle (384-322 BC, sometimes called the "father of science". It was Aristotle who first introduced the two key concepts of taxonomy as we practice it today: classification of organisms by type and binomial definition. Aristotle was the first to attempt to classify all the kinds of animals in his book on Animals (historia Animalium in Latin). He grouped the types of creatures according to their similarities: animals with blood and animals without blood, animals that live on water and animals that live on land.

Abu Usman 'Umer Aljahiz: Abu Usman Umer Aljahiz was the first eminent Arab zoologist of the Muslim world. He used to slaughter animals for studying the internal organs of their bodies. He also opened the abdomen of pregnant animals to find out the number of embryos and the location of each one of them in the body. His encyclopedic work in seven big volumes Kitab al-Haywan (Book of Animals) is the most famous work on zoology, in which he has described diseases and treatment.

Carolus Linnaeus: He is considered as the father of taxonomy.

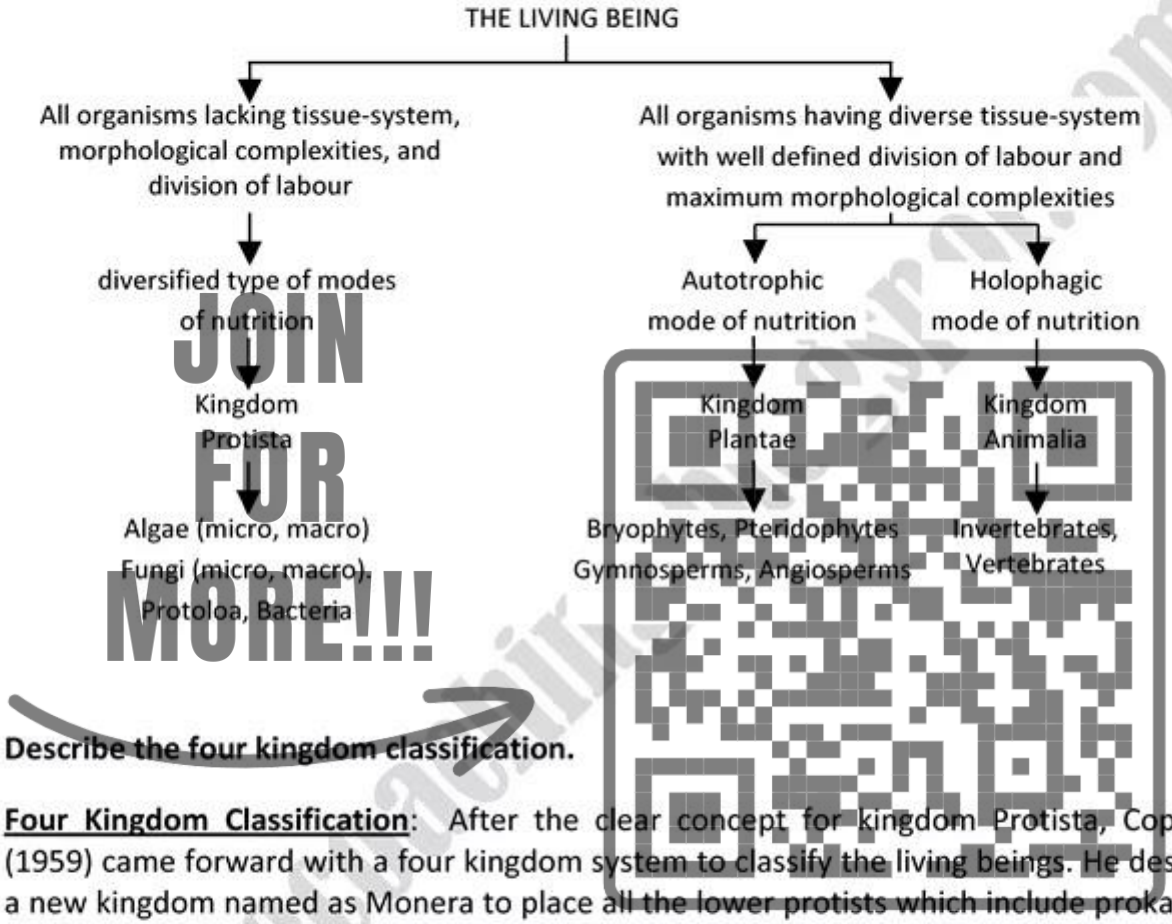
Q.9: How living organisms are classified into two kingdom classification?

Ans. **Two Kingdom Classification**: Previously the organisms were classified into two groups; all the organisms possess cell wall were placed in plant kingdom and all the organisms do not possess cell wall were placed in animal kingdom.



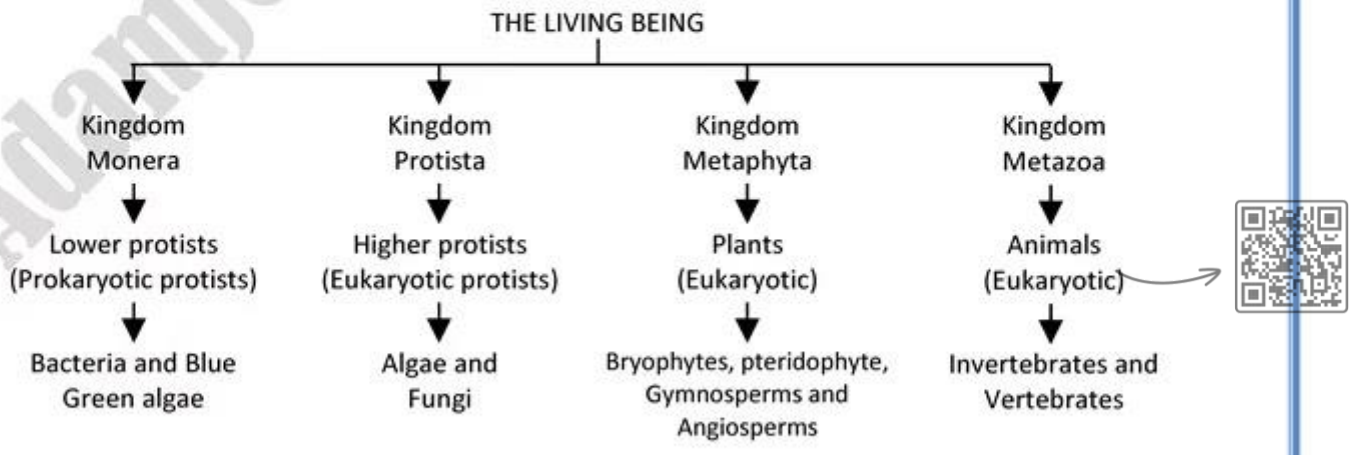
Q.10: How living organisms are classified into three kingdom classification?

Ans. **Three Kingdom Classification**: Ernst Hackle in 1866, introduced a new kingdom named as Protista to accommodate the organisms exhibiting characters either common to both plants and animals, or unique to their own such as Euglena, Bacteria were also placed under this kingdom.



Q.11: Describe the four kingdom classification.

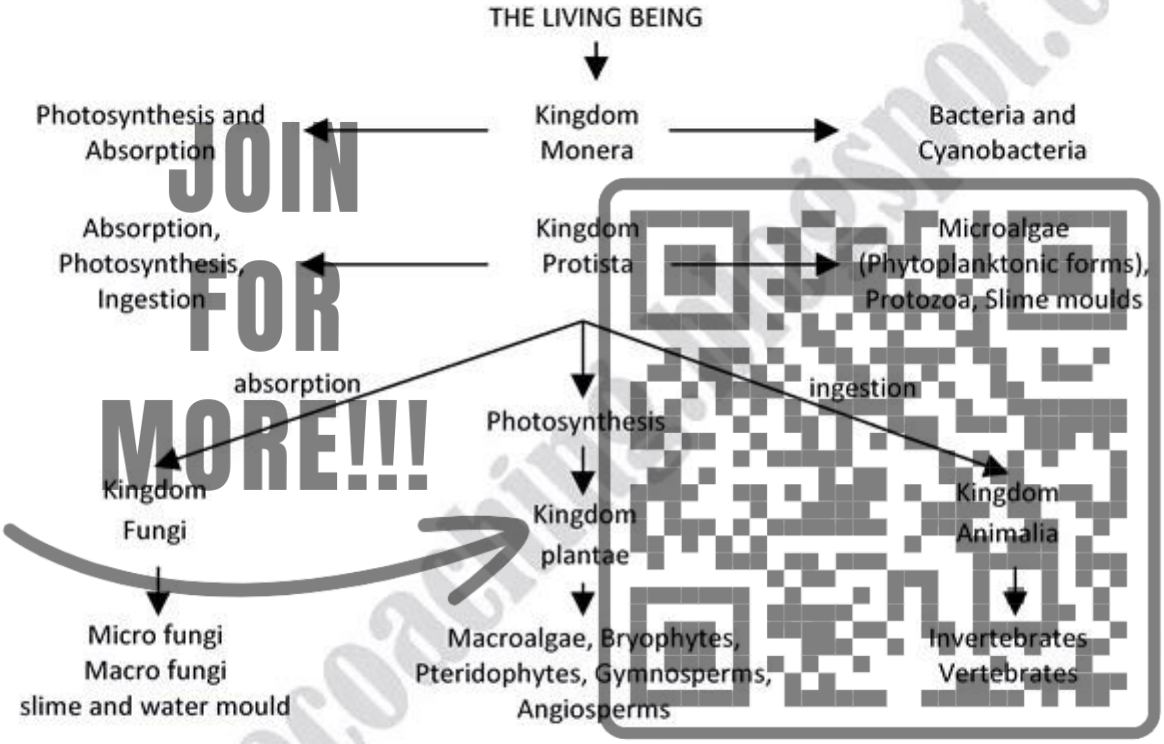
Ans: **Four Kingdom Classification**: After the clear concept for kingdom Protista, Copeland (1959) came forward with a four kingdom system to classify the living beings. He designed a new kingdom named as Monera to place all the lower protists which include prokaryotic unicellular organisms and remaining single celled eukaryotic organisms were included in Protista.



Q.12: Describe in detail five kingdom classification.

Ans: **Five Kingdom Classification:** Robert Whittaker in 1969 classified the organisms into five kingdoms which clearly categorized fungi into a separate kingdom. This system of classification was based on:

- Cellular structure and body organization; unicellular Prokaryote, Unicellular and multicellular eukaryotes.
- Mode of nutrition; autotrophs (plants), Ingestive heterotrophs (animals) and absorptive heterotrophs (fungi).



Five Kingdoms:

(i) **Kingdom Monera**: It includes all the prokaryotes i.e., bacteria and cyanobacteria.

(ii) **Kingdom Protista**: It is the place for all the eukaryotic unicellular organisms, except yeast which some of them have the features of both plant and animal like most protists are aquatic. It includes protozoa and unicellular algae.

(iii) **Kingdom Fungi**: It includes all the multicellular eukaryotic fungi. They are Achlorophyllous, absorptive heterotrophs. They have cell wall made up of mainly chitin. They have a body called Mycelium which is made up of a thread like structure called hyphae.

(iv) **Kingdom Plantae**: It includes all the multicellular, eukaryotic, photosynthetic or arganisms. They have cell wall mainly made up of cellulose. It includes multicellular algae, bryophytes, pteridophytes, gymnosperm and angiosperms.

(v) **Kingdom Animalia**: All animals are multicellular, eukaryotic which are ingestive heterotrophs without cell wall. It includes all vertebrates and invertebrates except protozoa.

Q.13: What do you know about the structure of virus? Why virus is not placed in any kingdom?

Ans: **Structure of Virus**: Virus is non cellular obligate endoparasite (lives inside host cell) It does not have cellular organization but do have nuclear material either DNA or RNA. It has protein coat called capsid that encloses the nucleic acid. It reproduces only inside the host cell. It causes number of diseases in plant like tobacco Mosaic Disease etc. and animals like, cold, flue, dengue, polio, hepatitis, AIDS etc. Due to its non-cellular nature it cannot be placed in any of the five kingdoms.

Q.14: What do you know about bionomial nomenclature? What are the advantages of scientific over common names?

Ans: **Binomial Nomenclature:** A scientific name given to each species comprising two words is known as binomial nomenclature.

Carolus Linnaeus, Swedish naturalist and explorer, who was the first to frame principles for defining natural genera and species of organisms and to create a uniform system for naming them. Through a system of nomenclature in which each species of animal, plant or others receives name of two terms of which the first identifies the genus to which it belongs and the second the species itself or its specific names.

The Advantages of Scientific over Common Names: The advantages of scientific over common names are that they are accepted by speakers of all languages, that each name applies only to one species, and that each species has only one name. As common names cause many problems to identify the organisms as different regions have different languages for the same thing for example; common name of onion in Urdu is "Piyaz" but in other regions it is also known as 'ganda' or 'basal' etc. but in scientific language it is known as Allium cepa.

This avoids the confusion that often arises from the use of a common name to designate different things in different places or from existence of several Common names for a single species.

Q.15: Describe the principles of binomial nomenclature.

Ans: **Principles for Binomial Nomenclature**: Some of the rules which are universally adopted for writing scientific name of a species are:

- Scientific name of any organisms should be italicized when printed, such as Homo sapiens and when handwritten these are underlined.
- The first word of the name is generic always started with capital letter, while second term is species which is never capitalized.
- When the scientific name is written first time, it is written full but when it is repeated several times it is abbreviated. For example: The scientific name of the red rose is Rosa indica, it is abbreviated as R. indica.
- Sometimes the author name appears after species name which means the species was described by him. For example; (mango plant) Mangifera indica L. it means Mangifera indica was first described by Linnaeus.

Q.16: Define conservation of biodiversity.

Ans: **Conservation of Biogiversity:** Conservation of biodiversity simply is the way of caring, saving the species, inhabit on earth from dangers.

Q.17: What are the factors which affecting biodiversity in Pakistan?

Ans: Pakistan is one of few countries in the world to have every kind of geological structure. The geography of Pakistan is a blend of landscapes. You'll find plains, deserts, forests, hills and plateaus. There are coastal areas along the Arabian Sea and mountains of the Karakoram Range in the north part of Pakistan.

This diversity contains diversified habitats and landscapes that support a rich biodiversity of both fauna and flora (animals and plants respectively). Arid and semi-arid regions covering almost 80% of the total land area of the country possess significant portion of country's biodiversity. During the last two-three decades, a number of animal and plant species have become threatened endangered mainly due to over exploitation and loss of natural habitat. Factors like deforestation, overgrazing, soil erosion, salinity and water logging are posing major treats to the remaining biodiversity of the country. The continuing loss of forest habitat, with its associated fauna and flora, will have serious implications for the nation's other natural and agricultural ecosystems. To overcome all these problems biodiversity should be paid attention in order to save the organisms from being endangered.

Q.18: Describe the reasons to conserve biodiversity.

Ans: **Reasons to Conserve Biodiversity**: Biologists warned that global ecosystem would be collapsed if biodiversity continues to reduced at the same rate. Therefore, it is mandatory to conserve life on earth in order to make nature stable. Some of the key points are highlighted below:

- Human should conserve biodiversity because of its benefit for example services and biological resources which are essential to live our life on earth.
- Biodiversity boosts ecosystem productivity where each species can easily survive in their habitat, if the one will not conserve biodiversity, so food chain and ecosystem will be imbalanced.
- With more plants, trees and animals, the soil improved and became stronger less prone to erosion, drought and flooding.

Q.19: What are the problems associated to conserve biodiversity in Pakistan?

Ans: **Problems Associated to Conserve Biodiversity in Pakistan**: The article from 2009 "Biodiversity in Pakistan Key issue", identified some of the primary challenges to implement Biodiversity Action Plan (BAP) are:

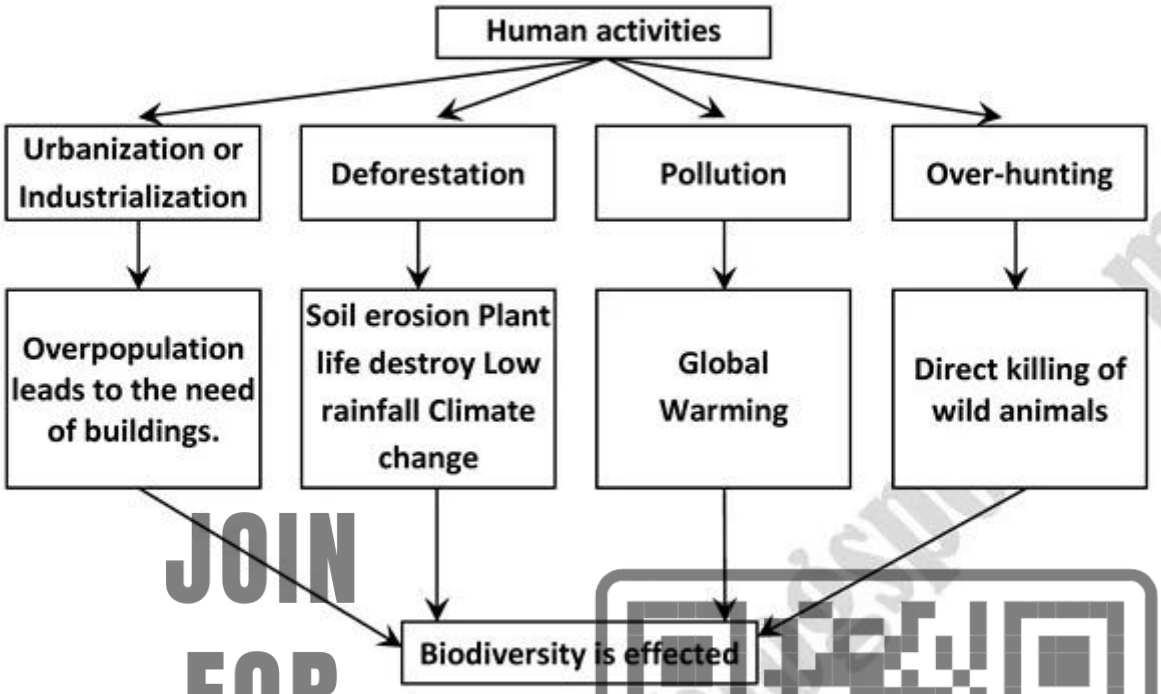
- Lack of awareness of environmental issues on the part of decision-makers and civil society.
- Weak governance (slow decision-making processes, inability to conceptualize policy and lack of distinction between public and private interests).
- Weak capacity of government departments (lack of individual capacity and incentives for performance).
- Lack of funding.

Q.20: Describe the problems associated to conserve biodiversity due to human intervention.

Ans: **Problems Associated to Conserve Biodiversity due to Human Intervention:**

The International Union for Conservation of Nature (IUCN) reported that 75 percent of genetic diversity of agricultural crops has been lost, 75 percent of the world's fisheries are over exploited, and one-third of coral reefs are threatened with extinction. Man is the factor, which is directly involved in the destruction of biodiversity. The table below show some of the human intervention in the loss of biodiversity.

Table: Impact of human activities on Biodiversity.



Climate changes are not the only pressure on our environments. Habitat loss and degradation, pollution, overexploitation, and invasive species also play significant roles in biodiversity decline. These pressures are because of human invading activity.

Q.21: What is deforestation? Describe its causes and effects on biodiversity.

Ans: **Deforestation**: The cutting down of trees for the conversion of forest into non-forest land is known as deforestation.

Forests cover 31% of the land area on our planet. They produce vital oxygen and provide homes for people and wildlife. Many of the world's most threatened and endangered animals live in forests, and billions of people rely on its benefits. Forests offer food, fresh air clothing, medicine and shelter. Forests play a critical role in reducing climate change because they act as a carbon sink soaking up carbon dioxide that would otherwise be free in the atmosphere and contribute to ongoing changes in climate patterns. But man is destroying this natural beauty by cutting them down for his sake and comfort.

Causes of Deforestation: Deforestation is done deliberately due to the mining, pap urbanization, timber, for making roads and agriculture expansion and livestock breeding.

Effects of Deforestation: Deforestation result with the great loss in biodiversity such as: increase in the concentration of green-house gases (carbon dioxide, methane, water vapour, nitrous oxide etc.) which leads to global warming, temperature will be high that cause glaciers melting which is the reason of raising sea level and cause flood. It is also the reason of habitat loss of wild life. Soil erosion, low rainfall due to no transpiration are also the result of deforestation.

Q.22: Write few lines on endangered and extinct species.

Ans: **Endangered and Extinct Species:** Due to human activities such as entertainment or food, animals are becoming endangered (at risk of extinction in future) of some have gone extinct (surety of not finding the last individual that species in ecosystem). Some of the endangered species are mentioned below:

Q.23: Why amoeba is not placed in animal kingdom?

Ans: We can't say amoeba or any other single celled hetrotropic organism as animal because they don't come under the kingdom Animalia. They all comes under Kingdom Protista.

As we consider five kingdom classification system in which following characters were took into account:

1) cell type (prokaryote or eukaryotes)
2) complexity of cell organization (differentiated or non-differentiated)
3) mode of nutrition (autotrophic or hetrotrophic)
4) Reproduction
5) evolutionary relationship.

According to which all such organisms like amoeba, paramaecium, egulena, slime moulds, diatoms, dinoflagellates, etc fall under the kingdom Protista.

Amoeba is a unicellular, made up of only one cell, thus it cannot be an animal.

Explanation: Because animals are multicellular, means that organisms consist of more than one cell.

Q.24: Why cyanobacteria are placed in monera?

Ans: Bacteria are neither plants nor animals and today are placed in a separate kingdom called the Monera. Some bacteria, including the very important cyanobacteria or blue-green algae, are capable of photosynthesis, thereby acting like plants. Bacteria are very simple cells.

Blue-green algae, also called cyanobacteria, any of a large, heterogeneous group of prokaryotic, principally photosynthetic organisms. Algae have since been reclassified as protists, and the prokaryotic nature of the blue-green algae has caused them to be classified with bacteria in the prokaryotic kingdom Monera.

Cyanobacteria are included in Kingdom Monera because they are neither plants nor animals, they are single celled organism and are prokaryotes. They are simplest organism. So, they were placed in Kingdom Monera.

Q.25: Distinguish between the following in tabulated form

(i) Plan't kingdom and Animal kingdom

(ii) Monera and protista

(iii) Fungi and Plantae

Ans: **(i) Difference between Plant Kingdom and Animal Kingdom**

	Plant Kingdom	Animal Kingdom
1.	It has multicellular eukaryote plants.	It has multicellular eukaryote animals.
2.	Presence of cell wall (made up of cellulose.)	Absence of cell wall.
3.	Capable of producing their own food (autotrophic mode of nutrition.)	Depend on others for their food requirements (heterotrophic mode of nutrition.)
4.	Photosynthesis occurrence due to the presence of chloroplast.	Since they are non-green in nature and do not produce chlorophyll, they do not undergo photosynthesis.
5.	They are immobile.	They are mobile.
6.	Can grow throughout their life.	Achieve a maximum size and then stop growing.
7.	Consume carbon dioxide and release oxygen.	Consume oxygen and release carbon dioxide.
8.	Have two sets of chromosomes (diploid.)	Have only one set of the chromosome (haploid.)
9.	Have reserved food in the form of starch.	Have reserved food in the form of glucose.

(ii) Difference between Kingdom Monera and Kingdom Protista

	Kingdom Monera	Kingdom Protista
1.	Monera are unicellular organism's having prokaryotic cellular structure.	Protista are also unicellular organisms though possess eukaryotic cellular organization.
2.	Cellular organelles are absent.	Well defined as well membrane-bounded cellular organelles are present.
3.	Monera are simple in structure, with no complexity.	Protista are complex in structure.

4.	It contains small microorganisms.	It contains organisms that are larger than Monera.
5.	Mitochondria and chloroplast are not present.	Mitochondria present for cellular respiration, chloroplast for photosynthesis.
6.	Moneras does not possess a true nucleus.	Protists have their own nuclei, bounded with nuclear membrane.
7.	Mode of nutrition can be autotrophic or heterotrophic.	Mode of nutrition can be holozoic or parasitic or photosynthetic.
8.	Flagella and cilia are not present in Monera.	Falagella and cilia are used for locomotion in some organisms, some also have pseudopodia.
9.	They are cosmopolitan, which means they are found everywhere.	They are found partially in aquatic environment, moist soil, shady places, etc.

(iii) Difference between Kingdom Fungi and Kingdom Plantae

	Kingdom Fungi	Kingdom Plantae
1.	Fungi are eukaryotic heterophs (without chlorophyll) living either as saprophytes; feeding on dead or decaying matter or as parasites.	Plants are eukaryotic autotrophs (with chlorophyll) therefore they can produce their own food.
2.	Fungi are the decomposers of the ecosystem.	Plants are the producers in an ecosystem.
3.	Fungi cell wall is made up of chitin.	Plant cell wall is made up of cellulose.
4.	Fungi may be septate or aseptate.	Plants have definite cell wall.
5.	Fungi cell may be uninucleate or multinucleate.	Plant cells generally possess single nucleus.
6.	Fungi body is filamentous made up of mycelium and hyphae, non-parachymatous without complex organs or differentiation.	Plant body is differentiated into stem, root and leaf.
7.	In plants, stored food is starch.	In fungi, stored food is glycogen.
8.	Plants reproduce by seeds.	Fungi reproduce by spores.

Biology 9th- Short Question Answers

➔ BIODIVERSITY

CHAPTER# 03

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define and explain 'Classification'.

Ans: **Classification**: Biologists mapped the whole diversity of organisms exist on earth, into simple group. To understand about the characteristics of specific organisms individually, is simply called classification. Classification is actually based on the similar and dissimilar characteristics what organisms shared with each other and by this biologists can easily study and identify the organisms.

Q.2: What is biodiversity?

Ans: **Biodiversity**: Biodiversity is the combination of two words; Bio (life), diversity (variation) thus it is defined as, "The biodiversity or biological diversity is the degree of variation within or among the species exist on different regions of the earth". It is comprised of different organisms such as bacteria, protozoans, algae, fungi, animals and plants.

Q.3: Define taxonomy.

Ans: **Taxonomy**: Biologists classified the organisms in order to make them study easily, so the science of classification is called Taxonomy. (Tazm=group, Nomy=naming)

Q.4: Explain the units of classification.

Ans: **Units of Classification:**

1. **Species:** Species is a group of organisms which can interbreed and produce fertile offspring.
2. **Genus**: Group of closely related species is called genus.
3. **Family**: Group of closely related genera is called family.
4. **Order**: Group of closely related families is called order.
5. **Class**: Group of closely related order is called class.
6. **Phylum**: Group of closely related classes is called phylum.
7. **Kingdom**: Group of closely related phyla is placed together in Kingdom.

Q.5: What do you know about the structure of virus? Why virus is not placed in any kingdom?

Ans: **Structure of Virus**: Virus is non cellular obligate endoparasite (lives inside host cell) It does not have cellular organization but do have nuclear material either DNA or RNA. It has protein coat called capsid that encloses the nucleic acid. It reproduces only inside the host cell. It causes number of diseases in plant like tobacco Mosaic Disease etc. and animals like, cold, flue, dengue, polio, hepatitis, AIDS etc. Due to its non-cellular nature it cannot be placed in any of the five kingdoms.

Q.6: Define conservation of biodiversity.

Ans: **Conservation of Biodiversity**: Conservation of biodiversity simply is the way of caring, saving the species, inhabit on earth from dangers.

Q.7: Write few lines on endangered and extinct species.

Ans: **Endangered and Extinct Species:** Due to human activities such as entertainment or food, animals are becoming endangered (at risk of extinction in future) of some have gone extinct (surety of not finding the last individual that species in ecosystem). Some of the endangered species are mentioned below:

Q.8: Why scientific naming is necessary?

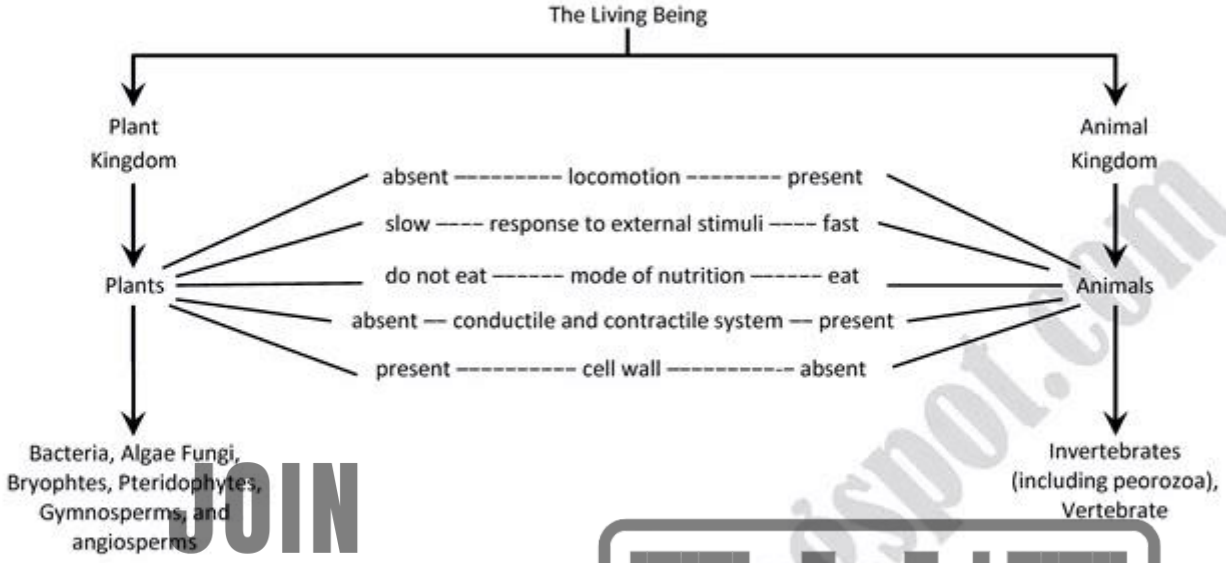
Ans. The advantages of scientific over common names are that they are accepted by speakers of all languages, that each name applies only to one species, and that each species has only one name. As common names cause many problems to identify the organisms as different regions have different languages for the same thing for example; common name of onion in Urdu is "Piyaz" but in other regions it is also known as 'ganda' or 'basal' etc. but in scientific language it is k own as Allium cepa.

Q.9: Why amoeba is not placed in animal kingdom?

Ans. We can't say amoeba or any other single celled hetrotropic organism as animal because they don't come under the kingdom Animalia. They all comes under Kingdom Protista.

Q.10: How living organisms are classified into two kingdom classification?

Ans. Two Kingdom Classification



Q.11: Why virus is not placed in any kingdom?

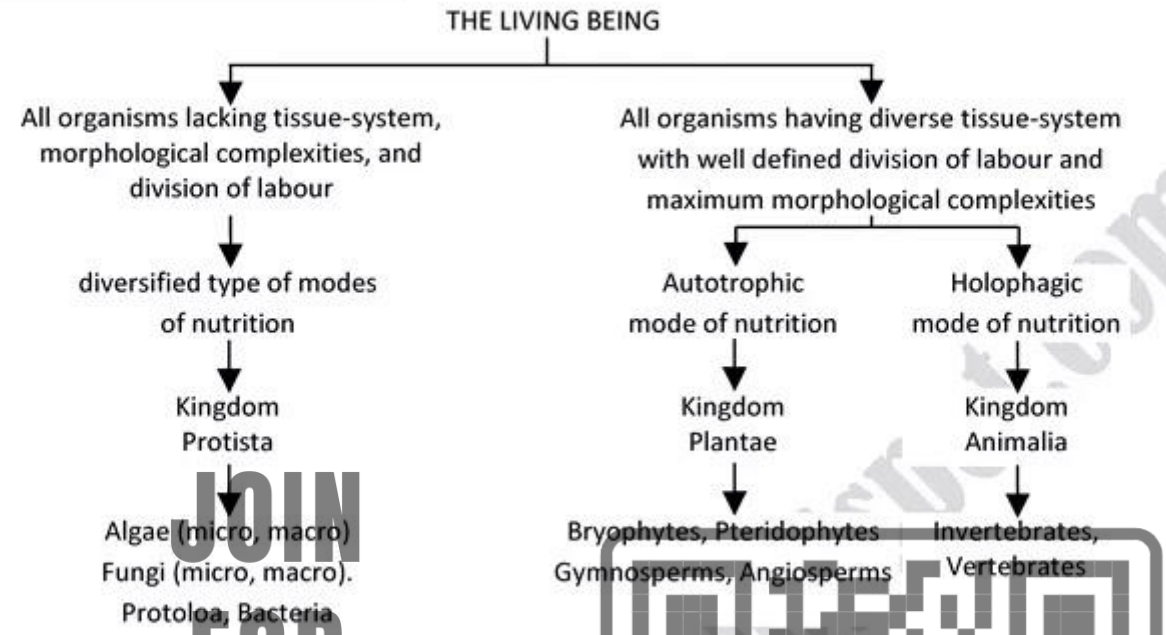
Ans. Virus is non cellular obligate endoparasite (lives inside host cell) it does not have cellular organization but do have nuclear material either DNA or RNA. It has protein coat called capsid that encloses the nucleic acid. It reproduces only inside the host cell. It causes number of diseases in plant like tobacco Mosaic Disease etc. and animals like, cold, flue, dengue, polio, hepatitis, AIDS etc. Due to its non-cellular nature it cannot be placed in any of the five kingdoms.

Q.13: Why cyanobacteria are placed in monera?

Ans. Blue-green algae, also called cyanobacteria, any of a large, heterogeneous group of prokaryotic, principally photosynthetic organisms. Algae have since been reclassified as protists, and the prokaryotic nature of the blue-green algae has caused them to be classified with bacteria in the prokaryotic kingdom Monera.

Q.12: Draw chart showing three kingdom classification.

Ans. Three Kingdom Classification



Biology 9th- Detailed Question Answers

➔ CELLS AND TISSUES

CHAPTER# 04

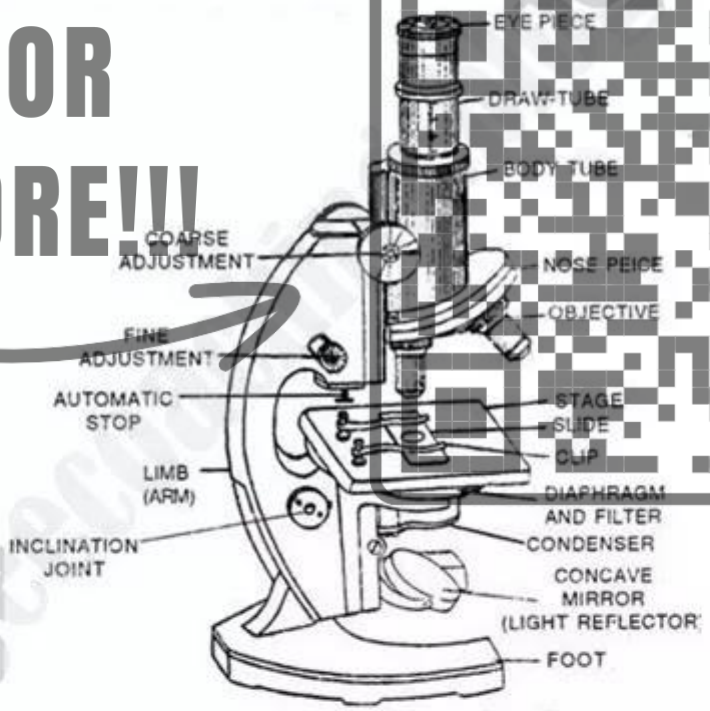
ADAMJEECOACHING.BLOGSPOT.COM

Q.1: What is Cell?

Ans: **Cell**: "All living organisms are composed of cells. It is the basic structural and functional unit of life. It is a set of organelles made up of proteins, carbohydrates, lipids and nucleic acids."

Q.2: What is a microscope? How many parameters are important in microscopy?

Ans: **Microscope**: Microscopes are instruments designed to produce magnified visual or photographic images of objects too small to be seen with the naked eye.



Important Parameters in Microscopy: There are two parameters especially important in microscopy; magnification and resolution.

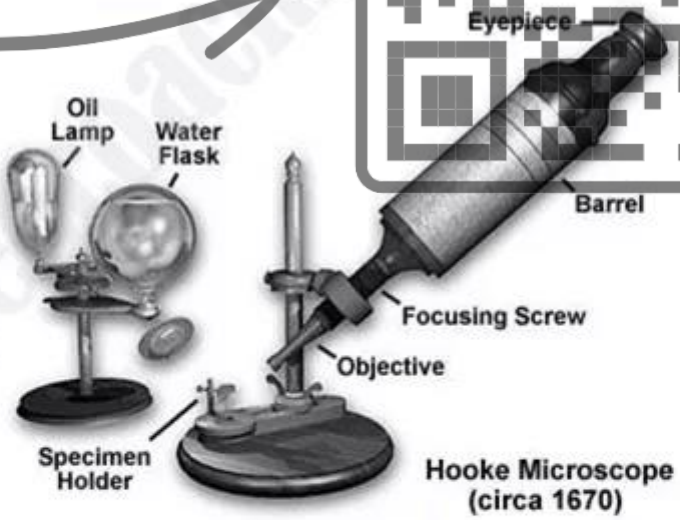
- **Magnification**: The enlargement of an image is called magnification. By combining a number of lenses in the correct manner, a microscope can be produced that will yield very high magnification values.
- **Resolution**: The resolution of a microscope is defined as the smallest distance between two points on a specimen that can still be distinguished as two objects. It helps to measure clarity of object.

Both magnification and resolution are very important if we want a clear picture of something less than 0.1. For example, if a microscope has high magnification but low resolution, all we'll get is a bigger version of a blurry image.

Q.3: Who invented the microscope?

Ans: Zacharias Janssen is generally believed to the first investigator to invent the compound microscope in the 1590. It was simply a tube with lenses at each end and its magnification ranged from 3X to 9X.

Robert Hooke had improved his version of the compound microscope to observe organisms.



Q.4: Describe the types of microscope.

Ans: **Types of Microscope**: There are two types of microscope are used in microscopy:

(i) light microscope (LM)

(ii) electron microscope (EM)

(i) **Light Microscope**: In a light microscope, visible light passes through the specimen. The magnification of a light microscope is formed by using a mixture of the powers of the eye piece and the objective lens.

(ii) **Electron Microscope**: Electron microscope differs from light microscope, that they produce an image of a specimen by using a beam of electrons rather than a beam of light. Electrons have a much shorter wavelength than visible light, and this allows electron microscopes to produce higher resolution images than standard light microscopes. Electron microscopes can be used to examine not just whole cells, but also' the sub-cellular structures and compartments within them. A live cell cannot be imaged by electron microscope.

Electron microscope has a resolution as small as 0.2 nanometer (nm) and magnification upto 250,000 times.

There are two major types of electron microscopes.

(a) Scanning electron microscopy (SEM)

(b) Transmission electron microscopy (TEM)

(a) **Scanning Electron Microscopy (SEM)**: In scanning electron microscopy, a beam of electrons moves back and forth across the surface of a cell or tissue, creating a detailed image of the 3D surface.

(b) **Transmission Electron Microscopy (TEM)**: In transmission electron microscopy, in contrast, the sample is cut into extremely thin slices before imaging, and the electron beam passes through the slice rather than skimming over its surface. TEM is often used to obtained detailed images of the internal structures of cells.

	
Mosquito face under electron Microscope	Electron Microscope

Q.5: Define the following terms:

(i) Specimen (ii) Micrograph

Ans: (i) **Specimen**: It is a biological sample we are looking at.

(ii) **Micrograph**: A photograph of an image taken through a microscope is called micrograph.

Q.6: How can we calculate the total magnification of a compound light microscope?

Ans: In order to ascertain to total magnification when viewing an image with a compound light microscope, take the power of the objective lenses, which is at 4x, 10x, 40x and multiply it by the power of the eye piece which is typically 10x. Therefore, a 10x eyepiece used with a 10x objective lens will produce a magnification of 100x. This means that the object can be magnified, 40x, 100x or 400x.

Q.7: Write the differences between light microscope and electron microscope.

Ans: **Differences Between Light Microscope And Electron Microscope**

	Light Microscope	Electron Microscope
1.	These microscopes use visible light as the source of illumination.	These microscopes use a beam of electrons as a source of illumination.
2.	Light microscope uses glass lenses for magnification.	It uses electromagnetic lenses instead of glass lenses.
3.	The image of the specimen is projected into the human eye.	The image cannot focus in human eye, therefore, screen or photographic plates are used to review and focus the image.
4.	It achieves a resolution above 0.2m.	It achieves a resolution of about 0.2nm, a thousand times improvement over light microscope.

Q.8: Compare resolution with magnification.

Ans.

	Resolution	Magnification
1.	Resolution is the capacity to separate adjacent objects.	Magnification is a means of increasing size of the object.
2.	Resolution is maintained upto certain magnification.	By increasing magnification resolution is disturbed.
3.	Resolution improves with the wave length of light.	Magnification improves with the focal length of the light.

Q.9: Describe the brief history of the development of cell theory.

Ans: History of the Development of Cell Theory: Ancient Greeks were the first to make comprehensive attempts to organize the data of the natural world. Aristotle presented an organized observation to support the idea that all animals and plants are somehow related. Later this idea gave rise to questions like 'is there a fundamental unit of structure shared by all organisms'? But before microscope was first used in 17th century, no one knew that living organisms do share a fundamental unit i.e. cell.

Year	History
1665	Cell was first observed by ***Robert Hooke***, an English scientist, discovered a honeycomb like structure in a cork slice using a primitive compound microscope. He only saw cell walls as this was dead tissue. He coined the term "cell" for these individual compartments he saw.
1670	First living cells were seen by ***Anton van Leeuwenhoek***, a Dutch biologist, from pond I water with a microscope.
1683	**Miniature animals**: ***Anton van Leeuwenhoek*** made several more discoveries on a microscopic level, I eventually publishing a letter to the Royal Society in which he included detailed drawings of what he saw. Among these was the first protozoa and bacteria discovered.
1833	The center of the cell was seen by ***Robert Brown***, an English botanist, discovered the nucleus in plant cells.
1839	**Cell theory:** ***Theodor Schwann***, a German botanist reached the conclusion that not only plants, but animal tissue as well is composed of cells. This ended debates that plants and animals were fundamentally different in structure. He also pulled together and organized previous statement on cells into one theory, which states: 1. Cells are organisms and all organisms consist of one or more cells. 2. The cell is the basic structure unit for all organisms.
1840	***Albrecht von Roelliker*** discovered that sperm and eggs are also cells.
1845	***Carl Heinrich Braun*** reworked the cell theory, calling cells the basic unit of life.
1855	3rd part to the cell theory added by Rudolf Virchow, a German physiologist / physician / pathologist. Added that cell is not Denovo structure. This translates mean that all cells develop only from existing cells.
1862	***Louis Pasteur*** was a French biologist; microbiologist and chemist provided the experimental proof of this idea.

Q.10: How and when cell was discovered?

Ans: Cell was first observed by **Robert Hooke,** an English scientist, discovered a honeycomb-like structure in a cork slice using a primitive compound microscope. He only saw cell walls as this was dead tissue. He found small honey comb like chambers called 'cellula' for these individual compartments he saw which were later called cell by him.

Q.11: Who discovered the neucleus?

Ans: In 1833, Robert Brown, an English botanist, discovered a spherical body called nucleus in the cell of orchids.

Q.12: Who proposed the cell theory? Explain the salient features of cell theory.

Ans: Cell Theory: One of the most important concepts in biology is that a cell is a basic structural and functional unit of living organisms. This is known as a cell theory and was proposed jointly by two scientists in 1839. A Belgian Botanist called Schleiden and the German zoologist called Schwan. In 1855 Rudolf Virchow, a German physicians proposed an important extension of cell theory-that all living cells arise from pre-existing.

The postulates of cell theory are:

(i) All Living organisms are made of one or more cells.
(ii) The cell is the fundamental unit of structure and function in all living organisms.
(iii) The new cell is derived from pre-existing cells dividing into two by cell division.
(iv) The cell contains the hereditary m9terial which is passed from generation to generation.

Q.13: Define Sub-cellular and Acellular Particles.

Ans: **Sub-cellular and Acellular Particles**: According to the first principle of the cell theory all organisms are composed of one or more cells.

Viruses, prions and viroids are not composed of cells rather they are sub-cellular or Acellular particles but do not run any metabolic activity inside them. As they show some characteristics of living organisms i.e. they can increase in number and can transmit their characteristics to the next generations.

- **Sub-cellular Particles**: They are particles smaller than the living cell and are found suspended in the cytosol (of a cell) like the nucleus, Golgi complex and the mitochondria.
- **Acellular Particles:** While acellular particles/organisms are particles that do not have a cell like the viruses, viroids and prions. They are not alive/inactive outside a living environment but become active immediately they are inside a living environment (like a cell).

Q.14: Write a few lines about a cell.

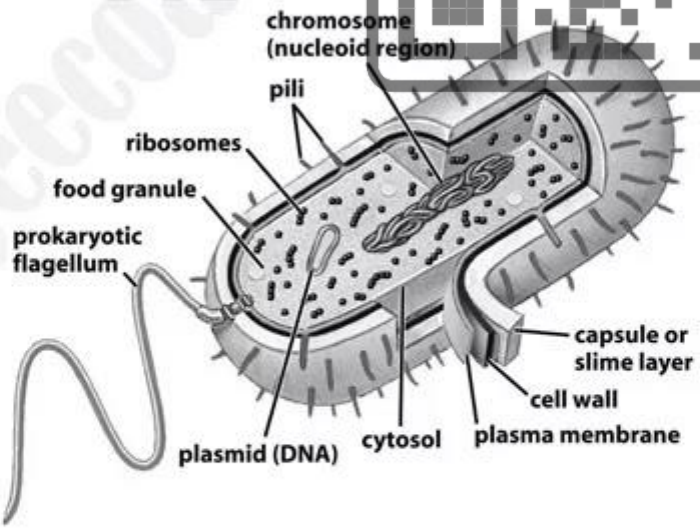
Ans: **Cell** : Cells are the basic units of organisms and all tissues and organs are composed of cells. There are different types of cells. Cells can either be prokaryotic or eukaryotic. Eukaryotic cells are eukaryotes. Plant cells are generally a cubical shape while animal cells are usually spherical. Plants cells and animal cells have evolved different organelles to perform specific functions.

The activity of an organism depends on the total activity of independent cells. Energy flow occurs in cells through the breakdown of carbohydrates by respiration. Cells contain the information necessary for the creation of new cells. This information is known as 'hereditary information' and is contains within DNA. DNA (the hereditary information of cells) is passed from 'parent' cells to 'daughter' cells during cell division.

The contents of cells from similar species are basically the same. Cells are the smallest from of life; the functional and structural units of all living things. Our body contains several billion cells, organized into over 200 major types, with hundreds of cell-specific functions. Some functions performed by cells are so vital to the existence of life that all cells perform them (e.g. cellular respiration). Others are highly specialized (e.g. Photosynthesis).

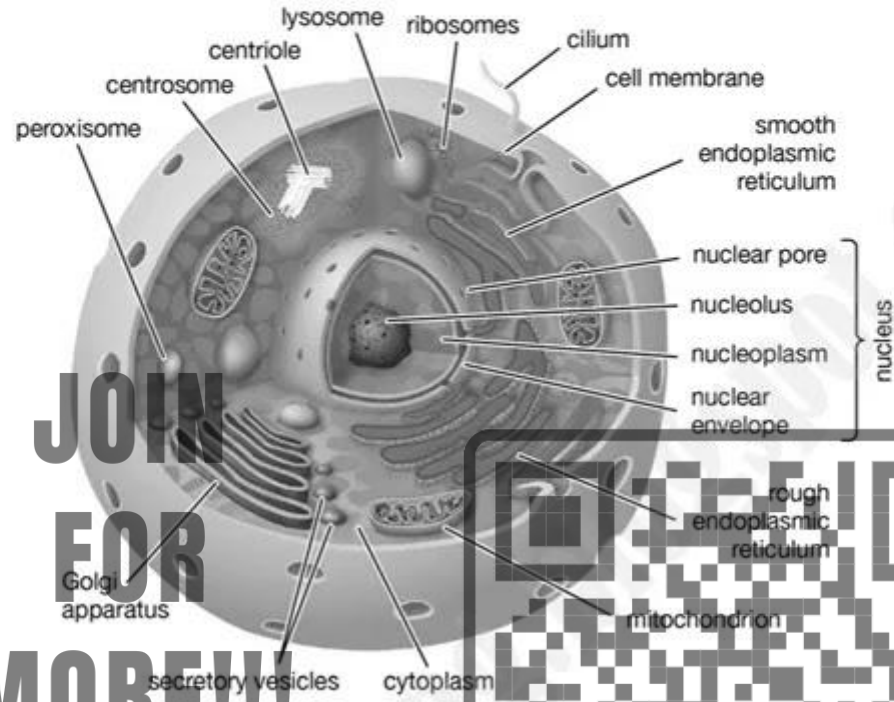
Q.15 How many types of cells are there? Name and define them.

Ans: **Prokaryotes**: Prokaryotes are organisms without a cell nucleus, or any other membrane bound organelles. Most are unicellular, but some prokaryotes are multicellular.



The structure of bacterial (prokaryotes) cell

Eukaryotes: Eukaryotes are organisms whose cells are organized into complex structures by internal membranes and a cytoskeleton; The most characteristic membrane bound structure is the nucleus. Animals, plants, fungi, and protists are eukaryotes.



The structure of an animal (eukaryotic) cell

Q.16: Compare prokaryotes and eukaryotes in tabulated form.

