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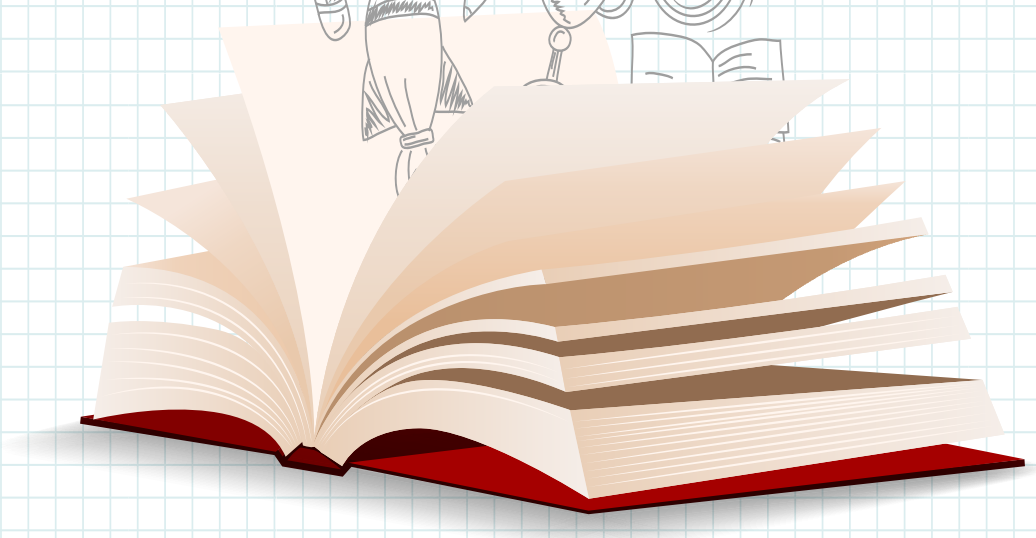

10th Standard

Science and Technology Part -2

Students Academy

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PREFACE

This book is prepared for the students of 10th standard to study Science and Technology Part 2.

The care is been taken to produce the concepts in a way, that students can remember and learn science with fun and develop affection and curiosity for studying science.

While studying a chapter or concept, one can find related work assignments or activities to enhance the subject knowledge.

The book is circulated for free of cost.

A big thanks to Ebalbharti for providing the Content Guidelines.

I hope this book turns out to be a guiding light for the students who will be appearing SSC Board examination.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think I've nearly missed something or needs any correction or want to appreciate the efforts of my triumphs, I would love to hear from you.

Please write your review on: **saiphy.learning@gmail.com**

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants !

From,

Author: Sainath Sadulla

Edition: First 2021

1. Heredity and Evolution

Heredity and hereditary changes

- Heredity is the transfer of **biological characters** from one generation to another via genes.
- **Johann Gregor Mendel** is pioneer of the modern genetics.
- In 1901, mutational theory was given by **Hugo de Vries**.
- In 1902, paired chromosomes in the cells of grasshopper were observed by **Walter Sutton**.
- In1944, trio of scientists **Ostwald Avery, Mclyn McCarthy and Colin MacLeod** proved that except viruses, all living organisms have DNA as genetic material.
- In 1961, the French geneticists **Francois Jacob and Jack Monad** proposed a model for process of protein synthesis with the help of DNA in bacterial cells. It helped to uncover the genetic codes hidden in DNA. Thereby, the technique of recombinant DNA technology emerged which has vast scope in the field of genetic engineering.
- The science of heredity is useful for **diagnosis, treatment and prevention** of hereditary disorders, production of hybrid varieties of animals and plants and in industrial processes in which microbes are used.