Ans: **Comparison between Prokaryotes and Eukaryotes:**

Cellular Structures	Prokaryotic cell	Eukaryotic cell
Nucleus	Absent	Present
True Membrane Bound Nucleus	Absent	Present
Number of chromosomes	One but not true chromosome Plasmids	More than one
Number of cells	Usually unicellular (some cyanobacteria may be multicellular)	Usually multicellular but few are unicellular
Genetic Recombination	Partial, unidirectional transfers DNA	Meiosis and fusion of gametes
Lysosomes and Peroxisome	Absent	Present

Microtubules	Absent or rare	Present
Endoplasmic reticulum	Absent	Present
Mitochondria	Absent	Present
Cytoskeleton	May be absent	Present
Ribosomes	Smaller 705	Larger 805
Vesicles	Present	Present
Golgi Apparatus	Absent	Present
Chloroplasts	Absent (chlorophyll scattered in the cytoplasm)	Present in plants
Plasma membrane with steroid	Usually no	Yes
Permeability of nuclear membrane	Not present	Selective
Vacuoles	Absent	Present
Cell Size	1-10 µm	1-100 µm
Cell Wall	Usually chemically complex	Only in plant cells and fungi (chemically simpler)
Flagella	Submicroscopic in size, composed of only one fiber	Microscopic in size; membrane bound
Example:	Bacteria and Cyanobacteria	Animals and plants

Q.17: Differentiate between prokaryotic and eukaryotic cell.

Ans:

	Prokaryotic Cell	Eukaryotic Cell
1.	Nuclear membrane is absent therefore prokaryotic cells do not possess distinct nucleus.	A double nuclear membrane is present. They have well defined nucleus.
2.	They do not have many membrane bound structures e.g. Mitochondria, endoplasmic Reticulum, Golgi apparatus etc.	They have membrane bounded structures (organelles).
3.	Ribosomes are of small size and freely scattered in cytoplasm.	Ribosomes are of large size and present either on endoplasmic reticulum or free in cytoplasm.

4.	Nucleoplasm is absent.	Nucleoplasm is present.
5.	Single chromosome is found.	Proper chromosomes in diploid numbers are present.
6.	Respiratory enzymes are located on the inner surface of the cell membrane.	Respiratory enzymes are present in mitochondria.
7.	These cells are simple and comparatively smaller in size i.e. average 0.5-10nm in diameter.	These cells are complex comparatively large in size i.e. 10-100nm in diameter average.
8.	Bacteria and cyanobacteria are examples of Prokaryotes.	Fungi, algae, animal and plants are examples of eukaryotes.

Q.18: Describe the cell as a structural and functional unit of life.

Ans: **Cell as a Structural Unit:**

(i) All living organisms are composed of cells.

(ii) Cells are the unit of structure of living organisms or the building block of which living things are made.

(iii) Cells are of many different shape and sizes.

Cells as a Functional Unit:

(i) Cells have to perform different functions.

(ii) All basic functional activities, characteristics of living things occur in the cell.

(iii) Therefore, cell is a unit of function of all living organisms.

Q.19: Write the differences between plant cell and animal cell.

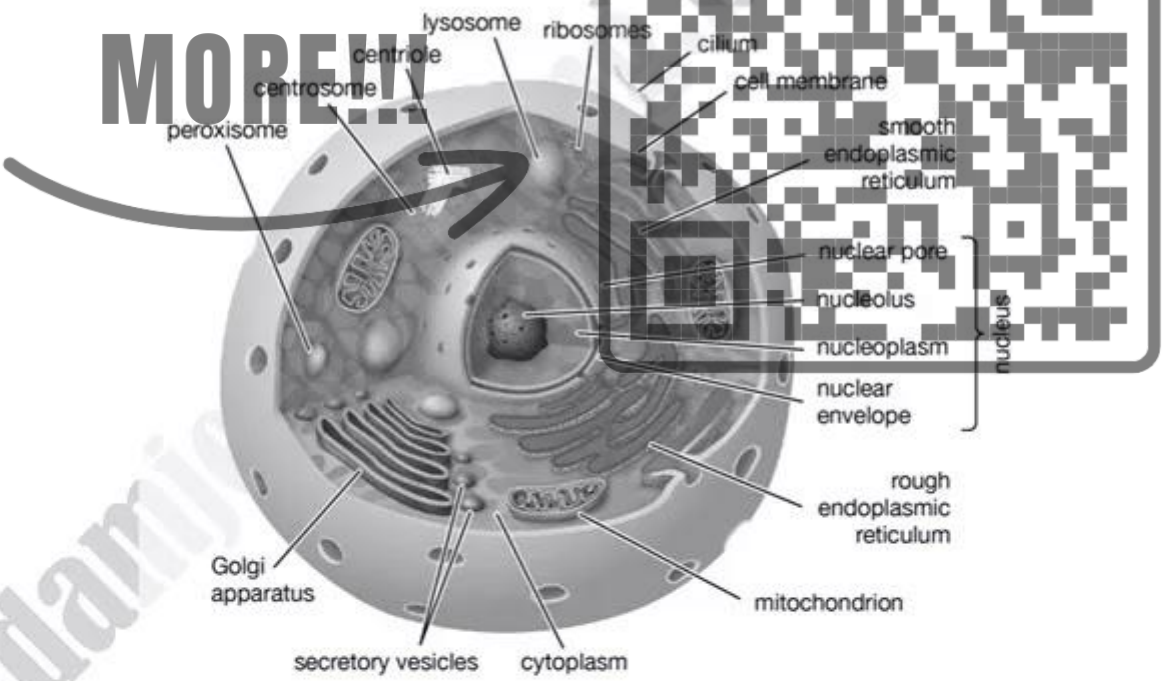
Ans: **Difference Between Animal Cell and Plant Cell:**

	Animal Cell	Plant Cell
1.	A cell wall is absent in animal cell but they have cell membrane which is made up of protein and lipid.	Plant cells have rigid cellulose cell wall in addition to the cell membrane.
2.	Plastids are absent in animal cells.	Almost all plants cells contain plastids such as chloroplasts, chromoplasts and leucoplasts.
3.	Animal cells usually have small vacuoles (if any).	Plant cells have a large central vacuole filled with cell sap in mature cells.
4.	Centrosomes are present in animal cell which help in cell division.	Centrosomes are absent in plant cell.

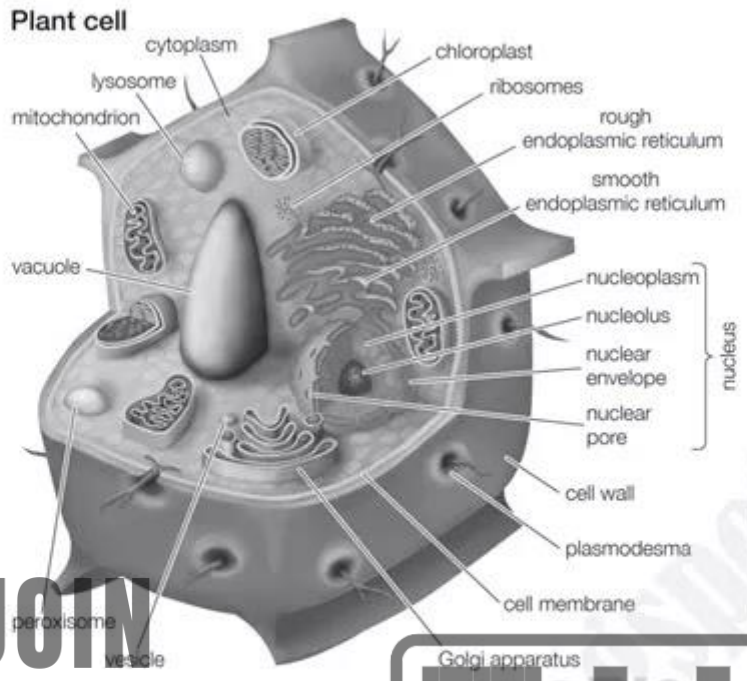
5.	The cytoplasm fills the cell.	Its cytoplasm is reduced to a thin lining.
6.	Animals do not have plasmodesmata or pits.	Plant cells contain plasmodesmata or pits Nucleus if found near the edge or periphery of the mature cell.
7.	Nucleus is generally found at the centre of the cytoplasm.	Plant cells rarely contain Lysosomes as the plant vacuole handles molecule degradation.
8.	Animal cells possess Lysosomes which contain enzymes that digest cellular macromolecules.	Plant cells do not typically contain Centrioles.
9.	Animal cells contain these cylindrical structures that organize the assembly of microtubules during cell division.	Plant cells have rigid cellulose cell wall in addition to the cell membrane.

Q.20: Draw and label plant cell and animal cell.

Ans:



Animal Cell



Plant Cell

Q.21: Name the organelles which are present in a typical cell.

Ans: The organelles of a typical cell are:

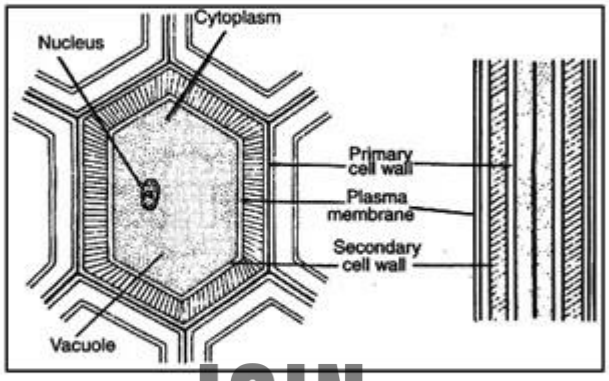
1. Cell wall (only in plant cell)
2. Cell Membrane
3. Nucleus
4. Cytoplasm: It Contains

(i) Mitochondria (ii) Endoplasmic Reticulum
(iii) Golgi bodies (iv) Ribosomes
(v) Centrioles (only in animal cell) (vi) Plastids (only in plant cell)
(vii) Vacuoles

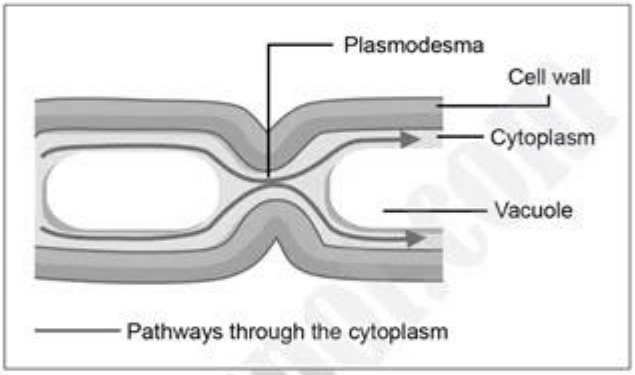
Q.22: Explain the structure and function of cell wall.

Ans: A cell wall is a tough, rigid non-living and permeable protective layer in some cell types. This outer covering is positioned next to the cell membrane (plasma membrane) in plant cells, fungi, algae and bacteria. The cell wall has many important functions in a cell including protection, structure and support.

Composition of Cell Wall: Cell wall composition varies depending on the organism. In plants, the cell wall is composed mainly of strong fibers of cellulose. Bacterial cell walls are composed of a -sugar and amino acid called Peptidoglycan. The main components of fungal cell walls are chitin, glucans and proteins. In plants, the wall is composed of o



structure of the cell wall



cell wall showing plasmodesma

Structure of Cell Wall: It may consist up to three layers that help to support the plant. These layers include the middle lamella, the primary cell wall and the secondary cell wall.

Middle lamella: It separates one cell from another. It is a thin membranous layer on the outer side of the cell and is made of a sticky substance called pectin and cellulose.

Primary Cell Wall: It lies on the inside of the middle lamella and is mainly composed of cellulose.

Secondary Cell Wall: It lies alongside the cell membrane. It is made up of a thick and tough material of cellulose which is held together by a hard, water proof substance called lignin. It is only found in cells which· provide mechanical support in plants, i.e. some cells of xylem like tracheid and vessel.

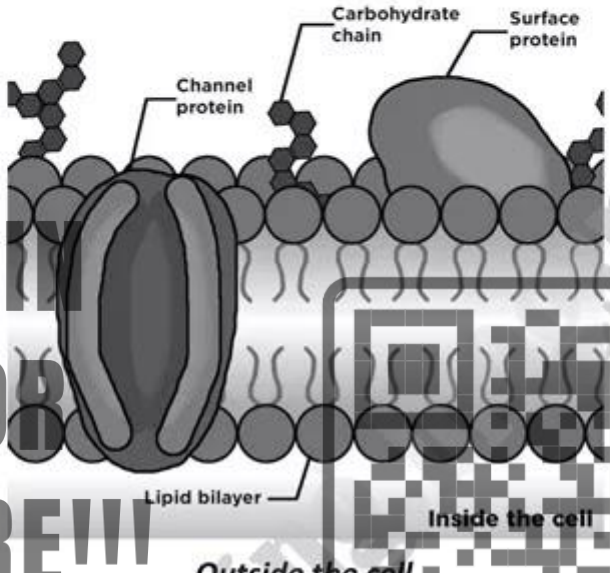
The opening in the cell wall is called plasmodesmeta which contain strands of cytoplasm that connect adjacent cells. This allows cells to interact with one another, allowing molecules to travel between plant cells.

Functions of Cell Wall: The main function of the wall is to protect the inner part of the plant cell, it gives plant cells a more uniform and regular shape and provides support for the plant body. The cell wall is completely permeable to water and mineral salts which allows distribution of nutrients throughout the plant.

Q.23: Explain the structure and function of cell membrane.

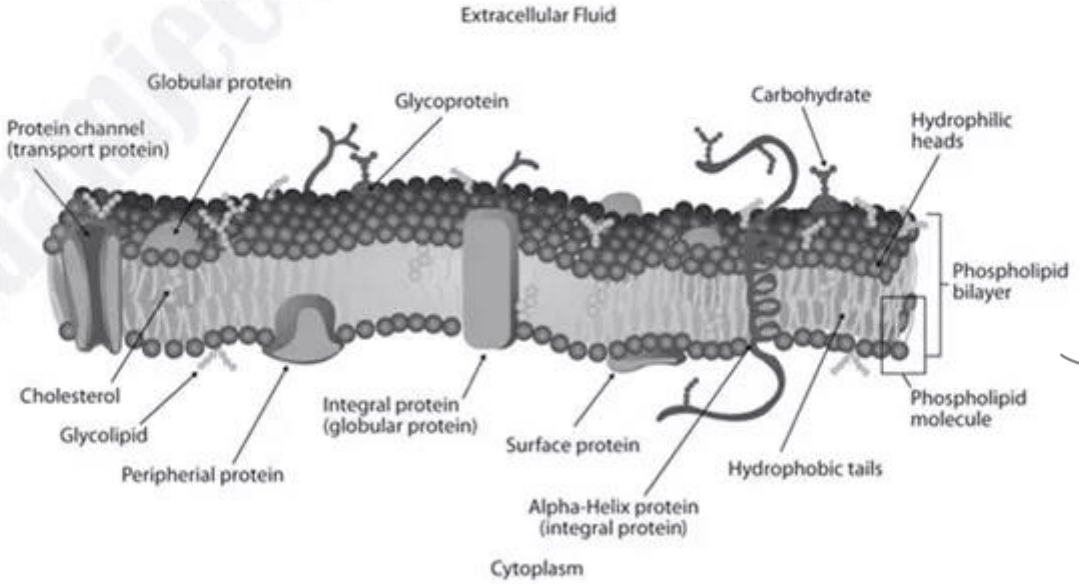
Ans: The cell membrane is the outer most living boundary of all cells. The cell membrane, also called the plasma membrane, physically separates the intracellular space (inside the cell) from the extracellular environment (outside the cell). The cell membrane surrounds and protects the cytoplasm.

The cell membrane is composed of a double layer (bilayer) of special lipids called phospholipids.



Q.24: Describe the fluid mosaic model.

Ans: S. J. Singer and G. L. Nicolson proposed the Fluid Mosaic Model of the cell membrane in 1972. This model describes that phospholipids acting like matrix and conjugated glycolproteins (glucose and protein together) may float freely in this matrix.



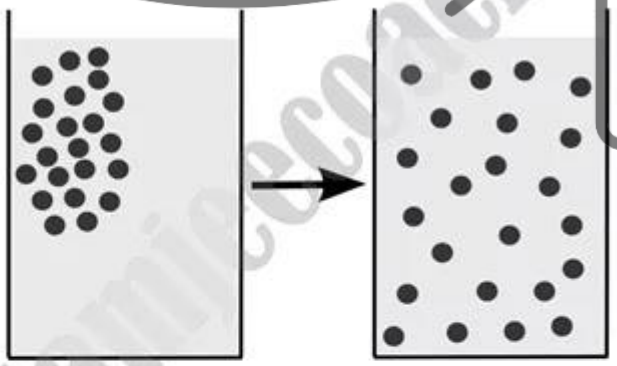
This model describes the structure of the cell membrane as a fluid structure with various protein and carbohydrate components floating freely in the membrane. All the exchange between the cell and its environment have to pass through the cell membrane. The cell membrane is selectively permeable to ions (e.g. hydrogen, sodium), small molecules (oxygen, carbon dioxide) and larger molecules (glucose and amino acids) and controls the movement of substances in and out of the cells. It performs many important functions within the cell such as osmosis, diffusion, transport of nutrients into the cell, processes of ingestion and secretion.

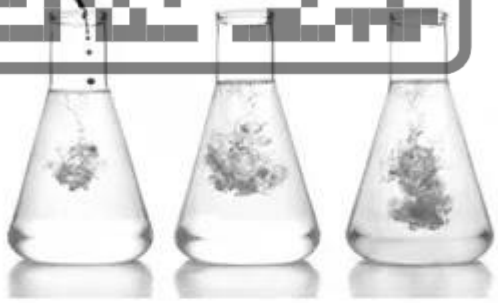
Q.25: How does movement across the cell membrane occur?

Ans: **Movement Across the Membrane**: Movement of substances across cell membranes is necessary as it allows cells to acquire oxygen and nutrients, excrete waste products and control the concentration of required substances in the cell (e.g. oxygen, water, hormones, ions, etc). This movement occurs by diffusion, osmosis, facilitated diffusion and active transport.

Diffusion: Diffusion is the movement of substance from a region of high concentration to low concentration. It is therefore said to occur down a concentration gradient. Diffusion is a passive process which means it does not require any energy input. It can occur across a living or non-living membrane and can occur in a liquid or gas medium.

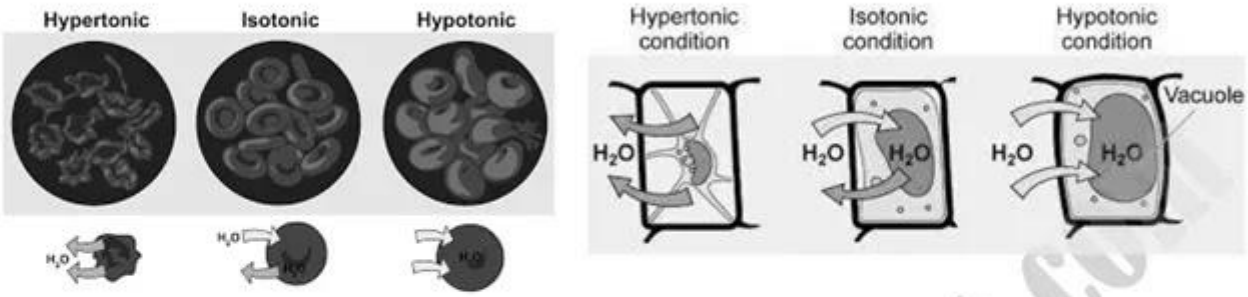
Examples: Diffusion of carbon dioxide, oxygen, water and other small molecules those are able to dissolve within the lipid bilayer.





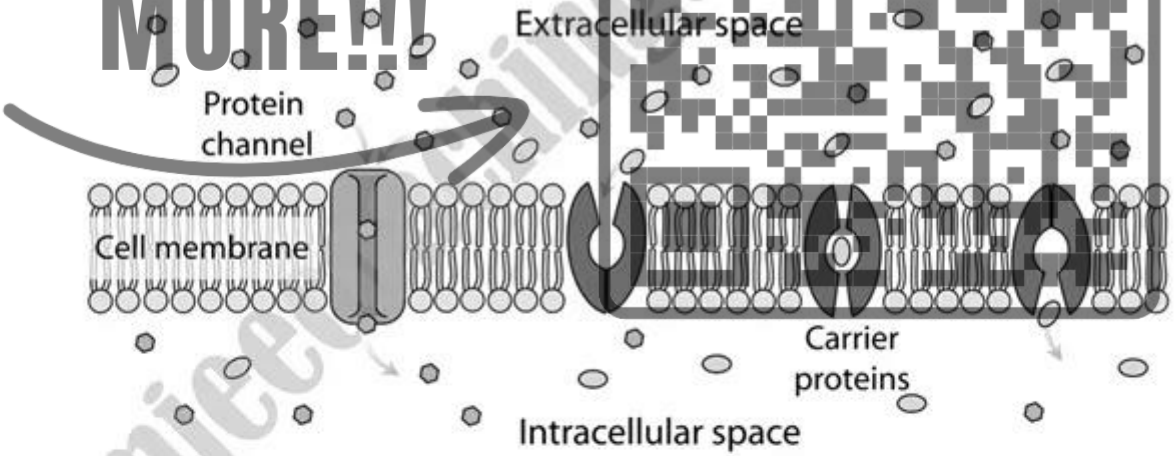
Osmosis: Movement of water always occurs down a concentration gradient, i.e., from dilute solution of concentrated solution. Osmosis is also passive process and does not require any input of energy. Cell membranes allow molecules of water to pass through, but they do not allow molecules of most dissolved substance, e.g. salt and sugar, to pass through it.

In biological systems, osmosis is vital to plant and animal cell survival. Following figure demonstrates how osmosis affects red blood cells and plant cell, when they are placed in three different solutions with different concentrations.

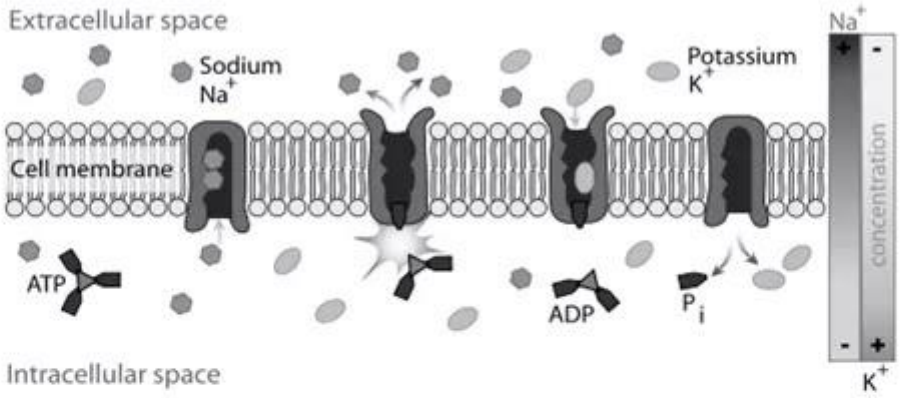


Plant cells use osmosis to absorb water from the soil and transport it to the leaves. In hypertonic conditions a plant cell loses water and cytoplasm shrinks and shrinkage of cytoplasm called plasmolysis. Osmosis in the kidneys keeps the water and salt level in the body and blood at the correct levels.

Facilitated Diffusion: Facilitated diffusion is a special form of diffusion which allows rapid exchange of specific substance. Particles are taken up by carrier proteins which change their shape as a result. The change in shape causes the particles to be released on the other side of the membrane.



Active Transport: Active transport is the movement of substance against a concentration gradient, from a region of low concentration to high concentration using an input of energy. In biological systems, the form in which this energy occurs in adenosine triphosphate (ATP). Examples of substance moved include sodium and potassium ions as shown in the figure.



ATP and ADP are molecules involved with moving energy within cells.

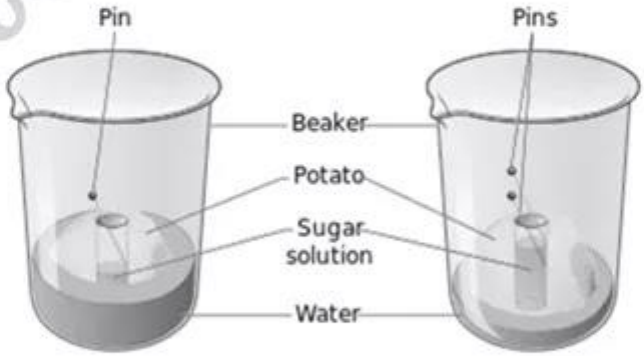
Activity: Predicting the direction of osmosis apparatus:

* Beaker * Large potato * Potato peeler/scalpel * Pins

* Concentrated sucrose/sugar solution. To obtain this, add 100g of sugar to 200ml of water

Procedure:

1. Peel off the skin of a large sized potato with a scalpel/potato peeler.
2. Cut is one end to make the base flat.
3. Make a hollow cavity in the potato almost to the bottom of the potato.
4. Add the concentrated sugar solution into the cavity of the potato, filling it about half way. Mark the level by inserting a pin at the level of the sugar solution (insert the pin at an angle into the cavity at the level)(A).
5. Carefully place the potato in the beaker containing water.
6. Observe what happens to the level of the sugar solution in the potato.
7. After 15 to 20 minutes, mark the level by inserting the second pin at the level of the sugar solution (insert as the first pin)(B).



(A) Before Osmosis (B) After Osmosis

Q.26: Describe the composition and function of cytoplasm.

Ans: **Cytoplasm**: The cytoplasm is the jelly-like substance that fills the cell. It consists of up to 90% water. It also contains dissolved nutrients and waste products.

Functions: Its main function is to hold together the organelles which make up the cytoplasm. It also nourishes the cell by supplying it with salts and sugars and provides a medium for metabolic reactions to occur.

Q.27: What is the composition and function of cytoskeleton?

Ans: **Cytoskeleton**: A microscopic network of protein consists of microtubules an various filaments that spread out through are cytoplasm. Microtubules are made of tubulin while filaments made up of active protein.

Function: It provides both structural support and means of transport within the cell.

Q.28: Write a note on nucleus.

Ans: **Nucleus or Karyon**: It is the most important, the largest and visible organelle of a cell. It is present in the centre of the animal cell. It contains the entire cell's genetic information in the form of DNA. The presence of a nucleus is the primary factor that distinguishes eukaryotes from prokaryotes. It consists of the following four parts:

(i) Nuclear Membrane (ii) Nucleoplasm
(iii) Nucleolus (iv) Chromosome

(i) **Nuclear Membrane**: Nucleus is covered by two phospholipids membranes known as nuclear envelope that separates the nucleus and its contents from the cytoplasm. Nuclear pores are found in the nuclear envelope and help to regulate the exchange of materials (such as RNA and proteins) between the nucleus and the cytoplasm.

Function: Various materials diffuse in and out of the nucleus through this membrane.

(ii) **Nucleoplasm**: Inside nuclear envelope, granular fluid is present called nucleoplasm. It contains nucleoli and a network of thread like structures called chromatin network. The genetic material is found in chromatin network.

Function: It has few complex and important materials which help in the synthesis of DNA and RNA.

(iii) **Nucleolus**: In nucleus an aggregation of RNA is also present called nucleolus. It is a small rounded body. It has no membrane.

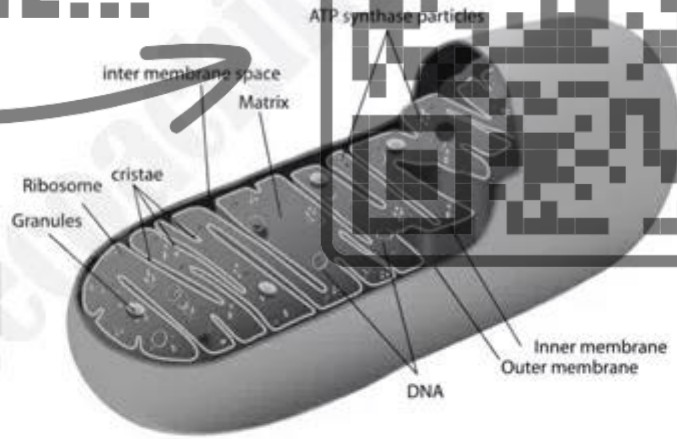
(iv) **Chromosomes**: They are large, elongated and thread like structures. They are composed of Deoxyribonucleic Acid (DNA) and protein. The number of chromosomes in the cells of all individuals of the same species always remains the same.

Function: They play significant role in the inheritance of characters as well as in controlling or regulating the cell activities.

Q.29: Explain the structure and function of mitochondria.

Ans: **Mitochondria**: A mitochondrion is a membrane bound organelle found in eukaryotic cells. Mitochondria contain two phospholipid bilayers: there is an outer membrane, and an inner membrane. The inner membrane contains many folds called cristae which contain specialized membrane proteins that enable the mitochondria to synthesize ATP. Inside the inner membrane is a jelly-like fluid called matrix.

Function: Mitochondria play an important role in respiration. They contain enzymes which break the food for the production of energy.



Q.30: Why mitochondria is also called power house of cell?

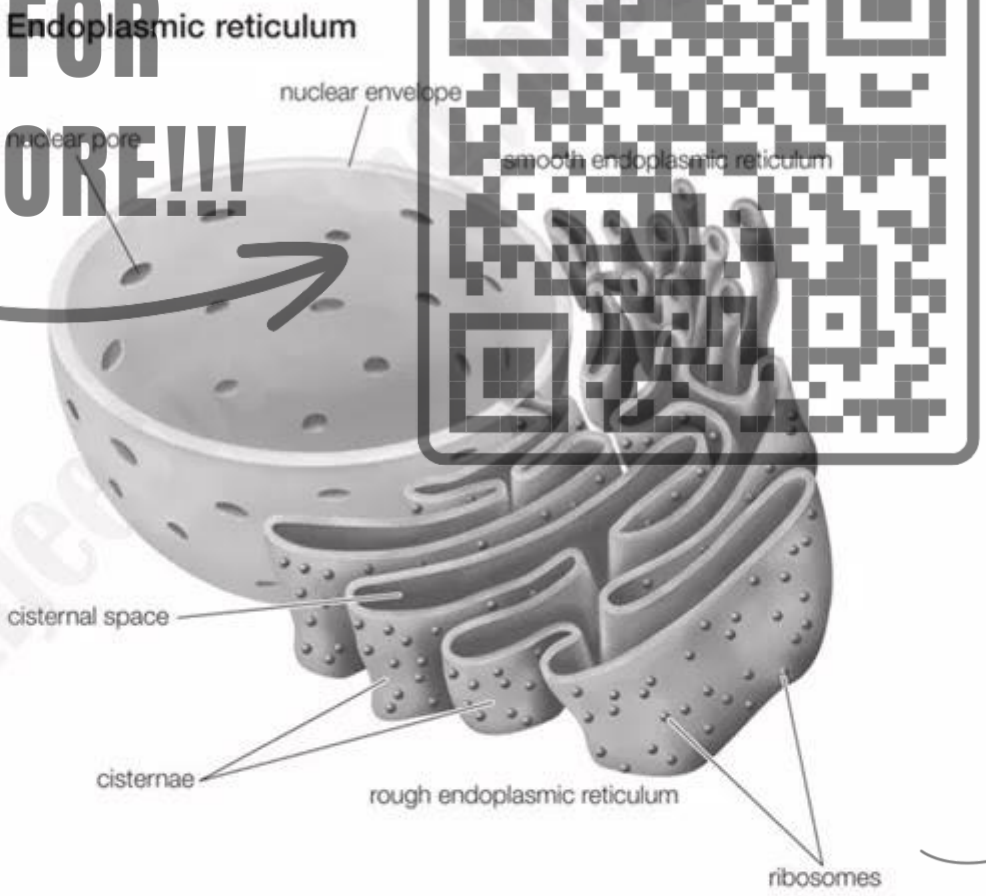
Ans: Mitochondria is the site of aerobic respiration. During aerobic respiration energy is produced in the form of ATP. Therefore the mitochondria is also called "Power House" of cell.

Q.31: Write a note on Endoplasmic Reticulum.

Ans: **Endoplasmic Reticulum**: The endoplasmic reticulum (ER) is an organelle found in eukaryotic cells only. The ER has a double membrane consisting of a network of hollow tubes, flattened sheets and round sacs. These flattened, hollow folds and sacs are called cisternae. The ER is located in the cytoplasm and is connected to the nuclear envelope. There are two types of endoplasmic reticulum: smooth and rough ER.

Smooth Endoplasmic Reticulum: It does not have any Ribosomes attached. It is involved in the synthesis of lipids, including oils, phospholipids and steroids. It is also responsible for metabolism of carbohydrates, regulation of calcium concentration and detoxification.

Rough Endoplasmic Reticulum: It is covered with Ribosomes giving the endoplasmic reticulum its rough appearance. It is responsible for protein synthesis and plays a role in membrane production. The folds present in the membrane increase the surface area allowing more Ribosomes to the present on the ER, thereby allowing greater protein production.

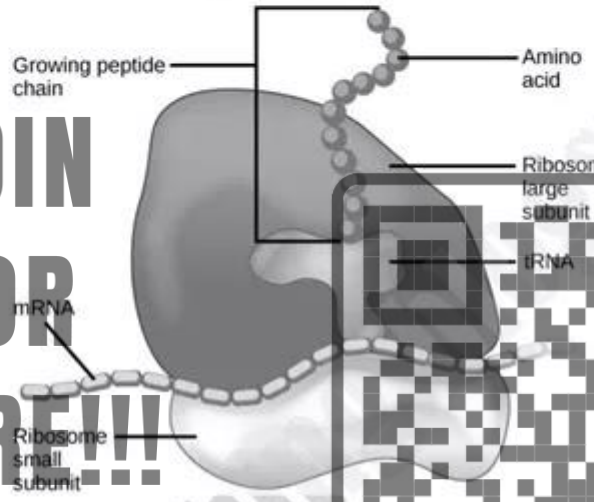


Q.32: Describe the structure and function of Ribosomes.

Ans: **Ribosomes**: They are tiny granular structures which are not bounded by membrane. They are composed of RNA and protein. Ribosomes may occur singly in the cytoplasm or in groups or may be attached to the endoplasmic reticulum thus forming the rough endoplasmic reticulum.

Function: They occur in the cytoplasm and are the sites where protein synthesis occurs. Therefore, they are called protein factories of the cell.

Diagram of Ribosome

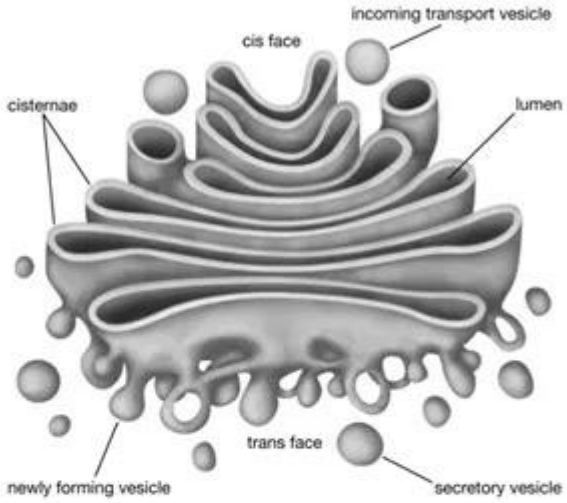


Q.33: Write a note on Golgi Body.

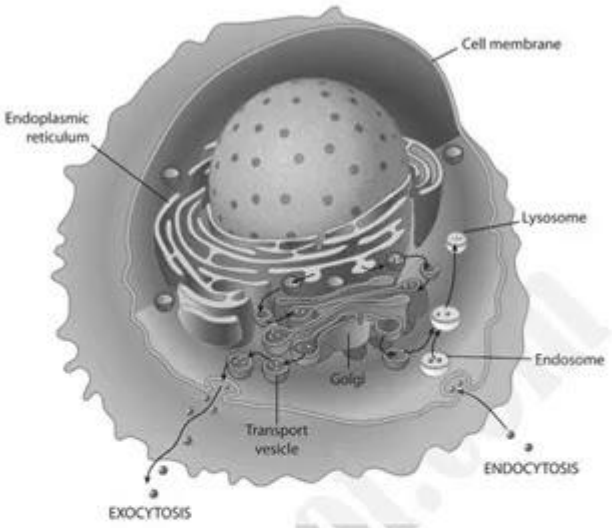
Ans: **Golgi Body**: The Golgi body was discovered by the Italian physician Camillo Golgi. It was one of the first organelles to be discovered and described in detail because its large size made it easier to observe. It is important for proteins to be transported through Golgi body from where they are synthesized to where they are required in the cell. The Golgi body is the sorting organelle of the cell.

The Golgi body consists of a stack of flat membrane-bound sacs called cisternae. The cisternae within the Golgi body consist of enzymes which modify the packaged products of the Golgi body.

Function: Proteins are transported from the rough endoplasmic reticulum (RER) to the Golgi. In the Golgi, proteins are modified and packaged into vesicle. The Golgi body therefore receives proteins made in one location in the cell and transfers these to another location within the cell where they are required. For this reason the Golgi body can be considered to be the 'post office' of the cell.



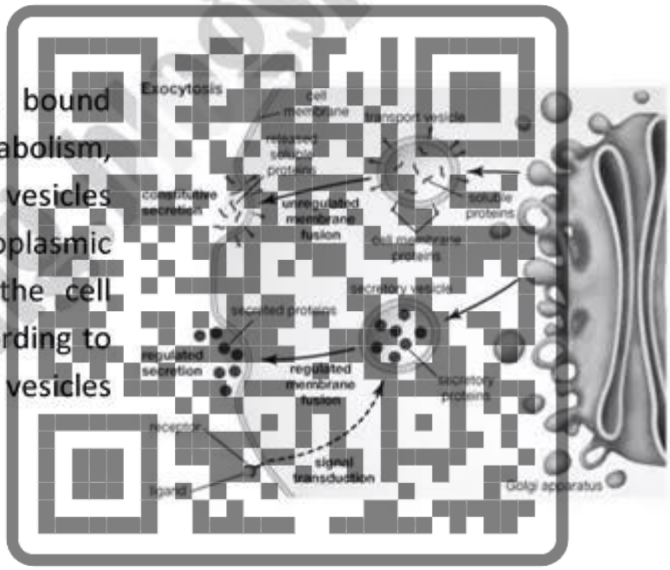
Golgi Apparatus



Golgi Body in a Cell

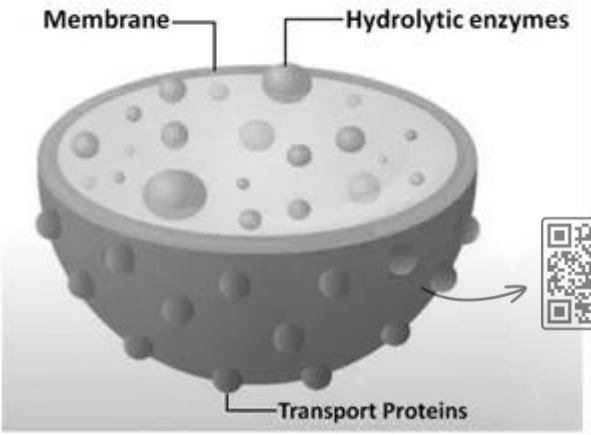
Q.34: What do you know about vesicles?

Ans. **Vesicles**: They are small, membrane bound spherical sacs which facilitate the metabolism, transport and storage of molecules. Many vesicles are made in the Golgi body and the endoplasmic reticulum, or are made from parts of the cell membrane. Vesicles can be classified according to their contents and function. Transport vesicles transport molecules within the cell.



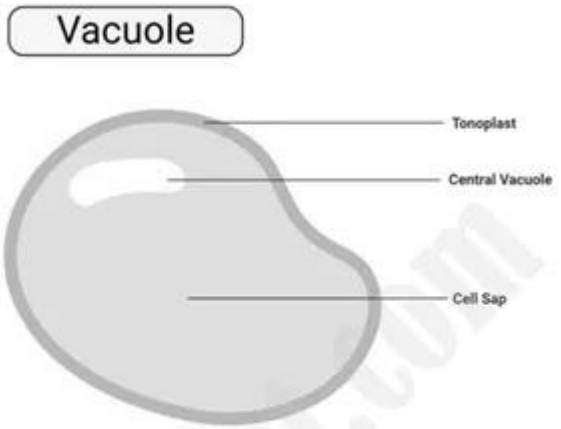
Q.35: Write few lines about Lysosomes

Ans: **Lysosomes**: They are formed by the Golgi body and contain powerful digestive enzymes that can potentially digest the cell. These powerful enzymes can digest cell structures and food molecules such as carbohydrates and proteins. Lysosomes are abundant in animal cells that ingest food through food vacuoles. When a cell dies, the lysosome releases its enzymes and digests the cell.



Q.36: Explain the structure and function of Vacuoles.

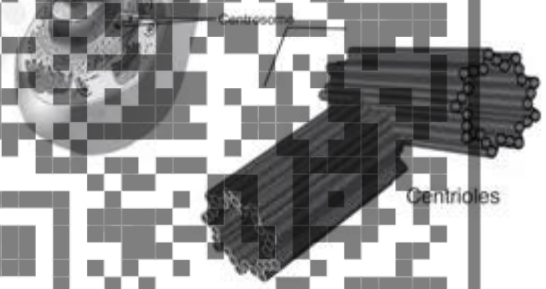
Ans: **Vacuoles**: Vacuoles are fluid-filled spaces that occur in the cytoplasm of plant cells, but are very small or completely absent in animal cells. Plant cells generally have one large vacuole that takes up most of the cell's volume in mature cell. A selectively permeable boundary called the tonoplast, surround the vacuole. The vacuole contains cell sap which is a liquid consisting of water, mineral salts, sugars and amino acids.



Function: The vacuole plays an important role in hydrolysis, excretion of cellular waste, substances.

Q.37: Explain the structure and function of Centrioles.

Ans. **Centrioles**: Animal cells contain a special organelle called a centriole. The centriole is a cylindrical tube-like structure that is composed of 27 microtubules arranged in a very particular pattern of triplets in rows. The site where two centrioles arranged perpendicular to each other are referred to as a centrosome. The centrosome plays a very important role in cell division. The centrioles are responsible for organizing the microtubules that position the chromosomes in the correct location during cell division.

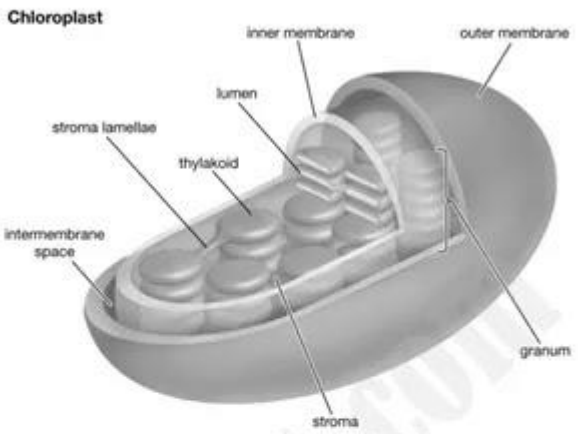


Q.38: Define Plastids and its types.

Ans: Plastids: Plastids are large cytoplasmic and major organelles found in the cells of plants and algae. Plastids are the site of manufacture and storage of important chemical compounds used by the cell. Plastids often contain pigments used in photosynthesis, and the types of pigments present can change or determine the cell's colour. There are different types of plastids:

(i) Chloroplast (ii) Chromoplast (iii) Leucoplast

(i) **Chloraplasts**: This is the most important type of plastid. Green-coloured plastids found in plants and algae. These are present in the green parts of the plant particularly in leaves. The chloroplast is a double-membraned organelle. Within the double membrane is a gel-like substance called stroma. Stroma contains enzymes for photosynthesis. Suspended in the stroma are stack life structures called grana (singular=granum). Each granum is a stack of thylakoid discs. The chlorophyll molecules (green pigments) are found on the surface of the thylakoid discs.



Function: Chlorophyll absorbs energy from the sun for photosynthesis and manufacture carbohydrates by the process of photosynthesis.

(ii) **Chromoplasts**: They have colouered pigments other than green such as red, orange or yellow. These are present in the petals of the flower, in the ripened fruit pigments, flowers of autumn leaves and other coloured parts of plant.

Function: Their function is to help the plant in pollination and dispersal of fruits.

(iii) **Leucoplasts**: They are colourless, triangular and tabular or of any other shape plastids. They are found in the cells of underground parts of plants.

Function: They store food in roots in the form of starch.

Q.39: Why iodine used to stain the onion peel?

Ans. Iodine is often used to stain onion cells before microscopic examination to enhance the visibility of the cell. It is used in staining cells of an onion peel on the slide due to following reason.

- Onion bulb is made up of scaly leaves which store starch granules in their cytoplasm of the cells.
- Iodine binds to starch in the granules and develops blue black colour.
- This procedure of staining onion cells with iodine makes the onion cells visible clearly. It also confirms the fact that onion stores reserve food material in the form of starch.

Q.40: Why cell membrane is semipermeable in nature?

Ans. Plants and animals are made up of cells. It is here that we find the most common example of a semipermeable membrane in action - a process called osmosis. Cells are surrounded by membranes. These membranes are made up of phospholipids (a type of lipid or fat) and proteins. Cell membranes are semipermeable, which means molecules can move through them. This is pretty important for cells to survive.

Q.41: What is the difference between cell wall and cell membrane?

Ans. **Difference between cell wall and cell membrane**

	Cell Wall	Cell Membrane
1.	It is the outer most boundary of plant cells, bacterial cells and fungal cells.	It is the membrane which surrounds cytoplasm, but in plant cell it is surrounded by cell wall.
2.	It is mainly composed of cellulose and pectin.	It is mainly composed of lipids and proteins.
3.	It is made up of three main layers primary wall, middle lamella, secondary wall.	It is made up of protein and lipid bilayer in which protein molecules float.
4.	It is permeable membrane. It gives definite shape and rigidity to plant.	It is selectively permeable membrane; In animal cells infolds of cell membrane take in materials in the form of vacuole.

Q.42: Write the differences between Mitochondria and Plastids.

Ans. **Differences between Mitochondria and Plastids**

	Mitochondria	Plastids
1.	Mitochondria are found in both animal and plant cells.	Plastids are found in the cells of higher plants.
2.	They do not contain pigments.	They contain different types of pigments.
3.	They produce energy.	They capture (use) energy.
4.	They contain enzymes which break the food.	They do not contain enzymes.
5.	They help in respiration.	They help in photosynthesis.
6.	They have no types.	There are three types of plastids.

Q.43: Distinguish between Lysosome and Ribosomes.

Ans: Difference between Lysosome and Ribosome.

	Ribosomes	Lysosomes
1.	They are found in both prokaryotic and eukaryotic cells (plant and animal cells).	They are found only in eukaryotic cells or animal cells.
2.	It is not enclosed by a membrane.	It is enclosed by a membrane.
3.	It is comparatively smaller in size than lysosomes, its size ranges from 20 to 30 nm.	It is larger in size than ribosomes, It size ranges from 0.1 to 1.2 micrometer.
4.	It is made of rRNA and ribosomal proteins.	It is made of membrane proteins and digestive enzymes.
5.	It can be found in the cytoplasm either bound to the endoplasmic reticulum or scattered in the cytoplasm.	It is evenly distributed in the cytoplasm.
6.	It has two subunits: small and large subunit.	It lacks the segments.
7.	It is actively involved in the translation of mRNAs.	It is involved in intracellular digestion.
8.	It is a macromolecule.	It is a cell organelle.
9.	It plays an important role in protein synthesis.	It plays an important role in intracellular digestion and destroys the dead cells.

Q.44: Explain cell size and shape and relate them with its surface area and volume ratio.

Ans: Volume Ratio: Cells are microscopic mostly because of this constraint; there are some physiological limits to how big a cell can grow. The scale, or size of a cell compared to other objects, is incredibly small.

The smallest cells are bacteria called mycoplasmas, with diameter between 0.1µm to 1.0µm. The bulkiest cells are bird eggs, and the longest cells are some muscle cells and nerve cells. Most cells lie between these extremes. Cell size and shape are related to cell function. Bird eggs are bulky because they contain a large amount of nutrient for the developing young. Long muscle cells are efficient in pulling different body parts together. Lengthy nerve cells can transmit messages between different parts of body. On the other hand, small cell size also has many benefits. For example human red blood cells are only 8 µm in diameter and therefore can move through our tiniest blood vessels i.e. capillaries. Most cells are small in size. In relation of their volumes, large cells have less surface area as compared to small cells. The given figure shows this relationship using cube-shaped

cells. The figure shows 1 large cell and 27 small cells. In both cases, the total volume is same.

Volume = 30 µm x 30 µm x 30 µm = 27,000 µm^3

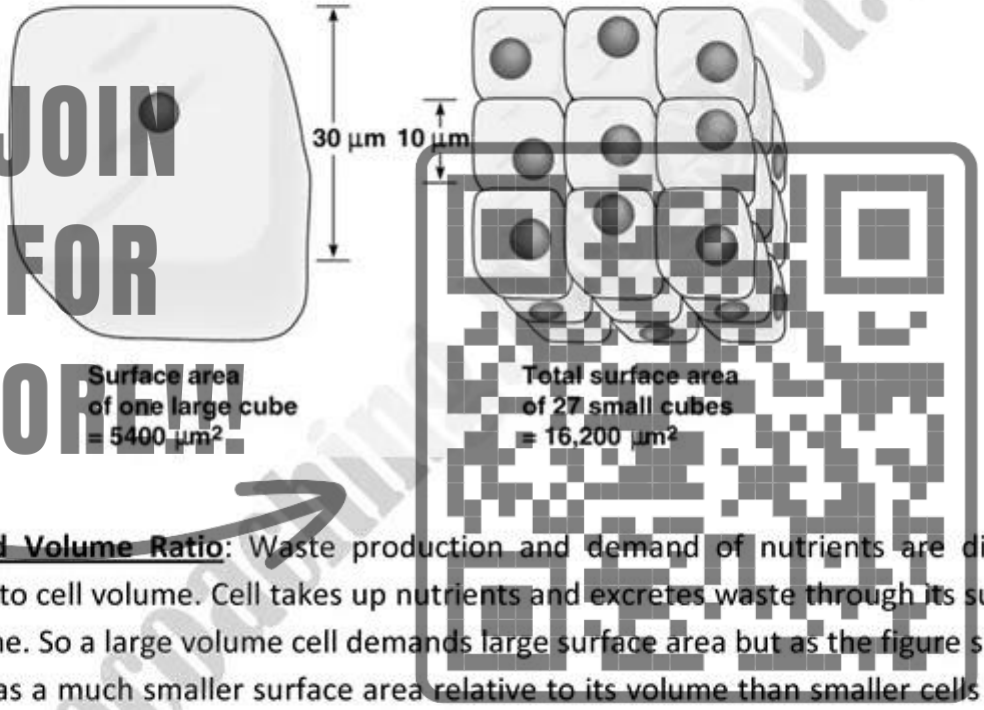
In contrast to the total volume, the total surface areas are very different. Because a cubical shape has 6 sides, its surface area is 6 times the area of 1 side.

The surface areas of cubes are as follows:

Surface area of 1 large cube = 6 x (30 µm x 30 µm) = 5400 µm^2

Surface area of small cube = 6 x (10 µm x 10 µm) = 600 µm^2

Surface area of 27 small cubes = 27 x 600 µm^2 = 16,200 µm^2



Cell Size and Volume Ratio: Waste production and demand of nutrients are directly proportional to cell volume. Cell takes up nutrients and excretes waste through its surface cell membrane. So a large volume cell demands large surface area but as the figure shows, a large cell has a much smaller surface area relative to its volume than smaller cells have. Each internal region of the cell has to be served by part of the cell surface. As a cell grows bigger, its internal volume enlarges and the cell membrane expands. Unfortunately, the volume increases more rapidly than does the surface area, and so the relative amount of surface area available to pass materials to a unit volume of the cell steadily decreases. Hence we conclude that the membranes of small cells can serve their volumes more easily than the membrane of a large cell.

In life sciences it is important to note that whenever a structure has an increased surface area, there is an increase in the functioning of that structure.

Activity 1: Examining Plant Cells Under the Microscope:

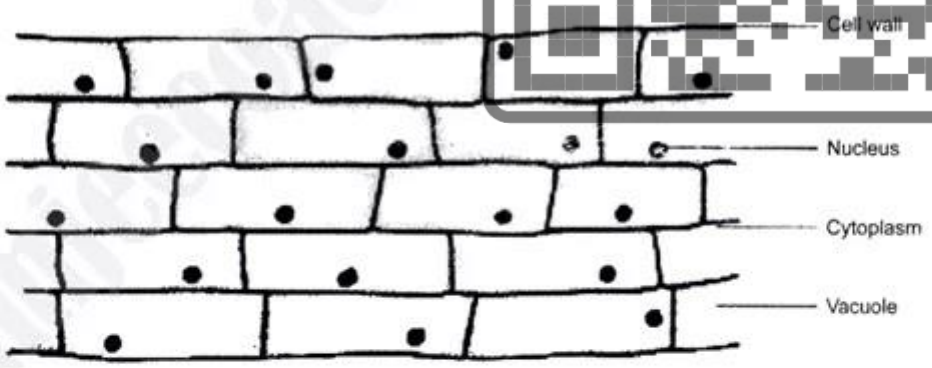
To study the microscopic structures of plant cells.

Apparatus:

* Onion
* Blade
* Slides and cover slips
* Brushes
* Tissue paper
* Compound microscope
* Forceps
* Dropper
* Iodine solution
* Watch glass
* Petri dish containing water

Procedure:

1. Peel off the outer most layer of an onion carefully, using a pair of forceps.
2. Place the peeled layer in a watch glass containing water. Make certain that the onion peel does not roil or fold.
3. Using a scalpel or a thin blade, cut a square place of the onion peel (about $1cm^2$).
4. Remove the thin transparent skin from the inside curve of a small piece of raw onion and place it on a drop of iodine solution on a clean side.
5. Cover the peel with a cover slip ensuring that no bubbles are formed.
6. Using a piece of tissue paper wipe off any excess iodine solution remaining on the slide.
7. Observe the onion skin under low power of the microscope and then under high power.
8. Draw a neat diagram of 5-10 cells of the typical cells you can see.



Activity 2: Examining Animal Cells Under the Microscope:

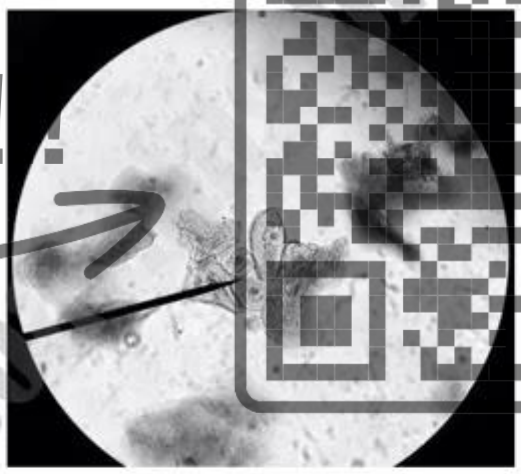
To study the microscopic structures of human cheek cells under a compound microscope.

Apparatus:

* Cotton bud * Clean slide * Methylene blue * Dropper
* Water * Tissue paper * Forceps * Microscope

Procedure:

1. Place a drop of water on a clean glass slide.
2. Using a clean ear bud, wipe the inside of your cheek. The ear bud will collect a moist film.
3. Spread the moist film on a drop of water on a clean glass slide, creating a small smear on the slide.
4. Use a cover slip to cover the slide gently.
5. Place one or two drops of stain on the side of the cover slip.
6. Use a piece of tissue to remove the excess dye.
7. Observe the cheek cells under low power magnification and then under high power magnification.

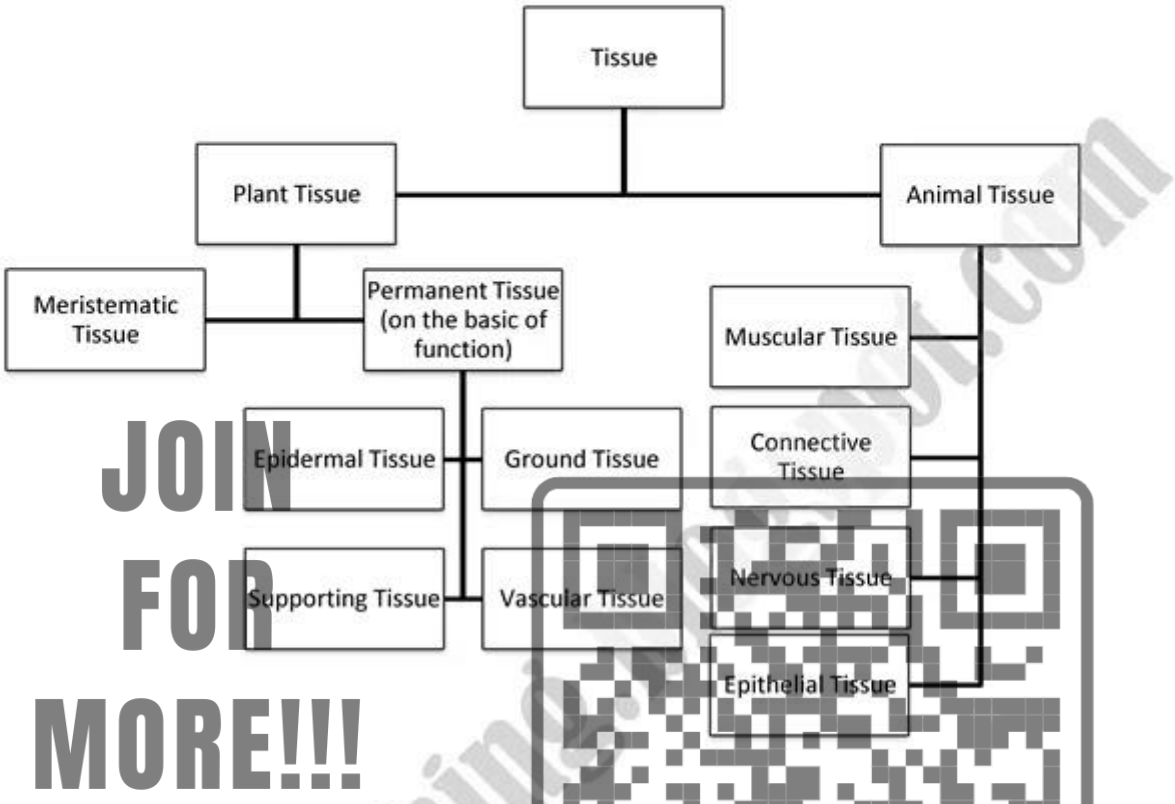


Questions:

1. What are the shapes of epidermal cells of onion peel and the human cheek cells?
2. Why is iodine used to stain the onion peel?
3. What is the difference between the arrangement of cells in onion cells and in human cheek cells?
4. Why is a cell considered the structural functional unit of living things?

Q.45: What is tissue? And mention the types of tissue.

Ans: **Tissue**: A group of cells which are similar in structure and function is called tissue.



Q.46: Name the types of animal tissues.

Ans: **Animal Tissues**: Humans and other large multicellular animals are made up of four basic types of tissue:

(i) Epithelial tissue (ii) Connective tissue

(iii) Muscular tissue, and (iv) Nervous tissue.

Q.47: Describe the types of Epithelial Tissue in detail.

Ans. **Epithelial Tissue** : Epithelial Tissue covers the surface of the body, lines the spaces inside the body and forms glands For instance, the outer layer of our skin is an epithelial tissue and the lining of small intestine is made up of epithelial tissues.

Epithelial cells are polarized, means that they have a top and a bottom side. There are different types of epithelial tissue depending on their function in a particular location. The simplest classification of these tissues is based on the number of cell layers.

Simple Epithelial Tissue: When the epithelium is composed of a single layer of called simple epithelial tissue.

(i) **Simple Squamous Epithelium**: It is found in the alveoli of lungs, and its structure is important for the exchange of gases between the blood and lungs.

(ii) **Simple Cuboidal Epithelia**: They line the lumen of collecting ducts in the kidney and are present in the thyroid gland around the follicles that secrete thyroid hormones.

(iii) **Simple Columnar Epithelia**: They are found in the female reproductive system and in the digestive tract.

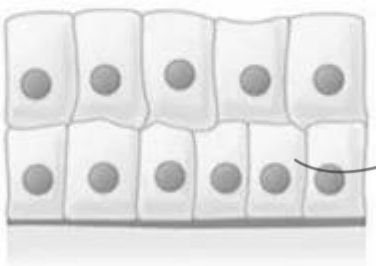
Stratified Epithelial Tissue: Stratified epithelia consist of more than one layer of cells and only one layer is in direct contact with the basement membrane.

(i) **Stratified Squamous Epithelia**: They are found in skin, with many dead, keratinized cells providing protection against water and nutrient loss.

(ii) **Stratified Cuboidal Epithelia**: They are found surrounding the ducts of many glands, including mammary glands in the breast and salivary glands in the mouth.

(iii) **Stratified Columnar Epithelia**: They are a rare, found predominantly in some organs of the reproductive system.

Transitional Epithelia: They are a special subset of stratified epithelia. They are exclusively found in the excretory system.

	Simple	Stratified
Squamous	 Simple squamous spithelium	Startified squamous epithelium
Cubical	 Simple cuboidal epithelium	 Stratified cuboidal epithelium
Columnar	 Simple columnar epithelium	 Stratified columnar epithelium

Q.48: Describe the Connective Tissue and its types.

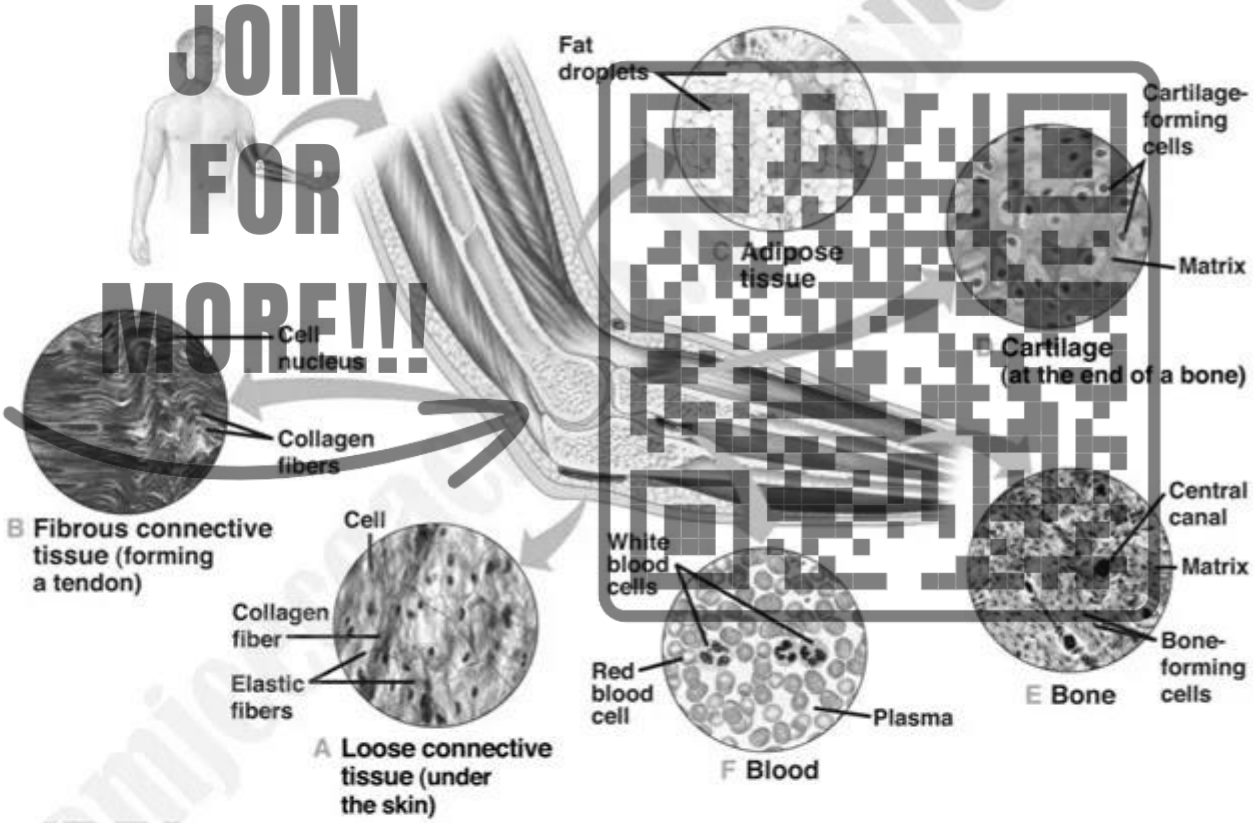
Ans: **Connective Tissue**: This tissue which connects or bind the different types of cells called connective tissues. They also bind other tissues of the body with each other. Connective tissue holds structures in the body together, such as tendons.

Cartilage: It is a type of supporting connective tissue. It is a dense connective tissue. Cartilage has limited ground substance and can range from semisolid to a flexible matrix.

Bone: It is another type of supporting connective tissue. Bone can either be compact (dense) or spongy (cancellous), and contains the osteoblasts or osteocytes cells.

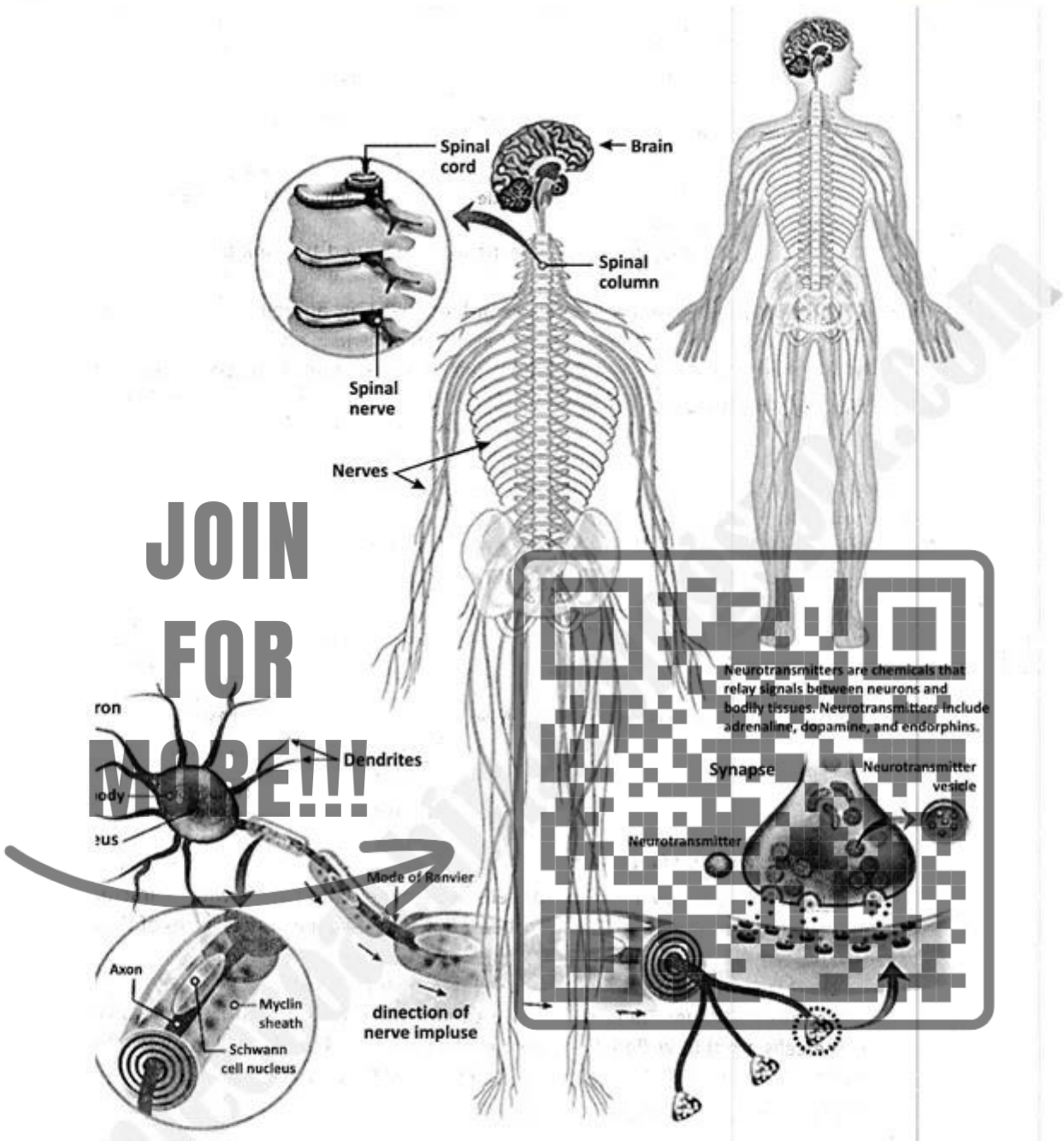
Adipose: It is another type of supporting connective tissue that provides cushions and stores excess energy and fat.

Blood: It referred to as connective tissue. It is a type of fluid connective tissue.



Q.49: Write a short note on nervous tissue.

Ans: **Nervous Tissue**: Nervous tissues are composed of neurons, which transmit information to other cells. Nervous tissue is found in the brain, spinal cord, and nerves. It is responsible for coordinating and controlling many body activities. It stimulates muscle contraction, creates an awareness of the environment, and plays a major role in emotions, memory, and reasoning. To do all these things, cells in nervous tissue need to be able to communicate with each other by way of electrical nerve impulses.



Q.50: What do you know about muscle tissue and its types?

Ans. **Muscle Tissue**: Muscle tissue contains the cells that are responsible for the contraction of muscles. There are three types of muscular tissues:

(i) Cardiac (ii) Smooth (iii) Skeletal

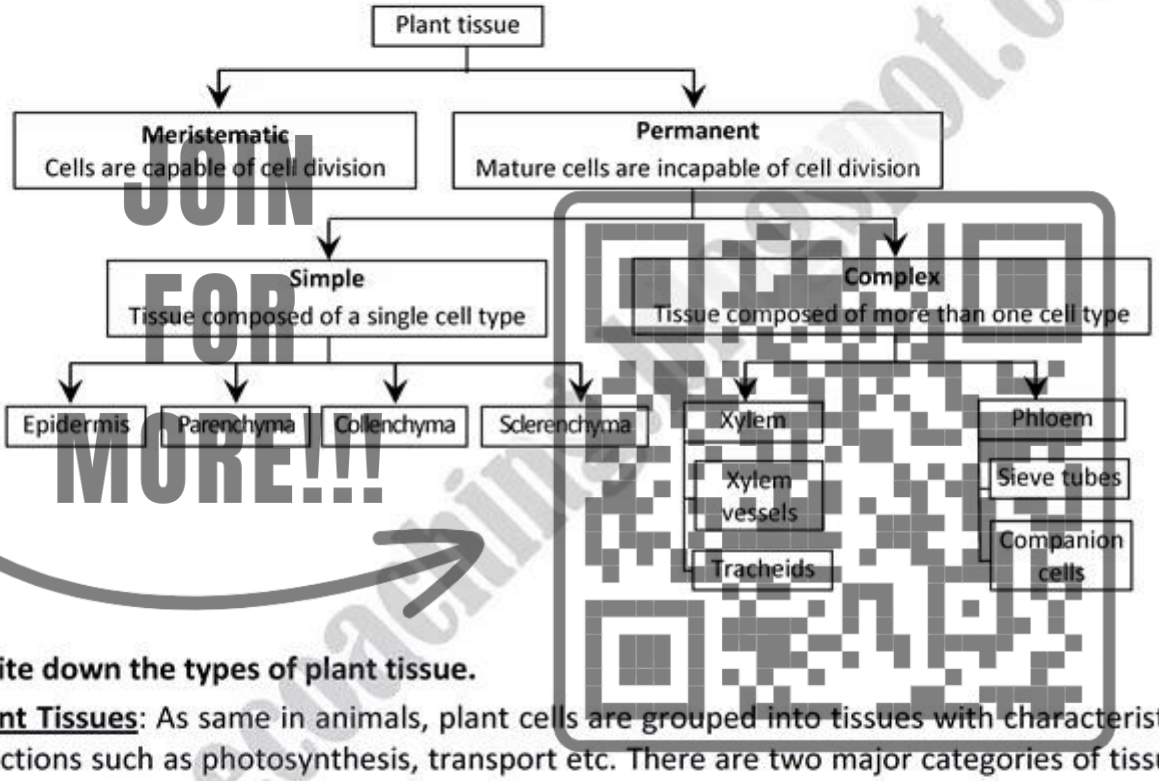
(i) **Skeletal Muscle**: Skeletal muscle which is also called striated (striped) muscle, is what we refer to as muscle in everyday life. Skeletal muscle is attached to bones by tendons. For instance, the muscles in our legs and our arms are skeletal muscle.

(ii) **Cardiac muscle**: It is found only in the walls of the heart. Like skeletal muscle, cardiac muscle is striated, or striped. But it's not under voluntary control. It means we don't need to think about making your heart beat.

(iii) **Smooth muscle**: It is found in the walls of blood vessels, as well as in the walls of the digestive tract, the uterus, the urinary bladder; and various other internal structures. Smooth muscle is un-striped, (unstriated), it is involuntary, not under conscious control.

Q.51: Draw chart of plant tissues.

Ans.



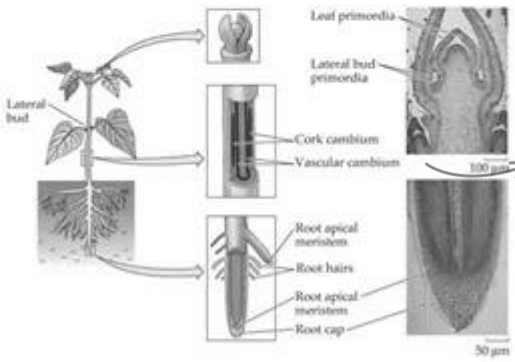
Q.52: Write down the types of plant tissue.

Ans: **Plant Tissues**: As same in animals, plant cells are grouped into tissues with characteristics functions such as photosynthesis, transport etc. There are two major categories of tissues in plants:

(1) Meristematic tissue (2) Permanent tissues

(1) Meristematic Tissue: These tissues are composed of cells, which have the ability to divide. The cells are thin walled, have large nucleus and number of small vacuoles. Usually they do not have inter-cellular spaces, so the cells are arranged compactly. Two main types of Meristematic tissues are recognized in plants.

Location of Meristematic Tissues



(i) **Apical Meristerms**: These tissues are present at the apex of roots and stems. According to their position they are Apical meristems. Stem and root increase in length by the division of cells of these tissues. This type of growth is called primary growth.

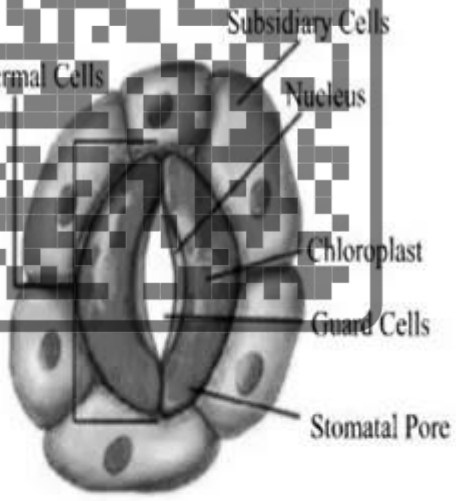
(ii) **Lateral meristems**: These tissues are located on the lateral sides of roots and shoot. By dividing, they are responsible for increase in growth of plant parts. This growth is called secondary growth.

(2) **Permanent Tissues**: Permanent tissues originate from Meristematic tissue. The cells of these tissues do not have the ability to divide and may have intercellular spaces in between cells. They are further classified into following types: either on the basis of position or composition. There are two types of permanent tissues

(a) Simple permanent tissue
(b) Compound or complex tissue.

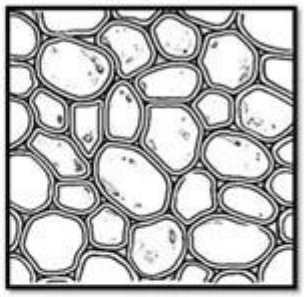
(a) **Simple Permanent Tissues**: Simple permanent tissues are made up of only one type of cell.

(i) **Epidermal Tissues**: Epidermal tissues are composed of a single layer of cells and they cover plant body. They act as a barrier between environment and internal plant tissues. In roots, they are also responsible for the absorption of water and minerals. On stem and leaves they secrete cutin (the coating of cutin is called cuticle which prevents evaporation. Epidermal tissues also have some specialized structure that perform specific functions; for example root hairs and stomata.

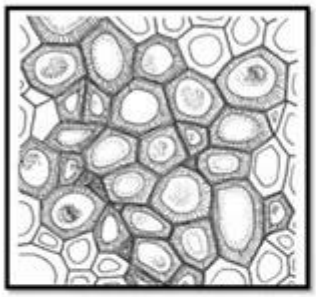


(ii) **Ground Tissues**: Ground tissues are simple tissues made up of parenchyma cells. Parenchyma cells are the most abundant cells in plants. Overall they are spherical but flat at point of contact. They have thin primary cell walls and have large vacuoles for storage of food. In leaves, they are called mesophyll and are the sites of photosynthesis. In other parts, they are the sites of respiration and protein synthesis.

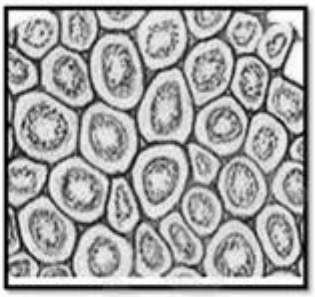
(iii) **Supporting Tissues**: These tissues provide strength and flexibility to plants. They are further of two types.



Parenchyma



Sclerenchyma



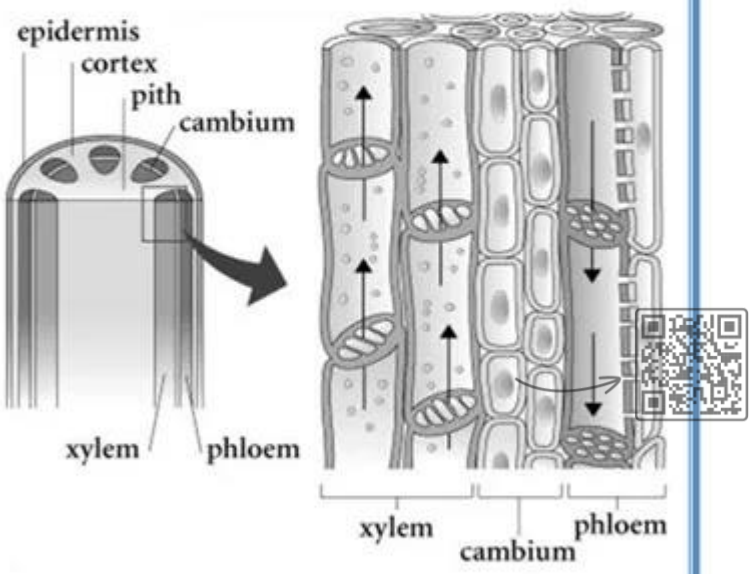
Chlorenchyma

(a) Collenchyma Tissues: They are found in cortex (beneath epidermis) of young stems and in the midribs of leaves and in petals of flowers. They are made of elongated cells with unevenly thickened primary cell walls. They are flexible and function to support the organs in which they are found.

(b) Sclerenchyma Tissues: They are composed of cells with rigid secondary cell walls. Their cell walls are hardened with lignin, which is the main chemical component of wood. Mature sclerenchyma cells cannot elongate and most of them are dead.

(b) **Compound (Complex) Tissues**: A plant tissue composed of more than one type of cell is called a compound or complex tissue. Xylem and phloem tissues, found only in vascular plants, are examples of compound tissues.

(i) **Xylem Tissues**: Xylem tissue is cambium responsible for the transport of water and dissolved substances from roots to the aerial parts. Due to the presence of lignin, the secondary walls of its cells are thick and rigid. That is why xylem tissue also provides support to plant body. Two main types of cell are found in xylem tissue i.e. vessel and tracheids.



Vessels have thick secondary cell walls. Their cells lack end walls and join together to from long tubes. Tracheids are made up of slender cells with overlapping ends.

(ii) **Phloem Tissues**: Phloem tissue is responsible for the conduction of dissolved organic matter (food) between different parts of plant body. Phloem tissue mainly contains sieve tube cells and companion cells. Sieve tube cells are long and their end walls have small pores. Many sieve tube cells join to form long sieve tubes. Companion cells are parenchymatous, narrow, elongated cells, and are closely associated with the sieve tube. Conduction with the sieve tube is done through the pores present on the walls of these cells. They help the sieve tubes in conduction of food materials and make proteins for sieve tube cells.

Biology 9th- Short Question Answers

CELLS AND TISSUES

CHAPTER# 04

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: What is Cell?

Ans: Cell: "All living organisms are composed of cells. It is the basic structural and functional unit of life. It is a set of organelles made up of proteins, carbohydrates, lipids and nucleic acids."

Q.2: What is a microscope? How many parameters are important in microscopy?

Ans: Microscope: Microscopes are instruments designed to produce magnified visual or photographic images of objects too small to be seen with the naked eye.

Q.3: Who invented the microscope?

Ans: Zacharias Janssen is generally believed to the first investigator to invent the compound microscope in the 1590. It was simply a tube with lenses at each end and its magnification ranged from 3X to 9X.

Q.4: How can we calculate the total magnification of a compound light microscope?

Ans: In order to ascertain to total magnification when viewing an image with a compound light microscope, take the power of the objective lenses, which is at 4x, 10x, 40x and multiply it by the power of the eye piece which is typically 10x. Therefore, a 10x eyepiece used with a 10x objective lens will produce a magnification of 100x. This means that the object can be magnified, 40x, 100x or 400x.

Q.5: Compare resolution with magnification.

Ans.

	Resolution	Magnification
1.	Resolution is the capacity to separate adjacent objects.	Magnification is a means of increasing size of the object.
2.	Resolution is maintained upto certain magnification.	By increasing magnification resolution is disturbed.
3.	Resolution improves with the wave length of light.	Magnification improves with the focal length of the light.

Q.6: Write the differences between light microscope and electron microscope.

Ans: **Differences Between Light Microscope And Electron Microscope**

	Light Microscope	Electron Microscope
1.	These microscopes use visible light as the source of illumination.	These microscopes use a beam of electrons as a source of illumination.
2.	Light microscope uses glass lenses for magnification.	It uses electromagnetic lenses instead of glass lenses.
3.	The image of the specimen is projected into the human eye.	The image cannot focus in human eye, therefore, screen or photographic plates are used to review and focus the image.
4.	It achieves a resolution above 0.2m.	It achieves a resolution of about 0.2nm, a thousand times improvement over light microscope.

Q.7: Who discovered the neucleus?

Ans: In 1833, Robert Brown, an English botanist, discovered a spherical body called nucleus in the cell of orchids.

Q.8: Describe the cell as a structural and functional unit of life.

Ans: **Cell as a Structural Unit**:

(i) All living organisms are composed of cells.

(ii) Cells are the unit of structure of living organisms or the building block of which living things are made.

(iii) Cells are of many different shape and sizes.

Cells as a Functional Unit:

(i) Cells have to perform different functions.

(ii) All basic functional activities, characteristics of living things occur in the cell.

(iii) Therefore, cell is a unit of function of all living organisms.

Q.9: What is the composition and function of cytoskeleton?

Ans: **Cytoskeleton**: A microscopic network of protein consists of microtubules an various filaments that spread out through are cytoplasm. Microtubules are made of tubulin while filaments made up of active protein.

Function: It provides both structural support and means of transport within the cell.

Q.10: Describe the composition and function of cytoplasm.

Ans: **Cytoplasm**: The cytoplasm is the jelly-like substance that fills the cell. It consists of up to 90% water. It also contains dissolved nutrients and waste products.

Functions: Its main function is to hold together the organelles which make up the cytoplasm. It also nourishes the cell by supplying it with salts and sugars and provides a medium for metabolic reactions to occur.

Q.11: Name the types of animal tissues.

Ans: **Animal Tissues**: Humans and other large multicellular animals are made up of four basic types of tissue:

(i) Epithelial tissue (ii) Connective tissue
(iii) Muscular tissue, and (iv) Nervous tissue.

Q.12: Why mitochondria is also called power house of cell?

Ans: Mitochondria is the site of aerobic respiration. During aerobic respiration energy is produced in the form of ATP. Therefore the mitochondria is also called "Power House" of cell.

Q.13: Why iodine used to stain the onion peel?

Ans. Iodine is often used to stain onion cells before microscopic examination to enhance the visibility of the cell. It is used in staining cells of an onion peel on the slide due to following reason.

- Onion bulb is made up of scaly leaves which store starch granules in their cytoplasm of the cells.
- Iodine binds to starch in the granules and develops blue black colour.
- This procedure of staining onion cells with iodine makes the onion cells visible clearly. It also confirms the fact that onion stores reserve food material in the form of starch.

Q.14: Why cell membrane is semipermeable in nature?

Ans: Plants and animals are made up of cells. It is here that we find the most common example of a semipermeable membrane in action - a process called osmosis. Cells are surrounded by membranes. These membranes are made up of phospholipids (a type of lipid or fat) and proteins.

Q.15: How electron microscope is different from simple compound microscope?

Ans:

	Light Microscope	Electron Microscope
1.	These microscopes use visible light as the source of illumination.	These microscopes use a beam of electrons as a source of illumination.
2.	Light microscope uses glass lenses for magnification.	It uses electromagnetic lenses instead of glass lenses.
3.	The image of the specimen is projected into the human eye.	The image cannot focus in human eye, therefore, screen or photographic plates are used to review and focus the image.
4.	It achieves a resolution above 0.2m.	It achieves a resolution of about 0.2nm, a thousand times improvement over light microscope.

Q.16: How facilitated diffusion is different from active transport?

Ans: Diffusion is the movement of substance from a region of high concentration to low concentration. It is therefore said to occur down a concentration gradient. Diffusion is a passive process which means it does not require any energy input. It can occur across a living or non-living membrane and can occur in a liquid or gas medium.

Q.17: Why cell is considered as the structural and functional unit of living things?

Ans: **Cell as a Structural Unit**:

(i) All living organisms are composed of cells.

(ii) Cells are the unit of structure of living organisms or the building block of which living things are made.

(iii) Cells are of many different shape and sizes.

Cells as a Functional Unit:

(i) Cells have to perform different functions.

(ii) All basic functional activities, characteristics of living things occur in the cell.

(iii) Therefore, cell is a unit of function of all living organisms.

Biology 9th – Detailed Question Answers

➔ CELL CYCLE

CHAPTER# 05

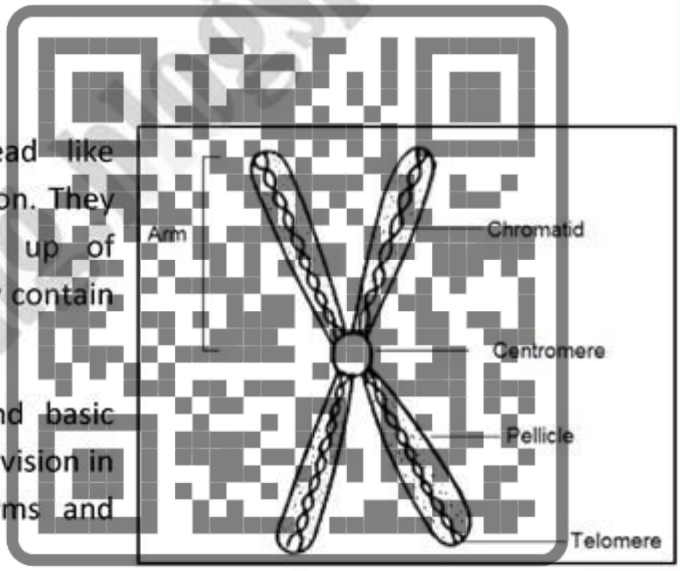
ADAMJEECOACHING.BLOGSPOT.COM

Q.1: How were chromosomes discovered?

Ans: The term Chromosomes is given by German embryologist Walter Fleming in 1882 when he was examining the rapidly dividing cells of salamander larvae after treating with Perkin's Aniline. He observed that chromosomes colour is much darker than the rest of organelles. The term chromosomes is misnomer because its means coloured body later it was found that chromosomes are colourless bodies.

Q.2: Define and briefly explain chromosomes.

Ans: **Chromosomes**: Chromosomes are thread like structure, appear at the time of cell division. They are found in specific numbers, made up of chromatin material in eukaryotic cell. They contain heredity units called Genes.



Chromosomes are made up of DNA and basic protein, Histones, appear during the cell division in the shape of rod. It has two part arms and centromere.

Q.3: Briefly describe the formation of chromosomes.

Ans: **Formation of Chromosomes**: Each chromosome in eukaryotes is composed of chromatin fiber, which is made of nucleosomes. Chromatin fibers are packaged by proteins into a condensed structure called chromatin. Chromatin allows the very long DNA molecules to fit into the cell nucleus. During cell division chromatin condenses further to form microscopically visible chromosomes. The structure of chromosomes varies through the cell cycle.

During cell cycle chromatin material replicate, divide and passed successfully to their daughter cells for survival of their progeny. Sometimes cell-division is also responsible for genetic diversity.

Q.4: Name the types of chromosomes.

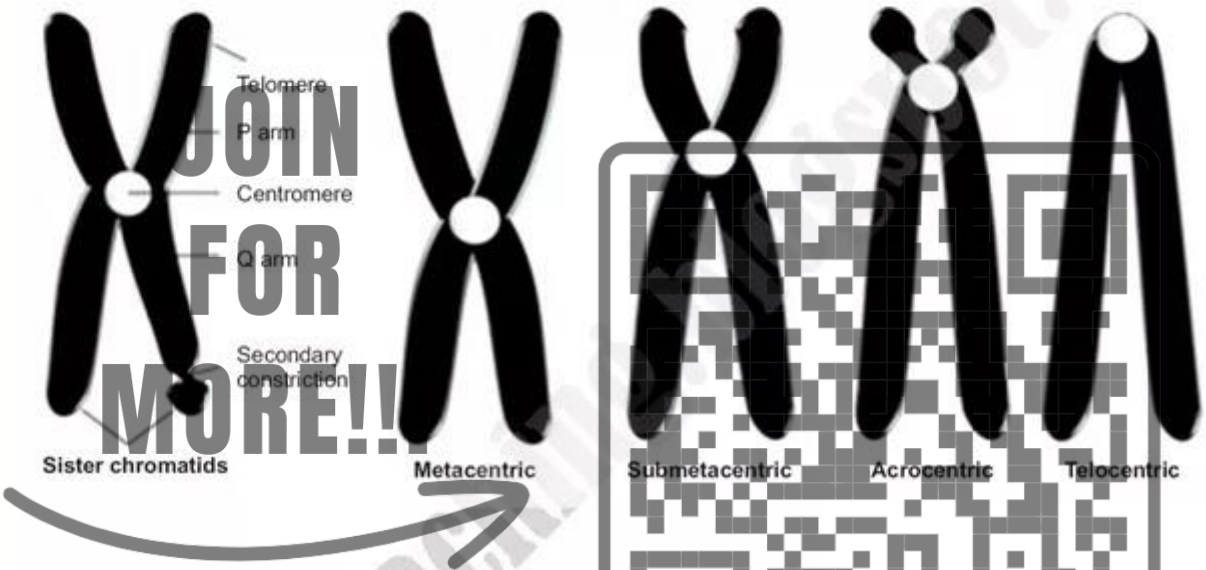
Ans: **Types of Chromosomes**: The chromosomes are of different types, depending upon position of centromere. These types are:

(i) **Metacentric**: Chromosomes with equal arms.

(ii) **Sub-meta centric**: Chromosomes with un equal arms.

(iii) **Acrocentric or sub-telocentric**: Rod like chromosomes with one arm very small and other very long. The centromere is sub-terminal.

(iv) **Telocentric**: Location of centromere at the end of chromosomes.



Q.5: What are chromatids?

Ans: **Chromatids**: In the beginning of cell-division each chromosome is consist of two genetically identical copies of thread attach with each other called chromatids or sister chromatids.

Q.6: Define cell cycle. How many phases a cell cycle has?

Ans: **Cell Cycle**: The sequence of changes which occurs between one cell division and the next is called Cell Cycle. The cell cycle undergoes a sequence of changes, which involve period of growth, replication of DNA following by cell division. This sequence of changes is called cell cycle.

It has two phases:

(i) Interphase, which is the period of non-division.

(ii) M-phase, which is a period of cell division.

Q.7: Explain interphase and its sub-phases.

Ans: **Interphase**: The period of cell cycle between two consecutive divisions is called Interphase. It is a period of growth and synthesis of DNA. During this period of cell prepares itself for the M-phase.

Sub-phases of Interphase: The Interphase is divided further into three sub-phases:

(1) G1-Phase (2) S-phase (3) G2-phase.

(i) **G1 (Gap one) phase:** It is the period of extensive metabolic activity, in which cell grows in size, specific enzymes are synthesized and DNA base units are accumulated for the DNA synthesis. At a point in G1, the cell may enter into a phase called G_o (G-knot) were cell cycle stops. It remains for days, weeks or in some cases even for the life time of the organism.

(ii) **S(Synthesis) phase:** During this phase, replication of DNA occurs. As a result of its chromatin material is duplicated.

(iii) **G2(Gap two) phase:(Pre-Mitotic Phase):** In this phase, cell grows is size, cell organelles are replicate in numbers as well as enzyme require for cell-division also synthesize during this phase.

Q.8: Define mitosis.

Ans: **Mitosis**: In this type of cell division a parent cell divides into two daughter cells in a way that the number of chromosomes in the daughter cells remains the same as in the parent cell.

Q.9: Describe the phases of mitosis. Draw a neat and labeled diagram.

Ans: **Phases of Mitosis**: Although mitosis is a continuous process, but for the study point of view are can divide it into two phases:

(a) Karyokinesis - nuclear division

(b) Cytokinesis - cytoplasmic division

(a) **Karyokinesis**: The Karyokinesis can be divided further for convenience into four phases which are:

(i) Prophase (ii) Metaphase

(iii) Anaphase (iv) Telophase

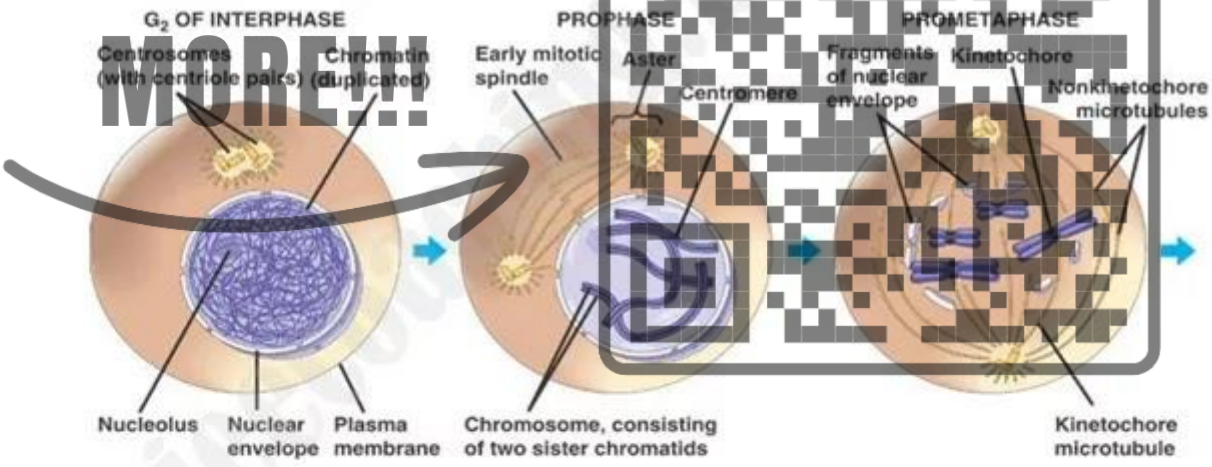
(i) **Prophase**: During early prophase chromatin material condenses and become visible as thick coiled, threadlike structures called chromosomes. Each chromosome at this stage is already double, consists of two chromatids. The chromatids are attached to each other at centromere. The nuclear membrane gradually disappears and at the same time Centrosome divides to form two centrioles, each moves

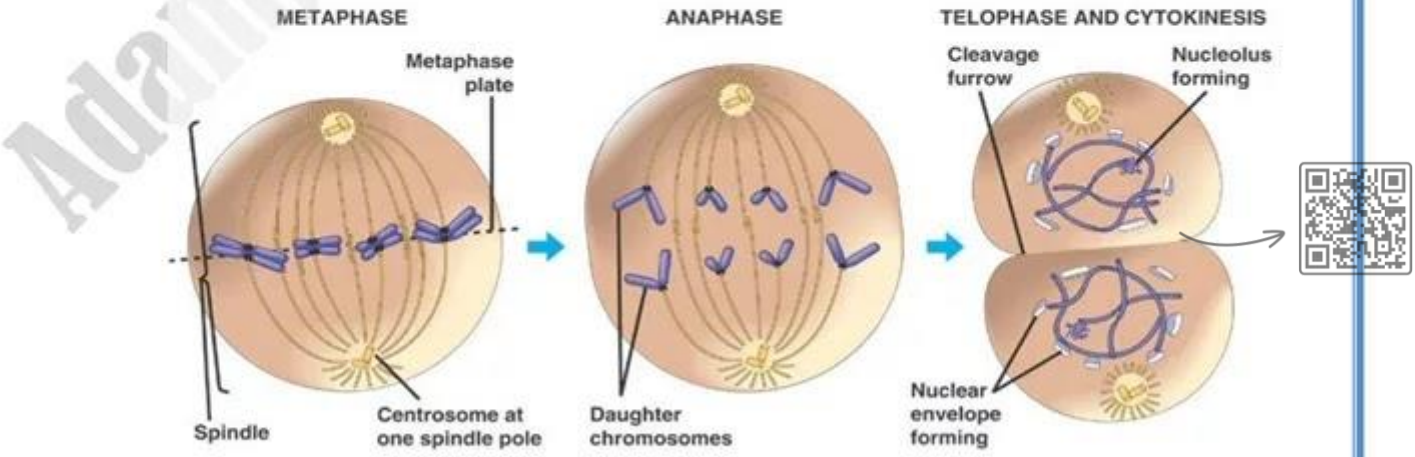
towards the opposite pole of the animal cell and forms the spindle fibers. The centrioles are absent in plant cells.

(ii) **Metaphase**: During this phase each chromosomes arranges itself on the equator of the spindle. Each chromosome is attached to separate spindle fibre by its centromere.

(iii) **Anaphase**: In this phase the spindle fibre contract, centromere of a chromosome divides and the chromatides of each chromosome separates from each other and move towards the other poles. In this way one set of the chromatids (each chromatid is now an independent chromosome) move towards one pole while the other set towards the other pole.

(iv) **Telophase**: This is a stage when the chromatids (now called chromosomes) reach at the respective poles and their movement ceases. Each pole receives the same number of chromosomes as were present in the parent cell. The nuclear membrane is reformed around each set of chromosomes. In this way two daughter nuclei formed in each cell.