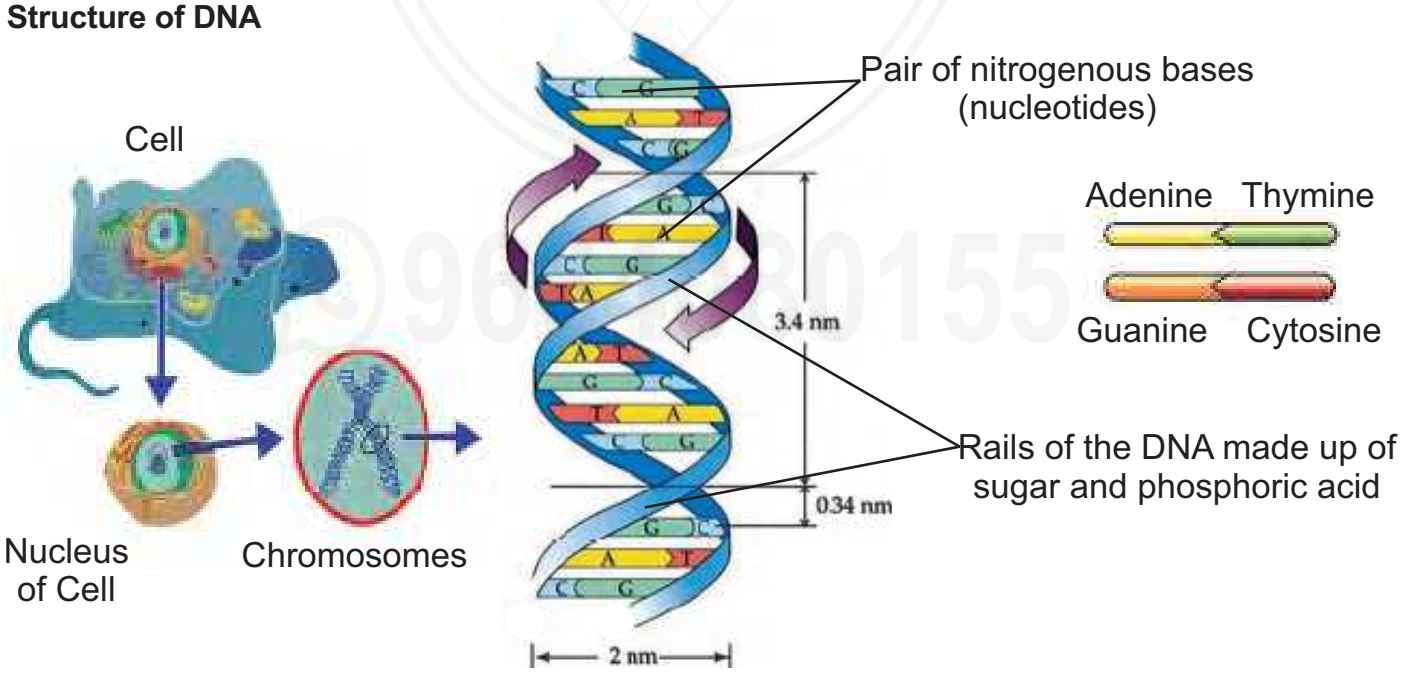
Q.1 Which component of the cellular nucleus of living organisms carries hereditary characters?
Ans : DNA

Q.2 What do we call to the process of transfer of physical and mental characters from parents to the progeny?
Ans : Heredity

Q. 3 Which are the components the DNA molecule?
Ans : 1) Phosphate 2) A Sugar (Deoxyribose)
3) Adenine, Guanine, Cytosine & Thymine (4 Nitrogenous Bases)

Q.4 Sketch and explain the structure of DNA and various types of RNA.

Structure of DNA



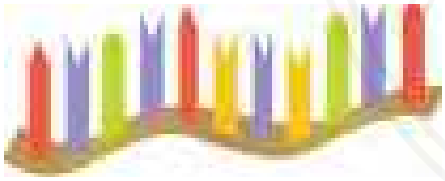
Deoxyribonucleic acid (DNA) :

1. The structure of the DNA molecule is the same in all organisms.
Watson and Crick produced a model of the DNA molecule. As per this model, two parallel threads of nucleotides are coiled around each other. This arrangement is called a 'double helix'.
2. DNA is made up of nucleotide molecules. A phosphate group, a sugar group and a nitrogen base are present in each nucleotide.
3. The nitrogen base is of four types: cytosine(C), guanine, thymine(T),and adenine(A).
4.The order in which these nitrogen bases are present determines the genetic code and also instructs cells how to prepare proteins.
5. Adenine pairs with Thymine and Guanine pairs with Cytosine.
6. DNA is coiled tightly to form chromosomes which are found inside the nucleus of a cell.

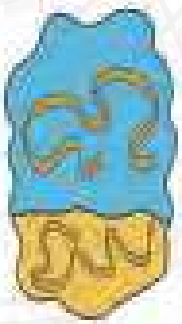
Ribonucleic acid (RNA) :

RNA is the second important nucleic acid of the cell.
This nucleic acid is made up of ribose sugar, phosphate molecules and four types of nitrogenous bases adenine, guanine, cytosine and uracil.
The nucleotide i.e. smallest unit of the chain of the RNA molecule is formed by combination of a ribose sugar, phosphate molecule and one of the nitrogenous bases.
Large numbers of nucleotides are bonded together to form the macromolecule of RNA.
According to function, there are three types of RNA.
1. Ribosomal RNA (rRNA) : The molecule of RNA which is a component of the ribosome organelle is called a ribosomal RNA. Ribosomes perform the function of protein synthesis.
2. Messenger RNA (mRNA) : The RNA molecule that carries the information of protein synthesis from genes i.e. DNA chain in the cell nucleus to ribosomes in the cytoplasm which produce the proteins, is called messenger RNA.
3. Transfer RNA (tRNA) : The RNA molecule which, according to the message of the mRNA carries the amino acid up to the ribosomes is called transfer RNA.

Structure of Various RNA



mRNA

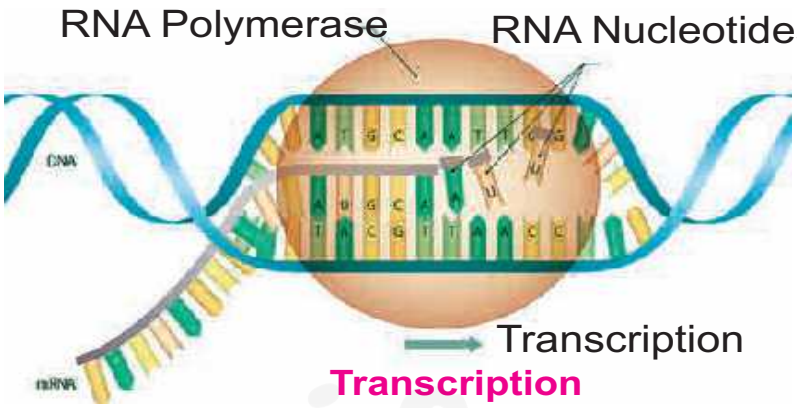


rRNA

tRNA

Q.5 Explain the process of formation of complex protiens

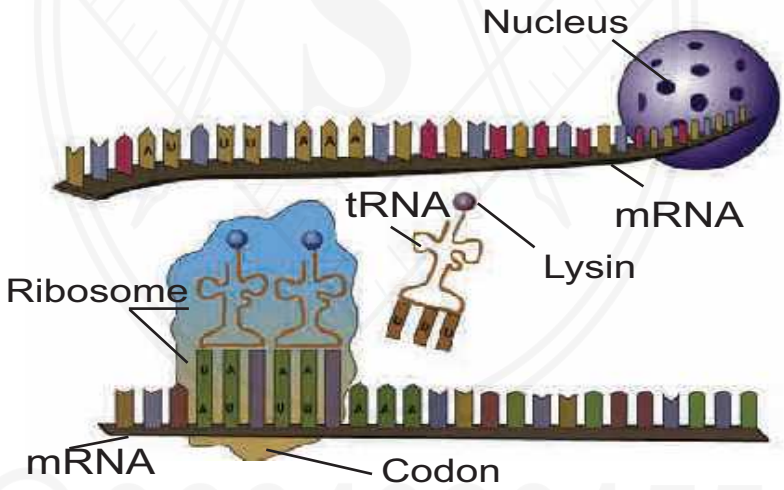
1. With the help of RNA, the genes present in the form of DNA participate in the functioning of cell and thereby control the structure and functioning of the body.
2. Information about protein synthesis is stored in the DNA and synthesis of appropriate proteins as per requirement is necessary for body.
3. These proteins are synthesized by DNA through the RNA. This is called as 'Central Dogma'.
4. mRNA is produced as per the sequence of nucleotides on DNA.
5. Only one of the two strands of DNA is used in this process. The sequence of nucleotides in mRNA being produced is always complementary to the DNA strand used for synthesis. Besides, there is uracil in RNA instead of thymine of DNA.
This process of RNA synthesis is called as'transcription'.



Transcription

6. The mRNA formed in nucleus comes in cytoplasm. It brings in the coded message from DNA. The message contains the codes for amino acids. The code for each amino acid consists of three nucleotides. It is called as 'triplet codon'.
7. Each mRNA is made up of thousands of triplet codons. As per the message on mRNA, amino acids are supplied by the tRNA.
8. For this purpose, tRNA has 'anticodon' having complementary sequence to the codon on mRNA. This is called as 'translation'.
9. The amino acids brought in by tRNA are bonded together by peptide bonds with the help of rRNA.
10. During this process, the ribosome keeps on moving from one end of mRNA to other end by the distance of one triplet codon. This is called as 'translocation'. Such many chains come together to form complex proteins.