(b) **Cytokinesis**: Soon the cytoplasm of the cell also divides and two daughter cells are formed. In animal cell cytokinesis takes, place by developing a constriction. This constriction become deep to divide cytoplasm in two equal halves and two daughter cells are formed. In plant cells it occurs by developing cell plate. In this way the daughter cells become the exact copies of their parent cell.

Q.10: What is the significance of mitosis?

Ans: **Significance of Mitosis**: Mitosis plays an important role in the life of an organism.

(i) It is responsible for development and growth organisms by increasing exact copies of cells.

(ii) With few exceptions all kinds of asexual reproduction and vegetative propagation take place by mitosis.

(iii) The production of new somatic cells, such as blood cells depends on mitosis.

(iv) The healing of wounds, repair of wear and tear within organism is also dependent upon the mitotic division.

Q.11: Why mitosis is necessary for growth?

Ans: Mitosis is a way of making more cells that are genetically the same as the parent cell. It plays an important part in the development of embryos, and it is important for the growth and development of our bodies as well. Mitosis produces new cells, and replaces cells that are old; lost or damaged.

Q.12: What do you know about cell death? Define apoptosis and necrosis.

Ans: **Cell Death**: Cell in an organism depends upon various extra cellular signals for its regulated and controlled activities. It means all the activities even the death of cells is programmed. Programmed cell death helps in proper control of multicellular development, which may lead to deletion of entire structure, e.g. the tail of developing human embryo, or so e part an organ which is more required like tissue between developing digits.

Ways of Cell Death: There are two ways of cell death in multicellular organisms.

Apoptosis or Self-Destruction (Autophagy): "Programmed change which lead to sequence of physiological changes in cell by which cells commit suicide collectively called Apoptosis".

Necrosis: This type of cell death is caused by external factors i.e. infection, toxin an tumor i.e. accidental cell death.

Q.13: Define meiosis.

Ans: **Meiosis**: Meiosis is a type of cell division in which single cell divides into four daughter cells and number of chromosomes becomes half in each daughter cell.

Q.14: Briefly describe the phases of meiosis.

Ans: **Phases of Meiosis**: In animal meiosis takes place in germ cell to produce gametes i.e. sperms and eggs whereas in plants it takes place in spore mother cells (S.M.C) to produce spores.

Meiosis is a series to two divisions, MEIOSIS I and MEIOSIS II with result in the formation of four haploid cells.

Meiosis I (First Meiotic Division): First meiotic division is the reduction division during which the chromosomes number is reduced to half. Meiosis I consists of Prophase I, Metaphase I, Anaphase I and Telophase I.

Prophase I: It consists of the longest phase of meiosis. It can be subdivided into following sub stage:

(i) Leptotene (ii) Zygotene (iii) Pachytene
(iv) Diplotene (v) Diakinesis

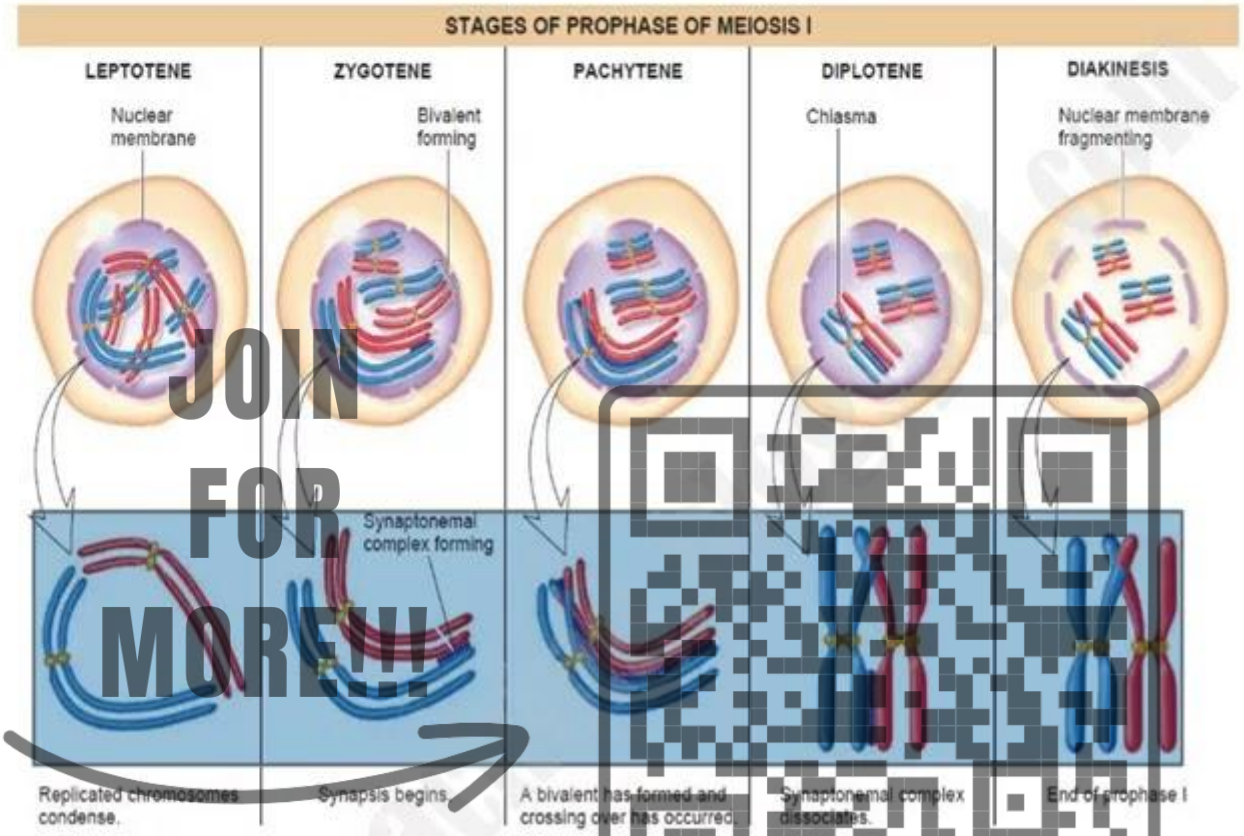
(i) **Leptotene**: During this sub stage, the chromatin network breaks into specific number of long thin beaded thread called leptotene. Each thread has two morphologically similar leptotene in each cell called homologous structure.

(ii) **Zygotene**: During this sub stage, the homologous (similar structure) chromosomes, which comes from the mother (by ovum) and father (by sperm) are attached towards each other and their lengthwise pairing takes place. The pairing of homologous chromosomes is known as synapsis, while the paired homologous chromosomes are known as bivalent.

(iii) **Pachytene**: The synaptic forces of attraction between each bivalent decrease and the chromosomes uncoil and separate. The separation is however incomplete and paired chromosomes are in contact with each other at one or more points, called Chiasmata. Each homologous chromosome split longitudinally except in the centromere region. No each bivalent is composed of four chromatids and therefore in known as bivalent tetrad.

(iv) **Diplotene**: The homologous chromosomes exchange their parts of chromatid at Chiasmata. This exchange of segments of chromatids at chiasmata between the homologous chromosomes is called Crossing Over.

(v) **Diakinesis**: During this sub stage, nucleoli and nuclear membrane are disappeared, whereas Mitotic Apparatus (spindle) is completed. Chiasmata moves from the centromere towards the ends of the chromosomes like a zipper. This type of movement of chiasmata is known as Terminalization. At the end of diakinesis, chromatids still remain compacted at their ends.

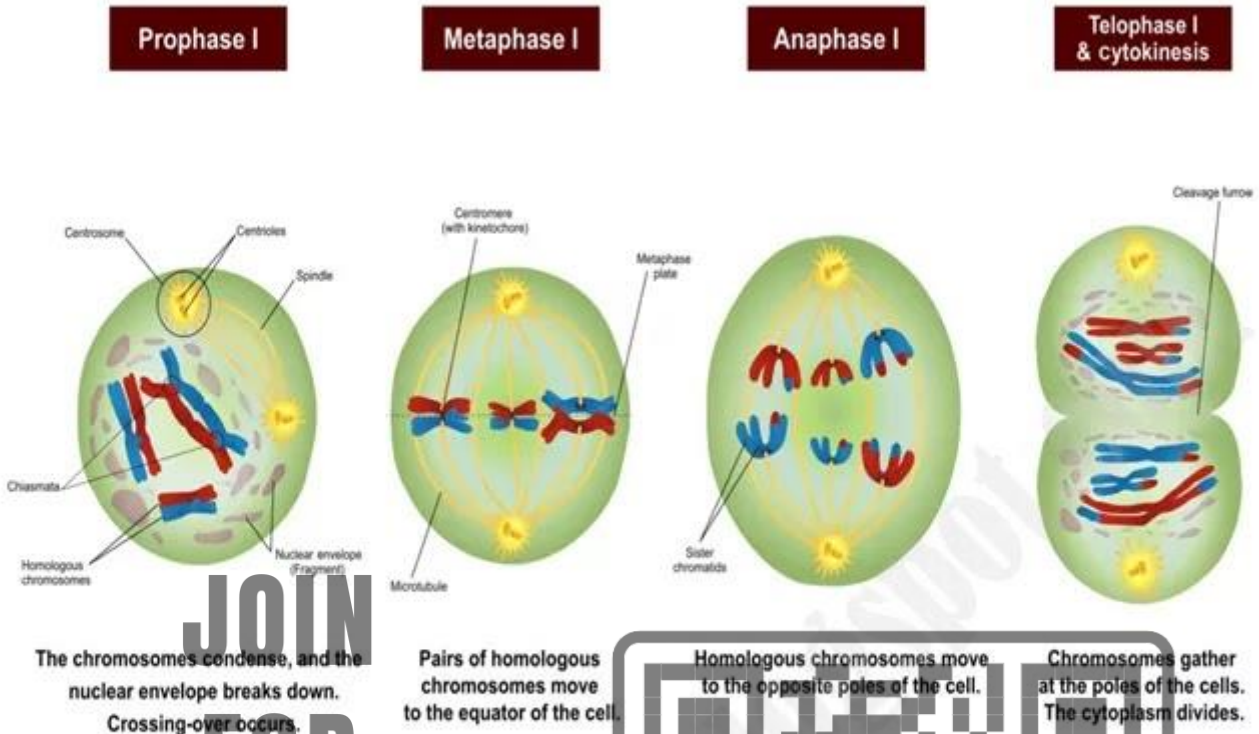


Metaphase I: In this phase, the bivalent line up at the equatorial plane. The centromere of each chromosome attached with same fibres of spindle.

Anaphase I: At this stage one chromosome from each member homologous pair (bivalent) begins to separate and move towards its respective pole by the contraction of spindle fibers. The actual reduction occurs at this stage because half the number of chromosomes moves to each pole. Moreover as a result of crossing over the two chromatids of a chromosome do not resemble with each other in the genetic terms.

Telophase I: The nuclear membrane form around the chromosomes at each pole and chromosomes become uncoil. The nucleolus reappears and thus two daughter nuclei formed.

Cytokinesis: Telophase may or may not be accompanied by cytokinesis and daughter cells formation.



Interphase: Following telophase I (if. this stage occurs), there is a short period called Interphase before meiosis II. It is similar to Interphase between mitotic divisions except that DNA replication does not occur. Replication of DNA is unnecessary because each chromosome already has two chromatids.

Second Meiotic Division (Meiosis II): The second meiotic division is actually the mitotic division which divides each haploid cell formed during meiosis I into two daughter haploid cells. The second meiotic division includes:

(i) Prophase II (ii) Metaphase II
(iii) Anaphase II (iv) Telophase II

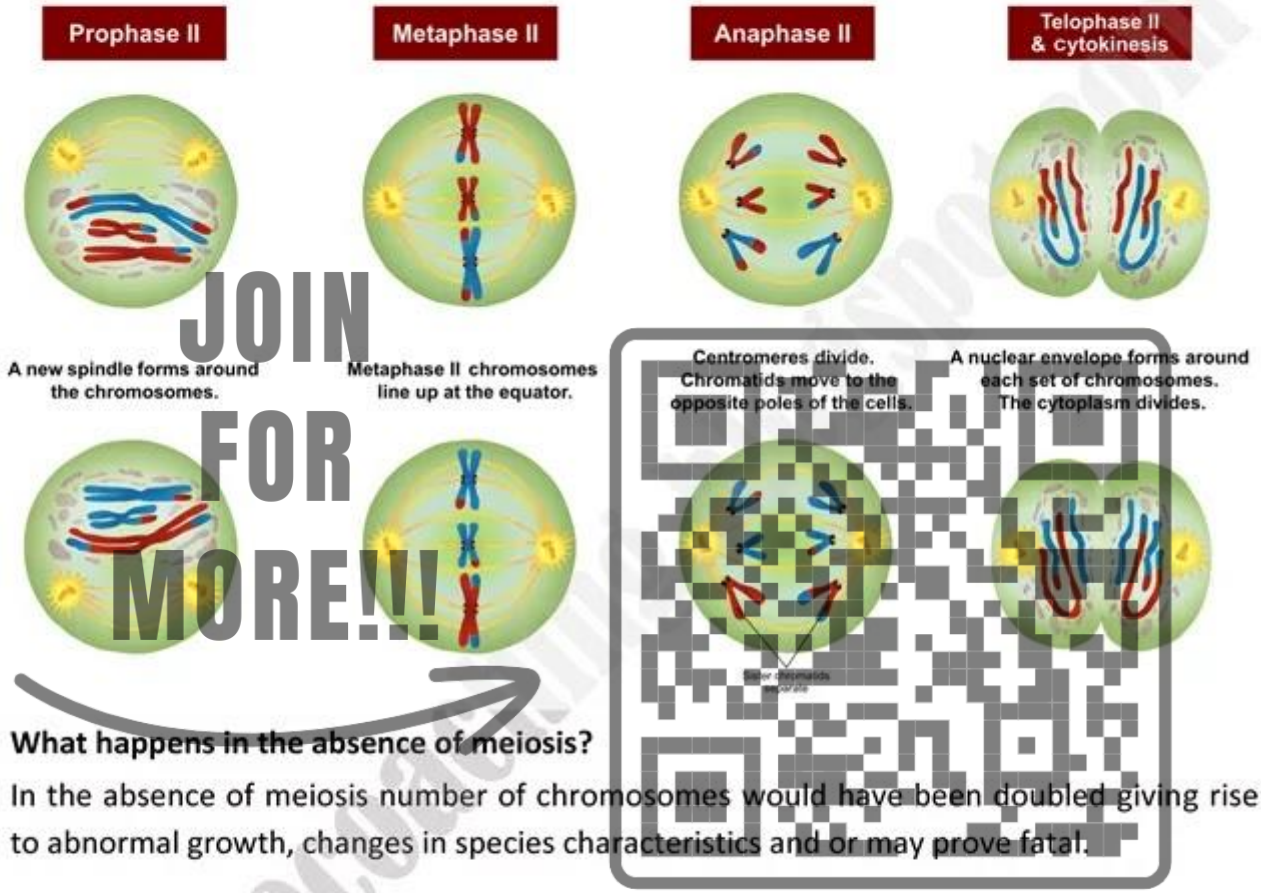
(i) **Prophase II**: The spindle fibres are formed. The nuclear membrane and the disappear.

(ii) **Metaphase II**: The chromosomes are attached to half spindle fibers by their centromere and get arranged at equatorial plane. Each chromosome attach with separate fiber of spindle.

(iii) **Anaphase II**: The spindle fibers attached to the centromeres shorten and the chromatids of chromosomes are pulled away one another. This movement continues until one complete set of chromosomes is positioned at each pole of the cell.

(iv) **Telophase II**: The spindle fibers disappear completely and chromosomes being to uncoil. They become longer and indistinct and form group at each pole. Around each group nuclear envelope is formed.

After the Karyokinesis in each haploid meiotic cell the cytokinesis Le. division of cytoplasm occurs and thus four haploid cells are formed.



Q.15: What happens in the absence of meiosis?

Ans: In the absence of meiosis number of chromosomes would have been doubled giving rise to abnormal growth, changes in species characteristics and or may prove fatal.

Q.16: What is the significance of meiosis?

Ans: **Significance of Meiosis**:

(i) **Constant number of Chromosomes**: Meiosis maintains chromosome number constant from generation to generation. It is due to the fact that meiosis reduces the diploid number of chromosomes to half i.e. haploid in the gametes.

During fertilization the diploid number of the chromosomes is restored.

(ii) **Responsible for genetic variation among species**: By crossing over, the meiosis provides an opportunity for the exchange of the genes between homologous chromosomes and thus cause the genetic variations among the species. The variations are the raw material of the evolutionary process.

Q.17: Explain phenomenon of non-disjunction.

Ans: **Non-disjunction**: In normal course of meiosis, the two chromosomes of each homologous pair separates and enter into two gametes, but sometimes a pair of homologous chromosomes fails to separate from one another, during meiosis I. This phenomenon is called Non-disjunction.

Non-disjunction produces gametes with abnormal number of chromosome i.e. either with less or extra chromosome. If such abnormal gametes fuse with normal gametes, the resulting zygote will also have abnormal number of chromosome.

Q.18: What is the difference between mitosis and meiosis?

Ans:

	Differences	Mitosis	Meiosis
1.	Type of Reproduction	Asexual	Sexual
2.	Genetically	Daughter cells are genetically Identical	Daughter cells are genetically different
3.	Crossing Over	No recombination/crossing over occurs in prophase	Involves recombination/crossing over of chromosomes in prophase I
4.	Number of divisions	It involves one cell division	It Involves two successive cell divisions.
5.	Pairing of Homologs	No	Yes
6.	Mother Cells	Can be either haploid or diploid	Always diploid
7.	Number of Daughter Cells produced	2 diploid cells	4 haploid cells
8.	Chromosome Number	Remains the same	Reduced by half
9.	Chromosomes Pairing	Does Not Occur	Takes place during zygotene of prophase I and continue upto metaphase I
10.	Creates	Makes everything other than sex cells	Sex cells only: female egg cells or male sperm cells
11.	Takes Place in	Somatic Cells	Germ Cells
12.	Chiasmata	Absent	Observed during prophase I and metaphase I
13.	Spindle Fibres	Disappear completely in telophase	Do not disappear completely in telophase I
14.	Nucleoli	Reappear at telophase	Do not reappear at telophase I

15.	Centromere Split	The centromeres split during anaphase	The centromeres do not separate during anaphase I, but during anaphase II
16.	Prophase	Simple Duration of prophase is short, usually of few hours	Complicated, Prophase is comparatively longer and may take days
17.	Synapsis	No Synapsis	Synapsis of homologous chromosomes takes place during prophase
18.	Exchange of Segments	Two chromatids of a chromosome do not exchange segments during prophase	Chromatids of two homologous chromosome exchange segments during crossing over
19.	Function	Cellular reproduction and general growth and repair of the body. Takes part in healing and repair	Genetic diversity through sexual reproduction. Takes part in the formation of gametes and maintenance of chromosome number
20.	Where it occurs?	Occurs in all organisms, except viruses	Only occurs in animals, plants, and fungi

Q.19: Differentiate between the following:

(i) Prophase and Prophase I

(ii) Prophase and Telophase

(iii) Apoptosis and Necrosis

Ans: **Difference between Prophase and Prophase I**

	Prophase	Prophase I
1.	Pair formation in between homologous chromosomes	It is a long phase and is divided into the sub phases.
2.	Does not occur as there is no attraction between them.	Pair formation (synapsis) due to attraction occurs in between homologous chromosomes
3.	Chiasma is not formed	Chiasma is formed
4.	Crossing over does not occur	Crossing over occurs
5.	Part exchange does not occur in the chromosome. So gene arranges not remains unchanged.	Part exchange occurs, which changes the gene arrangement of the chromosomes

Difference between Prophase and Telophase

	Prophase	Telophase
1.	Prophase is the first stage in mitosis	Telophase is the final stage in meiosis and mitosis
2.	In prophase the chromatin condenses to form the chromosomes.	In telophase the daughter chromosomes move towards the opposite ends of the spindle fibers.
3.	In prophase the nuclear content is not initiated to be distributed.	In telophase the nuclear content get equally distributed to become the part of daughter cells

Difference between Prophase and Necrosis

	Prophase	Necrosis
1.	Apoptosis, or programmed cell death, is a form of cell death that is generally triggered by normal, healthy processes in the body.	Necrosis is the premature death of cells and living tissue. Though necrosis is being researched as a possible form of programmed cell death, it is considered an "unprogrammed" cell death process at this time.
2.	It is usually beneficial. Only abnormal when cellular processes that keep the body in balance cause too many cell deaths or too few	Its effect is always detrimental
3.	Nucleus gets fragmented	Nucleus gets disorganized
4.	Chromatin condensation is a hallmark of apoptosis	No chromatin condensation occurs

Q.20: Why meiosis-I is called reduction division?

Ans: Meiosis is called reduction division because it reduces the number of chromosomes from diploid to haploid i.e. it gets reduced from 2N to IN (46 to 23) so as to maintain the species specific number 46 chromosomes(23 pairs) from generation to generation.

Q.21: How number of chromosomes remains constant from generation to generation?

Ans: There are 23 pairs of chromosome which are constant. The chromosome number is kept constant from generation to generation because of process of mitosis and meiosis.

While mitosis is equal division which ensures the chromosome number remains same in somatic cells, meiosis is reduction division which takes place in reproductive cells.

The chromosome number is reduced to half in the gamete cells so that fertilization restores it back to the original number.

Q.22: Why Interphase is called as phase of high metabolic activities?

Ans: Interphase is the portion of the cell cycle. It includes the G1, S and G2 phases. During interphase, the cell grows (G1), replicates its DNA (S) and prepares for mitosis (G2). Interphase is the phase of the cell cycle in which atypical cell spends most of its life. During interphase, the cell copies its DNA in preparation for mitosis. Interphase is the 'daily living' or metabolic phase of the cell, in which the cell obtains nutrients and metabolizes them, grows, reads DNA, and conducts other "normal" cell functions.

Q.23: Why interphase between meiosis-I and meiosis-II is short?

Ans: Interphase is a stage associated with replication of DNA, and growth. Once meiosis starts, the purpose is to produce a haploid gamete. So there is no further need of replication or growth. Hence between meiosis I and meiosis II, interphase is short.

Biology 9th - Short Question Answers

CELL CYCLE

CHAPTER# 05

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Why meiosis-I is called reduction division?

Ans: Meiosis is called reduction division because it reduces the number of chromosomes from diploid to haploid i.e. it gets reduced from 2N to IN (46 to 23) so as to maintain the species specific number 46 chromosomes(23 pairs) from generation to generation.

Q.2: Why mitosis is necessary for growth?

Ans. Mitosis is a way of making more cells that are genetically the same as the parent cell. It plays an important part in the development of embryos, and it is important for the growth and development of our bodies as well. Mitosis produces new cells, and replaces cells that are old; lost or damaged.

Q.3: How were chromosomes discovered?

Ans: The term Chromosomes is given by German embryologist Walter Fleming in 1882 when he was examining the rapidly dividing cells of salamander larvae after treating with Perkin's Aniline. He observed that chromosomes colour is much darker than the rest of organelles. The term chromosomes is misnomer because its means coloured body later it was found that chromosomes are colourless bodies.

Q.4: Name the types of chromosomes.

Ans: **Types of Chromosomes**: The chromosomes are of different types, depending upon position of centromere. These types are:

(i) **Metacentric**: Chromosomes with equal arms.

(ii) **Sub-meta centric**: Chromosomes with un equal arms.

(iii) **Acrocentric or sub-telocentric**: Rod like chromosomes with one arm very small and other very long. The centromere is sub-terminal.

(iv) **Telocentric**: Location of centromere at the end of chromosomes.

Q.5: Why interphase between meiosis-I and meiosis-II is short?

Ans. Interphase is a stage associated with replication of DNA, and growth. Once meiosis starts, the purpose is to produce a haploid gamete. So there is no further need of replication or growth. Hence between meiosis I and meiosis II, interphase is short.

Q.6: Define cell cycle. How many phases a cell cycle has?

Ans: **Cell Cycle**: The sequence of changes which occurs between one cell division and the next is called Cell Cycle. The cell cycle undergoes a sequence of changes, which involve period of growth, replication of DNA following by cell division. This sequence of changes is called cell cycle.

It has two phases:

(i) Interphase, which is the period of non-division.

(ii) M-phase, which is a period of cell division.

Q.7: How number of chromosomes remains constant from generation to generation?

Ans. There are 23 pairs of chromosome which are constant. The chromosome number is kept constant from generation to generation because of process of mitosis and meiosis. While mitosis is equal division which ensures the chromosome number remains same in somatic cells, meiosis is reduction division which takes place in reproductive cells.

Q.8: Why interphase is called as phase of high metabolic activities?

Ans. Interphase is the portion of the cell cycle. It includes the G1, S and G2 phases. During interphase, the cell grows (G1), replicates its DNA (S) and prepares for mitosis (G2). Interphase is the phase of the cell cycle in which atypical cell spends most of its life. During interphase, the cell copies its DNA in preparation for mitosis

Q.9: Define mitosis.

Ans: **Mitosis**: In this type of cell division a parent cell divides into two daughter cells in a way that the number of chromosomes in the daughter cells remains the same as in the parent cell.

Biology 9th – Detailed Question Answers

➔ ENZYMES

CHAPTER# 06

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define metabolic reactions and metabolism.

Ans: **Metabolic Reactions and Metabolism**: Life is another name of activity therefore thousands of chemical reactions take place in the body of an organism. These reactions of an organism are collectively called metabolic reactions and this phenomenon of chemical activity called metabolism.

Q.2: Briefly describe the types of metabolic activities.

Ans: **Types of Metabolic Activities**: The metabolic activities phenomenon of two types, either constructive or destructive.

Constructive Reactions: In constructive reactions large molecules are formed to form a structure of cell or body. These reactions are called anabolic reactions and this type of metabolism is called anabolism.

Destructive Reactions: On the contrary, the destructive reaction in which large molecules breakdown in small molecules to produce energy or to re-utilize further or to discard called catabolic reactions. The type of this metabolic activity is called catabolism.

Q.3: What is activation energy?

Ans: **Activation Energy**: The chemical reaction requires particular conditions to carry down at proper rate, temperature and pressure. The conditions of temperature and pressure inside cell or organism are generally found not suitable for chemical reaction e.g. inside human body normal temperature remain 37° and pressure is 120/80m.m of Hg. These conditions of temperature and pressure are not enough to perform any chemical reactions.

Now body requires some facilitators. These facilitators help to perform biochemical reactions at low energy. It is clear now that each reaction requires some amount of minimum energy to initiate a reaction. This minimum amount of energy is called activation energy. If this amount is high, the difficult will be the reaction or vice versa e.g. the activation energy needed to break a glucose molecule initially requires energy of 2 ATP molecules.

Q.4: What are enzymes?

Ans: **Enzymes**: The high amount of activator energy cannot be provided by organism itself therefore they require some facilitators to reduce this activation energy. These facilitators are special molecules made up of mostly protein called enzymes (En=inside, zyme=yeast). The name was coined due to observation when yeast was introduced in fruit sap which converted it into alcohol. Now the enzymes are defined as the biocatalysts which facilitate chemical reaction by lowering activation energy.

This action of enzyme allows biological reaction to proceed rapidly at relatively low temperature and pressure tolerable by living organism.

Q.5: Describe the characteristics of enzymes.

Ans: **Characteristics of Enzymes**:

(i) Enzymes are biocatalyst, made up of mostly proteins and therefore three dimensionally folded chains of amino acids with a specific shape. This shape is determined by the sequence of amino acids held together by bonds, for example Hydrogen bonds.

(ii) Enzymes speed up reactions by bringing reactants together and reducing the activation energy required starting the reaction (enzymatic reaction).

(iii) When an enzyme starts a chemical reaction, catalyzes the reaction hence does not utilized itself which means even a single or little amount of enzyme can start a reaction and catalyze fast.

(iv) Their presence does not affect the nature or properties of end products.

(v) They are very specific in their action; a single enzyme catalyzes only a single chemical reaction or a group of related reactions.

(vi) The shape of active site is complementary to shape of the substrate.

(vii) They are sensitive to even minor change in pH, temperature and substrate concentration.

(viii) Some enzymes require cofactor for their functioning.

(ix) Many enzymes work in a sequential manner to produce a specific product. This pathway is called metabolic pathway.

(x) Activity of enzymes can be enhanced by activator and can be decreased by inhibitors.

Q.6: Define: (i) substrate (ii) active site (iii) activator.

Ans: **Substrate**: Reactants of enzyme are called substrate.

Active Site: A small portion of enzyme where substrate attaches with enzyme is called active site.

Activator: Enzyme activators are molecules that can bind with an enzyme to increase its activity.

Q.7: Define and Explain cofactor.

Ans: **Cofactor**: A cofactor is a non-protein substance which may be organic or inorganic. Zn^{+2} ,Mg^{+2} , Mn^{+2} ,Fe^{+2} ,Cu^{+2} ,K^{+1} and Na^{+1} are inorganic cofactors and NADP, NAD and FAD are organic cofactors.

Cofactor can be categorized into prosthetic group (if organic cofactors are tightly bound to an enzyme) and Coenzymes (if organic cofactors are loosely attached with an enzyme).

Q.8: What is an enzyme inhibitor?

Ans: **Enzyme Inhibitor**: An enzyme inhibitor is a molecule that binds to an enzyme and decreases its activity. Since blocking an enzyme's activity can kill a pathogen.

Q.9: Describe the uses of enzymes in industries.

Ans: **Uses of Enzymes**: Many enzymes are used commercially in industries. The most common industries are:

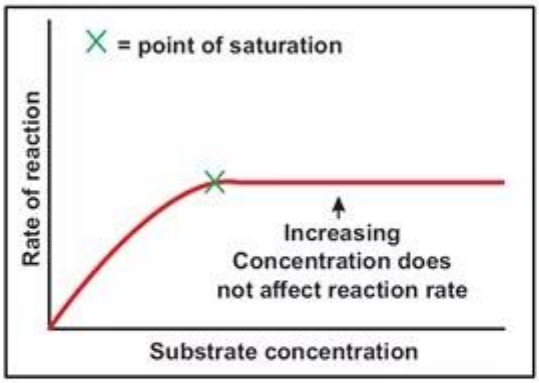
- Paper industry - To get cellulose for paper making.
- Food industry - For making bakery products and pizza
- Brewing industry - For conversion of sugar into alcohol
- Bio-detergents - Use to remove different type of stains

Q.10: Explain the factors affecting the activity of an enzyme.

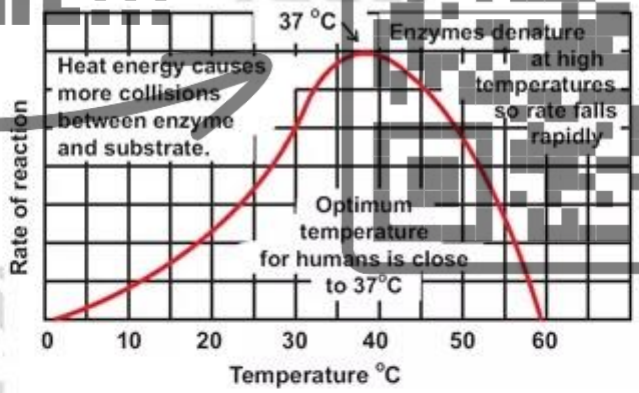
Ans: **Factors Affecting the Activity of an Enzyme**: In nature, organisms adjust the conditions of their enzymes to produce an optimum rate of reaction, where necessary, or they may have enzymes which are adopted to function well in extreme conditions where they live. The main factors which affecting the activity of an enzyme are as follows:

(i) **Substrate Concentration**: It has been shown experimentally that if the amount of the enzyme is kept constant and the substrate concentration is then gradually increased, the reaction velocity will increase until it reaches a maximum after which further increase in the substrate concentration produces no significant change in the reaction rate.

In other words, the enzyme molecules are saturated with substrate. The excess substrate molecules cannot react until the substrate already bond to the enzymes has reacted and been released (or been released without reacting).

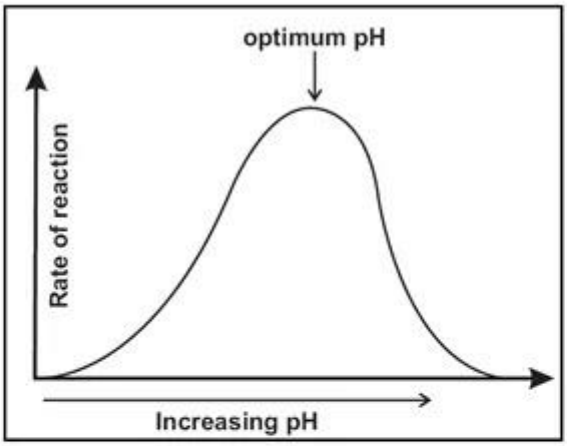


(ii) **Temperature**: The protein nature of the enzymes makes them extremely sensitive to thermal changes. Enzyme activity occurs within a narrow range of temperatures compared to ordinary chemical reactions. Enzymes catalyzes by randomly colliding with substrate molecules, increasing temperature and increase collision which also increases are rate of reaction, forming more product. However, increasing temperature also increases the vibrations and structure of enzymes is lost i.e. denature enzyme. These changes decrease the rate of enzyme action or it may seized completely.



In summary, as temperature increases, initially the rate of reaction will increase, because of increased kinetic energy. However, the effect of bond breaking will become greater and greater, and the rate of reaction will begin to decrease as shown in given diagram.

(iii) **pH**: Enzymes are also sensitive to pH due to their protein nature. All enzymes work at their maximum rate at narrow range of pH. The point where the enzyme is most active is known as optimum pH. For example, pepsin works at a low pH i.e. it is highly acidic; while trypsin works at a high pH i.e. it is basic.

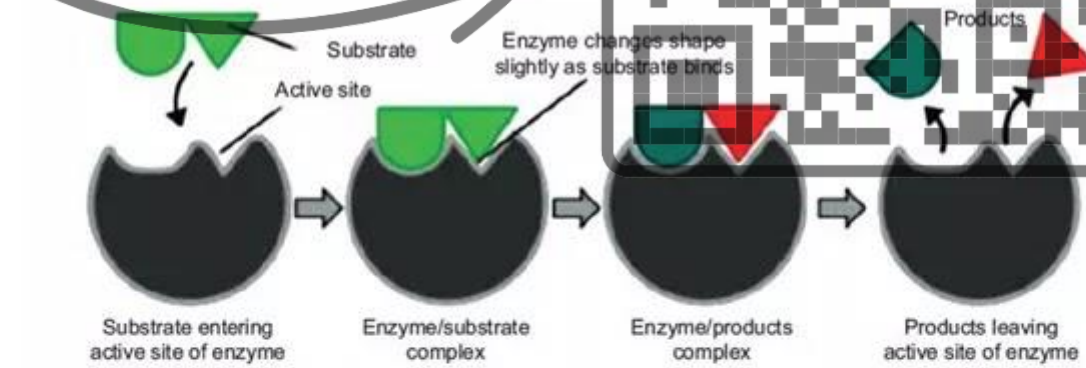


Effect of PH on enzyme activity

Most enzymes work at neutral pH 7.4. Small changes in pH above or below the optimum do not cause a permanent change to the enzyme, since the bonds can be reformed. However, extreme changes in pH can cause enzymes to denature and permanently lose their function.

Q.11: Describe the models explaining mechanism of enzyme action.

Ans: **Mechanism of Enzyme Action**: Enzyme catalyzes the reaction by attaching to substrate which ends to the product which ends to the product formation. Enzyme exposes its active site to attract specific substrate, makes enzyme substrate complex (ESC) after which the product is formed and enzyme is detached from it and used again for the same reaction.

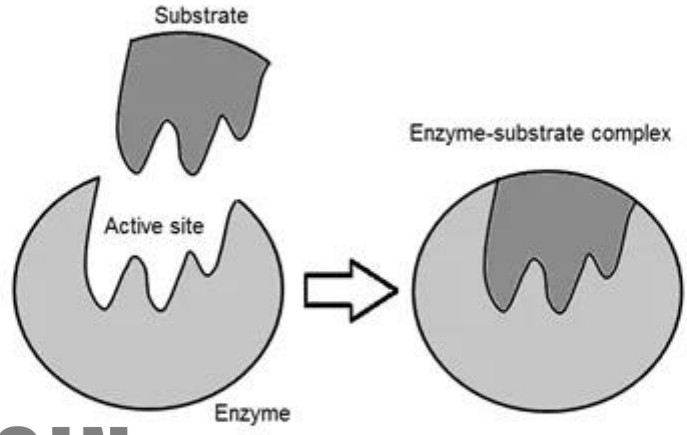


Action of Enzyme: In order to understand the mechanism of enzyme action two theories are proposed:

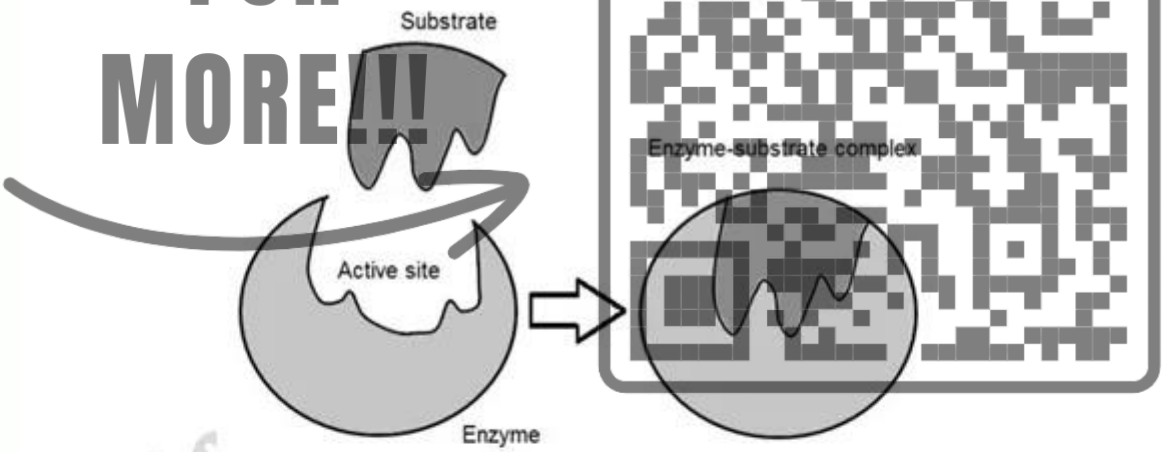
(i) Lock and key model (ii) Induced fit model.

(i) **The Lock and Key Model**: This theory was first postulated by Emil Fischer in 1894 shows the high specificity of enzymes. This theory explain that the enzyme and the substrate possess specific complementary geometric shapes that fit exactly into one another like a key into a lock/ only the correct size and shape of the substrate (the key)

would fit into active site (the key hole) of the enzyme (the lock). However/ it does not explain the stabilization of the transition state that the enzyme achieves. For example Lipase fits together with lipids to break them down.



(ii) **Induced Fit Model**: The induced fit model suggested by Daniel Koshland in 1958. It explains that active site continuously changes it shape until the substrate bind to it. It also says that active site of enzyme is flexible (lock and key theory does not explain it).



Q.12: What do you know about specificity of enzyme?

Ans: **Specificity of Enzyme**: In the human body there are more than 1000 known enzymes and all work with their own substrates. We know that enzymes are specific in nature therefore a particular enzyme can only bind to its specific substrate and it's all due to its active site. Active site of the enzyme possesses some geometric shape and as the enzymes are made up of proteins and proteins contain different type of amino acids which carry different charges / nature like acidic, basic, hydrophilic etc. hence active site is highly specific to its substrate. Some of the enzymes catalyze the reaction by recognizing the bond formed between the molecules, the functional group present in the molecules or the geometric shape of the molecules.

For example: proteases are the enzymes which catalyze the proteins only and lipase acts on lipids only. It means the enzymes are bond specific, so lipase can act an ester bond in lipids/fats substances.

Q.13: Briefly describe the categories of enzymes.

Ans: There are two categories of enzymes:

(i) Intracellular (ii) Extracellular

Intracellular enzymes work inside the cell such as ATPase, cytochrome C reductase etc. and **extracellular enzymes** work outside the cells such as pepsin, lipase etc.

Q.14: Why enzymes are specific in nature?

Ans: A few enzymes exhibit absolute specificity; that is, they will catalyze only one particular reaction. Other enzymes will be specific for a particular type of chemical bond or functional group. In general, there are four distinct types of specificity: Absolute specificity – the enzyme will catalyze only one reaction.

The reactants used in a reaction are also known as substrates. These substrates require enzymes to be specific so that enzymes act on the correct substrate or bond to catalyze the desired reaction. More precisely, the specificity of an enzyme is due to the precise interaction of the substrate with the enzyme.

Substrates are responsible for enzyme specificity. The molecular structure of a substrate connects to the enzyme so that the substrate can fit into the enzyme molecule.

For a substrate to bind to the active site of an enzyme it must fit in the active site and be chemically attracted to it.

Q.15: How enzyme reduces the amount of activation energy?

Ans: Enzymes can lower the activation energy of a chemical reaction in three ways. A ways the activation energy is lowered is having the enzyme bind two of the substrate molecules and orient them in a precise manner to encourage a reaction. This can be thought of as lining the binding pockets up for the substrates so that it is not left to random chance that they will collide and be oriented in this way. Another way enzyme can lower the activation energy by rearranging the electrons in the substrate so that there are areas that carry partial positive and partial negative charges which favor a reaction to occur. Lastly, the enzyme can strain the bound substrate which forces it to a transition state that favors a reaction. By manipulating the substrates of the reaction, the enzyme can lower the necessary energy needed to make the reaction occur.

Q.16: Why presence of enzymes does not effect on the nature and properties of end product?

Ans: The enzyme itself is not a component of the chemical reaction and is the same molecule at the beginning of the reaction as it is at the end. That is why their presence does not affect the nature or properties of end products.

Q.17: Distinguish between the following in tabulated form:

(i) Activator and Inhibitor (ii) Anabolism and Catabolism

Ans: **Difference between Activator and Inhibitor**

S No	Activator	Inhibitor
1.	Enzyme activators are molecules that can bind with an enzyme to increase its activity.	Enzyme inhibitors are molecules that can bind with an enzyme to decrease its activity
2.	They can be either proteins, peptides, lipids, small organic molecules or ions.	Two main types of inhibitors are reversible and irreversible inhibitors.

Difference between Anabolism and Catabolism

S No	Anabolism	Catabolism
1.	It is a metabolic chemical process used to build molecules required for the energy to do different activities by the body.	It is a metabolic chemical process used for breakdown of complex molecules to simple small molecules.
2.	In this state body requires energy to keep body in anabolic state. Nutrition is the main source.	In this state body releases energy in different activities.
3.	In anabolism state, energy is converted from kinetic energy to potential energy.	In catabolism state, energy is converted from potential energy to kinetic energy.
4.	Anabolism helps in furnishing and preserving tissues and results in muscle growth.	Catabolism helps in burning fats and calories.
5.	Anabolism requires less oxygen compared to catabolism.	Catabolism uses oxygen.
6.	Anabolism is in function during rest or sleep.	Catabolism is in function during activities.
7.	The main role is construction in metabolism.	The main role is destruction in metabolism.

Biology 9th - Short Question Answers

➔ ENZYMES

CHAPTER# 06

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Distinguish between the Activator and Inhibitor:

Difference between Activator and Inhibitor

S No	Activator	Inhibitor
1.	Enzyme activators are molecules that can bind with an enzyme to increase its activity.	Enzyme inhibitors are molecules that can bind with an enzyme to decrease its activity
2.	They can be either proteins, peptides, lipids, small organic molecules or ions.	Two main types of inhibitors are reversible and irreversible inhibitors.

Q.2: Distinguish between the Anabolism and Catabolism:

Difference between Anabolism and Catabolism

S No	Anabolism	Catabolism
1.	It is a metabolic chemical process used to build molecules required for the energy to do different activities by the body.	It is a metabolic chemical process used for breakdown of complex molecules to simple small molecules.
2.	In this state body requires energy to keep body in anabolic state. Nutrition is the main source.	In this state body releases energy in different activities.
3.	In anabolism state, energy is converted from kinetic energy to potential energy.	In catabolism state, energy is converted from potential energy to kinetic energy.

Q.3: How enzyme reduces the amount of activation energy?

Ans. Enzymes can lower the activation energy of a chemical reaction in three ways. A ways the activation energy is lowered is having the enzyme bind two of the substrate molecules and orient them in a precise manner to encourage a reaction. This can be thought of as lining the binding pockets up for the substrates so that it is not left to random chance that they will collide and be oriented in this way. Another way enzyme can lower the activation energy by rearranging the electrons in the substrate so that there are areas that carry partial positive and partial negative charges which favor a reaction to occur. Lastly, the enzyme can strain the bound substrate which forces it to a transition state that favors a reaction. By manipulating the substrates of the reaction, the enzyme can lower the necessary energy needed to make the reaction occur.

Q.4: Why presence of enzymes does not effect on the nature and properties of end product?

Ans. The enzyme itself is not a component of the chemical reaction and is the same molecule at the beginning of the reaction as it is at the end. That is why their presence does not affect the nature or properties of end products.

Q.5: How substrate concentrations affect enzyme activity?

Ans. It has been shown experimentally that if the amount of the enzyme is kept constant and the substrate concentration is then gradually increased, the reaction velocity will increase until it reaches a maximum after which further increase in the substrate concentration produces no significant change in the reaction rate.

Q.6: How enzymes are uses in industries?

Ans. Many enzymes are used commercially in industries. The most common industries are:

- Paper industry - To get cellulose for paper making.
- Food industry - For making bakery products and pizza
- Brewing industry - For conversion of sugar into alcohol
- Bio-detergents - Use to remove different type of stains

Q.7: What are enzymes?

Ans. **Enzymes**: The high amount of activator energy cannot be provided by organism itself therefore they require some facilitators to reduce this activation energy. These facilitators are special molecules made up of mostly protein called enzymes (En=inside, zyme=yeast).

This action of enzyme allows biological reaction to proceed rapidly at relatively low temperature and pressure tolerable by living organism.

Q.8: Define the categories of enzymes.

Ans: There are two categories of enzymes. Intracellular & Extracellular

Intracellular enzymes work inside the cell such as ATPase, cytochrome C reductase etc.

extracellular enzymes work outside the cells such as pepsin, lipase etc.

Q.9: Why enzymes are specific in nature?

Ans. A few enzymes exhibit absolute specificity; that is, they will catalyze only one particular reaction. Other enzymes will be specific for a particular type of chemical bond or functional group. In general, there are four distinct types of specificity: Absolute specificity – the enzyme will catalyze only one reaction.

Q.10: Describes any three characteristic of enzymes

Characteristics of Enzymes:

(i) Enzymes are biocatalyst, made up of mostly proteins and therefore three dimensionally folded chains of amino acids with a specific shape. This shape is determined by the sequence of amino acids held together by bonds, for example Hydrogen bonds.

(ii) When an enzyme starts a chemical reaction, catalyzes the reaction hence does not utilized itself which means even a single or little amount of enzyme can start a reaction and catalyze fast.

(iii) They are very specific in their action; a single enzyme catalyzes only a single chemical reaction or a group of related reactions.

Biology 9th- Detailed Question Answers

BIOENERGETICS

CHAPTER# 07

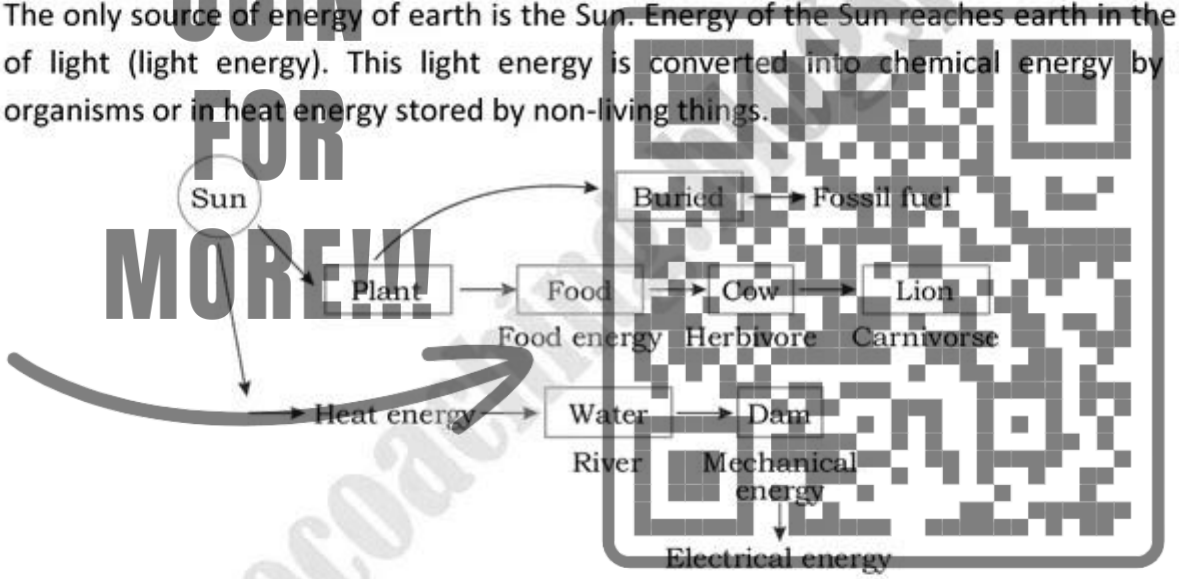
ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Why do living organisms need food?

Ans: Every machine requires energy (capacity to do work) for performing its functions, like automobiles which require fuel to produced energy. Cell phones have batteries which store energy and utilize it for their working. Living organisms are also like machine which require nutrients in the form of food. The special molecules of food contain energy.