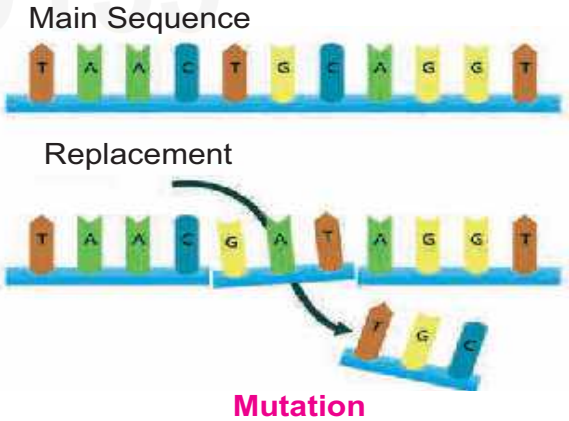
These proteins control various functions in the body of living organisms and their appearance too.



Translation & Translocation

Q.6 Short Note on Mutation

1. Living organisms can produce new individuals like themselves due to genes only and some of those genes are transmitted to the next generation without any changes.
2. Due to this, some of the characters of parents are transmitted to their offsprings. However, sometimes sudden changes occur in those genes. Sometimes, any nucleotide of the gene changes its position that causes a minor change which is nothing but the 'mutation'.



Mutation

Some mutations may be minor but some may be considerable. Ex. Mutation may cause the genetic disorders like sickle cell anemia. This is a everlasting process and it is one of the proof for Darwin's theory of natural selection.

Q.7 Short Note on Evolution

1.Evolution is a gradual change occur in living organism over a long duration.
2.This is a very slow going process through which development of organisms is achieved.
3.All the stages in changes occurred in various components ranging from stars and planets in space to the biosphere present on the earth should be included in the study of evolution.
4.Formation of new species due to changes in specific character of several generations of Living Organism as a response to natural selection is called as evolution.
5.Different theories about origin and evolution of life have been proposed till today of which theory of gradual development of living organisms is accepted.
6.According to this theory First living material that is Protoplasm has been formed in the ocean and then in due course of time unicellular organisms were formed.
7.Gradual changes took place in unicellular organisms from which large and more Complex organism were formed.
8.Changes and development in organisms has been all around and multidimensional and descriptive the evolution of different types of organisms.
9.Progressive development of plants and animals from the and sister have been different structural and functional organization is called evolution.

Q.8 Explain the various Evidences of evolution

1. Morphological Evidences

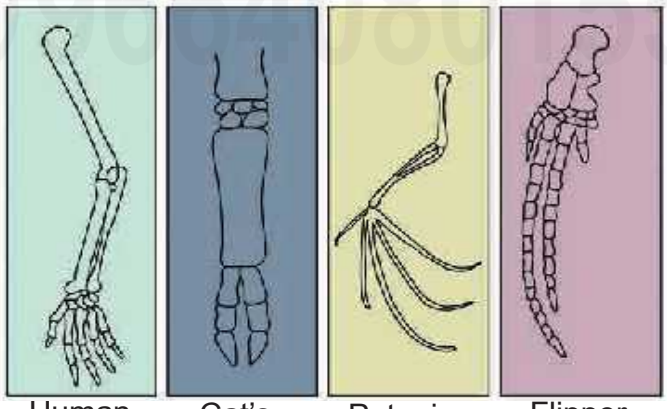
Various similarities like structure of mouth, position of eyes, structure of nostrils and ear pinnae and thickly distributed hairs on body are seen in animals whereas similarities in characters like leaf shape, leaf venation, leaf petiole, etc. occur in case of plants. This indicates that there are some similarities in those groups and hence it proves that their origin must be same and must have common ancestors.

Morphological evidences

2. Anatomical Evidances

There is similarity in structure of bones and bony joints in the organs of the humans, cats, bat and whales. This similarity indicates that those animals may have common ancestor.

Structure of bones

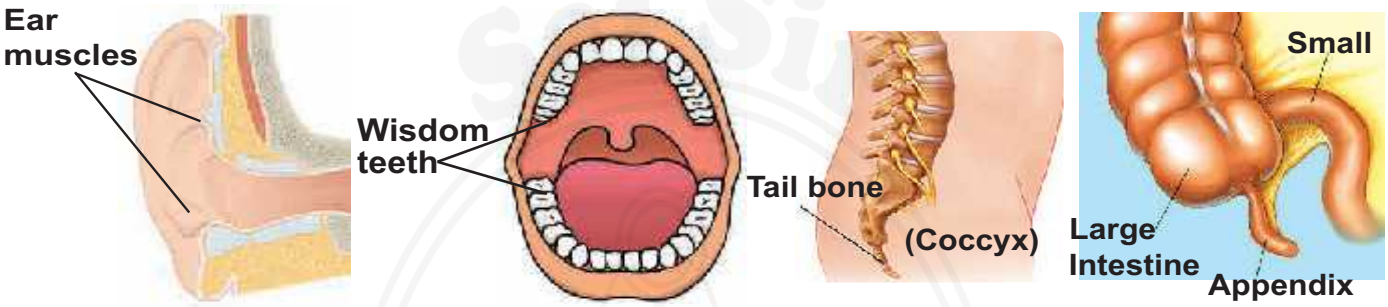


Human hand | Cat's foreleg | Patagium of Bat | Flipper of Whale

3. Vestigial Organs

Degenerated or underdeveloped useless organs of organisms are called as vestigial organs. In living organisms, sudden development of new tissues or organs for living in changing environment is not possible. Instead, existing organs undergo gradual changes. Mostly, a specific structure in the body is useful under certain situation. However, same structure under different situation may become useless or even harmful. Such structure begins to degenerate under such situation as per the principle of natural selection. It takes thousands of years for a structure to disappear. Such organs are seen in different phases of disappearance in different animals. Such organ, though non-functional in certain organism, it may be functional in other organisms i.e. it is not vestigial in other organisms.

Vestigial organs



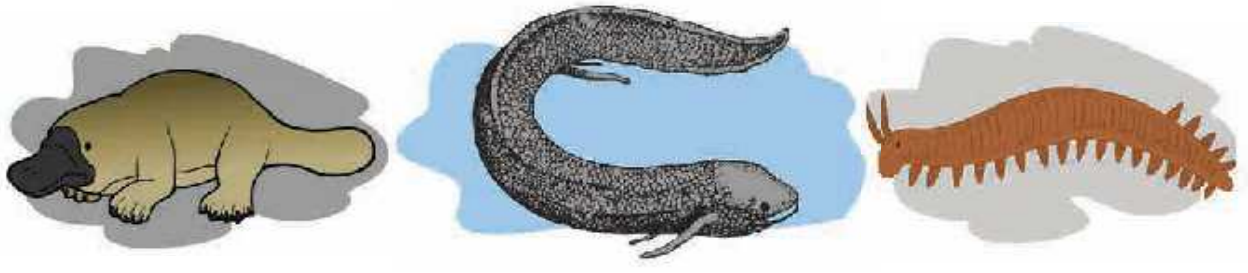
Appendix, which is useless to human, is useful and fully functional organ in ruminants. Similarly, muscles of Intestine ear pinna, which are useless to human, are useful in monkeys for movement of ear pinna. Various vestigial organs like tail-bone (coccyx), wisdom teeth, and body hairs are present in body of human being.

4. Paleontological Evidences

Large number of organisms get buried due to disasters like flood, earthquake, volcano, etc. Remnants and impressions of such organisms remain preserved underground. These are called as fossils. Study of fossils is an important aspect of study of evolution.

Some fossils

5. Connecting Links



Duckbill Platipus **Lungfish** **Peripatus**

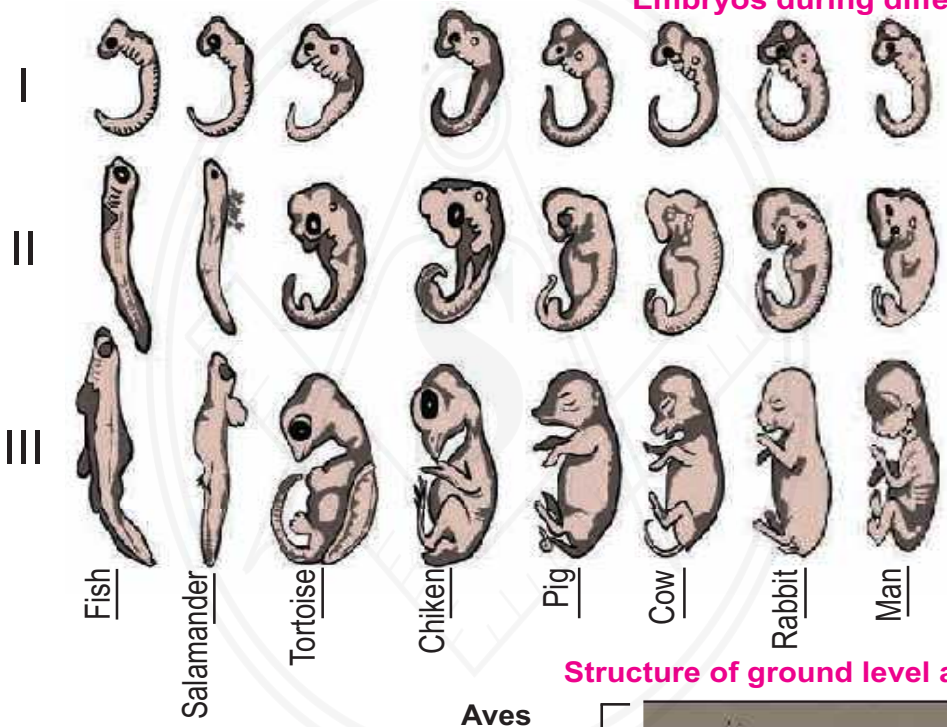
Some animals with special characteristics