Q.2: From where does the energy come in fuel and food molecules?

Ans: The only source of energy of earth is the Sun. Energy of the Sun reaches earth in the form of light (light energy). This light energy is converted into chemical energy by living organisms or in heat energy stored by non-living things.



The above chart shows that conversion of energy from one form to another form explained by law of conservation of energy or first law of thermodynamics which states that energy can neither be created nor be destroyed but it can change from one form to another form. As we can see that the heat energy of Light converts in K.E. energy which flows water. This K.E. of water in dams is converted into mechanical energy when falls on turbine. This mechanical energy converts into light energy in bulbs and LED lights or again in mechanical energy in our fans.

On the other hands this light energy when falls on green parts of plant is captured and converted into chemical energy. This chemical energy is stored as food energy in plants. When these parts are eaten by animal this energy transferred into them where the organisms buried and remain under pressure inside earth crust for millions of years their chemical energy is converted into fossil fuel.

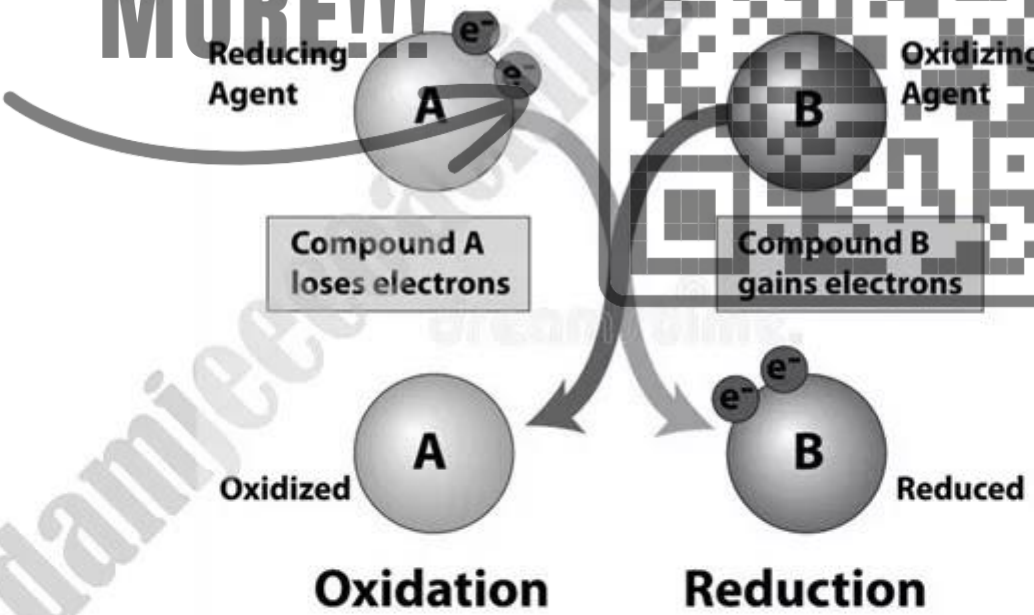
Q.3: Define Bioenergetics.

Ans: **Bioenergetics**: The study of this conversion of free energy into different forms by living organisms is Bioenergetics. It is the part of biology, Physics and chemistry concerned with the energy involved in making and breaking of chemical bonds found in the molecules of organisms. Bioenergetics can also be defined as the study of energy relationships energy transformation and transmission in living organisms.

Q.4: Describe the chemical process of energy transmission in living organisms.

Ans: **Chemical Process of Energy Transmission:** In living organisms the energy is transferred through gain or loss of electrons during formation and breaking of chemical bond. There are two chemical processes where it occurs, known with the name of oxidation and reduction.

(i) **Oxidation Reactions**: The oxidation reactions are those reactions in which loss of electrons (e-) and proton occurs. These electrons carry energy from the molecules from where they release to the molecules where they added e.g. iron reacts with oxygen to form a chemical called rust, in this reaction iron (Fe) loses some e- which transfer to oxygen. In this reaction Fe is oxidized and it transfers its energy to oxygen through electrons.

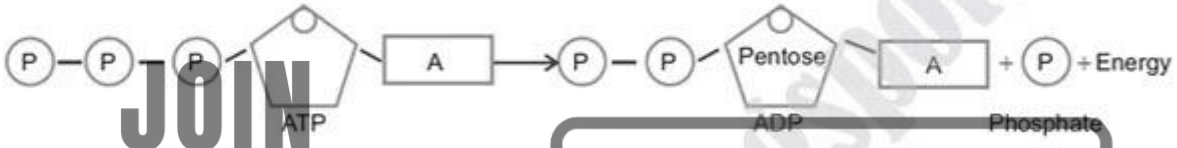


(ii) **Reduction Reactions**: On the other hand, reaction occur called reduction, where gain of e- and H+ occur. This gain of e- also brings energy which is stored in it. In living organisms these oxidation reduction (Redox) reactions occur continuously to transfer energy from one molecule to other molecule, without these reactions energy transfer becomes impossible in living system.

Q.5: Describe the formation of ATP.

Ans. **Energy Currency in Living Organism**: In our home we store energy in batteries when electricity is available from usual source or when light energy is available we capture it by solar plates. This energy of battery then is utilized at the time of power shutdown (load shedding). Living organisms also have similar type of system to store energy.

Adenosine Tn-Phosphate (ATP): In living organisms, energy is stored in a special molecule called Adenosine Tn-Phosphate (ATP). In organisms, energy is liberated during any oxidation reaction; this energy is utilized by molecules called Adenosine Di-Phosphate (ADP) to form a bond with phosphate (P). As a result the ADP become ATP, energy of oxidation is now stored in ATP.



Energy Stored in ATP: The amount of energy stored is 7.3 Kcal/mole. This stored energy in ATP will be utilized by living organism for performing any types of work e.g. transport of molecules against the concentration gradient. The energy is now become free (liberated) by breaking ATP molecule.

$$ATP \longrightarrow ADP + P + Energy\ (7.3\ kcal/mole)$$

So the formation of ATP is endergonic (energy intake) process and breakdown of ATP is exergonic (energy liberating) process.

Q.6: Define and describe the process of photosynthesis. What is its importance?

Ans. **Photosynthesis**: Photosynthesis is the fundamental process in which basic organic molecules and O_2 are produced for all bio-molecules and living organisms. This process is carried out by chlorophyll containing organisms like plants, algae, some protozons and some bacteria. Word photo means light and synthesis means to prepare. Plants utilize simple inorganic molecules carbon dioxide (CO_2) and water (H_20) which react by using light energy in the presence of pigments like chlorophyll to form glucose and oxygen.

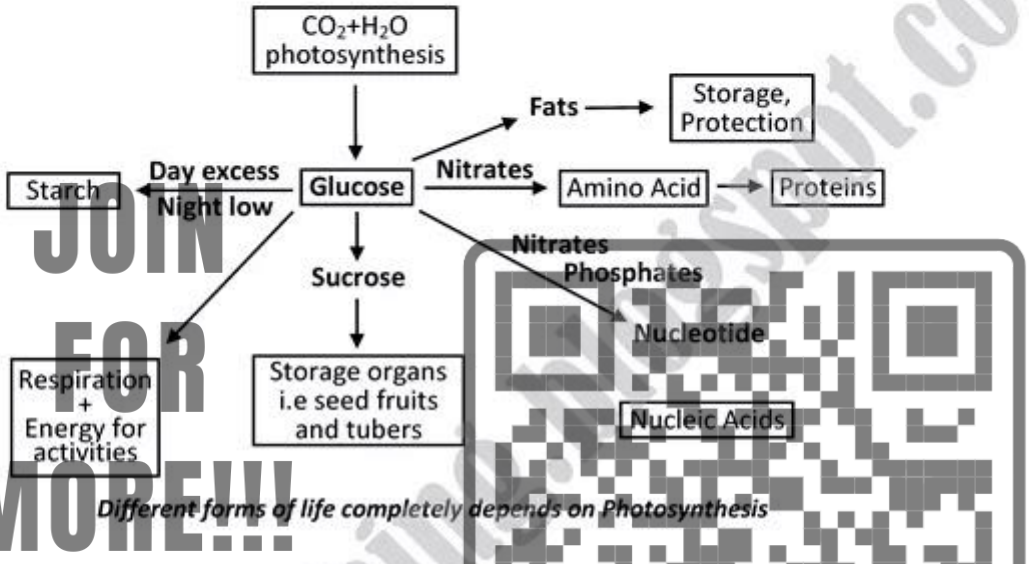
Equation:

$$\text{Carbondioxide + Water} \xrightarrow[\text{Chlorophyll}]{\text{Light}} \text{Glucose + Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6O_2$$

In other words photosynthesis converts light energy into chemical energy. The fundamental molecule produced during photosynthesis is simple sugar i.e. glucose. Glucose utilizes in most of the metabolism of plant to produce secondary products like starch and other polysaccharides. Plants also use carbohydrates to form fats, proteins and other chemical like nucleic acids.

This glucose is also used in respiration as reactant to produce energy for the metabolism of living organisms.



Importance of Photosynthesis:

(i) Plants are not the only organisms which depend on photosynthesis but animals (Heterotrophs) also depend on phototrophs. These organisms utilize the molecules of phototrophs as food molecules. If an animal is herbivorous it feeds directly on plants. If an animal is carnivorous it depends on those animals which feed on plant. These feeding sequences and relationship are called Food Chains.

(ii) On the other hand photosynthesis is the only process which produces free O_2 by splitting water. This O_2 is utilized by all living organisms for respiration to produce energy for metabolism. Without O_2 living organisms cannot survive. Through photosynthesis, quantity of CO_2 and O_2 in nature is maintained by plants.

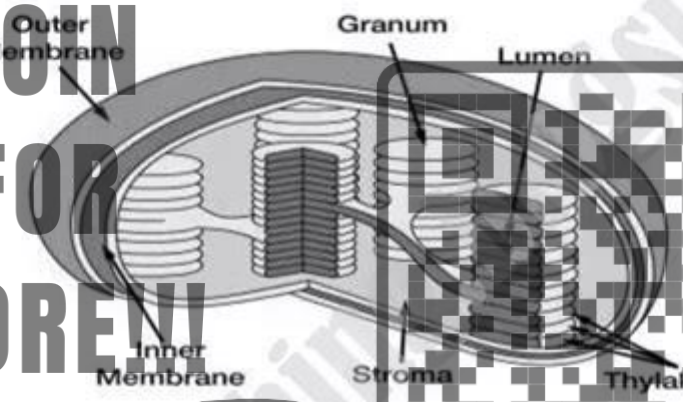
(iii) During photosynthesis plants fix CO_2 and release O_2 in environment. CO_2 has a property to absorb heat of the sun. If its quantity increases in environment, there will be increase in an environmental temperature on earth called global warming. Photosynthesis keeps the quantity of CO_2 maintained in environment i.e. indirectly keeping the concentration of CO_2 to maintain the temperature of earth.

Q.7: What is chlorophyll?

Ans: Chlorophyll is the green pigments found in the chloroplast of plant cell. It captures a specific part of visible light only, therefore it is not a reactant but absorbs energy needed to drive the reaction.

Q.8: Describe the structure of chloroplast.

Ans: **Structure of Chloroplast**: Green part of plants and algae contain special cell which contain special organelle called chloroplast. Chloroplast is double membrane bounded organelle, have semi-fluid proteins containing medium called Stroma. Another network of membrane is also embedded in it called Thylakoid membrane, somewhere this Thylakoid are piled at one another in stack called Grana (Singular-Granum).



Q.9: Briefly describe the reaction of photosynthesis.

Ans: The simple looking reaction of photosynthesis is not as simple as it looks. It involves number of chemical reactions which are catalyzed by number of enzymes, either in non-cyclic or cyclic ways. Each reaction occurs at different site in chloroplast i.e.

(i) Reaction in which light energy converted into chemical energy and stored in ATP (Adenosine Triphosphate) and $NADPH_2$ (reduced Nicotine amide Adenosine Dinucleotide Phosphate). This conversion occurs at Thylakoid membrane where solar energy is captured by pigments located in harvesting complex. This phase of photosynthesis is called light dependent reaction. It is non-cyclic process coupled with breakdown of H_2O molecules i.e. photolysis, takes place also at thylakoid membrane.

(ii) Reaction in which captured solar energy transferred to glucose from ATP and $NADPH_2$. It takes place in stroma, in cyclic manner. During this phase fixation of atmospheric CO_2 also takes place to form organic molecules.

Q.10: Describe two phases of photosynthesis in detail.

Ans: **Two phases of Photosynthesis**: Processes of Photosynthesis is mainly divided into two phases or reactions.

(i) Light Reaction or Light Dependent reaction.

(ii) Dark Reaction or Light Independent reaction.

(i) **Light Reaction or Light Dependent reaction**: The term light reaction or light dependent reaction is used due to the reason that during this phase of photosynthesis light energy is captured and converted into chemical energy.

Photolysis: Some of the light is utilized to split water into oxygen and H^+ with e^- (electron), this splitting of water is called Photolysis. Oxygen which is produced during photolysis is released in the environment where as H^+ together with CO_2 are used in building glucose.

Photosystem I & II: In chloroplast, different pigments absorb light of different wavelengths. Among them chlorophyll is the main light capturing molecules in thylakoid membrane which absorbs violet, blue and red light but reflects green therefore it appears green. In the thylakoid membrane other pigments and electron carrier molecules form highly organized assemblies in a series called photosystems. Each thylakoid contains thousands of copies of two different kind of photosystems called photosystems I and II. Each consists of two major parts, a light harvesting complex and an electron transport system.

The conversion of light energy takes places when the chlorophyll of reaction center receives energy. One of the electrons from chlorophyll "a" molecule leaves and jump over the electron transport system. This energized electron moves from one e- carrier to next. The electron releases energy, when it comes down, this energy drives reactions and produces two energy rich compounds. These are:

(a) ATP (Adenosine Triphosphate)

(b) $NADPH_2$ (Reduced Nicotinamide Adenosine Dinucleotide Phosphate)

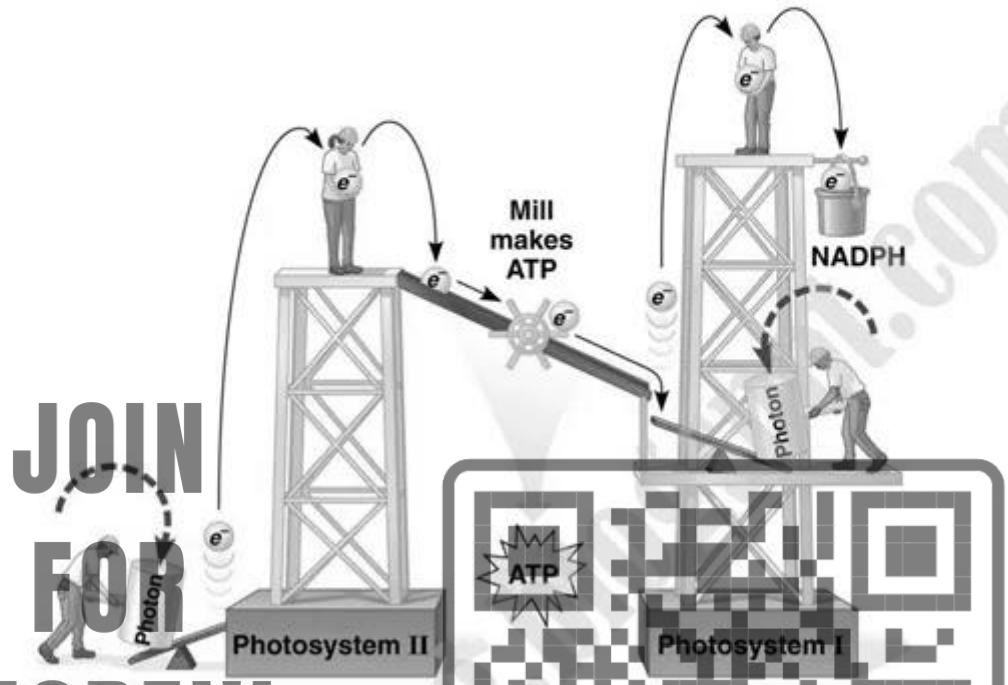
ADP is the compound which is already present in cell. It combines with phosphate by using energy of photon released from when moving through e-carriers in photosynthesis.

$$ADP + P \xrightarrow[\text{Enzyme Complex}]{\text{Light energy}} ATP$$

NADP also present in chloroplast is reduced into $NADPH_2$ by accepting Hydrogen ions (H^+) released from splitting of water.

$$\underset{\text{Cell}}{NADP} + \underset{\text{From Water}}{2H^+ + 2e} \longrightarrow \underset{\text{Reduced form}}{NADPH_2}$$

ATP and $NADPH_2$ both are energy rich compounds which provide energy, Hydrogen (H^+) and e- for the conversion of atmospheric CO2 into carbohydrates in chloroplast during light independent phase of photosynthesis.



Mechanical analogy for the light reactions

(ii) **Dark Reaction or Light Independent Reaction**: This phase of photosynthesis does not require energy of photon but also takes place in day simultaneously with the light reaction.

The ATP and $NADPH_2$ synthesized during the light dependent reaction are dissolved in stroma there, they provide energy to power the synthesis of glucose from CO_2 and H_2O (i.e. H^+ and e^- of water). This phase occurs independently, without light as long as ATP and $NADPH_2$ are available.

This phase of photosynthesis is cyclic phase. It occurs in set of reactions also called Calvin Benson Cycle due to its discoverer or the C_3 (three Carbon Containing Compounds formed initially) cycle.

The C_3 cycle requires:

(a) CO_2 - normally from air; some of it also comes from respiration.

(b) CO_2 capturing sugar - a pentose sugar.

(c) Enzymes to catalyze all the reactions.

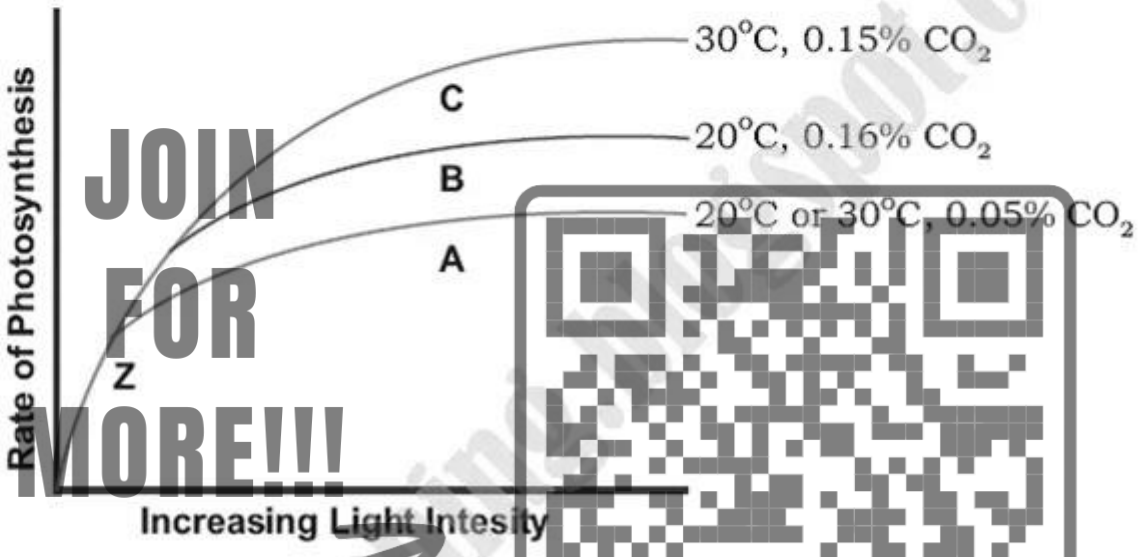
(d) Energy from ATP and $NADPH_2$ come from light dependent reaction.

Q.11: Define limiting factor.

Ans: **Limiting Factor**: Rate of biochemical reaction dependent on some factors which affect the rate are called limiting factor.

For example at low light intensity rate of photosynthesis increase continuously but at high light intensity the rate becomes constant.

Light intensity, carbon dioxide concentration and temperature can all be limiting factors for the rate of photosynthesis. Following graph shows the idea of limiting factor.



A - At point Z on graph, light intensity is limiting factor.

B - If light intensity increase to bright light and moderate temperature the concentration of CO_2, in air becomes limiting factor. It is clearly observed that the same plant if put into air containing high CO_2 then the rate of photosynthesis becomes high.

If there is high light intensity and high CO_2 concentration then the temperature becomes the limiting factor but the temperature should not be very high otherwise enzymes become denatured.

Activity: Find out the effect of light intensity on the rate of photosynthesis.

Apparatus:

Large beaker of water, boiling tube, stand and clamp, paper clip, fresh water plant hydrilla, ruler, stopwatch, thermometer, lamp etc.

Procedure:

(1) Take a healthy piece of hydrilla. Place it upside down in a boiling tube of water. It helps to sink the hydrilla.

(2) Clamp the tube to hold it upright in beaker to water. Ensure that the plant is perpendicular to source of light. The beaker of water is needed to maintain a constant temperature.

(3) Place a thermometer is water to record the temperature. Turn off the room lights to reduce back ground light and place a bench lamp close to the, beaker.

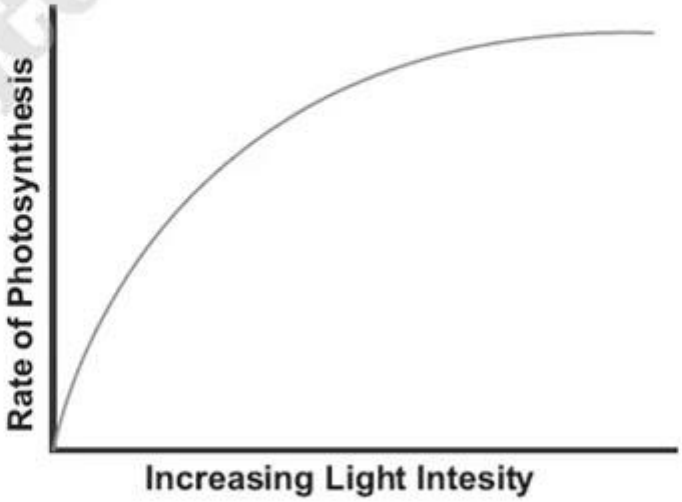
(4) Observe the plant for few minutes; you will see the bubbles of gas coming out from the cut end of plant. If no bubbles are seen repeat the experiment by using fresh piece of plant. Count the number of bubbles per minute. If the rate of bubbling is too fast to count, move the lamp away from the breaker until the rate becomes countable.

(5) Repeat the counts until you are sure that the rate is constant. Record the rate and the distance of the lamp from the plant.

(6) Change the distance of lamp from plant and take more measurement of the rate of bubbling at each distance. Take 3 values at each point.

(7) Repeat the counts at different distance from plant. Keep the temperature of water constant thought out the experiment.

Suppose that the rate of bubble production is the measure of the rate of photosynthesis. It is concluded that the rate of photosynthesis decreases at low light intensities. As the lamp is moved away from plant, the intensity of light falling on it also decreases.



Q.12: What is an ADP? How is it formed?

Ans: **ADP**: ADP is an abbreviation of Adenosine diphosphate. Each ADP compound consists of: Adenine, ribose and two phosphate groups.

Formation: When the terminal bond is broken the ATP is converted into ADP by enzyme ATP ase releasing a phosphate and liberating 30.6KJ (7.3Kcal) of energy.

An ADP is like a discharged battery. When the energy is made available by oxidation of food, ADP takes this energy to be converted to ATP that is to say that it becomes charged once again.

Q.13: Define respiration.

Ans: **Respiration**: To carry out all the life process cells requires energy. The source of this energy is food or photo assimilates (products of photosynthesis) in plants. Cells break food molecules to release their chemical energy. The breakdown of food molecules to release energy is called respiration.

Chemical Equation: Usually cells use oxygen to oxide food. It results CO_2 and water as waste products. This main food oxidized is the sugar i.e. glucose. The overall equation for this chemical reaction is:

$$\text{Glucose} + \text{Oxygen} \longrightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$$

$$C_6H_{12}O_6 \longrightarrow 6CO_2 + 6H_2O + ATP$$

Above equation shows that one molecule of glucose reacts with six molecules of Oxygen to produce six molecules of carbon dioxide and six molecules of water. The main product is energy which is produced in the form of energy rich molecules called ATP.

Q.14: What is the difference between breathing and respiration?

Ans: It is commonly believed that breathing and respiration processes are same but factually they are different, although they are linked.

Respiration is the chemical reaction takes place in cells to release energy from food while the breathing is movement of air in and out of the organism to supply O_2 and CO_2 , We use another term for breathing called Ventilation. Breathing allows the process of gaseous exchange at surface of cells and tissues. So the terms breathing, gaseous exchange and respiration are different from one another but linked together to make possible energy production at cellular level.

Q.15: What are the steps of respiration?

Ans: **Steps of Respiration**: Respiration consists of the following two steps.

(i) Breathing (ii) Cellular Respiration

(i) **Breathing:** Breathing involves the exchange of gasses.

(ii) **Cellular Respiration**: It is defined as the process in which the oxidation of food takes place within the cell with the help of oxygen and enzymes, resulting in the release of energy.

Q.16: Explain types of respiration with the help of chemical equation.

Ans: **Type of Respiration**: There are two types of respiration found in living organisms for the production of energy.

(i) Anaerobic Respiration or Fermentation

(ii) Aerobic Respiration

(i) **Anaerobic Respiration OR Fermentation**: The primitive type of respiration which takes place in the absence of O_2 or without O_2 is called anaerobic respiration or fermentation.

There are special conditions where O_2 is not available so the organisms adapt themselves to break down their food without oxygen which is called anaerobic respiration or fermentation. It takes place in some bacteria, fungi, endoparasite and sometimes in animal. During anaerobic respiration, glucose is not broken down completely so less amount of energy (5 to 10% as compared to aerobic respiration) is released but it can sustain life even in the absence of O_2. It had evolved on earth where there was no O_2 on earth. There are two types of anaerobic respiration.

(a) Alcoholic Fermentation (b) Acidic Fermentation

(a) **Alcoholic Fermentation**: The bacteria and fungi respire aerobically but when these organisms are deprived of oxygen they stop respiration aerobically and start respiring anaerobically instead. During anaerobic respiration they produce ethyl alcohol with CO_2.

Glucose $\longrightarrow$ Ethanol + CO_2 + Some energy

$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$ + Some ATP

(b) **Acidic Fermentation**: In animals when aerobic respiration is not enough to produce required energy they start anaerobic respiration. During this process glucose breaks down into a substance called lactic acid.

Glucose $\longrightarrow$ Lactic acid + Some energy

$C_6H_{12}O_6 \longrightarrow 2C_3H_6O_3$

A limited amount of energy is produced as compared to aerobic respiration but this is enough to power the athlete's muscles during start time of sprint. He experiences pain; this condition of pain is called muscle fatigue. The lactic acid is produced in his muscles bool stream.

(ii) **Aerobic Respiration**: In this type of respiration food breakdown occurs in the presence of oxygen to produce energy. It is a method of respiration found in majority of organisms. It takes place in the presence of free oxygen, oxidizing the food and releasing the maximum amount of energy i.e. 2827kj/mole of glucose or 36 ATP molecules/glucose.

The end products of aerobic respiration are CO_2 and H_2O

Glucose + Oxygen ⟶ Carbon dioxide + Water + Energy (36 ATP)

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6HP + 36\ ATP$

Q.17: What is the importance of anaerobic respiration?

Ans. **Importance of Anaerobic Respiration**:

(i) Anaerobic respiration is the emergency arrangement of energy which has an advantage that organisms can survive without O_2 or can work for short period with same pace for short period.

(ii) The other products of anaerobic respiration are acids. Vinegars are also organic acids that are produced commercially by acidic formulations.

(iii) Anaerobic respiration also produces ethyl alcohol. This process is commercially utilized by making alcoholic products like beer, wines and other beverages.

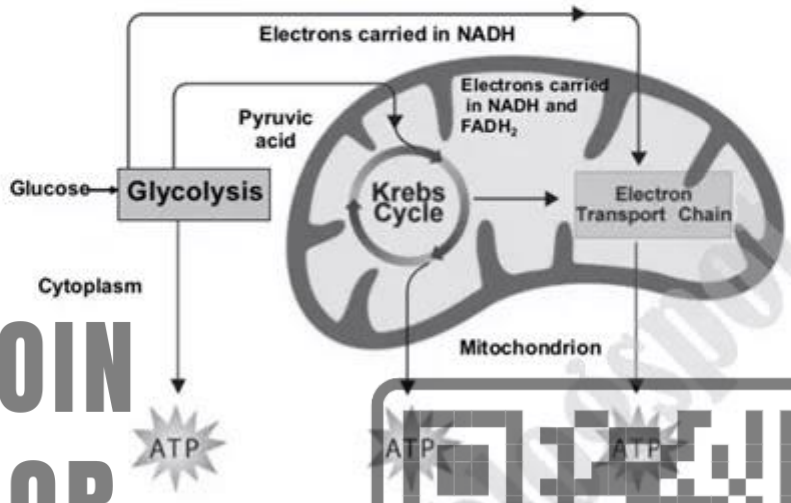
(iv) Baking industry is also based on it because anaerobic respiration also produces CO_2 which gives fluffy and soft shapes to cakes and breads also break down of starch into complex sugar to form bread and pizza.

Q.18: Describe the mechanism of aerobic respiration.

Ans. **Mechanism of Aerobic Respiration:** Aerobic Respiration takes place in 3 steps at different places in the cell.

(i) **Glycolysis:** First stage is that stage where a molecule of glucose (six carbon sugar) is broken down into two molecules of pyruvic acid (three carbon acid). It does not require oxygen. It takes place in both aerobic and anaerobic respiration. This splitting of glucose releases small amount of energy of glucose which is enough to generate 2 molecules of ATP. Glycolysis is a complex sequence of reaction all occur in cytosol.

(ii) **Kreb's or Citric acid Cycle**: The second stage of aerobic respiration in which pyruvic acid produced during glycolysis enters the mitochondria where O_2 available. Cellular respiration uses this O_2 to break pyruvic acid completely into CO_2 and H_2O in a cyclic manner. During Kreb's Cycle some ATP produce and some co-enzymes like NAD and FAD are reduced to $NADH_2$ and $FADH_2$. It takes place in matrix of mitochondria.



(iii) **Electron Transport Chain:** The last stage of aerobic respiration in which $NADH_2$ (Nicotinamide Adenosine Di-nucleotide) and $FADH_2$ (Flavinamide Adenosine Di-nucleotide) are oxidized to produce ATP and H_2O. It takes place at the cristae of mitochondria.

Q.19: Describe the usage of respiration energy in the body of organisms.

Ans: **Usage of Respiration Energy in the Body of Organisms**: Number of processes requires energy in the body of an organism. Body provides it from respiratory energy. Following are some processes which utilize respiratory energy.

(i) Synthesis of molecules - Formation of different molecules as well as large molecules from small molecules requires energy.

(ii) Cell division - During cell division formation of large molecules like DNA and protein takes place which require energy as well as movement of chromosome also require energy.

(iii) Growth without cell division - enlargement growth is not possible and both require formation of molecules which require energy.

(iv) Active transport - movement of ions and molecules from low concentration to high concentration requires energy.

(v) Muscle Contraction - Movement of muscle requires energy which is produced from chemical energy, chemical energy converted into kinetic energy.

(vi) Passage of Nerve impulse - Nerve Impulse (message of Neuron) is basically electrical signals moving long nerve fiber by active transport requires energy.

(vii) Maintenance of body temperature - In higher animal's body temperature is maintained at constant level, this temperature maintenance requires energy of respiration.

Q.20: Distinguish between the following in tabulated form:

(i) Respiration and photosynthesis

(ii) Light reaction and Dark reaction

(iii) Aerobic respiration and anaerobic respiration

(iv) Breathing and respiration

Ans: (i) **Difference Between Respiration and Photosynthesis**

	Respiration	Photosynthesis
1.	It is a catabolic process i.e. compounds are broken down.	It is an anabolic process i.e. compounds are formed in this process.
2.	It occurs during day and night a like	It occurs during day time only.
3.	It takes place inside mitochondria.	It takes place within chloroplast.
4.	In respiration energy is released from food materials.	Energy is used in this process, but energy is stored in the form of food materials.
5.	During this process O_2 enters the body and CO_2 is released.	In photosynthesis CO_2 enters the plant and O_2 is given out.
6.	It takes place in all the living cells of plants and animals.	It takes place in the green parts of the plant body.
7.	The end products of this process are CO_2 and H_2O	The end products of this process are simple carbohydrates and oxygen.
8.	The chemical equation for this process is: $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + Energy$	The chemical equation for this process is: $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
9.	During the breakdown of one glucose molecule, 38 ATP molecules are formed	During the formation of one glucose molecule, 18 ATP molecules are utilized.

(ii) **Difference Between Light reaction and Dark reaction**

	Light reaction	Dark reaction
1.	It takes place only in the presence of light.	It can take place in the presence or absenceof sunlight.
2.	It is a photochemical phase	It is a biochemical phase.
3.	It takes place in the grana of the chloroplast.	It takes place in the stroma of the chloroplast.
4.	NADP utilizes H+ ions to form NADPH.	The hydrogen of NADPH combines with CO_2
5.	The end products are ATP and NADPH.	Glucose is the end product. ATP and NADPH help in the formation of glucose.
6.	The water molecules split into hydrogen and oxygen.	Glucose is produced. CO2 is utilized in the dark reaction.
7.	Photolysis occurs in PS-II.	Photolysis does not occur.

(iii) **Difference Between Aerobic respiration and anaerobic respiration**

	Aerobic Respiration	Anaerobic Respiration
1.	It is that type of respiration in which oxygen is necessary.	It takes place in the absence of oxygen.
2.	It oxidizes the food completely.	It oxidizes the food partially
3.	During this process large amount of energy is released i.e. 2827KJ.	In this process, small amount of energy is released i.e. 210KJ (in bacteria & fungi) and 150 KJ (in animals).
4.	Carbon dioxide and water are the end products of this process.	The end products are lactic acid (in animals). Ethanol and carbon dioxide (in bacteria and fungi).

(iv) **Difference Between Breathing and Cellular respiration**

	Breathing	Cellular Respiration
1.	Breathing is a physical process in which O_2 is taken in and CO_2 is given out.	It is a biochemical process in which organic food is oxidized into CO_2 and H_2O.
2.	It occurs outside the cells.	It occurs inside the cells.
3.	There is no release of energy.	There is a gradual and stepwise release of energy.
4.	Enzymes are not involved.	Enzymes are involved.
5.	Oxygen is necessary in this process.	In anaerobic respiration oxygen is not necessary in this process.

Q.21: How CO_2 maintain the temperature of earth?

Ans: Carbon dioxide controls temperature because it has a property to absorb infrared radiation of the sun. When the carbon dioxide concentration goes up, temperature goes up. When the carbon dioxide concentration goes down, temperature goes down.

Q.22: Why the second phase of photosynthesis is called dark reaction?

Ans: Dark reactions do not need light. Instead, dark reaction uses ATP and $NADPH_2$ to produce energy molecules. No photosystem is required. Photolysis of water does not occur. The dark reaction in photosynthesis is called so because it does not require light energy.

Q.23: Why acidic fermentation is harmful?

Ans: Acidic fermentation is harmful because the lactic acid which accumulates in human may cause fatigue and pain during anaerobic respiration.

Biology 9th- Short Question Answers

BIOENERGETICS

CHAPTER# 07

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: How CO_2 maintain the temperature of earth?

Ans. Carbon dioxide controls temperature because it has a property to absorb infrared radiation of the sun. When the carbon dioxide concentration goes up, temperature goes up. When the carbon dioxide concentration goes down, temperature goes down.

Q.2: Why second phase of photosynthesis is called dark reaction?

Ans. Dark reactions do not need light. Instead, dark reaction uses ATP and $NADPH_2$ to produce energy molecules. No photosystem is required. Photolysis of water does not occur. The dark reaction in photosynthesis is called so because it does not require light energy.

Q.3: How respiration is different from breathing?

Ans. Respiration is the chemical reaction takes place in cells to release energy from food while the breathing is movement of air in and out of the organism to supply O_2 and CO_2, We use another term for breathing called Ventilation. Breathing allows the process of gaseous exchange at surface of cells and tissues. So the terms breathing, gaseous exchange and respiration are different from one another but linked together to make possible energy production at cellular level.

Q.4: Why acidic fermentation is harmful?

Ans. Acidic fermentation is harmful because the lactic acid which accumulates in human may cause fatigue and pain during anaerobic respiration.

Q.5: How glucose form secondary products in plants?

Ans. To carry out all the life process cells requires energy. The source of this energy is food or photo assimilates (products of photosynthesis) in plants. Cells break food molecules to release their chemical energy. The breakdown of food molecules to release energy is called respiration. Usually cells use oxygen to oxide food. It results CO_2 and water as waste products. This main food oxidized is the sugar i.e. glucose.

In this type of respiration food breakdown occurs in the presence of oxygen to produce energy. It is a method of respiration found in majority of organisms. It takes place in the presence of free oxygen, oxidizing the food and releasing the maximum amount of energy i.e. 2827kj/mole of glucose or 36 ATP molecules/glucose.

Q.6: Describe the three usage of respiration energy in the body of organisms.

Ans: **Usage of Respiration Energy in the Body of Organisms**: Number of processes requires energy in the body of an organism. Body provides it from respiratory energy. Following are some processes which utilize respiratory energy.

(i) Synthesis of molecules - Formation of different molecules as well as large molecules from small molecules requires energy.

(ii) Cell division - During cell division formation of large molecules like DNA and protein takes place which require energy as well as movement of chromosome also require energy.

(iii) Growth without cell division - enlargement growth is not possible and both require formation of molecules which require energy.

Q.7: Define respiration.

Ans: **Respiration**: To carry out all the life process cells requires energy. The source of this energy is food or photo assimilates (products of photosynthesis) in plants. Cells break food molecules to release their chemical energy. The breakdown of food molecules to release energy is called respiration.

Q.8: What is chlorophyll?

Ans: Chlorophyll is the green pigments found in the chloroplast of plant cell. It captures a specific part of visible light only, therefore it is not a reactant but absorbs energy needed to drive the reaction.

Q.9: Describe the structure of chloroplast.

Ans: **Structure of Chloroplast**: Green part of plants and algae contain special cell which contain special organelle called chloroplast. Chloroplast is double membrane bounded organelle, have semi-fluid proteins containing medium called Stroma. Another network of membrane is also embedded in it called Thylakoid membrane, somewhere this Thylakoid are piled at one another in stack called Grana (Singular-Granum).

Biology 9th – Detailed Question Answers

NUTRITION

CHAPTER# 08

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define nutrition and nutrients.

Ans: **Nutrition**: Process by which organisms obtain and use the nutrients required for maintaining life is called nutrition.

Nutrition is the study of nutrients in food, how the body uses nutrients and the relationship between diet, health and diseases.

Nutrients: Essential substances that our body needs in order to grow and stay healthy are known as nutrients.

Q.2: Briefly describe the process by which food is obtained or prepared.

Ans: Plants and animals to not obtain food by the same processes. Plants and some bacteria have the green pigment chlorophyll to synthesize food, while animals, fungi and other bacteria depend on other organisms for food. Based on this, there are two main modes of nutrition:

- autotrophic
- heterotrophic

Autotrophic Nutrition: It is the mode of nutrition in which an organism makes its own food from the simple inorganic materials like carbon dioxide, water and minerals present in the surrounding (with the help of energy). These processes are photosynthesis or either chemosynthesis.

Heterotrophic Nutrition: It is the mode of nutrition in which an organism can't make its own organic material but depends on other organisms for its food and use it for growth and energy.

Q.3: Name the process by which plants prepare their food.

Ans: **Photosynthesis**: Green plants, which are autotrophs, synthesize food through the process of photosynthesis. Photosynthesis is a process by which green plants, algae and some bacteria having chlorophyll, synthesize the simple sugar (glucose) from the simple raw materials i.e. water and carbon dioxide by using the energy of sunlight. Oxygen released in this process. The overall equation of photosynthesis is:

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{SunLight}} C_6H_{12}O_6 + 6H_2O + 6O_2$$

Q.4: Describe heterotrophic nutrition.

Ans: **Heterotrophic Nutrition**: The word "Heterotroph" is derived from two Greek words-heteros (other} and trophe (nutrition). Unlike autotrophs, which manufacture their own food, heterotrophic organisms obtain food form other organisms. As heterotrophs depend on other organisms for their food, they are also called consumers. All animals, non-green plants like and fungi come under this category.

Herbivores: Consumers which consume herbs and other plants are called herbivores.

Carnivores: Those consumers which consume animals are called carnivores.

After taking complex organic materials as food, heterotrophs break them into simple molecules with the help of biological catalysts, i.e., enzymes and utilize them for their own metabolism.

Q.5: Mention the types of heterotrophic nutrition.

Ans: Depending upon the mode of living and the mode of intake of food, hetertrophs may be parasitic, saprotrophic or holozoic.

(i) **Parasitic Nutrition**: Parasitic organisms, or parasites, live on or inside other living organisms, called hosts, and obtain their food from them. The host does not get any benefit from the parasite. This mode of nutrition is called parasitic nutrition. Different parasites, like Cuscuta (akash-bel), hookworms, tapeworms, leeches etc., have modes of feeding, depending upon habit, habitat and modifications.

(ii) **Saprotrophic Nutrition**: (Gr: Sapros=rotten, Trophic=nutrition): Saprotrophic organisms, or saprotrophs, derive their food from dead and decaying organic material. This mode of nutrition is called saprotrophic nutrition. They secrete enzymes that are released on food material outside their body, these enzymes breakdown complex food into simple forms. Common examples of saprotrophs are fungi (moulds, mushrooms, yeasts) and many bacteria.

(iii) **Holozoic Nutrition**: (Gr: Holo=Whole, Zoikos=of animal): In holozoic nutrition complex organic substances are ingested (taken in) without their being degraded or decomposed. After intake, such food is digested by enzymes produced within the organism. Digested food is absorbed into the body and the undigested product is egested (expelled out) from the body. This kind of nutrition is found mainly in non-parasitic animals-simple ones like Amoeba and complex ones like human beings.

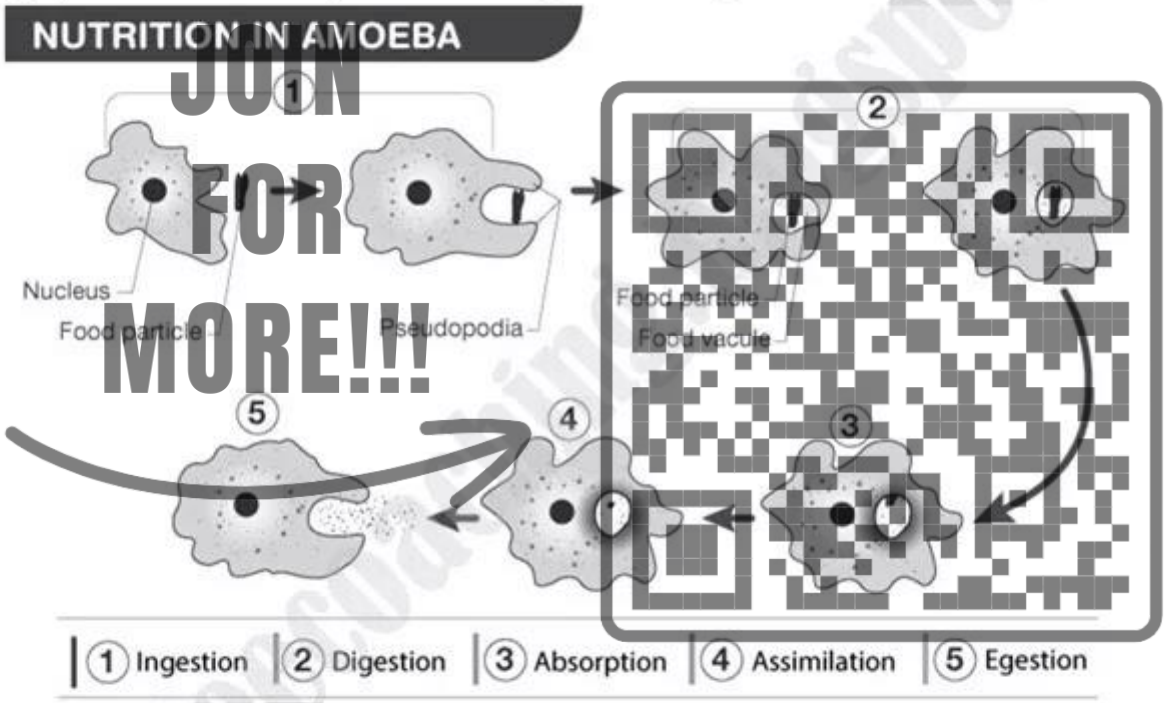
Q.6: How amoeba and paramecium obtain nutrition?

Ans: Different organisms obtain food in different ways.

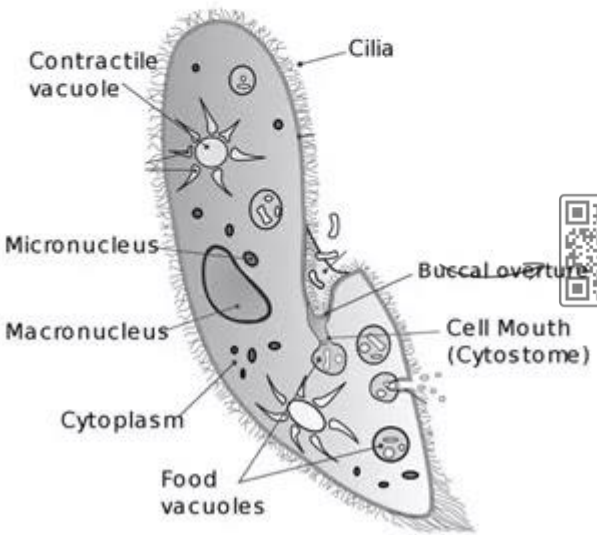
Nutrition in Amoeba: Nutrition in unicellular organisms like Amoeba, involves ingestion by the cell surface, digestion and egestion.

Amoeba takes in complex organic matter as food. Amoeba first identifies its food then throw out a number of small pseudopodia (projections of cytoplasm, also called false feet). These pseudopodia enclose the food particle and prevent it from escaping. The food enclosed in the cell membrane forms a food vacuole.

The complex food in broken down into simpler molecules with the help of digestive enzymes produced by an organelle called lysosome. The digested food is distributed in the cytoplasm and the undigested food is egested through the cell membrane.



Nutrition in Paramecium: In paramecium, a unicellular organism with a specific shape, food is ingested through a special opening, the cytostome (cell mouth). Food is brought to this opening by the lashing movement of cilia that cover the entire surface of the cell.



Q.7: Define mineral nutrition in plants.

Ans: **Mineral Nutrition in Plants**: The process involving the absorption, distribution and utilization of mineral substances by the plants for their growth and development is called mineral nutrition.

Q.8: What are macronutrients and micronutrients?

Ans: Plants have the most efficient mechanism for preparing their food by using many elements essential for plant nutrition. Plants require a steady supply of macronutrients and micronutrients. The difference between the two is quite simple: macronutrients are required in large quantities than micronutrients.

The names of the two categories don't apply, indicate that one type of nutrient is more important than another; it just means that more macronutrients must be present in the soil than micronutrients. Plants obtain nearly all of the nutrients they need from the soil, although some are synthesized produced via photosynthesis.

Q.9: Why nitrogen is essential for plants?

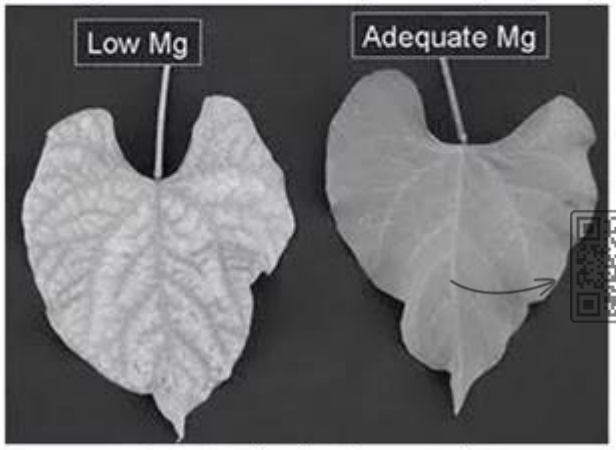
Ans: **Nitrogen** : Nitrogen is essential for plants to synthesize amino acids, which are the building blocks for protein synthesis and also required for the production of chlorophyll, nucleic acids, and enzymes. For all metabolic elements which plants use from soil, nitrogen needs in the largest amounts.

Q.10: What are the symptoms of nitrogen deficiency?

Ans: **Symptoms of Nitrogen Deficiency**: Nitrogen-deficient plants exhibit stunted growth, reduced yields and their foliage pale green.

Q.11: Why do plants need magnesium? What are the symptoms of magnesium deficiency?

Ans. **Magnesium**: Many enzymes in plant cells require magnesium in order to perform properly and is a constituent of the chlorophyll molecule, which is the driving force of photosynthesis.



Symptoms of Magnesium Deficiency: Magnesium deficiency is most prevalent on sandy textured soils, which are subject to leaching, particularly during seasons of excess rainfall.

The predominant symptom is interveinal chlorosis (dark green veins with yellow areas between the veins). The bottom leaves are always affected first as shown in above figure.

Q.12: What is the importance of fertilizers?