Some plants and animals show some morphological characters by which they can be related to two different groups; hence they are called as 'connecting links'. Ex. In *Peripatus*, characters like segmented body, thin cuticle, and parapodia-like organs are present. Similarly, these animals show tracheal respiration and open circulatory system similar to arthropods. This indicates that *Peripatus* is connecting link between annelida and arthropoda. Similarly, duck billed platypus lays eggs like reptiles but shows relationship with mammals too due to presence of mammary glands and hairs. Lung fish performs respiration with lungs irrespective of being fish. These examples indicate that mammals are evolved from reptiles and amphibians from fishes.

6. Embryological Evidences:

Comparative study of embryonic developmental stages of various vertebrates given in the picture shows that all embryos show extreme similarities during initial stages and those similarities decrease gradually. Similarities in initial stages indicate the common origin of all these animals.

Embryos during different stages



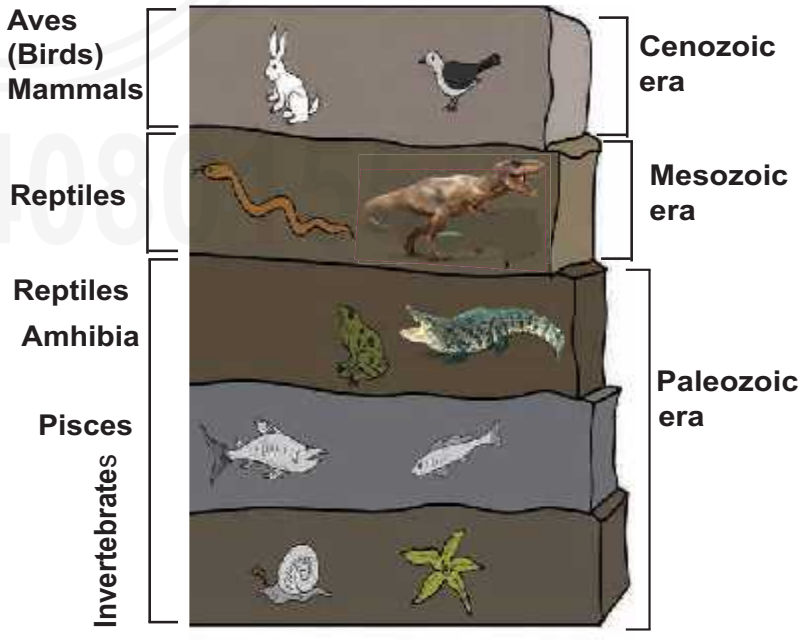
Q.9 Short Note On Carbon dating

Carbon dating method is based upon the radioactive decay of naturally occurring C-14 and it is developed by Willard Libby.

Carbon consumption of animals and plants stops after death and since then, only the decaying process of C-14 occurs continuously.

In case of dead bodies of plants and animals, instead of remaining constant, the ratio between C-14 and C-12 changes continuously as C-12 is non-radioactive.

Structure of ground level and fossils



The time passed since the death of a plant or animal can be calculated by measuring the radioactivity of C-14 and ratio of C-14 to C-12 present in their body.
This is 'carbon dating' method. It is used in paleontology and anthropology for determining the age of human fossils and manuscripts. Once the age of fossil been determined by such technique, it becomes easy to deduce the information about other erstwhile organisms. It also seems that vertebrates have been slowly originated from invertebrates.

Q.10 Explain the Darwin's theory of natural selection

1. Charles Darwin (English biologist) had collected innumerable specimens of plants and animals and depending upon the observations of those specimens; he published the book titled **'Origin of Species'** for the theory of natural selection which preaches the survival of fittest.
2. While explaining the concept, Darwin says that all the organisms reproduce prolifically. All the organisms compete with each other in a life - threatening manner.
3. In this competition, only those organisms sustain which show the modifications essential for winning the competition. However, besides this, natural selection also plays important role because nature selects only those organisms which are fit to live and the rest perish. 4. Sustaining and selected organisms can perform reproduction and thereby give rise to the new species with their own specific characters.
5. Darwin's theory of natural selection was widely accepted for long duration.

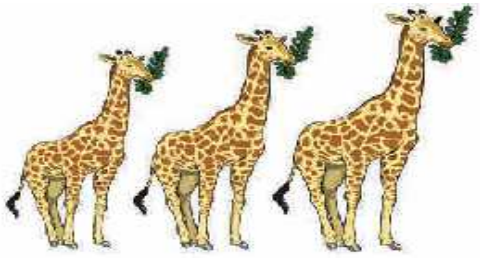
Q.11 State the objections raised on Darwin's theory of natural selection

Some objections were raised against the theory are :
1. Natural selection is not the only factor responsible for evolution.
2. Darwin did not mention any explanation about useful and useless modifications.
3. There is no explanation about slow changes and abrupt changes.

Irrespective of all these objections, Darwin's work on evolution has been a milestone.

Q.12 Short note on Lamarckism

1. Jean-Baptiste Lamarck proposed that morphological changes occurring in living organisms are responsible for evolution and the reason behind those morphological changes is activities or laziness of that organism.
He called this concept as principle of 'use or disuse of organs'.
2. He said that the neck of giraffe has become too long due to browsing on leaves of tall plants by extending their neck for several generations;
similarly, shoulders of the ironsmith have become very strong due to frequent hammering movements. Wings of birds like ostrich and emu have become weak due to no use. Legs of the birds like swan and duck have become useful for swimming due to living in water and snakes have lost their legs by modifications in their body for burrowing habit. All these examples are types of 'acquired characters' and are transferred from one to another generation.
This is called as theory of inheritance of acquired characters or Lamarckism.



Giraffe

3. Development of organs due to specific activities or their degeneration due to no use at all was widely accepted but transfer of those characters from generation to generation was rejected. Because it had been verified many times that modifications brought in us are not transferred to next generation and thereby Lamarck's theory was disproved.

Q.13 Define Ancestry of acquired characters

The living organism can transfer the characters which it has acquired, to the next generation. This is called ancestry of acquired characters.

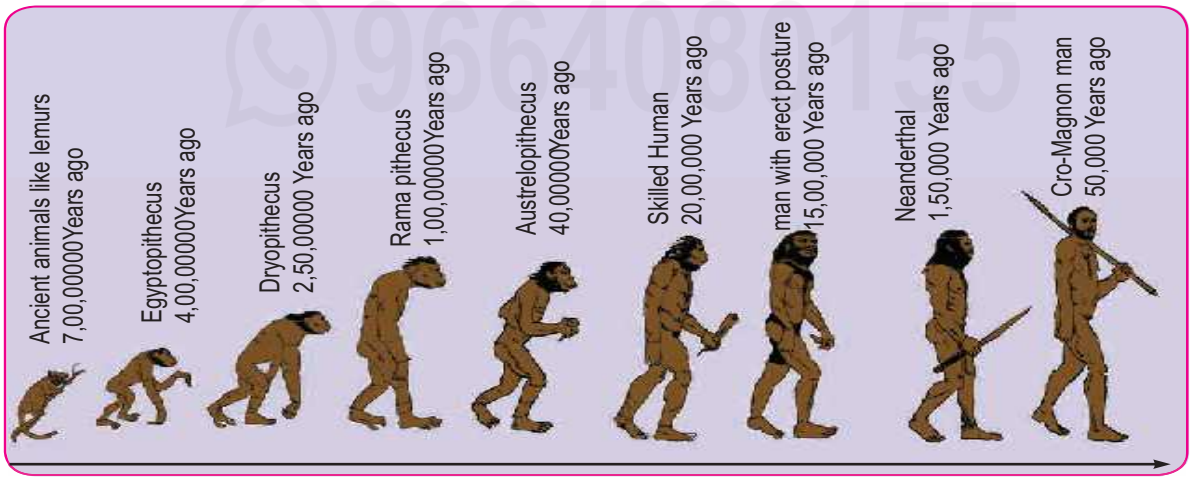
Q.14 Short note on Speciation

1. Formation of new species of plants and animals is the effect of evolution.
2. Species is the group of organisms that can produce fertile individuals through natural reproduction.
3. Each species grows in specific geographical conditions. Their food, habitat, reproductive ability and period is different.
4. However, genetic variation is responsible for formation of new species from earlier one.
5. Besides, geographical and reproductive changes are also responsible.