Ans: **Importance of Fertilizers**: Fertilizers are substances containing chemical elements such as manure of mixture of nitrates that improves the growth of plants. They give nutrition to the crops and produce more fruit, faster growth, more attractive flowers. When added to soil or water, plants can develop tolerance against pests like weeds, insects and diseases. And the use of manure and composts as fertilizers is probably almost as old as agriculture. Modern chemical fertilizers include one or more of the three elements that are most important in plant nutrition: nitrogen, phosphorus, and potassium. Chemicals fertilizers are simply that nutrients applied to agricultural fields to supplement required elements found naturally in the soil.

Q.13: Describe the environmental hazards related to chemical fertilizers.

Ans: **Environmental Hazard**: An environmental hazard is a condition, which has the potential to threat natural environment or adversely affect people's health, including pollution and natural disasters.

Environmental Hazards Related to Chemical Fertilizers: The farmers apply chemical fertilizer for better growth of their crops, but on the other side these fertilizers pollute water and soil as well. Some effects of chemical fertilizers on the environment are as follows:

(i) **Soil Nutrient Holding Capacity**: The massive quantities of inorganic fertilizers affect the soil nutrient holding capacity.

(ii) **Eutrophication**: The high solubility of fertilizers also degrade ecosystem through eutrophication (means an increase in chemical nutrients typically compounds containing nitrogen or phosphorus in an ecosystem).

(iii) **Emission of Greenhouse Gas**: Storage and application of some nitrogen fertilizers may cause emission of greenhouse gas, e.g. nitrous oxide.

(iv) **Soil Acidity**: Ammonia gas (NH_3) may be emitted from applied inorganic fertilizers. This extra ammonia can also increase soil acidity.

(v) **Past problems**: Excessive nitrogen fertilizers can lead pest problems by increasing their reproduction rate.

(vi) **Nutrient Balance**: It is recommended that nutrient content of the soil and nutrient requirement of crop should be carefully balanced with application of inorganic fertilizers. It is critical to apply no more than it is needed; any excess in nutrient will definitely develop pollution of any kind.

Q.14: What are the components of human food?

Ans: **Components of Human Food**: Holozoic nutrition is the type of heterotrophic nutrition. Heterotrophic organisms have to acquire and take in all the organic substances they need to survive. There are seven major classes of nutrients:

(i) carbohydrates (ii) protein (iii) fats (iv) minerals
(v) fiber (vi) vitamins (vii) water

Q.15: Write down the role and sources of carbohydrates, proteins and fats.

Ans: **Carbohydrates**: Carbohydrates are necessary for our body specially glucose, which is primary source of energy. They are generally divided in two categories:

(i) simple carbohydrates (ii) Complex carbohydrates

Simple Carbohydrates: Simple carbohydrates such as sucrose, which digest quickly.

Complex Carbohydrates: Complex carbohydrate such as starch etc. which digest slowly.

Sources of Carbohydrates: Source of simple carbohydrates include fruits sugars and processed grains, such as white rice or flour. We can find complex carbohydrates in green or starchy vegetables, potatoes, while grains, beans and lentils. The most common and abundant forms are sugars, fibers and starches.

***Carbohydrates** These starchy foods give us energy and warmth*

Proteins: Proteins consist of units called amino acids, attach together in complex formations. Proteins are complex molecules; the body takes longer to break them down. As a result, they are much slower and long lasting source of energy than carbohydrates.

Essential Amino Acids: There are 20 amino acids. The body synthesizes some of them from components within the body, but it cannot synthesize 9 of the amino acids called essential amino acids. They must be consumed in the diet.

The body needs protein to maintain and replace tissues and their function. Protein is not usually used for energy. However, if the body is not getting enough calories from other nutrients or from the fat stored in the body, protein is used for energy.

Proteins *Help build a strong and healthy body*

Fats: Fats are complex molecules composed of fatty acids and glycerol. The body needs fats for growth and energy. It also uses them to synthesize hormones and other substances needed for the body's activities.

Fats are the slowest source of energy but the most energy-efficient form of food. They body deposits excess fat in the abdomen (omental fat) and under the skin (sub-cutaneous fat) to use when it needs more energy. The body may also deposit excess fat in blood vessel and within organs, where it can block flow and damage organs, often causing serious disorders.

Some typical sources of saturated fats include:

- Fatty cuts of beef and lamb.
- Poultry skin.
- High fat dairy food (whole milk, butter, cheese, sour cream, ice cream)
- Tropical oils (coconut oil, palm oil, cocoa butter)

Fats, *Our body stores up fat to use as energy and protect us from the cold*

Q.16: Define calories.

Ans: **Calories**: The energy obtained from carbohydrates, proteins and fats is measured in units called calories.

Q.17: Write a short note on vitamins.

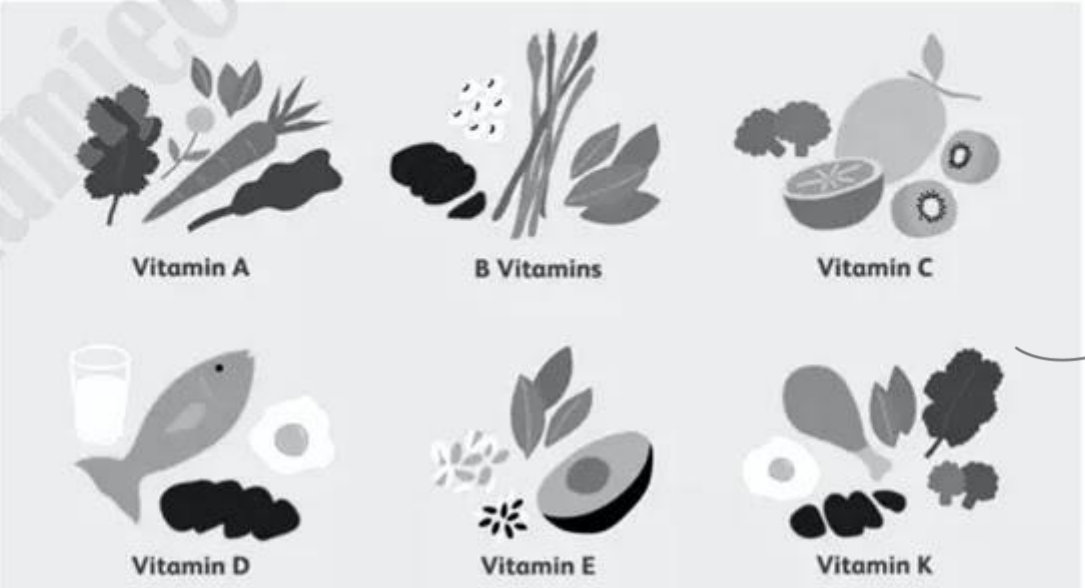
Ans: **Vitamins**: A vitamin is an organic molecule (or related set of molecules), an essential micronutrient that an organisms needs in small quantities for normal health and development. Lack of vitamins can cause several diseases. They are divided into two types:

(i) Fat-soluble vitamins (ii) Water soluble vitamins

(i) **Fat-Soluble Vitamins**: Vitamin which can soluble in organic solvent are called fat-soluble vitamins. They are less excreted from the body as compared to water-soluble vitamins. Vitamins A, D, E and K are fat-soluble vitamins.

(ii) **Water soluble Vitamins**: Vitamin which are soluble in water are called water soluble vitamins. These are vitamins Band C. Cooking or heating destroys the water soluble vitamins more readily than the fat-soluble vitamins.

Vitamin generic name	Deficiency diseases
Vitamin K	Bleeding disorder
Vitamin D	Rickets and osteomalacia
Vitamin C	Scurvey
Vitamin B	Beriberi
Vitamin A	Night blindness, eye-infection, rough skin, respiratory infections



Q.18: Write a short note on minerals.

Ans: **Minerals**: A class of naturally occurring solid inorganic substances with a characteristics crystalline form. Minerals are vital for proper human health.

Essential minerals include calcium, iron, zinc, iodine and chromium. Deficiencies can result in serious health conditions such as brittle bones and poor blood oxygenation. Minerals are found in a variety of foods including dairy and meat products.

Metabolic Function of Calcium: Calcium metabolism refers to the movements and regulation of calcium ions (Ca^{+2}) in and out of various body compartments. Goo calcium nutrition, along with low salt and high potassium intake, prevents from hypertension and kidney stones.

Sources of calcium include:

* Milk, cheese and other dairy foods
* Green leafy vegetables
* Soya beans
* Nuts
* Bread
* Fish

Deficiency Symptoms of Calcium:

* Fainting
* Chest pains
* Heat failure
* Wheezing
* Difficulty swallowing
* Numbness and tingling sensations around the mouth or in the fingers and toes
* Muscle cramps, particularly in the back and legs; may progress to muscle spasm (tetany)
* Voice changes due to spasm of the larynx

Metabolic Function of Iron: Iron plays a major role in oxygen transport and storage. It is a component of hemoglobin in red blood cells and Myoglobin in muscle cells.

Some of the best plant and animal sources of iron:

* Beans and lentils
* Tofu
* Dark green leafy vegetables such as spinach

Deficiency symptoms of iron:	
Extreme fatigue	Weakness
Pale skin	Headache, dizziness
Chest pain, fast heat beat or shortness breath	Inflammation or soreness of tongue
brittle nails	Poor appetite in infants

Q.19: What are metabolic functions of water and dietary fibers?

Ans: **Metabolic Function of Water**: Water is the medium for various enzymatic and chemical reactions in the body. It moves nutrients, hormones, antibodies and oxygen through the blood stream and lymphatic system. Water maintains the body temperature through evaporation as in sweating. Severe dehydration causes cardio-vascular problems.

Metabolic Function Dietary Fibers: Dietary fiber is the edible part of plants, or similar carbohydrates, that can't be digested and absorbed in the small intestine. Fiber plays very important role to prevent from constipation. Soluble fiber helps in lowering the blood cholesterol and blood sugar level.

Function of each body type in Human body

Carbohydrates	(i)	Sugar	→	For energy
	(ii)	Starch	→	For energy
	(iii)	Fiber	→	Prevents constipation
Proteins	→	For growth and repair of cells		
Fat	→	For energy and insulation		
Vitamins	(i)	Vitamin C	→	For healthy skin/gums
	(ii)	Vitamin D	→	For strong bones
Minerals	(i)	Calcium	→	For strong bones
	(ii)	Iron	→	For make red blood cells
Water	→	to dissolve and transport substances		

Q.20: Define and describe the balanced diet related to age, sex and activity,

Ans: **Balance Diet**: A diet which contains all of the nutrients like carbohydrates, fats, proteins, vitamins and minerals in proper proportion according to the requirement of the body is called balanced diet.

A Balanced Diet Related to Age, Sex and Activity: Different factors affect the nutritional requirement during the periods of body growth and development. Energy requirements change through life and depend on many factors, such as: Age, Sex and Level of activity.

The key stages in life include:

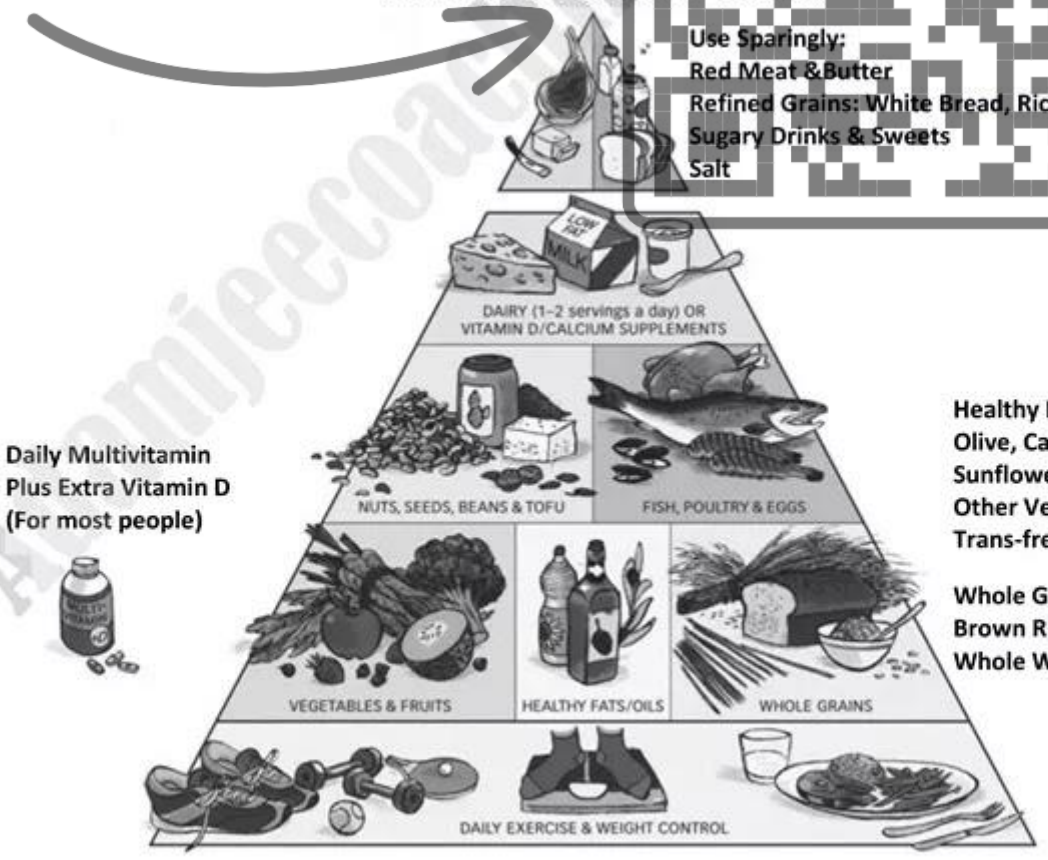
Childhood: The energy requirements of children increase rapidly because they grow quickly and become more active. Young children do not have large stomachs to cope with big meals. Therefore, to achieve the relatively high energy intake for their age, foods should be eaten as part of small and frequent meals.

Adolescence: It is a period of rapid growth and development and is when puberty occurs. The demand for energy and most nutrients are relatively high. Boys need more protein and energy than girls for growth. Children should be encouraged to remain a healthy weight with respect to their height.

Adulthood: A good supply of protein, calcium, iron, vitamin A and D, as part of healthy, balanced diet, are important. Calcium is needed for healthy tooth development, and together with vitamin D, can help develop strong bones.

Sex and Level of Activity: Men are more active than women so they need more energy than women of same age group. Muscular tissues are more in men, their body size is large, and therefore, boys of growing age need more body building nutrients (Proteins, Calcium) as compared to girls of same age.

THE HEALTHY EATING PYRAMID



Q.21: Describe problems related to Nutrition (Malnutrition).

Ans: **Problems Related to Nutrition (Malnutrition)**: Problems related to nutrition are grouped as malnutrition. The malnutrition is a condition that occurs when a body does not get enough nutrients. Malnutrition results from a poor diet or a lack of food. It happens when the intake of nutrients or energy is too high, too low, or poorly balanced. Consuming less than 2011 calories a day, one is considered to be under-nourished and suffering from hunger.

According to the World Health Organization (WHO), malnutrition is the gravest single threat to global public health. Globally, it contributes to 45 percent of deaths of children aged less than 5 years.

Types of Malnutrition : There are two types of malnutrition:

(i) Chronic Malnutrition: Characterized by delayed growth in the children.

(ii) Acute Malnutrition: Characterized by insufficient weight in relation to the child's height (emaciation). Acute malnutrition can be moderate of severe according to the child's weight. Under-nourishment and malnutrition have serious consequences for the health of the younger children. Worldwide, three nutrient deficiencies are of particular concern:

- Vitamin A deficiency is the world's most common cause of preventable child blindness and vision impairment.
- Iron deficiency is associated with decreased cognitive abilities and resistance of disease.
- Iodine deficiency is the major preventable cause of mental retardation worldwide.

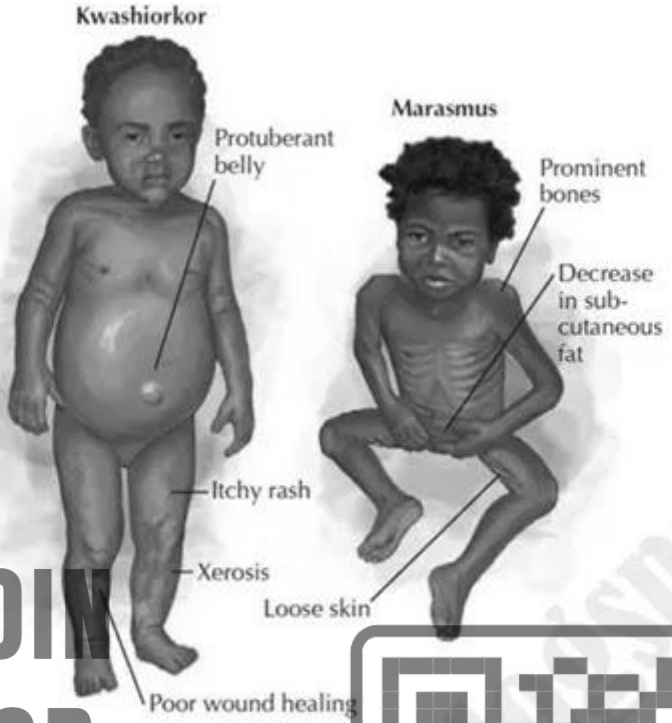
Q.22: What do you know about malnutrition problem in Pakistan?

Ans: Malnutrition is one of the most prevalent public health problems in Pakistan. It is one of the major underlying factors for high infant and under 5 mortality rate in Pakistan. Poverty, lack of education, poor environmental hygiene and food fads are some of the reasons for its high prevalence in Pakistan.

Q.23: Describe protein deficiency disorders.

Ans: **Protein Deficiency Disorders:** Protein energy malnutrition (PEM) refers to inadequate availability or absorption of energy and proteins in the body. It is the leading cause of death in children in developing countries. PEM may lead to diseases such as:

(i) **Kwashiorkor:** Kwashiorkor is a severe form of malnutrition, caused by a deficiency in dietary protein. The extreme lack of protein causes an osmotic imbalance in the gastro intestinal system causing swelling of the gut diagnosed as an edema or retention of water as shown in the given figure.



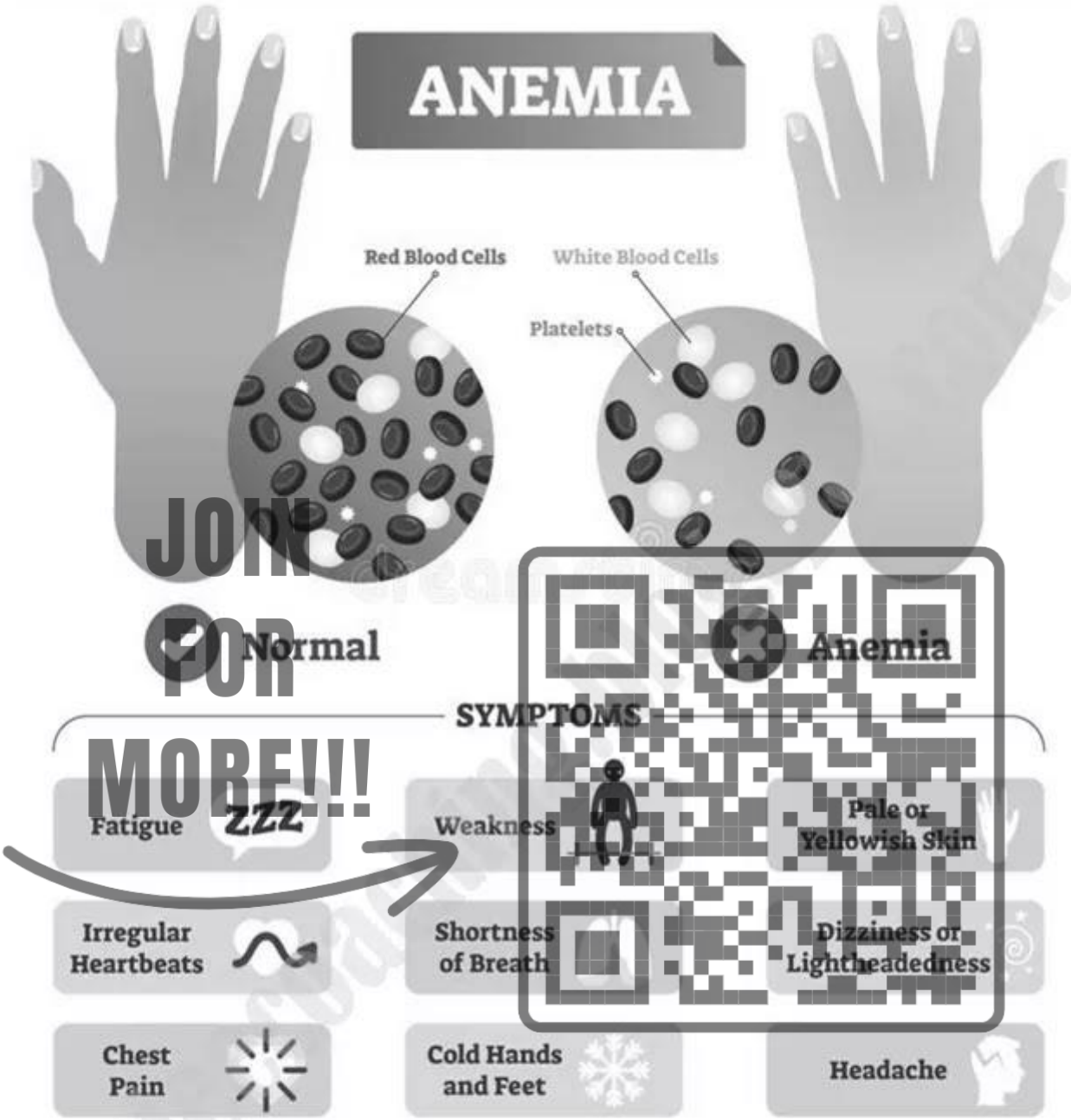
(ii) **Marasmus**: Marasmus is a form of severe malnutrition characterized by energy deficiency. It can occur in anyone with severe malnutrition but usually occur in children. A child with marasmus looks emaciated. Body weight is reduced to less than 62% of the normal (expected) body weight for the age as shown in the figure.

Q.24: Describe mineral deficiency diseases.

Ans: **Mineral Deficiency Disease**: Diseases resulting from deficiency of a mineral are relatively rare among humans some are given below:

(i) **Goiter**: Goiter is a condition in which thyroid gland becomes enlarged and it results in swelling in neck. Goiter is caused by an insufficient amount of "iodine" in diet. Iodine is used by thyroid gland to produce hormones that control the body's normal functioning and growth.

(ii) **Anemia** (most common of all mineral deficiency diseases): The term anemia literally means "a lack of blood". The condition is caused when number of red blood cells reduced to a level lower than normal. Hemoglobin molecule contains four atom of iron. If body fails to receive sufficient amount of iron, an adequate number of hemoglobin will not be formed. So, there are not enough functioning red blood cells. A person becomes weak and there is shortage of oxygen supply to body's cells.



Q.25: What do you know about over intake of nutrients?

Ans: **Over Intake of Nutrients**: It is a form of malnutrition in which more nutrients are taken than the amount required for normal growth, development and metabolism. The effects of over intake of nutrients are usually intensified when there is reduction in daily physical activity (decline in energy expenditure). High intake of carbohydrates and fats leads to obesity, diabetes and cardiovascular problems. Similarly, high dose of Vitamin A causes loss of appetite and liver problems. Excess dose of vitamin D can lead to deposition of calcium in various tissues.

Q.26: Describe the effects of malnutrition on human.

Ans: **The Effects of Malnutrition**: Malnutrition hurts people both mentally and physically. The more malnourished a person is; the more nutrients the person is missing, the more likely person will experience health issues. Some of them are given below:

(i) **Starvation**: It is a severe deficiency in caloric energy intake. It is the most extreme form of malnutrition. In humans, prolonged starvation can cause permanent organ damage and eventually, death.

(ii) **Heart Diseases**: The term "heart disease" is often used interchangeably with the term "cardiovascular disease". Cardiovascular disease generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack, chest pain (angina) or stoke. Heart problems occur in those people who take unbalanced diet. Fatty foods increase blood cholesterol level. It obstructs the blood vessels leading to heart diseases.

(iii) **Constipation**: People do not schedule their meals. This irregularity cause many health problems like constipation. It can be well defined, a condition in which there is difficulty in emptying the bowels, usually associated with hardened faeces.

(iv) **Obesity**: It is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. Obesity is most commonly caused by a combination of excessive food intake, lack of physical activity, and genetic susceptibility. Obesity is known as mother-disease and may lead to heart problems, hypertension, diabetes etc.

Q.27: Discuss the social problems related to malnutrition.

Ans: **Social Problems Related to Malnutrition**: Chronic malnutrition disables and even kills its victims. The World Health Organization (WHO) believed that malnutrition is a causative factor in nearly half of the 10.4 million deaths among children under age five in developing countries. An adequate amount of food or dietary energy supply is necessary to enjoy a healthful and productive life. Malnutrition is not a simple problem with a simple solution. It results from the complex interplay of social and biomedical factors.

(i) **Food Insecurity**: Food insufficiency refers to insufficient food supplies to meet minimum daily diet requirement.

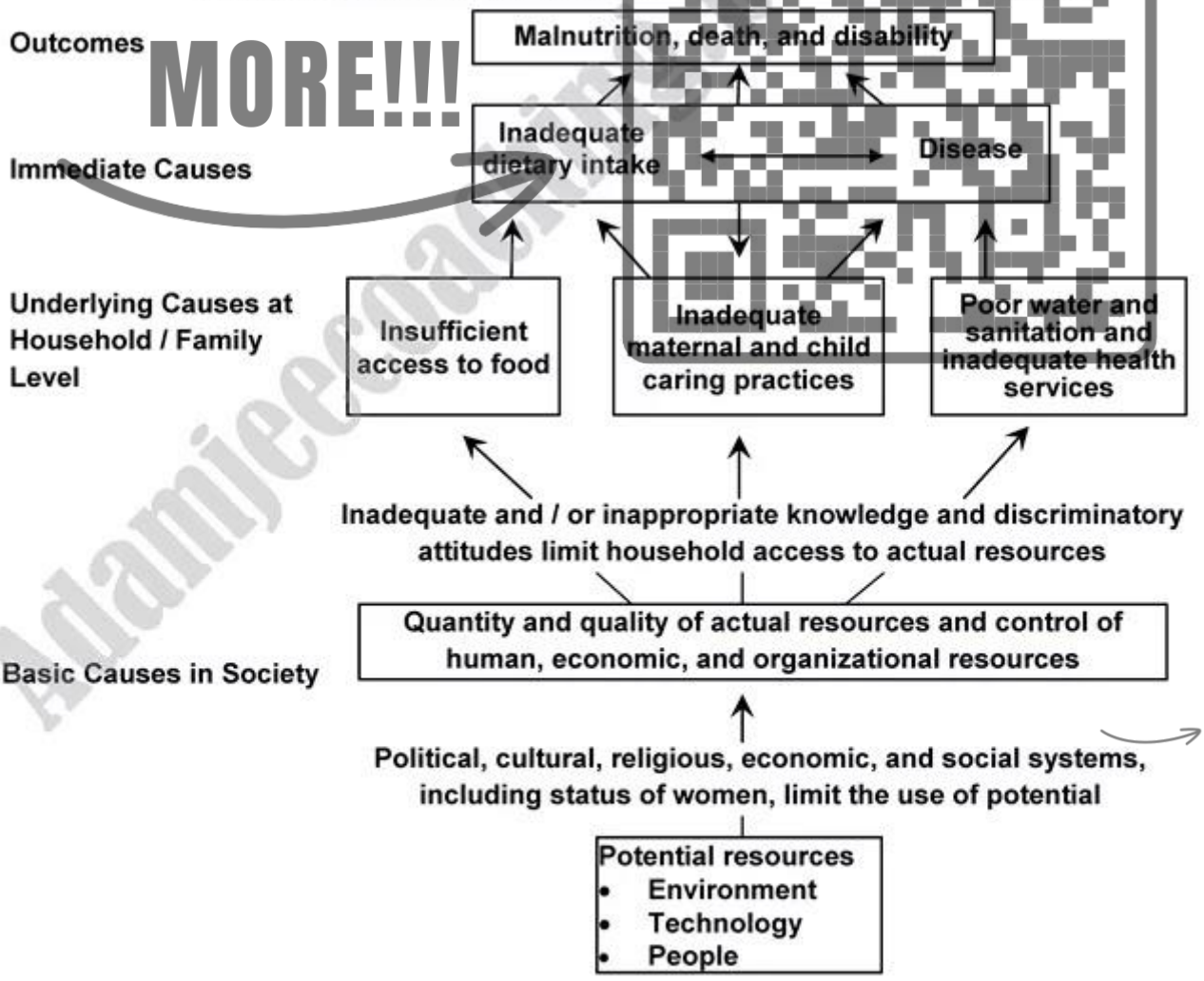
Several countries in Africa and parts of other developing countries do not produce enough food to keep up with the food needs and increased population. Not only do they not produce sufficient food supplies to meet their own needs, but they are economically unable to purchase available food from the exporting countries, which has led to food insecurity in poor countries; as a result, millions are hungry and malnourished. Besides these problems drought (lack of water) and flood (over flow of water) play terrible role in decreasing crop yields. Despite the profound effects of malnutrition problems on human and social developments, the world has shown only limited public alarm.

(ii) **Poverty**: For various reasons people in developing countries are increasingly unable to produce enough food to meet their own needs. To meet the ongoing demand for food, food-deficit countries (those unable to produce sufficient food to meet their needs) must import additional food and make it available to people. Even if there is an abundance of food, some people may not have access to it, because more and more, access t food in developing countries is determined by household income.

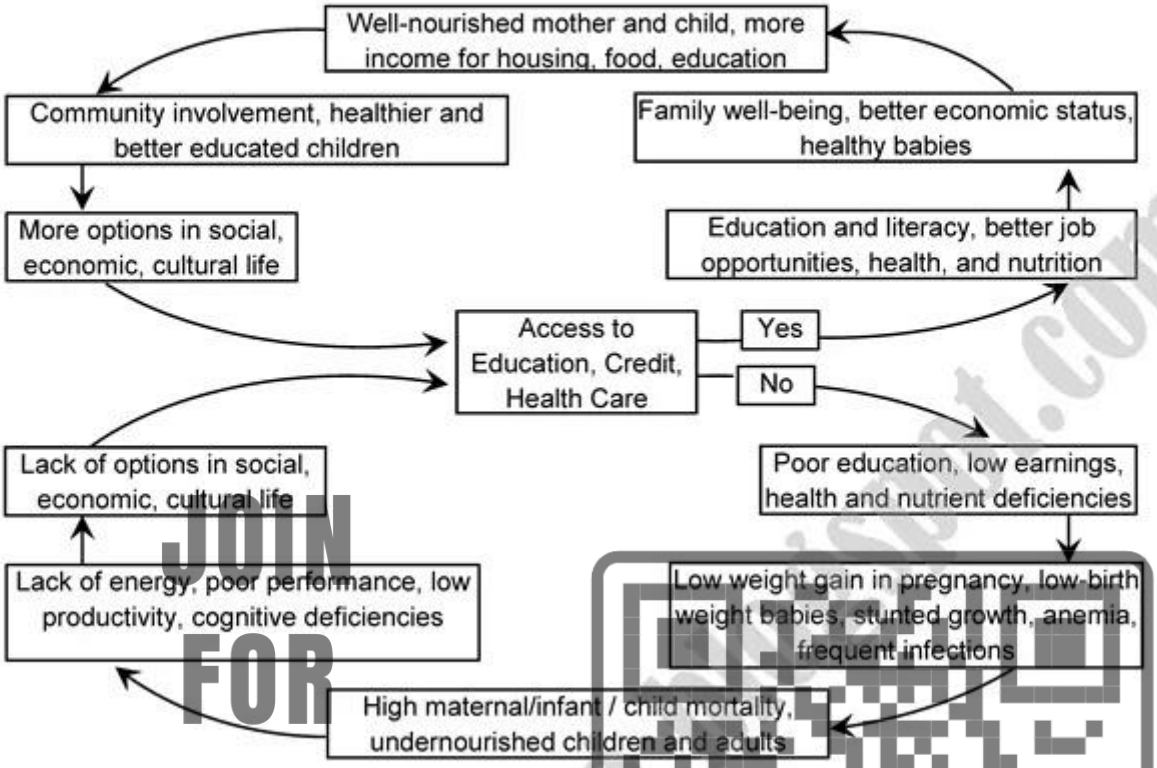
(iii) **Inequality**: Because of a cultural preference for men over women in many developing countries, many women risk malnutrition throughout their lives. The risk of malnutrition in girls begins at an early age. Although nutritional needs are the same for boys and girls in the first 10 years of life, boys often get more food and girls do.

(iv) **Risk of infection**: The normal human body has the capacity to resist foreign organisms to toxins through the immune system, but the immune system ceases to function properly when the body is malnourished. When the immune system (the general process of body) is compromised by malnutrition, the skin's ability to resist the invasion of organisms the acid secretion produced by the stomach to resist foreign agents, or the production of chemical compounds in the blood that destroy toxins can be affected adversely.

Graphic representation of the role of society regarding malnutrition



Graphic representation: how to overcome social and economic problems related to malnutrition?



Q.28: Define the terms digestion and egestion.

Ans: **Digestion**: Digestion is the process in which large and non-diffusible molecules of food are converted into small and diffusible molecules that can cross the membranes.
Digestive is important for breaking down food into nutrients, which the body uses for energy, growth and cell repair. Food and drinks must be changed into smaller molecules of nutrients before the blood absorbs them and carries them to cells throughout the body.
Egestion: After absorption of the digestible material, indigestible material expelled out of the body through the process of egestion.

Q.29: Describe human digestive system.

Ans: **The Digestive System of Human**: The digestive system is made up of the alimentary canal and the other abdominal organs that play a part in digestion, such as the liver and pancreas.
Alimentary Canal of Human: The alimentary canal (also called the digestive tract) is the long tube of organs-including the oral cavity, oesophagus, stomach and intestines-that runs from the mouth to the anus. An adult's digestive tract is about 30 feet (about 9 meters) long.

(i) **Oral Cavity**: It is the first part of alimentary canal. It is equipped with four kinds of teeth. The teeth grind the food. Oral cavity or mouth also has three pairs of salivary glands which produced saliva.

Functions: Saliva contains an enzymes Ptyalin which converts starch into maltose (sugar).

(ii) **Pharynx**: The pharynx, a passageway for food and air, is about 5 inches (12.7 centimeters) long. A flexible flap of tissue called the epiglottis reflexively closes over the windpipe when we swallow to prevent choking.

Functions: From the throat, bolus travels down a muscular tube in the chest called the esophagus.

(iii) **Oesophagus**: It is a long muscular tube which opens into stomach. At the end of the oesophagus, a muscular ring called a sphincter allow food to enter the stomach and then squeezes shut to keep food or fluid from flowing back up into the oesophagus.

Functions: This tube brings food into the stomach.

(iv) **Stomach**: It is a large bag like, thick walled organ which stores food. Its walls contain gastric glands which secrete gastric juice which contains HCl and enzymes called pepsin and renin.

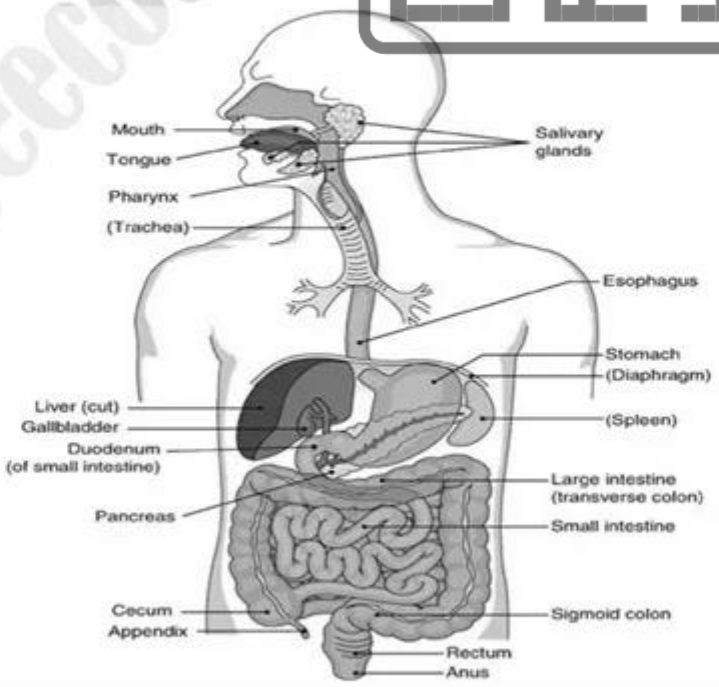
Functions: Pepsin breaks down proteins into peptones, renin curdles milk in infant and HCl kills germs.

(v) **Small Intestine**: The small intestine is made up of three parts:

(a) duodenum (b) jejunum (c) ileum

(a) **The Duodenum**: It is the first part of small intestine which is about 25cm (10 inches) long. It is C-shaped part of small intestine.

Functions: The duodenum receives chyme from the stomach and it is a part of alimentary canal where most of the digestive process occurs. Dusts that empty into the duodenum deliver pancreatic juice and bile from the pancreas and liver,



(b) **The Jejunum**: It is the coiled shaped mid-section of small intestine.

(c) **The Ileum**: It is the final section of small intestine which leads into the large intestine. Its inner surface bears numerous finger-like projections called villi, which has numerous blood capillaries and a lymph vessel.

Functions: Ileum absorbs completely digested food.

(vi) **Large Intestine**: It consists of three parts: Colon, Caecum and Rectum.

(a) **Colon**: It consists of three portions, an ascending, a transverse and a descending portion.

Function: It reabsorbs water and salts from the undigested food.

(b) **Caecum**: At the junction of the small and large intestine is a sac like structure the caecum and has a small finger like projection called appendix.

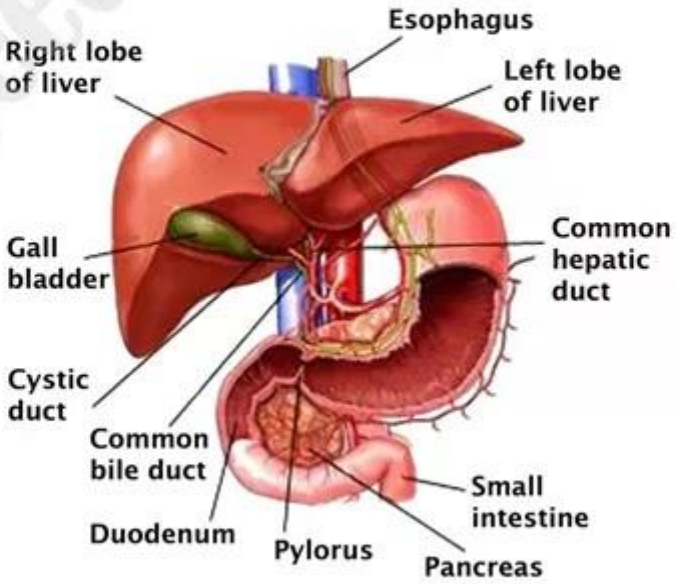
Function: It has no specific function is food digestion; but in human the appendix may get infected with germs -and foreign bodies. This causes severe inflammation and pain in the appendix and leads to appendicitis.

(c) **Rectum**: It is the last part of large intestine. It opens to the outside by anus.

Function: It stores undigested food.

Liver and its Functions: The liver produces bile, which helps the body to digest and of liver absorb fat. Bile is stored in the gallbladder until is needed. Bile travels through special channel (bile duct) directly into the small intestine.

It also makes a substance that neutralizes stomach acid. The liver also plays a major role in the handling and processing of duct nutrients, which are carried to the liver in the blood from the small intestine. The Liver is a metabolically active organ responsible for many vital life functions.



Q.30: Name and define the steps involved in digestion.

Ans: The digestion consists of following steps:

Ingestion: In this process, food is taken in.

Propulsion: Peristalsis-alternate waves of muscular contraction and relaxation in the primary digestive organs. The end result is to squeeze food from one part of the system to the next.

Peristalsis: The movement of food from oesophagus and onward up to anus takes place by means of an automatic movement. This automatic movement is termed as peristalsis.

Mechanical Digestion: The process of breaking the food mechanically into smaller pieces is called mechanical digestion. It is physical preparation of food for digestion.

Segmentation: It is mixing of food in the intestines with digestive juices.

Chemical Digestion: The chemical breakdown of food into smaller chemical molecules with the help of enzymes is called chemical digestion. Carbohydrates, fat and Proteins are broken down by enzymes.

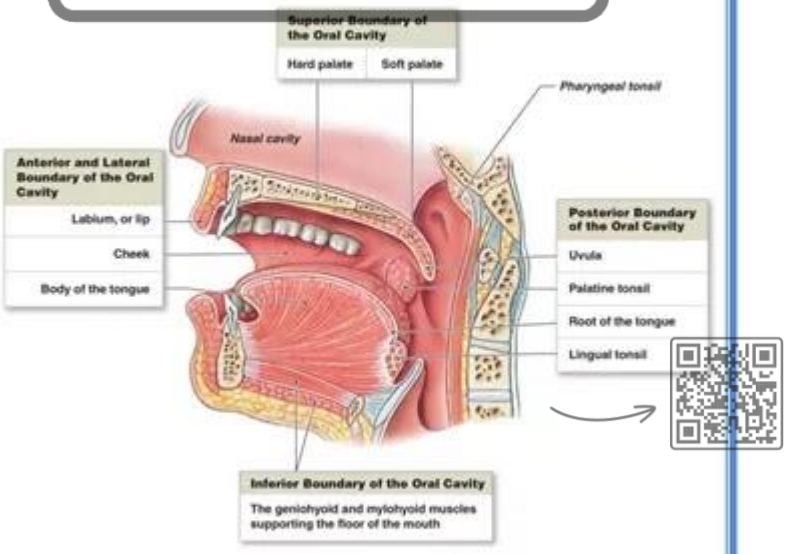
Absorption: In this process, the simple particles of food are absorbed by the cell. In this process, transfer of the digested portion of food into the blood from the digestive canal occurs.

Assimilations: In this process, the simple substances are again converted into complex ones by the cells for its various processes like growth, reproduction etc.

Egestion (Defecation): Removal or elimination of the waste products from the body is called egestion.

Q.31: What is oral cavity? Describe its functions.

Ans: **Oral Cavity**: Oral cavity is the space behind mouth in-between upper and lower jaw Digestion begins in the oral cavity, well before food reaches the stomach. When we see, smell, taste, or even imagine a tasty snack, our three pairs of salivary glands, which are located under the tongue and near the lower jaw, begin producing saliva. This flow saliva is coordinated with a brain reflex that triggered when we sense food or think about eating. In response to this sensory stimulation, the brain sends impulses through the nerves that control the salivary glands, telling them to prepare for a meal.



Functions of Oral Cavity: Oral cavity has many important functions:

(i) **Food Selection**: When food enters the oral cavity it tasted and felt. Here food is sleeted or rejected due to the taste, hard object or dirt. Smell and vision also help in selection.

(ii) **Grinding of Food**: The second function of oral cavity is the grinding of food by teeth. It is known as chewing or mastication. It is useful because esophagus can pass only small piece through it as well as enzymes cannot act on large pieces of food.

(iii) **Lubrication of Food**: The third function of the oral cavity is lubrication of food by mixing saliva secreted by salivary glands. It has two main functions.

(a) Adds water and mucus to the food.

(b) Partial digestion of starch by saliva which contains an enzyme salivary amylase.

(iv) **Chemical Digestion**: Saliva contains an enzyme salivary amylase which helps in the digestion of starch partially. Than the pieces of food are rolled up by the tongue in to small, slippery, spherical mass called bolus.

(v) **Swallowing of the Bolus**: Swallowing is accomplished by muscle movements by the tongue and mouth, food moves into the throat, or pharynx.

Q.32: Describe the functions of salivary glands.

Ans: **Salivary Glands**: When we see, smell, taste, or even imagine a tasty snack, our three pairs of salivary glands, which are located under the tongue and near the lower jaw, begin producing saliva. This flow saliva is coordinated with a brain reflex that triggered when we sense food or think about eating. In response to this sensory stimulation, the brain sends impulses through the nerves that control the salivary glands, telling them to prepare for a meal.

Functions of Salivary Glands: The main function of salivary glands is lubrication of food by mixing saliva secreted by salivary glands. It has two main functions.

(a) Adds water and mucus to the food.

(b) Partial digestion of starch by saliva which contains an enzyme salivary amylase.

Q.33: Why grinding and lubrication are necessary for swallowing?

Ans: **Grinding:** The grinding of food by teeth is known as chewing or mastication. It is useful because esophagus can pass only small piece through it as well as enzymes cannot act on large pieces of food.

Lubrication: Lubrication of food by mixing saliva secreted by salivary glands, has two main functions.

(a) Adds water and mucus to the food.

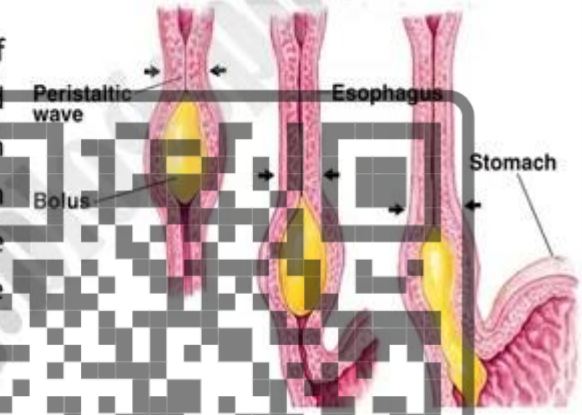
(b) Partial digestion of starch by saliva which contains an enzyme salivary amylase.

Than the pieces of food are rolled up by the tongue into small, slippery, spherical mass called bolus.

As chewing continues, the food is made softer and warmer, and the enzymes in saliva begin to break down carbohydrates in the food. After chewing, the food (now called a bolus) is swallowed easily.

Q.34: What is peristalsis?

Ans: **Peristalsis**: Waves of rtythmic movements of muscle contractions and relaxation called peristalsis which force down food wave through the oesophague to the stomach. A person normally isn't aware of the movements of the esophagus, stomach and intestine that take place as food passes through the digestive tract.



Q.35: Briefly describe the structure and function of stomach.

Ans: **Structure of Stomach**: Stomach is j-shaped thick walled, expandable bag, located in the left of abdomen just beneath the diaphragm.

The stomach has three regions:

(i) cardiac, just after the oesophagus,

(ii) fundus, the largest part of stomach, and

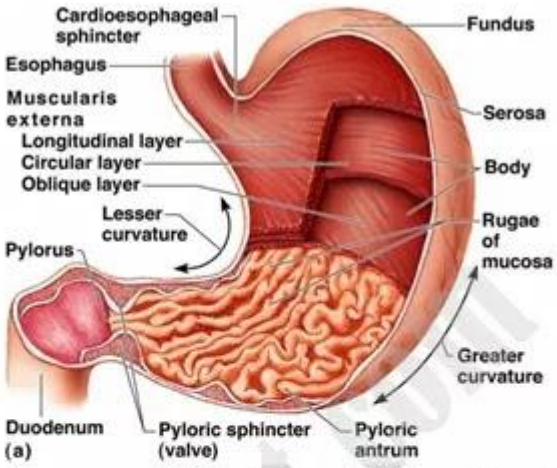
(iii) pyloric, part located at the other end of stomach and opens into small intestine. Stomach has two sphincters (opening which are guarded by muscles). The cardiac sphincter lies in between stomach and oesophagus. Pyloric sphincter is between stomach and small intestine.

Functions of Stomach:

(i) The stomach muscles churn and mix the food with acids and enzymes, breaking it into much smaller, digestible pieces. An acidic environment is needed for the digestion that takes place in the stomach.

(ii) **Gastric Juices**: Glands in the stomach lining produce about 3 quarts (2.8 liters) of these digestive juices each day. When food enters into the stomach the gastric juice is

secreted by gastric glands found in the stomach wall. It is composed of mucous, hydrochloric acid and protein digesting enzyme pepsinogen. Hydrochloric acid converts the inactive enzyme pepsinogen into active form called pepsin. HCl also kills micro-organisms present in food. Stomach is protected against the action of acid by mucus.



Pepsin partially digests the protein portion of the food into polypeptides and peptide chains. In stomach food is further broken apart through a process called churning. The walls of stomach contract and relax and these movements help in mixing of the gastric juice and food. The churning action also produces heat which helps to melt the lipid contents of the food. By the time food is ready to leave the stomach, it has been processed into a thick paste like liquid called chyme. The pylorus keeps chyme in the stomach until it reaches the right consistency to pass into the small intestine. Chyme is then squirted down into the small intestine, where digestion of food continues.

Q.36: Describe the actions of bile salts, pancreatic juice and intestinal juice.

Ans: **Bile Salts**: They have detergent action on particles of dietary fat which causes fat globules to break down or be emulsified into minute, microscopic droplets.

Pancreatic Juice: It is a liquid secreted by the pancreas, which contains a variety of enzymes, including protease like trypsinogen, pancreatic lipase and amylase, which digest protein, lipids and carbohydrates respectively.

Intestinal Juice: It is produced from the small intestine contain enzymes and pancreatic juice break down all four groups of molecules found in food (polysaccharides, proteins, fats and nucleic acids) into their component molecules.

Q.37: What are villi? Explain the role of villi in increasing the absorptive surface of intestine.

Ans: **Villi** : The inner wall of the small intestine is covered with millions of microscopic, finger-like projections called villi (singular, villus). Each villus is connected and richly supplied with blood capillaries and lymphatic vessel, i.e. lacteal. The walls of villus are made up of only one layer of cells, in thickness. The villi are the vehicles through which nutrients can be absorbed into the body. They increase the surface area over which absorption and digestion occur. These specialized cells help absorbed materials cross the intestinal lining into the bloodstream. The bloodstream carries simple sugars, amino acids and nucleosides to the liver via hepatic portal vein for storage or further chemical changes. From liver, the

required food molecules go towards the heart via the hepatic vein. The lymphatic system, a network of vessels that carry white blood cells and a fluid called lymph throughout the body, absorbs glycerol, fatty acids and vitamins.

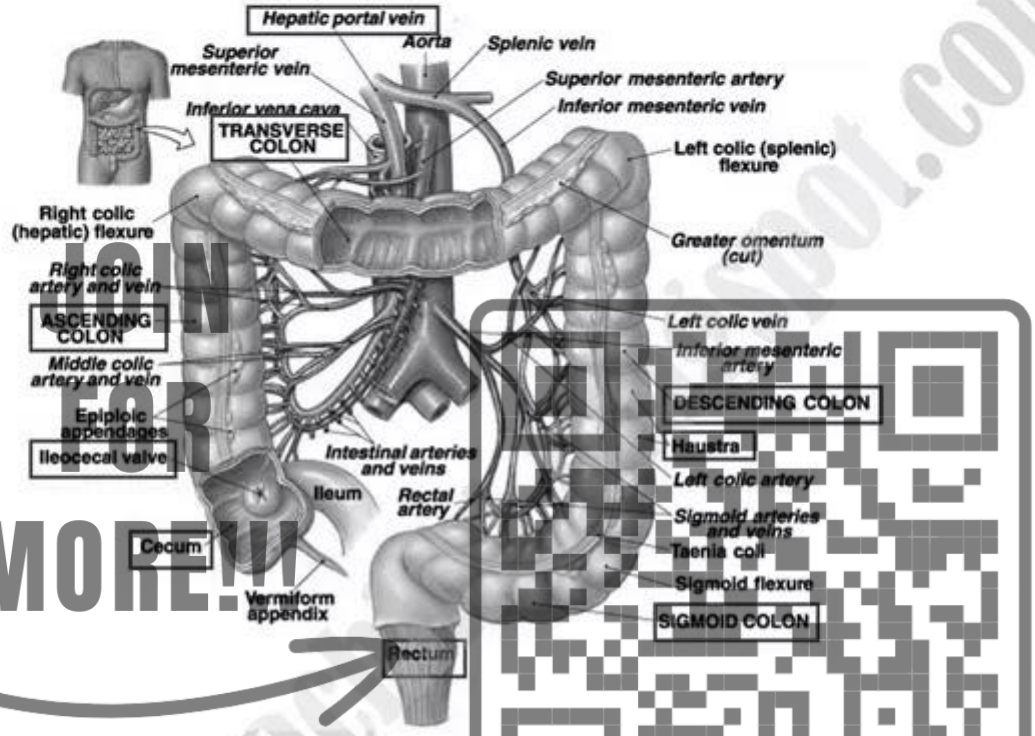
Polymers	Monomers	Roles
Complex Carbohydrates (i.e. starch)	Glucose and other simple sugars	Broken apart to get energy to make ATP.
Proteins	Amino acids	Used to make our own enzymes and other body proteins
Lipids (Fats, waxes, oils And steroids)	Fatty acid chains, glycerine (except steroid)	Used for cellular energy and energy storage, used to make cell membranes, steroid hormones

Q.38: Describe the structure and functions of large intestine.

Ans: **Structure of Large Intestine**: From the small intestine, food that has not been digested (and some water) travels to the large intestine through a muscular ring that prevents food from returning to the small intestine. By the time food reaches the large intestine, the work of absorbing nutrients is nearly finished.

The large intestine is made up of three parts:

(i) caecum (ii) colon (iii) rectum



(i) **Caecum**: The caecum is a pouch at the beginning of the large intestine that joins the small intestine to the large intestine. This transition area expands in diameter, allowing food to travel from the small intestine to the large. The appendix, a small, hollow, finger-like pouch, hangs at the end of the caecum. It no longer appears to the useful to the digestive process.

(ii) **Colon**: The colon extends from the caecum up the right side of the abdomen, across the upper abdomen, and then down the left side of the abdomen, finally connecting to the rectum. The colon has three parts: the ascending colon and transverse colon.

(iii) **Rectum**: It is the last part of large intestine. It opens to the outside by anus.

Functions of Large Intestine: The large intestine's main function is to remove water from the undigested matter and form solid waste that can be egested. The ascending colon absorbs fluids and salts and the descending colon holds the resulting waste (faeces). Faeces mainly consist of undigested material, large number of bacteria, sloughed off gastrointestinal cells, bile pigments and water. Bacteria in the colon help to digest the remaining food products. The rectum is where faeces are stored until they leave the digestive system through the anus as a bowel movement.

Q.39: Explain the disorders of gut.

Ans: **Diarrhea:** It is a condition in which the sufferer has frequent watery, loose bowel movements due to fast peristaltic movement. This condition may be accompanied by painful abdominal cramps, nusea, fever and generalized weakness. It occurs when required water is not absorbed in blood from colon. The main cause of diarrhea includes lack of adequate safe water, virus and bacteria. In malnourished individuals, diarrhea leads to severe dehydration and can be life threatening. To control diarrhea consume adequate amounts of wafer of replace loss, preferably mixed with essential salts and some amount of nutrients.

Constipation: Constipation is a condition, where a person experiences hard faeces that are difficult to eliminate. The main causes of constipation are hardening of faeces due to excessive absorption of water through colon, insufficient intake of dietary fiber, dehydration, use of medicine (e.g. those containing iron, calcium and aluminum) and tumors in rectum or anus. The treatment of constipation is change in diet and exercise habits, use of laxative (e.g. paraffin) may be in some cases. To prevent constipation is easier than treatment.

Ulcer (Peptic Ulcer): It is a sore in gut lining and can be different organs such as; ulcer of stomach is called "gastric ulcer", Ulcer of duodenum is called "duodenal ulcer", ulcer of oesophagus is called "esophageal ulcer" and breakdown of tissues by acidic gastric juice. It can be due to the long term use of anti-inflammatory medicine (e.g. aspirin), smoking, drinking coffee, colas and eating spicy food. Few of the signs are as: abdominal burning after meals, abdominal pain, rush of saliva after an episode of regurgitation, nausea and loss of appetite and weight. Ulcer can be treated with medicine, containing (alkaline composition) and avoiding spicy food.

Q.40: How stomach linings are protected from acidic environment?

Ans: Our stomach protects itself from being digested by its own enzymes, or burnt by the corrosive hydrochloric acid, by secreting sticky, neutralising mucus that clings to the stomach walls. If this layer becomes damaged in any way it can result in painful and unpleasant stomach ulcers.

The stomach is protected by the epithelial cells, which produce and secrete a bicarbonate rich solution that coats the mucosa. Bicarbonate is alkaline, a base, and neutralizes the acid secreted by the parietal cells, producing water in the process. This continuous supply of bicarbonate is the main way that your stomach protects itself from auto-digestion (the stomach digesting itself) and the overall acidic environment.

Q.41: Why fats are called most efficient from of food?

Ans: Fats are the slowest source of enemy but the most energy-efficient form of food. Each gram of fat supplies the body with about 9 calories, more than twice that supplied by proteins or carbohydrates. Because fats are such an efficient form of energy, the body stores any excess energy as fat. The body deposits excess fat in the abdomen (omental fat) and under the skin (subcutaneous fat) to use when it needs more energy.

Q.42: Distinguish between the following in tabulated form:

(i) Fat-soluble vitamins and water soluble vitamins
(ii) Marasmus and kwashiorkor
(iii) Chemical digestion and mechanical digestion
(iv) Autotrophic nutrition and heterotrophic nutrition
(v) Inorganic fertilizers and organic fertilizers
(vi) Carnivores and Herbivores
(vii) Digestion in stomach and digestion in intestine

Ans: (i) **Fat-soluble vitamins and water soluble vitamins**

	Water soluble vitamins	Fat-soluble vitamins
Vitamins	B,C	A,D,E,K
Site of Absorption	Small intestines	Small intestine
Dietary intake	Excess intake usually detected and excreted by the kidneys	Excess intake tends to be stored in fact storage sites
Solubility	Hydrophilic	Hydrophobic
Capitalize	Easily absorbed the blood, travels freely in the blood stream	Absorbed into the lymphatic system, many require protein carriers to travel in the blood
Body storage	Not generally	Yes
Deficiency	Deficiency symptoms appear relatively quickly	Deficiency symptoms are slow to develop
Toxicity	Low risk	Higher risk
Need for daily consumption	Yes	No

(ii) **Marasmus and kwashiorkor**

	kwashiorkor	Marasmus
1.	The deficiency of protein in the body of children upto three years leads to the kwashiorkor.	The deficiency of calories and other nutrition in the children of upto one year leads to Marasmus
2.	It occurs due to deficiency of proteins.	It occurs due to deficiency of calories, proteins and other nutrients
3.	Acute illness, trauma, infections, measles, sepsis are some of the causes of the kwashiorkor.	Chronic infections, prolonged starvation, recurring infections are some of the significant causes of Marasmus
4.	Muscles and limbs get thin	Limbs get thin
5.	Oedema (when an excess of watery fluid is accumulated in the tissues or cavity of the body) is present.	Oedema is absent
6.	Subcutaneous fat (harmless fat present under the skin and protect against some pathogens and disease) is present.	Subcutaneous fat is absent
7.	Typical weight loss is observed.	There is severe weight loss
8.	Enlargement in fatty liver cells	No such enlargement is observed
9.	Appetite is prodigious	Appetite is poor
10.	Cracky skin appears	Wrinkled and dry skin appears
11.	No prominent ribs	Prominent ribs
12.	High mortality	Low mortality, until the condition, is severe

(iii) **Chemical digestion and mechanical digestion**

	Mechanical digestion	Chemical digestion
1.	Mechanical digestion refers to the breakdown of food into digestible particles, mainly by teeth	Chemical digestion refers to the process by which compounds with a high molecular weight in the food are broken down into small substances that can be absorbed by the body.
2.	It occurs from the mouth to the stomach	It occurs from the mouth to the intestine
3.	A major part of mechanical digestion occurs in the mouth	A major part of chemical digestion occurs in the stomach.

4.	It is driven by teeth	It is driven by enzymes
5.	It increases the surface area for the enzymatic reactions in the chemical digestion	It enhances the absorption of the nutrients by breaking down them into small molecules

(iv) **Autotrophic nutrition and heterotrophic nutrition**

	Autotrophic nutrition	**Heterotrophic nutrition**
1.	Autotrophic nutrition is a mode of nutrition in which an organism prepares its own food with the help of simple inorganic materials like water and carbon dioxide from the surrounding	Heterotrophic nutrition is a mode of nutrition in which an organism cannot prepare its own food and depend upon other organisms for its food.
2.	For autotrophic nutrition, presence of chlorophyll (green pigment) and sunlight are necessary. Autotrophic nutrition takes place during day time.	No green pigment and sunlight is required for heterotrophic nutrition.
3.	All green plants synthesizing their own food through the biological process are referred to as photosynthesis are examples of autotrophs.	Animals including herbivores, omnivores and carnivores are examples of Heterotrophs.
4.	In the food chain, autotrophs are the primary producers.	Heterotrophs are consumers; they are place at secondary or tertiary level.
5.	Types of autotrophic mode of nutrition include: phototrophic and chemotrophic.	Types of heterotrophic mode of nutrition include: holozoic, saprophytic, parasitic and symbiotic association.
6.	Autotrophs are independent of any organisms.	Heterotrophs rely on other organisms for their food.
7.	Autotrophs are capable of storing sunlight and chemical energy.	Heterotrophs are not capable of storing energy.
8.	Heterotrophs can move from one place to another in search of food.	Autotrophs cannot move from one place to another.
9.	In autotrophs, the process of digestion is absent.	Heterotrophs, the process of digestion is required to convert complex molecules into simpler molecules.

(v) **Inorganic fertilizers and organic fertilizers**

	Chemical Fertilizers	Organic Fertilizers
1.	Chemical fertilizers are rich equally in three essential nutrients that are needed for crops and always ready for immediate supply of nutrients to plants if situation demands.	Adds natural nutrients to soil, increases soil organic matter, improves soil structure and tilth, improves water holding capacity, reduces soil crusting problems, reduces erosion from wind and water, Slow and consistent release of nutrients.
2.	Several chemical fertilizers have high acid content. They have the ability to burn the skin. Changes soil fertility.	Have slow release capability; distribution of nutrients in organic fertilizers is not equal.
3.	Immediate supply or fast release	Slow release
4.	Chemical fertilizers are manufactured from synthetic material	Organic fertilizers are made from materials derived from living things
5.	Artificially prepared	Prepared naturally
6.	Chemical fertilizer has an equal distribution of three essential nutrients: phosphorous, nitrogen, potassium.	Have unequal distribution of essential nutrients.

(vi) **Carnivores and Herbivores**

	Carnivores	Herbivores
1.	Those animals which feed upon other animals are called carnivores.	Those animals which use plants for their food are called herbivores.
2.	They have sharp, long strong and pointed canine teeth.	They do not have strong, and pointed canines.
3.	Cat, dog, lion are carnivores	Horse, deer, cattle are herbivores.

(vii) **Digestion in stomach and digestion in intestine**

	Digestion in stomach	Digestion in intestine
1.	Gastric glands are present in stomach.	Intestinal glands are present in small intestine.
2.	Gastric glands secrete gastric juice.	Intestinal glands secrete intestinal juice.
3.	Food becomes acidic due to the presence of HCl in stomach.	Food is neutralized due to bile and pancreatic juices.

Biology 9th - Short Question Answers

NUTRITION

CHAPTER# 08

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Why fertilizers are necessary for plant?

Ans. Fertilizers are substances containing chemical elements such as manure of mixture of nitrates that improves the growth of plants. They give nutrition to the crops and produce more fruit, faster growth, more attractive flowers. When added to soil or water, plants can develop tolerance against pests like weeds, insects and diseases. And the use of manure and composts as fertilizers is probably almost as old as agriculture. Modern chemical fertilizers include one or more of the three elements that are most important in plant nutrition: nitrogen, phosphorus, and potassium. Chemicals fertilizers are simply that nutrients applied to agricultural fields to supplement required elements found naturally in the soil.

Q.2: How stomach linings are protected from acidic environment?

Ans. Our stomach protects itself from being digested by its own enzymes, or burnt by the corrosive hydrochloric acid, by secreting sticky, neutralising mucus that clings to the stomach walls. If this layer becomes damaged in any way it can result in painful and unpleasant stomach ulcers.

The stomach is protected by the epithelial cells, which produce and secrete a bicarbonate rich solution that coats the mucosa. Bicarbonate is alkaline, a base, and neutralizes the acid secreted by the parietal cells, producing water in the process. This continuous supply of bicarbonate is the main way that your stomach protects itself from auto-digestion (the stomach digesting itself) and the overall acidic environment.

Q.3: Why nitrogen is essential for plants?

Ans. Nitrogen is essential for plants to synthesize amino acids, which are the building blocks for protein synthesis and also required for the production of chlorophyll, nucleic acids, and enzymes. For all metabolic elements which plants use from soil, nitrogen needs in the largest amounts.

Q.4: Why fats are called most efficient form of food?

Ans. Fats are the slowest source of enemy but the most energy-efficient form of food. Each gram of fat supplies the body with about 9 calories, more than twice that supplied by proteins or carbohydrates. Because fats are such an efficient form of energy, the body stores any excess energy as fat. The body deposits excess fat in the abdomen (omental fat) and under the skin (subcutaneous fat) to use when it needs more energy.

Q.5: Why grinding and lubrication are necessary for swallowing?

Ans. **Grinding:** The grinding of food by teeth is known as chewing or mastication. It is useful because esophagus can pass only small piece through it as well as enzymes cannot act on large pieces of food.

Lubrication: Lubrication of food by mixing saliva secreted by salivary glands, has two main functions.

(a) Adds water and mucus to the food.

(b) Partial digestion of starch by saliva which contains an enzyme salivary amylase.

Than the pieces of food are rolled up by the tongue into small, slippery, spherical mass called bolus.

As chewing continues, the food is made softer and warmer, and the enzymes in saliva begin to break down carbohydrates in the food. After chewing, the food (now called a bolus) is swallowed easily.

Q.6: Define nutrition and nutrients.

Ans: **Nutrition**: Process by which organisms obtain and use the nutrients required for maintaining life is called nutrition.

Nutrition is the study of nutrients in food, how the body uses nutrients and the relationship between diet, health and diseases.

Nutrients: Essential substances that our body needs in order to grow and stay healthy are known as nutrients.

Q.7: Define Autotrophic Nutrition and Heterotrophic Nutrition.

Ans. **Autotrophic Nutrition**: It is the mode of nutrition in which an organism makes its own food from the simple inorganic materials like carbon dioxide, water and minerals present in the surrounding (with the help of energy). These processes are photosynthesis or either chemosynthesis.

Heterotrophic Nutrition: It is the mode of nutrition in which an organism can't make its own organic material but depends on other organisms for its food and use it for growth and energy.

Q.8: Describe heterotrophic nutrition.

Ans: **Heterotrophic Nutrition**: The word "Heterotroph" is derived from two Greek words- heteros (other} and trophe (nutrition). Unlike autotrophs, which manufacture their own food, heterotrophic organisms obtain food form other organisms. As heterotrophs depend on other organisms for their food, they are also called consumers. All animals, non-green plants like and fungi come under this category.

Q.9: Define mineral nutrition in plants.

Ans: **Mineral Nutrition in Plants**: The process involving the absorption, distribution and utilization of mineral substances by the plants for their growth and development is called mineral nutrition.

Q.10: Why nitrogen is essential for plants?

Ans: **Nitrogen** : Nitrogen is essential for plants to synthesize amino acids, which are the building blocks for protein synthesis and also required for the production of chlorophyll, nucleic acids, and enzymes. For all metabolic elements which plants use from soil, nitrogen needs in the largest amounts.

Q.11: Define sources of Carbohydrates?

Ans: **Sources of Carbohydrates**: Source of simple carbohydrates include fruits sugars and processed grains, such as white rice or flour. We can find complex carbohydrates in green or starchy vegetables, potatoes, while grains, beans and lentils. The most common and abundant forms are sugars, fibers and starches.

Q.12: Define calories.

Ans: **Calories**: The energy obtained from carbohydrates, proteins and fats is measured in units called calories.

Q.13: Write a short note on vitamins.

Ans: **Vitamins**: A vitamin is an organic molecule (or related set of molecules), an essential micronutrient that an organisms needs in small quantities for normal health and development. Lack of vitamins can cause several diseases. They are divided into two types:

Q.14: Define balance diet?

Ans: **Balance Diet**: A diet which contains all of the nutrients like carbohydrates, fats, proteins, vitamins and minerals in proper proportion according to the requirement of the body is called balanced diet.

Biology 9th – Detailed Question Answers

TRANSPORT

CHAPTER# 09

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define and explain transport system in living organisms. What is its importance?

Ans: **Transport System**: Every organism requires number of substances for their survival and maintenance of healthy life. These substances or their raw materials are taken by Organism from environment or may be from internal sources. If the distance between source and required organ is small enough, organism does not require any transport system but if the distance is too long then the organism require to develop a system called transport stem.

The transport system requires at least two components.

(i) Transport of raw material from environment to organ where they required for metabolism.

(ii) Transport of metabolites from cell to organs where they require.

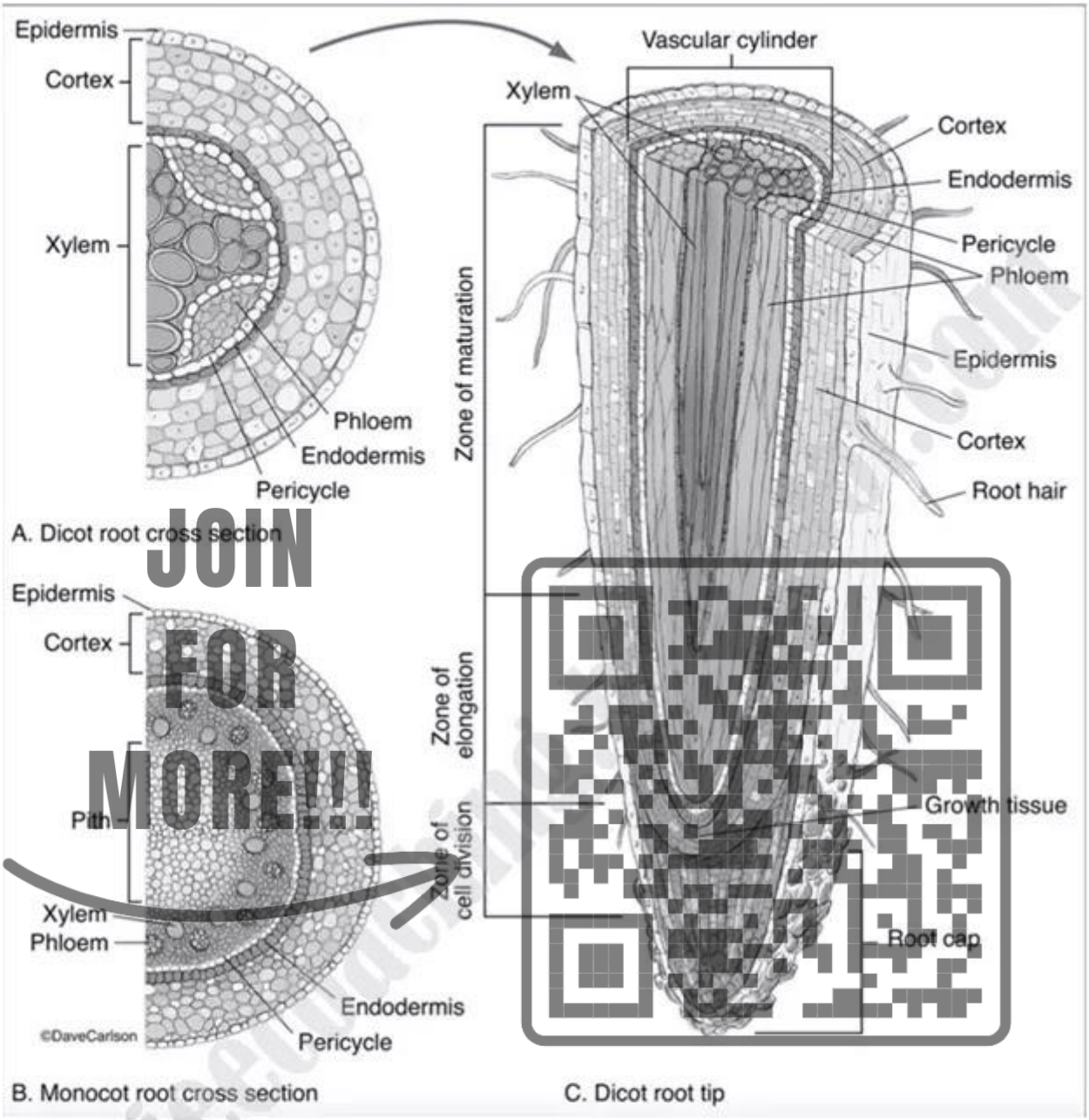
Plants are autotrophs which synthesize organic biomolecules from inorganic molecules. These inorganic molecules are transported from environment into plans, converted into biomolecules. These biomolecules are also transported within the plant where they required. Animals are heterotrophs which get organic molecules as food, digest them into digestive tract, diffuse into blood and transport to organs where required.

Q.2: Briefly describe the structure of roots.

Ans: **Structure of Roots**: Water and mineral salts enter the plant through root, so it is necessary to understand the external and internal structure of root. Externally, root has a root tip which is the growing part of root covered by root cap. The remaining part of root is highly branched and each branch is heavily covered by root hairs. Each root hair is a fine tubular outgrowth of an epidermal cell. It grows between soil particles and remains in close contact with the soil solution surrounding them.

Internally, we can study the root by taking transverse section (T.S.) of root. The T.S. of root shows that root is mainly consist of:

- Epidermis (Epidlema) the outer layer of cells, some of these cells have root hair.
- The Cortex part of root between epidermis and endodermis, consist of number of cellular layers.



Q.3: Define passive and active transport?

Ans. The root absorbs water and minerals from soil through root hairs. There are two processes of transport:

(i) **Passive Transport:** The uptake of water and mineral by osmosis and diffusion without using energy of ATP. It is due to concentration gradient i.e. always takes place from high to low quantity of substances.

(ii) **Active Transport**: .Movement of substances from low quantity to high quantity i.e. against the gradient and it requires energy of ATP. This movement is called active transport.

Q.4: Describe the uptake of water from soil through roots in plants.

Ans: **Uptake of Water From Soil**: The root hair is long, thin and tubular structure. It increases the surface area which increases the rate of absorption of water and minerals. The cell membrane prevents the cell sap (a mixture of sugar, salts and amino acids in solution form) from leaking out. The cell sap has low tendency of water loss i.e. water potential, then the solution of soil which result in water movement from soil to root hair. This process of water potential is called Osmosis.

Ascent of Sap: As a result of osmosis of water, the root hair become turgid and their cell-sap become dilute than that of adjacent cells so the water moves from root hair to their neighbour cells. In this way, water may pass from cell to cell and finally forced into xylem and ascend up to the aerial part of plant. This upward movement of water with mineral is called ascent of sap, other factor and forces are also involved in ascent of sap.

Low Solute Quantity in Soil: For absorption of water by root, it is necessary that the solute quantity in soil solution should be low and solute quantity in sap should be comparatively high, otherwise the direction of water movement will be reversed and plant may die due to dehydration.

Q.5: Describe mineral transport in plants.

Ans: **Mineral Transport:** Plants also require minerals i.e. nitrates, sulphates, phosphates etc. These minerals are also taken up by root hair in two ways:

(i) By diffusion, when the concentration of certain ions in soil is higher than that in root hair cells i.e. passive transport.

(ii) By active transport, plant requires some substance even they found in soil in low quantity. The roots have to absorb these ions against a concentration gradient by using energy of ATP, which is active transport.

Q.6: Define diffusion. Give two examples.

Ans: **Diffusion:** "It is the movement of molecules from the area of higher concentration to the area of lower concentration." OR "It is a process in which the random movement of the molecules or ions takes place from a region of higher concentration to a region of lower concentration."A few substances freely diffuse across the cell membrane. For example oxygen, carbon dioxide diffuse in and out of the cells.

Explanation with examples: Diffusion is a well known phenomenon. It can be clearly explained by these examples.

Examples No 1: When an ink drop is placed into a beaker of water, initially surrounding turns coloured. The colour then spreads progressively until all the water is uniformly coloured.

Examples No 2: If we spray perfume in one corner of a room, initially its fragrance will be strongest in that corner and will spread by diffusion in all areas of the room.

Q.7: Describe the importance of diffusion with example.

Ans: **Importance of diffusion:** Importance of diffusion can be describe as follows:

(i) **Help in Biological process:** In the plants during photosynthesis and respiration the exchange of carbon dioxide and oxygen gases, between the cell and the atmosphere take place by diffusion.

(ii) **Help in transpiration**: During stomatal transpiration, water vapours from the intercellular spaces escape out in the outer atmosphere by the process.

(iii) **Small organisms use diffusion**: Many small organisms such as Amoeba and Hydra depend on diffusion for obtaining oxygen and getting rid of carbon dioxide.

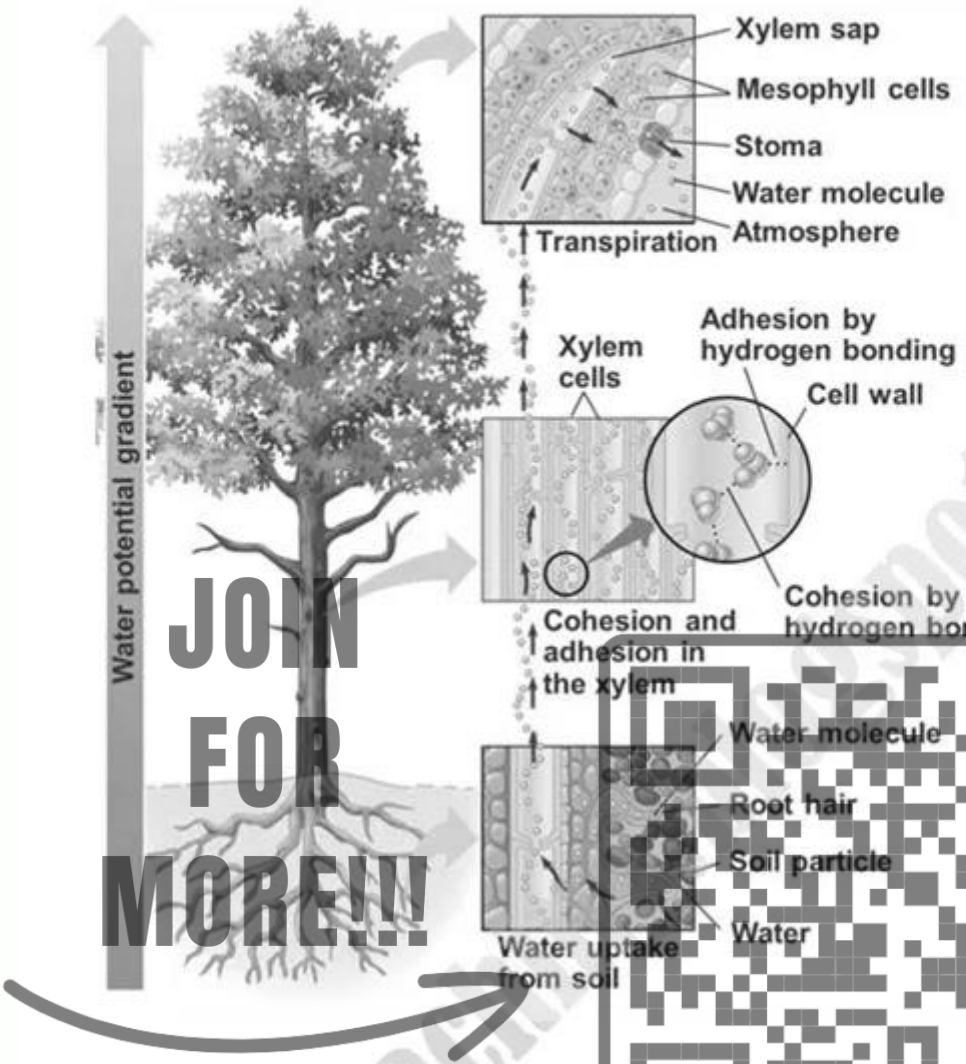
(iv) **Large animals depends on diffusion:** In the lungs of large animals, the exchange of gases (carbon dioxide and oxygen) between air and blood also takes place by diffusion.

Q.8: What is meant by osmosis? Write its importance.

Ans: **Osmosis:** "It is a special type of diffusion. In this process water molecules move from higher concentration to lower concentration through semi permeable membrane." OR "Osmosis is a process by which solvent molecules (water) diffuse across selectively permeable membrane, from a region of low solute concentration to the high solute concentration."

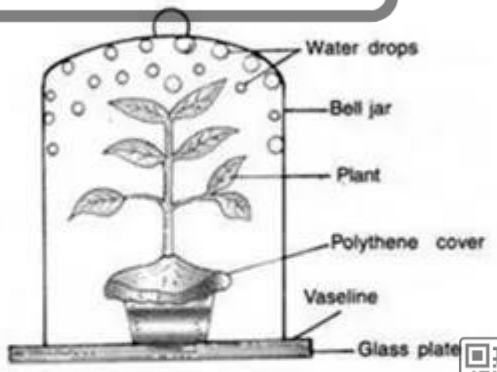
Q.9: Define transpiration.

Ans. **Transpiration**: Plants absorb water continuously from soil. Some of its quantity utilized in photosynthesis and other metabolic function while the rest is retained in cell to maintain turgidity of cell. Some water is removed in the form of vapours. This loss of internal water of plant in the form of vapours from aerial part of plant is called transpiration. Transpiration mainly takes place through special pores guarded by specialized guard cells called. Stomata (sing: stoma).



Activity: Evidence of Transpiration

- Take a potted plant and wrap a polyethylene bag around pot not around the plant to make sure that water is not coming from soil of pot and surface pot.
- Place the pot on the glass plate and cover it with dry bell jar.
- Take another jar without plant for control setup.
- Put these two jars side by side in an area where light fall on it for two hours.



Observation: We will observe water droplet at the bell jar which has plant while other jar remains dry.

Q.10: How many types of leaves are there on the basis of stomatal distribution?

Ans: Plants have three types of leaves on the basis of stomatal distribution.

(i) Leaves that have stomata at lower epidermis called bifacial leaves e.g. leaves of mango plant.

(ii) Leaves that have stomata at both surface (upper and lower epidermis called monofacial leaves e.g. leaves of maze plant.

(iii) Leaves that have stomata at upper epidermis only e.g. leaves of water lily.

Activity: To find that transpiration mainly take place through stomata perform simple experiment.

Requirement: Few leaves, petroleum jelly or wax, scale etc.

Procedure:

- Take three leaves of peepal or mango tree where stomata are mainly present at lower surface of leaves.
- The leaves should be of equal size.
- Treat leaves as follow:
  - Leaf 1-cover the upper epidermis surface with petroleum jelly or any wax.
  - Leaf 2-cover lower surface with same.
  - Leaf 3-cover both surface with same.
- Weight each leaf before and after covering.
- Hang these leaves near window in sunlight.
- After few hours note the conditions and weigh again.
- Leaf which loss more weight transpire efficiently.
- It will be observed that the leaf 1 transpire more efficiently because it has stomata at lower epidermis.

The experiment shows that most of the water vapour is lost from the surface where stomata are present.

Q.11: Describe the relation of transpiration with leaf surface.

Ans: **Relation of Transpiration with Leaf Surface:** Surface area of leaf is also an important factor for the rate of transpiration, because the larger size leaves have high number of somata which increase the rate of transpiration.

Q.12: Why the leaves of desert plants modified as spines?

Ans. The desert plants require to save their water so they have smaller size leaves or their leaves becomes spines to reduce number of stomata as well as rate transpiration.

Q.13: What are stomata? Describe its structure and working.

Ans. **Stomata:** Stomata are the pores usually found in the leaf epidermis.

Structure: A stoma (singular of stomata) is surrounded by two kidney shaped, guard cells, these cells contain chloroplast while other epidermal cells do not. The guard cell control the opening and closing of stomata.

The inner wall of guard cell is think and inelastic whereas the outer wall is thin, elastic and permeable.

Mechanism of Stomata: The changes in the turgidity of guard cell controls are opening and closing of stomata.

Opening and Closing of Stomata: Stomata open when the guard cell becomes turgid and close when the guard cells become flacid. The turgidity of guard cell is regulated by concentration of solutes present in it which mainly depends upon the rate of photosynthesis. Opening and closing of stomata is one of the important factors to control rate of transpiration. The stomata remain open during the sunny day; as a result rate of transpiration increases. But at night they are closed, hence transpiration also stops.

Q.14: Define the terms transpiration pull and transpiration stream.

Ans. **Transpiration Pull:** Transpiration maintains low concentration of water and high concentration of solute in cell i.e. high solute potential. The high solute potential of leaf cells attract more water and draw more water from xylem. This continuous withdrawal of water from xylem develops deficit or water in xylem which develops a pull or tension called transpiration pull.

Transpiration Stream: As a result of this transpiration pull and water attraction for other water molecules i.e. cohesion of water, what is pulled upward in the xylem vessels through a continuous column called transpiration stream, which helps in ascent of sap.

Q.15: Describe importance of transpiration.

Ans. **Importance of Transpiration:** Transpiration plays an important role in the life of plants.

(i) **Provide a Suction Force:** By active transpiration, a suction force the transpiration pull is created which helps in the upward movement of water and minerals.

(ii) **Help in Absorption:** Transpiration also increases the rate of absorption.

(iii) **Remove Excess of Water:** Transpiration helps in evaporating excess amount of water.

(iv) **Prevent Overheating:** Transpiration maintains a suitable temperature for the leaves and prevents overheating.

(v) **Help in Ascent of Sap:** It helps in ascent of sap.

(vi) **Help in Stomatal Movement:** Stomata are opened and closed by guard cells due to transpiration which indirectly influence the process of photosynthesis and respiration.

(vii) **Cause Wilting:** Excessive loss of water from aerial parts also results in wilting and dehydration leading to death of plants in extreme conditions.

Q.16: Describe the factors which affect the rate of transpiration.

Ans. **Factors Affecting the Rate of Transpiration:** The rate of transpiration is also affected by some of the following environmental factors.

(i) **Temperature**: Rate of evaporation of water from cell surface increases with increase in temperature,

(ii) **Humidity**: Transpiration takes place only when concentration of the vapours must be low outside than inside, so dry atmosphere is also the condition for transpiration. The rate of transpiration decreases with the increase in water vapours in atmosphere i.e. humidity.

(iii) **Wind**: The increase in wind velocity increases the rate of transpiration. The wind decreases the water vapours around plant and make the atmosphere dry.

(iv) **Atmospheric Pressure**: Low atmospheric pressure increases the rate of transpiration through reduction in the density of air.

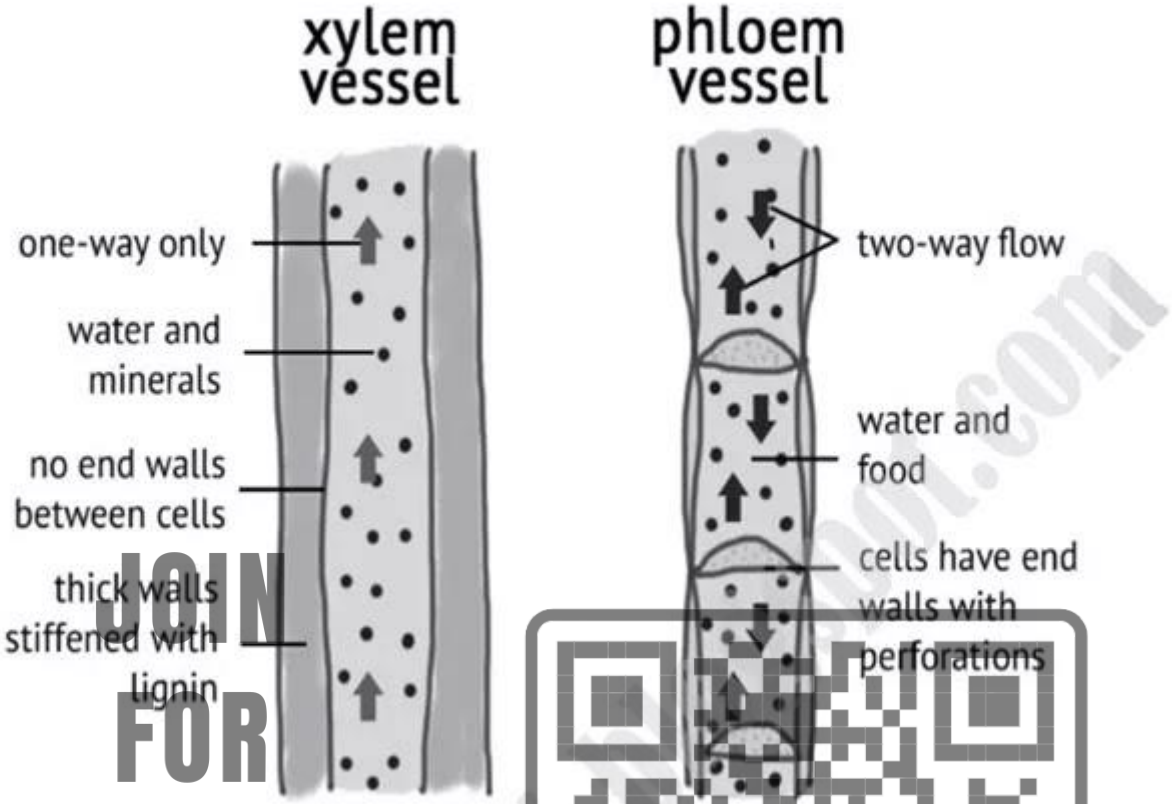
Q.17: Describe the transport of water and food in plants.

Ans. **Transport of Water and Food in Stem**: Flowering plants have a system of vessels for transport of water, minerals and food. These vessels are called transport or vascular tissues.

There are two types of transport tissues in plants.

(i) **Xylem (Wood):** In flowering plants xylem is made up of four types of tissues but the main tissues are the xylem vessels. A xylem vessel is a long, hollow, tubular structure from root to leaf. It is made up of many dead cells arranged vertically. The walls of these vessels become strong by the deposition of chemical substance called lignin.

Dead cells of xylem vessels arranged vertically have empty space inside called lumen without protoplasm and end walls. This tube reduces the resistance of water flowing through the xylem. It gives faster passage to sap, as a result transpiration pull is created in leaf. The thick, rigid and lignified walls of vessels also provide mechanical support which strengthens the wall.



Phloem (Bast): Like xylem, phloem is also made up of four types of tissues but mainly consist of sieve tubes and companion cells. Phloem conducts manufactured food (sucrose) from part of plant where it is synthesized in high quantity to other parts of plant where it is required.

Sieve Tubes: The sieve tubes or sieve tube elements of phloem is made up of columns of elongated and thin walled living cells. The transverse walls separating the cells have lots of minute pores. The cross walls look like a sieve and therefore called sieve plates. A mature sieve tube cell has only a thin layer of cytoplasm inside the cell. This cytoplasm is connected to cells above and below through sieve plates. Each sieve tube cell has lost its central vacuole, nucleus and most organelles.

Companion Cells: Each sieve tube cell has a companion cell beside it, which carries out the metabolic processes need to keep the sieve tube cells alive. Each companion cell is narrow, thin walled cell with many mitochondria, cytoplasm and nucleus. Companion cells provide nutrients and help the sieve tube cells to transport manufactured food.

In contrast to sieve tube cell, the companion cells have· many mitochondria to provide energy needed for the companion cells to load sugar from mesophyll cell to sieve tube cells by active transport. The perforations of sieve plates allow rapid flow of manufactured food substance through the sieve tube.

Q.18: Describe the transport in animals.

Ans: **Transport in Unicellular Animals:** Cytoplasm of unicellular animals remains very much close to plasma membrane which remains in contact with environment. In these animals oxygen can diffuse through the body surface and reach easily to energy producing organelles. Similarly, the waste products can rapidly move from the body by simple diffusion.

Transport in Multicellular Animals: On the other hand, in multi-cellular organisms like mammals including man, many cells are situated away from environment. Only simple diffusion is not enough to supply O_2 (oxygen) to these cells and to get rid of wastes from there. It needs proper transport system to carry substances from one part of the body to another.

Q.19: Define translocation. Describe Munch theory. OR Describe mechanism of translocation.

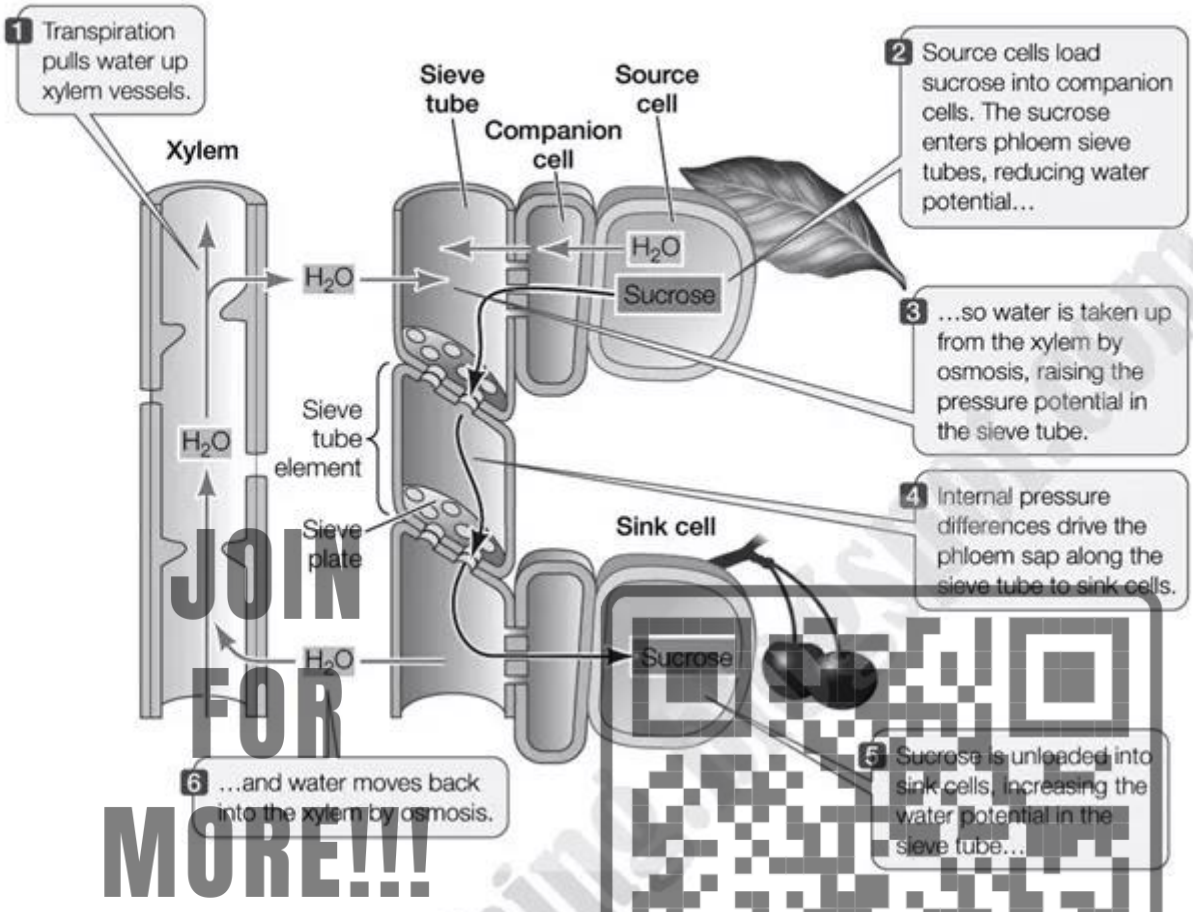
Ans: **Translocation:** In higher plant, only the green parts specially leaves can manufacture food and it must be supplied to other non-green parts like root, stem and flower for consumption and storage.

The movement of organic materials (food) takes place through phloem. Along with food, phloem also conducts other substances such as vitamins, hormones etc. the movement of prepared food from leaves to different parts of plant through phloem elements (sieve tubes) is called translocation.

Mechanism of Translocation: It is an established fact that translocation of solutes takes place through phloem but it is still debatable that how it occurs. Several hypothesis and theories have been proposed to explain the mechanism of translocation. Among them bulk flow or Munch hypothesis is the most convincing.

Munch Theory (OR Bulk Flow Theory): According to this hypothesis, solutes are translocated through the sieve tubes which flow in bulk from the supply end i.e. source (leaves) to the consumption end i.e. sink (root) under a turgor pressure gradient.

As a result of photosynthesis, the supply ends (leaves) have a large amount of organic solutes, which causes tremendous increase in suction pressure of leaf cells (Mesophyll cells) and they draw water from the xylem of the leaf. As consequence their turgor pressure is increased. The turgor pressure in the cells of stem and root is comparatively low and hence, the soluble organic solutes begin to flow in mass from mesophyll through sieve-tubes down to the cells of stem and root under the gradient of turgor pressure. These solutes are either consumed or stored in insoluble from. The excess water is released back into the xylem vessels.



Q.20: What is circulatory system?

Ans: **Circulatory System:** The system involved in the transport of various substances within the body of an animal is called Circulatory system. The circulatory system transports gases like O_2, CO_2 etc. nutrients, wastes, hormones and defense proteins.

Q.21: How many types a/circulatory system are in animals? Name and define them with examples.

Ans: **Types of Circulatory System**: There are two types of blood circulatory System found in animals.

(i) Open circulatory system (ii) Closed circulatory system

(i) **Open Circulatory System**: In this type of Circulatory System blood flows through the spaces among tissues so it directly comes in contact with tissues. It remains filled in the open tissue space called Sinuses. After exchange of materials with tissues, blood enters the pumping organs or heart which pumps it into blood vessels. These vessels drain out blood into sinuses so it remains in Circulation. This types of circulatory system found in arthropods and molluscs.

(ii) **Closed Circulatory System:** This type of circulatory system allows blood to flow inside the closed tubular blood vessels and never comes out in direct contact with tissues. Most vertebrates and some invertebrates, such as this annelid earthworm, have a closed circulatory system.

Open circulatory system *Closed circulatory system*

Q.22: Which type of circulatory system is found in man? Write the names of the components of the circulatory system of man.

Ans: **Transport in Man:** In man, closed type of circulatory system is found, which consists of following components.

(i) **Blood**: It is a fluid with cells and other dissolved substance.

(ii) **Heart**: It is a pumping, pulsatile organ.

(iii) **Blood Vessels**: They are tubes i.e. arteries, veins and capillaries.

This is much more efficient and rapid system of transport.

Q.23: What is blood? Describe the composition of blood and explain its functional importance. OR What is blood? Write components of blood. Also give their functions.

Ans: **Blood**: Blood is a special type of connective tissue, found in the form of fluid which circulates in the body. It transports substances in the body of an organism. It consists of two parts:

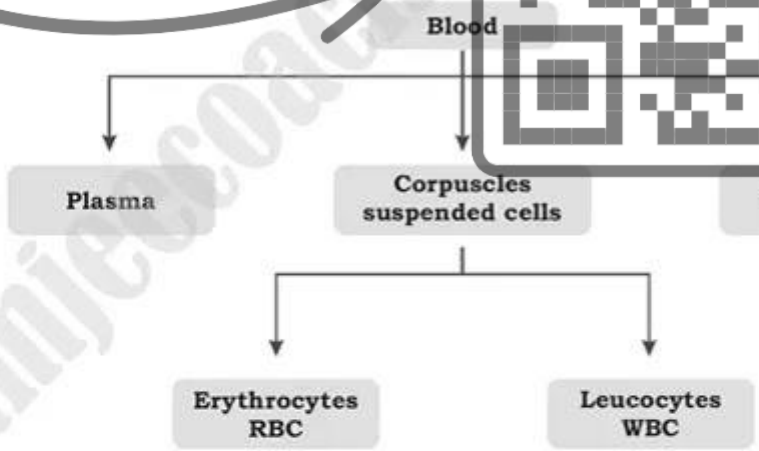
(i) Plasma (ii) Corpuscles

(i) **Plasma:** Plasma is the fluid part of blood and constitutes about 55% by volume of whole blood. It is pale yellowish liquid. About 90% of plasma is water in which complex mixture of various substances are dissolved. There are dissolved mineral salts like bicarbonates, sulphates, chlorides and phosphates of sodium (Na) and potassium (K). All these are found in the form of ions. Salts of calcium are also present in blood for clotting of blood.

Soluble proteins are also present in plasma i.e. Serum albumin, Serum globulin, fibrinogen and prothrombin. The last two play important part in clotting of blood. Antibodies are also present in plasma, which are involved in fighting diseases.

Plasma contains digested food substances such as glucose, amino acids, fatty acids and vitamins. It also contains excretory products such as Urea, Uric acid and creatinine. Carbon dioxide (CO_2) is also present as bicarbonate ions. It also contains hormones.

Function: It provides medium for exchanging of materials between the body cells and the blood.



(ii) **Corpuscles OR Blood Cells:** In man, 45% of the blood consists of blood cells. The blood cells are of following three types:

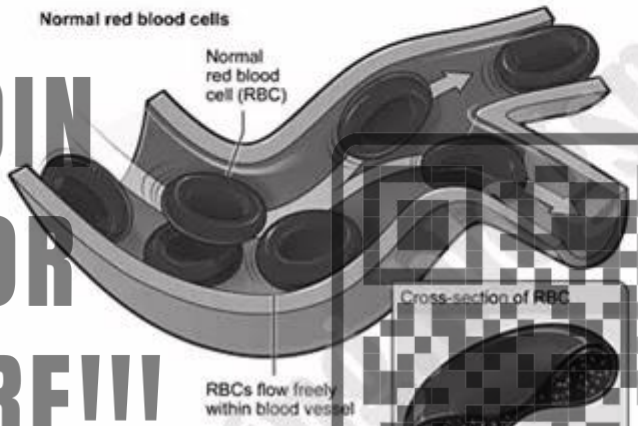
(a) Red blood corpuscles (RBCs)

(b) White blood corpuscles (WBCs)

(c) Platelets

(a) **Red Blood Corpuscles (RBCs):** R.B.Cs in mammals are circular, disc like, biconcave cells. Their mature R.B.Cs do not have nucleus, mitochondria, endoplasmic reticulum and Golgi bodies. $1mm^3$ (1 drop) of blood contains approximately 5 million R.B.Cs. They contain hemoglobin which is the respiratory pigment. It transports oxygen and carbon dioxide. It readily combines with oxygen in lungs and transport it to all the tissues of the body. Deficiency of hemoglobin slows down the metabolic activities. The red colour of the blood is due to this material of the RBC.

Function: R.B.Cs contain hemoglobin which is the respiratory pigment. It transport oxygen, from the lungs to other tissues of the body, and from the tissues, the carbon dioxide to lungs.

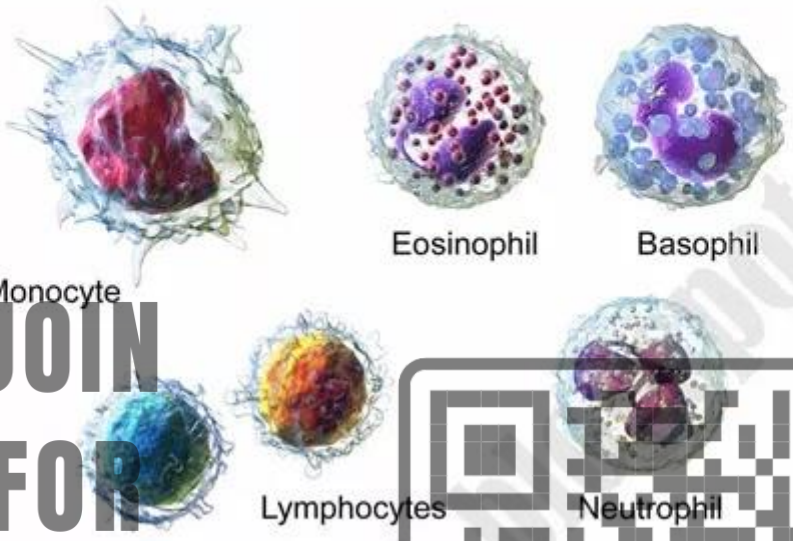


Erythrocytes (R.B.Cs)	
Shape	Bi-concave; Circular like disc
Size	0.007 – 0.008mm in diameter
Composition	Non-nucleated, contain red pigment hemoglobin protein containing iron.
Quantity	5,000,000 /cubic millimeter
Place of production	Bone marrow
Life	120 days on Average
Place of distribution	Spleen and liver
Function	Transports O_2 from lungs to body cell. Transports CO_2 from body cell to lungs.

(b) **White Blood Corpuscles (WBCs):** They are colourless, irregular in shape, nucleated and larger than of R.B.Cs. $1mm^3$ (1 drop) of blood contains approximately 7 thousand W.B.Cs.

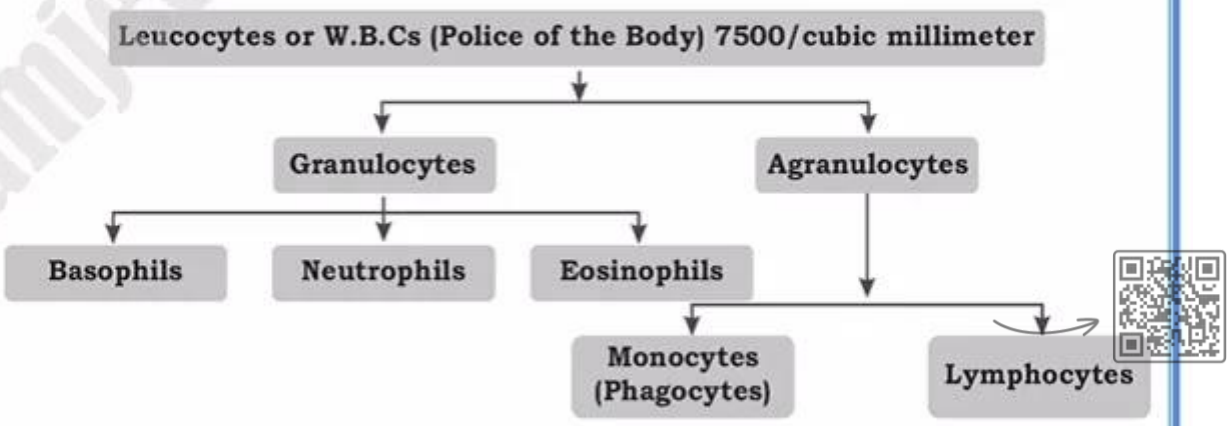
They are of several types and can be distinguished on the basis of the shape of the nucleus. They have the ability to differentiate between their own body cells and the foreign cells.

Function: W. B.Cs are commonly known as "Police of the body" because they protect the body by killing the germs and provide defence against diseases.



There are several types of white blood cells which perform different functions.

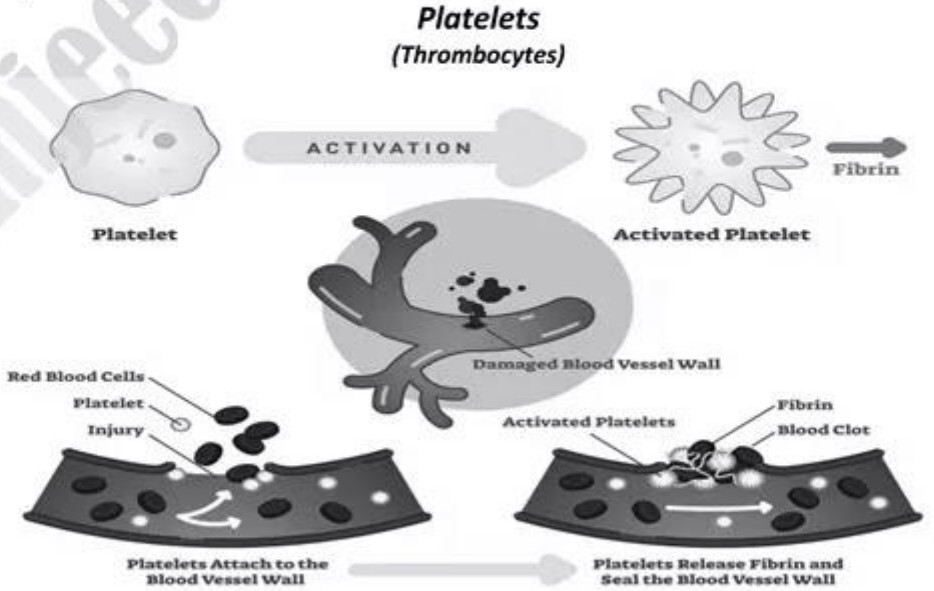
Break down of Haemoglobin



Type of WBCs	Description	Average number	Function
(A) Granulocytes			
Neutrophils	About twice the size of RBCs, nucleus 2 to 5 lobed.	62% of W.B.Cs	Destroys small particles by Phagocytsis
Eosinophils	Nucleus bibbed	2% of W.B.Cs	Inactivates inflammation producing substances, attack parasite
Basophils	Nucleus bibbed	Less than 1% of W.B.Cs	Release heparin to prevent blood clots and histamine which causes inflammation
(B) Agranulocytes			
Monocytes	3 to 4 times larger than RBCs, nuclear shape from round to lobed	3% of W.B.Cs	Marcophages, destroys large particles by phagocytosis
Lympocytes	Slightly larger than RBCs, nucleus nearly occupies cell	32% of W.B.Cs	Immune response by producing antibodies

(iii) **Platelets**: Platelets are the fragments of cells which are formed from large precursor cells in the bone marrow. On injury, exposure to the air stimulates the platelets at cut end to produce in enzyme in blood. This enzyme causes the soluble plasma protein fibrinogen to form insoluble fiber of another protein fibrin which forms a network of fibers around wound.

Function: It protects blood to flow that is called clot, which prevents bleeding and stops the entry of pathogen.



Q.24: Describe the major functions performed by the blood.

Ans: Functions of blood are as follows:

(i) **Transport of Gases:** Blood transports oxygen from the lungs to other tissues of the body and brings back CO_2 from the tissues to lungs.

(ii) **To Defend the Body**: It defends the body by killing the germs, which somehow enter the body.

(iii) **To Transport Nutrients:** It transports nutrients from the gut to all parts of the body.

(iv) **Removal of Nitrogenous Waste:** It transports nitrogenous waste from tissues to excretory organs to expel them out.

(v) **Transport of Hormones:** Blood transports hormones from the endocrine glands to their target organs.

(vi) **Temperature Control:** It also maintains uniform body temperature.

(vii) **Distribution of Heat**: Blood circulates in the body continuously and thus it helps to distribute the heat in the body uniformly to all parts of the body.

(viii) **Stop Bleeding:** Due to presence of platelets and fibrinogen protein, blood makes a clot to stop bleeding.

Q.25: What are the parts of closed circulatory system? Write about heart and its function.

Ans: Closed circulatory system consists of following parts:

(i) Heart (ii) Blood vessels (iii) Blood

It is a muscular, pulsatile organ. It pushes blood into a blood vessel (Artery) which gives off many branches each leading to a different organ of the body. In each organ, the artery breaks up into microscopic vessels, the capillaries which form a network. The exchange of various substances between blood and the tissues of the body takes place here. Later capillaries gradually fuse together to form veins which bring the blood back to the heart.

Function: Heart is a muscular pumping organ & its continuous beating makes the blood to circulate in the body.

Q.26: Define heart rate.

Ans: **Heart Rate:** The number of heartbeats in a minute i.e. the heart rate can be measured by the beating of heart. On average, a healthy heart beats 72 times in a minute. The normal range of heart is 60-100 beats in a minute. It is necessary to keep the heart rate within the normal range. The slow of fast heart rate may cause severe heart diseases. The heart rate may vary from person to person.

Q.27: Write a note on blood disorders.

Ans: **Blood Disorders**:

(a) **Leukemia:** It is a type of cancer that affects the blood, bone marrow and lymphatic system. In this type of blood cancer, number of W.B.C.s increases and R.B.Cs decreases.

Symptoms:

- Fever of chill
- Frequency or severe infections
- Swollen lymph node
- Easy bleeding or burnishing
- Ting red spots on skin
- Bone pain or tenderness
- Persistent fatigue, weakness
- Loss of weight without try
- Enlarge liver or spleen
- Recurrent nose bleeding
- Sweating at night

Causes: Leukemia is thought to occur when some blood cells acquire mutations in their DNA. Some abnormalities cause the cell to grow and divide more rapidly and continue living when normal cells would die. With passage of time, these abnormal cells in the bone marrow, leading fever healthy white blood cells, red cells and platelets.

- Genetic disorder
- Exposure to certain chemicals
- Smoking
- Family history

(b) **Thalassemia:** It is the name of a group of inherited conditions that affect the blood hemoglobin. Persons having Thalassemia do not produce or produce little amount of hemoglobin, which is used by red blood cells to carry oxygen around the body . Person having problem of Thalassemia have following symptoms:

Symptoms:

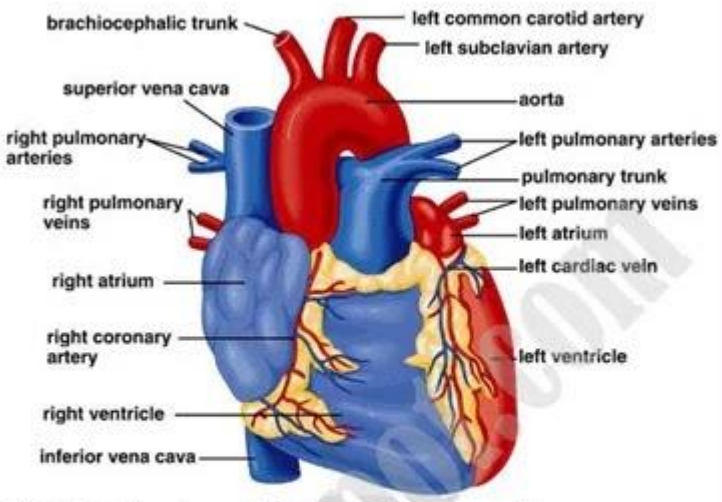
- A pale and results appearance
- Slowed growth and delayed puberty
- An enlarge spleen, liver or heart
- Poor appetite
- Dark urine
- Jaundice

(c) **Thalassemia Major:** It occurs when a child inherits two mutated genes, one from each parent. Children born with this disorder usually develop the symptoms of severe anemia within the first year of life. They lack the ability to produce normal, hemoglobin and feel chronic fatigue.

Thalassemia minor have occurred when a child inherit it from one of the parent. Persons have mild anemia and slight lowering of hemoglobin level in the blood. It resembles with mild iron deficiency anemia. People with this disorder do not have any symptoms.

Q.28: Describe the external and internal structure of human heart.

Ans. **External Structure of Heart**: Heart is the major organ of circulatory system. It is a muscular pump which keeps the blood circulating throughout the body. It is located in the thorax slightly at the left side. It is enclosed in a fibrous bag like protective cover called Pericardium. It is conical in shape externally. The space between pericardium and heart is pericardial cavity which is filled with a fluid called pericardial fluid. This fluid reduce friction and Pericardium protects the heart, prevent it from over extension.



Internal Structure of Heart: Internally, it consists of four chambers:

- The upper two are thin walled called atria (singular: artrium),
- The lower two are thick walled called ventricles.

Atria: Atria are thin walled chambers. They are completely separated from each other by a septum called interatrial septum. The right atrium receives deoxygenated blood from all tissues of the body. The left atrium receives oxygenated blood from the lungs. Each atrium is connected with its ventricle by an auriculoventricular aperture.

The function of atria is to stretch to receive blood as it returns to the heart and them contract with enough force to push the blood through the atrioventricular valves into the ventricles. This requires a lower pressure than that developed in the ventricles, so the walls of the atria are much thicker and more elastic than those of the ventricles.

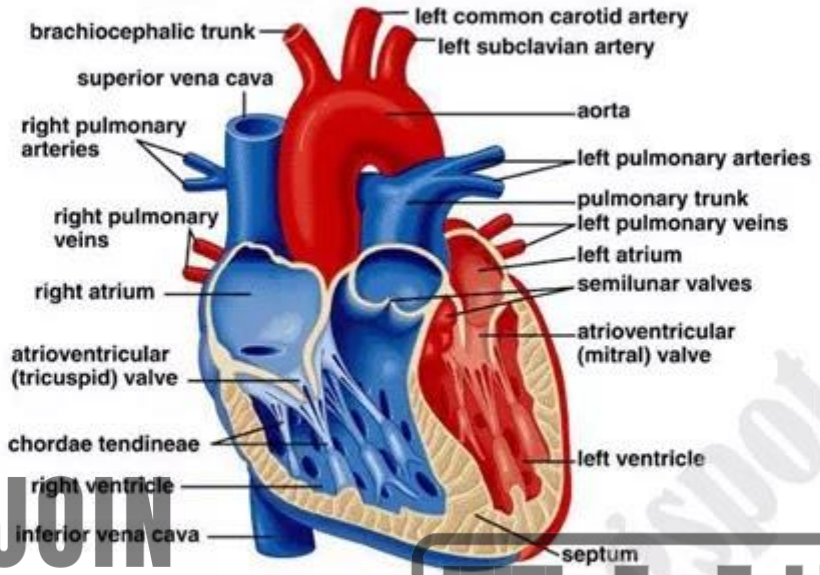
Ventricles: Similarly, the two ventricles are also separated from each other by a muscular partition called inter-ventricle septum.

The right atrium and right ventricle are connected by Tricuspid Valve. Similarly, left atrium and left ventricle are connected by bicuspid valve. These valves prevent the backward flow of blood from the ventricles to the atria. Two main blood vessels are arising from ventricles to carry blood from heart to all parts of the body.

The blood from the right ventricle is pumped through pulmonary arch to the lungs for oxygenation while the blood from the left ventricle is pumped through a systemic aorta to all the parts of the body. The pulmonary arch and systemic aorta, both are guarded by semi-lunar valves to prevent backward flow of blood.

There is difference in thickness and narrow in space. This is related to their functions. The right ventricle only pumps blood to the lungs while the left ventricle pumps blood to all other parts of the body. The resistance to blood flow through the body capillary networks

is for higher than that through the lung capillaries so, a high pressure is developed in the systemic circulation, it requires a thicker muscle wall and narrow space.



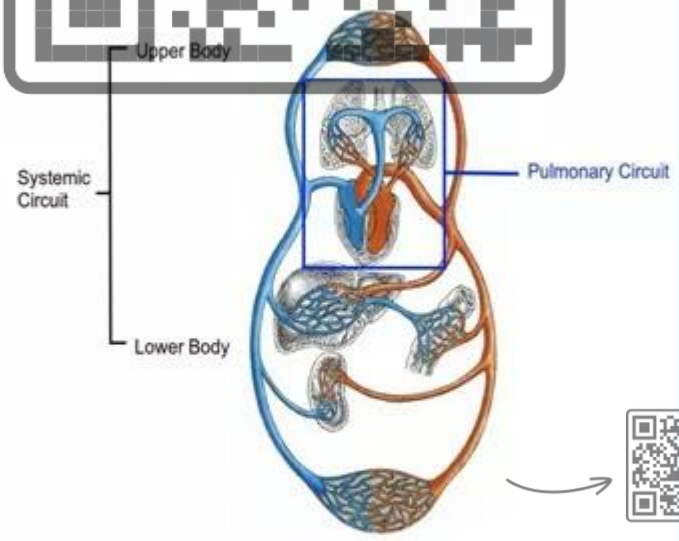
Q.29: Explain double circuit circulation in man. OR Explain mechanism of circulation in human.

Ans. **Double Circuit Circulation in Man:** The circulation of blood in our body is called double circuit because it circulates blood in two separate circuits and enter twice in heart during complete circulation. These two circuits are:

(i) Pulmonary Circuit - from heart to lungs and back from lungs to heart.

(ii) Systemic Circuit -from heart to different organs and from ,organs back to h

(i) **Pulmonary Circuit:** It transports blood from right ventricle to lungs through pulmonary arteries and flow back to heart in left atrium through pulmonary veins.



The deoxygenated blood from all over the body except lungs received in right atrium and then collected into right ventricle, upon contraction of ventricle this deoxygenated blood enters into pulmonary arch which supply this blood to the lungs, where blood gives up its CO_2 and receives O_2 from air at capillary level. The deoxygenated blood now becomes oxygenated which flow back to the left atrium through pulmonary veins. This oxygenated blood now circulates through the body by Systemic Circulation.

(ii) **Systemic Circuit**: Circulation of oxygenated blood from left ventricle through systemic aorta to all organs of body and back to heart by superior and inferior vena cava as deoxygenated blood is called systemic circulation or circuit. Upon contraction the left ventricle forces oxygenated blood into systemic aorta, the largest artery of our body. Initially, the aorta gives off three branches which supply blood to head, arms and shoulders.

This aorta then descends down and gives off many branches which supply blood to their respective organs e.g. a branch which supplies blood to liver called Hepatic artery, another branch called renal artery supplies blood to the kidney and coronary artery to heart etc.

Q.30: Define heart beat and describe its phases.

Ans: **Heart Beat:** The pumping of blood by the rhythmic pulsation of heart throughout the body is called heartbeat.

It is a two phase pumping action of blood that takes less than a second.

The First Phase: When blood is collected in the left and right atrium, the heart receives an electrical signal that causes the atria to contract. This contraction pushes blood in to the right and left ventricles through tricuspid and bicuspid values respectively.

The Second Phase: The second phase of pumping blood begins when the ventricles are full of blood. The electrical signals travel along a pathway of cells to the ventricles, this causes ventricles to contract. The relaxation of heart muscle and allowing the chambers to fill with blood, this phase of heartbeat is called diastole. The connection of heart muscle and pumping the blood from the chambers into the arteries named as systole.

Q.31: Describe the effects of slow and fast heart rate.

Ans: **The Effects of Slow Heart Rate**: The decreasing heart rate is a result of slow heartbeat, which leads to condition called bradycardia. In this condition, the heart rate is too slow (to below 60 beats per minute) due to very slow heartbeat. This slow heart rate reduces amount of blood and oxygen to vital organs of body, and causes shortness of breath, dropping of blood pressure, extreme fatigue etc.

The Effects of Fast Heart Rate: On the other hand, when a heart beats very fast (more than 100 beats per minute), this condition is called tachycardia. Due to this rapid heart rate, the function of heart becomes very hard. It means that the heart does not have enough time to fill with blood and enough blood is pumped forward. The tachycardia is caused by the fever, dehydration, excessive caffeine or a reaction to medication. Chest pain, dizziness and fainting are the symptoms of tachycardia.

Cause of tachycardia can be:

- Sudden cardiac arrest
- Heart failure
- Weaken heart muscle
- Lung diseases

Q.32: Define pulse rate.

Ans: **Pulse Rate:** Contrary to the heart rate, the pulse rate is exactly equal to the heartbeat. If the heartbeat is faster so as the pulse rate and if the heartbeat is slower, the pulse rate will be slower too. Taking a pulse is therefore a direct measure of heart rate.

Q.33: Describe the main veins of human body.

Ans: **Main Veins of the Body**: Blood returned to the heart by the main veins as follows: Pulmonary veins bring oxygenated blood from the lungs to the left atrium of the hear. Inferior vena cava runs upwards parallel to the dorsal aorta and brings deoxygenated blood from the lower body. Among these are renal vein bringing blood from kidneys, hepatic vein bringing blood from the liver and femoral veins brings blood from lower limb to the right atrium. Superior vena cava brings deoxygenated blood from the heat, neck and arms to right atrium.

Q.34: Describe blood vessels with their structure.

Ans: **Blood Vessels:** These are tubes in which blood circulates in the body in a closed circulatory system. They run through all of the tissues of the body, while some blood vessels are as wide as our thumb, most of them are much finer than a. human hair. There are three types of blood vessels, which are:

(i) Arteries (ii) Veins (iii) Capillaries.

(i) **Arteries:** The blood vessels that carry blood from heart to various organs of the body are termed as arteries.

Function: Arteries carry oxygenated blood (except pulmonary artery) away from the heart. Right ventricle of heart pumps blood into the pulmonary artery that goes to the lungs. Left ventricle of heart pumps blood into the aorta (largest artery in body). Every organ receives blood from arteries that branch off the aorta. The first branch called the coronary artery, carry blood to the walls of heart itself. Other branches carry blood to the brain, intestine and other organs.

Structure: Arteries are thick walled and more elastic than veins. Their inner space or lumen is narrow. The wall of an artery is composed of three layers.

(a) The innermost layer is made up of epithelial tissues.

(b) The middle layer consists mostly of smooth muscle and elastic fibers.

(c) The outer wall is made up of flexible connective tissues.

Because of layered structure arteries have both strength and flexibility.

The arteries on reaching closer to the tissues, divide into arterioles. The arteriole further divide into very fine branches, the capillaries.

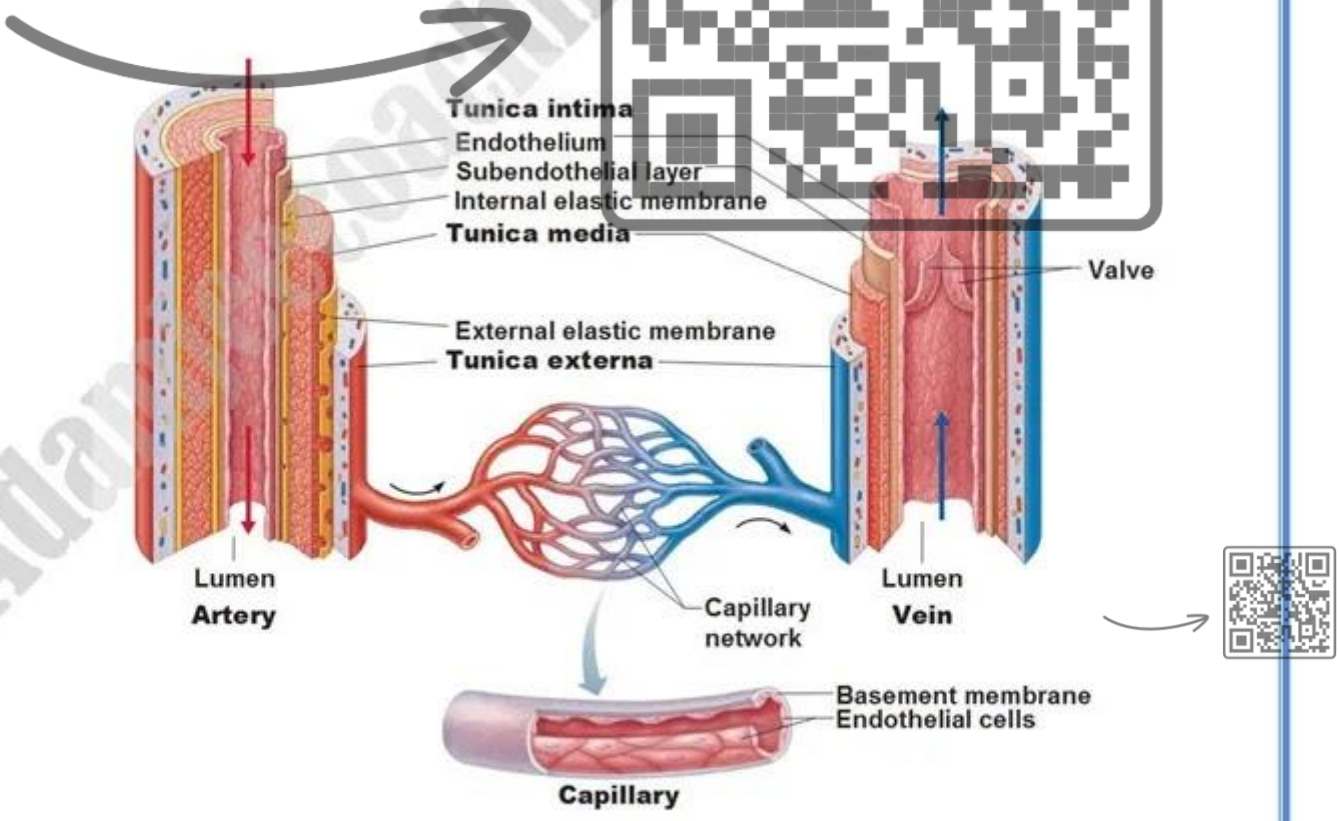
(ii) **Veins:** Veins are the blood vessels that bring deoxygenated blood (except pulmonary vein) back to the heart. They are formed by the union of smaller branches called venules which in turn are formed by the fusion of capillaries with the other.

Structure: The walls of veins, like those of arteries have three layers, with muscle in the middle layer. However, the walls of vein are generally thinner than those of arteries. They have large lumen.

Blood pressure in the veins is much lower than the blood pressure in the arteries. Semi lunar valves in the veins prevent) backflow of blood. Flow of blood along the veins is assisted by the action of skeletal muscles on the veins.

(iii) **Capillaries:** They are microscopic blood vessels found in the cells of tissues where exchange of various substances occurs between blood and the surrounding tissues.

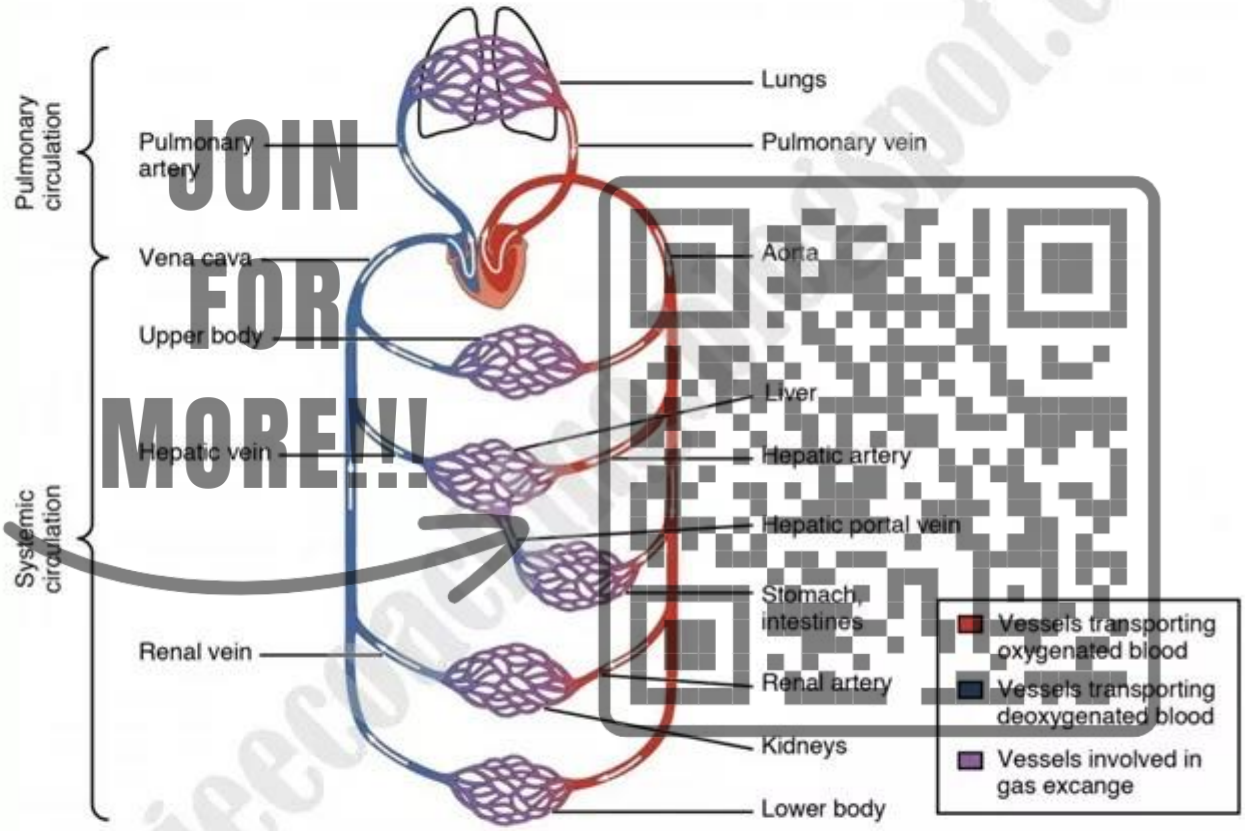
Structure: They have walls made up of single layer of flattened cells called endothelium. Capillary walls are partially permeable that enable substances diffuse readily through it. They are originated from arterioles and branches repeatedly to provide large surface area for the exchange of substances between the blood and the tissue cells.



Q.35: Describe the main arteries of human body.

Ans: **Main Arteries of the Body**: The pulmonary artery which originates from the right ventricle carries deoxygenated blood towards the lungs and aorta which originates from the left ventricle carries oxygenated blood towards the body. Aorta terminates into arteries of the head, neck and arms. Aortic arch curls backward to the left side of the heart and continues downwards as the dorsal aorta, which distributes blood to regions of the body below the heart.

For example, it supplies blood (oxygenated) through hepatic artery to the liver, renal artery to kidney and femoral artery to lower limb.



Q.36: Who explained pulmonary and systematic circulations?

Ans: Ibn-al-Nafees was the first Arab-Physician to explain pulmonary circulation. He believed that all the blood that reached the left ventricle passed through the lungs.

William Harvey was an English Physician to explain systematic circulation in detail. He believed that blood being pump to the brain and body by the heart.

Q.37: Describe cardiovascular disorders (CVD).

Ans: **Cardiovascular disorders (CVD):** In recent days CVD becomes leading cause of death around the world so it is essential to understand them.

Atherosclerosis (ATH): Most common among cardiovascular disease is atherosclerosis is (ATH). ATH is disorder in which bad fats (i.e. low density lipoprotein or LDL and cholesterol) get deposited in blood vessels internal layer.

Accumulation of fats leads to gradual narrowing of lumen of blood vessel. Narrow lumen leads to gradual compromise of blood supply to target organs, and leads to myocardial infarction and stroke.

Atherosclerosis: It is a process in which arteries loss their elasticity due to some pathological process (e.g. ATH) or simply by aging. Loss of elasticity leads to high blood pressure which may eventually be able to lead to vascular hemorrhage.

Causes of Myocardial Infarction: Causes of myocardial infarction can be divided into non modifiable factors (which we cannot change) and modifiable factors (which we can change)

Non-modifiable factors	Modifiable factors
Sex (More in males)	Stationary life (no exercise)
Age (More in old age)	Smoking
Race (More in blacks)	Stress
Family history	Heavy alcohol consumption
	High fat diet

Q.38: What is vascular surgery?

Ans: **Vascular Surgery:** Vascular surgery is a prominent field of surgery in which vessels i.e. arteries, vines and lymphatic vessels are managed by vascular surgeons. Field gained very prominence when surgery involves bypass surgeries of heart, angioplasty and fistula formation in cases of renal failure.

Q.39: What do you know about the leading causes of death in Pakistan?

Ans: **Leading Causes of Death in Pakistan:** In 2018 cardiovascular disorders (ischemic heart diseases) and stroke (paralysis which is due to damage of brain tissue) becomes major cause of deaths in the world. Stationary life style, poor socioeconomic status; unavailability of state of the art facilities of health, unavailability of doctors in rural areas, lack of health and dietary awareness, etc. all contributed to increase incidence of cardiovascular disorders in our country.

Q.40: Differentiate between the following:

(i) Pulmonary circuit and systematic circuit

(ii) Open type circulatory system and close type circulatory system

(iii) Xylem and Phloem

(iv) Arteries and Veins

(v) W.B.Cs and R.B.Cs

Ans. (i) Difference between Pulmonary circuit and systematic circuit

	Pulmonary Circuit	Systematic Circuit
1.	It carries deoxygenated blood from the right ventricle of the heart to the lungs through the pulmonary artery.	It carries oxygenated blood from the Left ventricle of the heart to the rest of the body by the aorta.
2.	It carries oxygenated blood from the lungs to the left atrium of the heart by the pulmonary vein.	It carries deoxygenated blood from the body to the right atrium of the heart by the superior and inferior vena cava
3.	It is composed of pulmonary artery and pulmonary vein.	It is composed of inferior and superior vena cava, aorta, and other small blood vessels.
4.	It carries blood to the lungs.	It carries blood throughout the body.
5.	It helps to release carbon dioxide from the blood while dissolving oxygen in the blood.	It helps to provide nutrients and oxygen to the metabolizing cells in the body

(ii) Difference between Open type circulatory system and close type circulatory system

	Open type circulatory system	close type circulatory system
1.	The hemolymph directly bathes the organs and tissues.	The blood circulates within closed vessels.
2.	The blood and interstitial fluid cannot be distinguished.	Blood and interstitial fluid are distinct.
3.	Blood is pumped into the body cavity.	Blood is pumped through the vessels by the heart.
4.	Capillary system is absent.	Capillary system is present.
5.	Blood is in direct contact with the surrounding tissues.	Blood is not in direct contact with the tissues.
6.	Nutrients are exchanged directly between blood and tissues.	The nutrients are exchanged via tissue fluid.
7.	No transport of gases.	Gases are transported.

8.	The fluid flowing in this system is called hemolymph.	Fluid flowing in this system is called blood.
9.	No respiratory pigments are present.	Respiratory pigments are present.
10.	The volume of blood cannot be controlled.	The volume of blood can be controlled by the contraction and relaxation of blood vessels.
11.	Blood flow is slow.	Blood flow is rapid.
12.	The open spaces are called sinuses and lacunae	Closed spaces involve arteries and veins.
13.	Examples: Snails, clams, cockroaches and Spiders	Examples: Humans, squids, cats, earthworms.

(iii) Difference between Xylem and Phloem

	Xylem	Phloem
1.	Xylem is a vascular tissue that transports water and dissolved minerals absorbed from the roots to the rest of the plant.	Phloem is a vascular tissue that transports soluble organic compounds prepared during photosynthesis from the green parts of the plant to the rest of the plant.
2.	It is located in the centre of the vascular bundle	It is located on the outer side of the vascular bundle.
3.	Xylem forms most of the bulk of the wood.	Phloem forms most of the bulk of the bark.
4.	Xylem, tissues are found in leaves, roots, and stems.	Phloem tissues are found in stems and leaves which later grow in the roots, fruits, and seeds.
5.	Xylem tissue is composed of xylem vessels, fibers, and tracheids.	Phloem tissue is composed of like sieve tubes, companion cells, phloem fibers, and phloem parenchyma.
6.	Xylem fibers are robust and longer.	Phloem fibers are flexible in shorter.
7.	The cells of the xylem tissue are dead cells except for the parenchyma cells.	The cells of the phloem tissue are living cells except for the blast fibers.
8.	The cell wall of the cells in the xylem is thick-walled.	The cell wall of the cells of the phloem is thin-walled
9.	The quantity of xylem tissue in the vascular bundles is more than the phloem tissue.	The quantity of phloem tissue is comparatively less in the vascular tissue.

10.	Two types of conducive cells are present in xylem; tracheids and vessels.	Only one type of conducive cell is present in phloem; sieve tubes.
11.	The conducive tissues consist of dead cells.	The conducive tissues consist of living cells
12.	The primary function of xylem is to transport water and dissolved minerals from the root to different parts of the plant.	The primary function of the phloem is to transport the prepared sugars from the leaves to different parts of the plant.
13.	The transport by xylem is unidirectional; the water and mineral are only moved up from the roots.	The transport by phloem is bidirectional; the food can travel both up and down the plant.
14.	Xylem also aids in providing physical support the plant.	Phloem is not involved in mechanical support.

(iv) Difference between Arteries and Veins

	Arteries	Veins
1.	Moves away from the heart.	Moves towards the heart.
2.	Distributes blood to the body organs.	Collects blood from body organs.
3.	Blood pressure is high in arteries.	Blood pressure in veins is low.
4.	Valves are absent.	Valves are present.
5.	Carry oxygenated blood except pulmonary artery.	Carry deoxygenated blood, except pulmonary vein.
6.	Arteries end in capillaries.	Veins start in blood capillaries.
7.	They are deep seated.	They can be seen subcutaneously.
8.	They do not collapse when there is no blood in it.	They collapse when there is no blood in it or cut across.
9.	Arteries are further divided into arterioles.	Veins are further divided into venules.
10.	They are round and relatively thick walled.	Veins are usually flattened or collapsed with thin walls.
11.	Arteries have small lumen.	Veins have large lumen.
12.	Arteries are reddish in colour.	Veins are bluish in colour.
13.	Arteries show spurty movement of blood giving pulse.	Veins show sluggish movement of blood.
14.	If arterial wall is injured, the blood comes-out like a fountain in a large area all around the artery.	If venous wall is injured, blood comes out, collects in a pool in a small area around vein.

(v) Difference between W.B.Cs and R.B.Cs

	Red Blood Cells	White Blood Cells
1.	These are smaller in size and more numerous in numbers.	These are larger in size and fewer in number.
2.	These are non-nucleated, biconcave disc like cells.	They are nucleated and amoeboid cells and keep on changing their shape.
3.	These cells contain a special type of protein called hemoglobin (respiratory pigment) due to which they are red in colour.	Hemoglobin is absent in WBCs due to which they are white or colourless.
4.	RBCs cannot diffuse out through capillary wall.	WBCs can diffuse out through capillary walls.
5.	RBCs help in gaseous transport.	WBCs help in killing bacteria and foreign particles.
6.	RBCs settle together to form rouleaux (i.e. stack over each other due to abnormal shape).	WBCs do not form rouleaux.

Q.41: Why capillaries are made up of single layer of endothelium?

Ans: Capillaries are made up of single layer of endothelium because Substances such as glucose, oxygen, and wastes can quickly pass through it on their way to or from the cells.

Q.42: Why veins contain semilunar valves in it?

Ans: Semilunar valves in veins prevent backflow of blood.

Q.43: Why atherosclerosis cause myocardial Infraction and stroke?

Ans: During progression of atherosclerosis, myeloid cells destabilize lipid-rich plaque in the arterial wall and cause its rupture, thus triggering myocardial infarction and stroke.

Biology 9th - Short Question Answers

TRANSPORT

CHAPTER# 09

ADAMJEECOACHING.BLOGSPOT.COM

Q.1: Define passive and active transport?

Ans. The root absorbs water and minerals from soil through root hairs. There are two processes of transport:

(i) **Passive Transport:** The uptake of water and mineral by osmosis and diffusion without using energy of ATP. It is due to concentration gradient i.e. always takes place from high to low quantity of substances.

(ii) **Active Transport**: .Movement of substances from low quantity to high quantity i.e. against the gradient and it requires energy of ATP. This movement is called active transport.

Q.2: Describe mineral transport in plants.

Ans: **Mineral Transport:** Plants also require minerals i.e. nitrates, sulphates, phosphates etc. These minerals are also taken up by root hair in two ways:

(i) By diffusion, when the concentration of certain ions in soil is higher than that in root hair cells i.e. passive transport.

(ii) By active transport, plant requires some substance even they found in soil in low quantity. The roots have to absorb these ions against a concentration gradient by using energy of ATP, which is active transport.

Q.3: Describe the importance of diffusion with example.

Ans: **Importance of diffusion:** Importance of diffusion can be describe as follows:

(i) **Help in Biological process:** In the plants during photosynthesis and respiration the exchange of carbon dioxide and oxygen gases, between the cell and the atmosphere take place by diffusion.

(ii) **Help in transpiration**: During stomatal transpiration, water vapours from the intercellular spaces escape out in the outer atmosphere by the process.

(iii) **Small organisms use diffusion**: Many small organisms such as Amoeba and Hydra depend on diffusion for obtaining oxygen and getting rid of carbon dioxide.

(iv) **Large animals depends on diffusion:** In the lungs of large animals, the exchange of gases (carbon dioxide and oxygen) between air and blood also takes place by diffusion.

Q.4: What is meant by osmosis? Write its importance.

Ans: **Osmosis:** "It is a special type of diffusion. In this process water molecules move from higher concentration to lower concentration through semi permeable membrane." OR "Osmosis is a process by which solvent molecules (water) diffuse across selectively permeable membrane, from a region of low solute concentration to the high solute concentration."

Q.5: Define transpiration.

Ans. **Transpiration**: Plants absorb water continuously from soil. Some of its quantity utilized in photosynthesis and other metabolic function while the rest is retained in cell to maintain turgidity of cell. Some water is removed in the form of vapours. This loss of internal water of plant in the form of vapours from aerial part of plant is called transpiration. Transpiration mainly takes place through special pores guarded by specialized guard cells called. Stomata (sing. stoma).

Q.6: How many types of leaves are there on the basis of stomatal distribution?

Ans: Plants have three types of leaves on the basis of stomatal distribution.

(i) Leaves that have stomata at lower epidermis called bifacial leaves e.g. leaves of mango plant.

(ii) Leaves that have stomata at both surface (upper and lower epidermis called monofacial leaves e.g. leaves of maze plant.

(iii) Leaves that have stomata at upper epidermis only e.g. leaves of water lily.

Q.7: Describe the relation of transpiration with leaf surface.

Ans: **Relation of Transpiration with Leaf Surface:** Surface area of leaf is also an important factor for the rate of transpiration, because the larger size leaves have high number of somata which increase the rate of transpiration.

Q.8: Why the leaves of desert plants modified as spines?

Ans. The desert plants require to save their water so they have smaller size leaves or their leaves becomes spines to reduce number of stomata as well as rate transpiration.

Q.9: What is circulatory system?

Ans: **Circulatory System:** The system involved in the transport of various substances within the body of an animal is called Circulatory system. The circulatory system transports gases like O_2, CO_2 etc. nutrients, wastes, hormones and defense proteins.

Q.10: Describe the transport in animals.

Ans: **Transport in Unicellular Animals:** Cytoplasm of unicellular animals remains very much close to plasma membrane which remains in contact with environment. In these animals oxygen can diffuse through the body surface and reach easily to energy producing organelles. Similarly, the waste products can rapidly move from the body by simple diffusion.

Transport in Multicellular Animals: On the other hand, in multi-cellular organisms like mammals including man, many cells are situated away from environment. Only simple diffusion is not enough to supply O_2 (oxygen) to these cells and to get rid of wastes from there. It needs proper transport system to carry substances from one part of the body to another.

Q.11: Which type of circulatory system is found in man? Write the names of the components of the circulatory system of man.

Ans: **Transport in Man:** In man, closed type of circulatory system is found, which consists of following components.

(i) **Blood**: It is a fluid with cells and other dissolved substance.

(ii) **Heart**: It is a pumping, pulsatile organ.

(iii) **Blood Vessels**: They are tubes i.e. arteries, veins and capillaries.

This is much more efficient and rapid system of transport.

Q.12: Define heart rate.

Ans: **Heart Rate:** The number of heartbeats in a minute i.e. the heart rate can be measured by the beating of heart. On average, a healthy heart beats 72 times in a minute. The normal range of heart is 60-100 beats in a minute. It is necessary to keep the heart rate within the normal range. The slow of fast heart rate may cause severe heart diseases. The heart rate may vary from person to person.

Q.13: Define pulse rate.

Ans: **Pulse Rate:** Contrary to the heart rate, the pulse rate is exactly equal to the heartbeat. If the heartbeat is faster so as the pulse rate and if the heartbeat is slower, the pulse rate will be slower too. Taking a pulse is therefore a direct measure of heart rate.

Q.14: Why capillaries are made up of single layer of endothelium?

Ans: Capillaries are made up of single layer of endothelium because Substances such as glucose, oxygen, and wastes can quickly pass through it on their way to or from the cells.

Q.15: Describe the main veins of human body.

Ans: **Main Veins of the Body**: Blood returned to the heart by the main veins as follows: Pulmonary veins bring oxygenated blood from the lungs to the left atrium of the hear. Inferior vena cava runs upwards parallel to the dorsal aorta and brings deoxygenated blood from the lower body. Among these are renal vein bringing blood from kidneys, hepatic vein bringing blood from the liver and femoral veins brings blood from lower limb to the right atrium. Superior vena cava brings deoxygenated blood from the heat, neck and arms to right atrium.

Q.16: Who explained pulmonary and systematic circulations?

Ans: Ibn-al-Nafees was the first Arab-Physician to explain pulmonary circulation. He believed that all the blood that reached the left ventricle passed through the lungs.

William Harvey was an English Physician to explain systematic circulation in detail. He believed that blood being pump to the brain and body by the heart.

Q.17: What is vascular surgery?

Ans: **Vascular Surgery:** Vascular surgery is a prominent field of surgery in which vessels i.e. arteries, vines and lymphatic vessels are managed by vascular surgeons. Field gained very prominence when surgery involves bypass surgeries of heart, angioplasty and fistula formation in cases of renal failure.

Q.18: Why veins contain semilunar valves in it?

Ans: Semilunar valves in veins prevent backflow of blood.

Q.19: Why atherosclerosis cause myocardial Infraction and stroke?

Ans: During progression of atherosclerosis, myeloid cells destabilize lipid-rich plaque in the arterial wall and cause its rupture, thus triggering myocardial infarction and stroke.