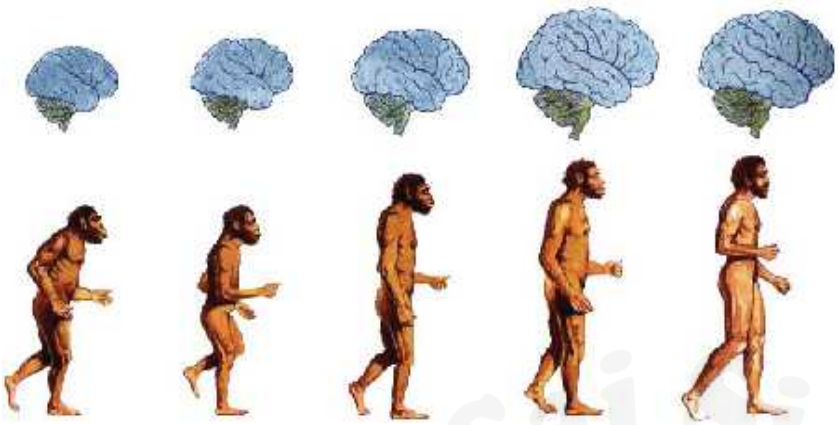
Similarly, geographical or reproductive isolation also leads to speciation

Q.15 Write the evolutionary history of modern man

1. Approximately 7 crore year ago monkey like animals are said to be evolved from\ some ancestors who were more or less similar to modern lemurs.
2. Tale of those monkeys like animals of Africa is said to have disappeared about 4 crore years ago.
3. Evolution of some of the 2 crore years old species of apes seems to have occurred in different ways. They had to use their hands more for eating food and other work.
4. First human like animal recorded was 'Ramapithecus' ape from East Africa.
5. This ape grew up in size and become more intelligent and evolved about 40 lakh years ago.
6. Skilled humans appear to be the member of genus homo.
7. About 15 lakh years ago human walking with erect posture evolved and existed in China and Indonesia of Asian continent.
8. Evolution of upright man continued in the direction of developing its brain for the period of about 1 lakh years.
9. Brain of 50 thousand year old man had been sufficiently evolved to the extent that it could be considered as member of the class-wise-man (Homo Sapiens)
10. Neanderthal man can be considered as the example of wise man.
11. The Cro-magnon man evolved about 50 thousand years ago and afterwards, this evolution had been faster than the earlier.

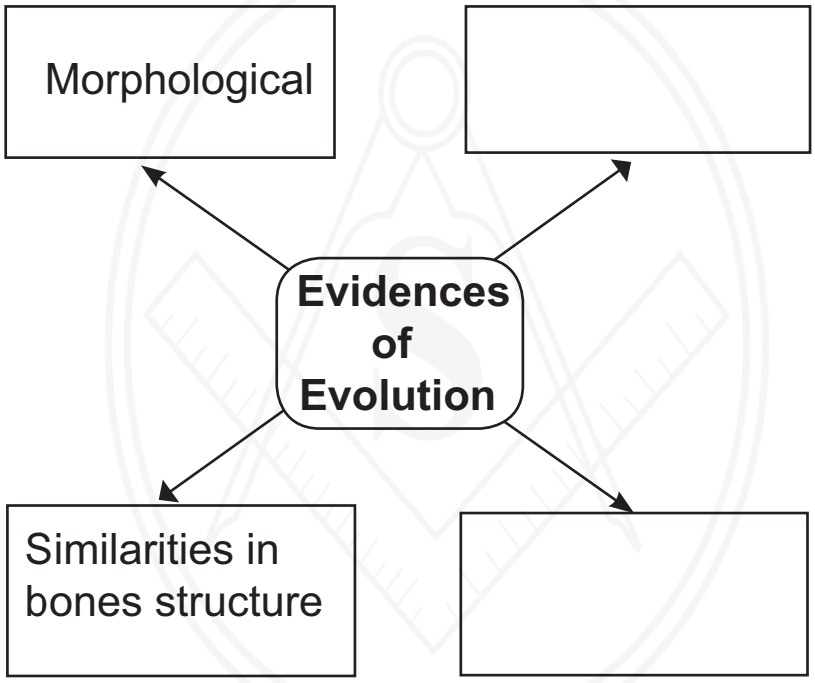


Journey of human



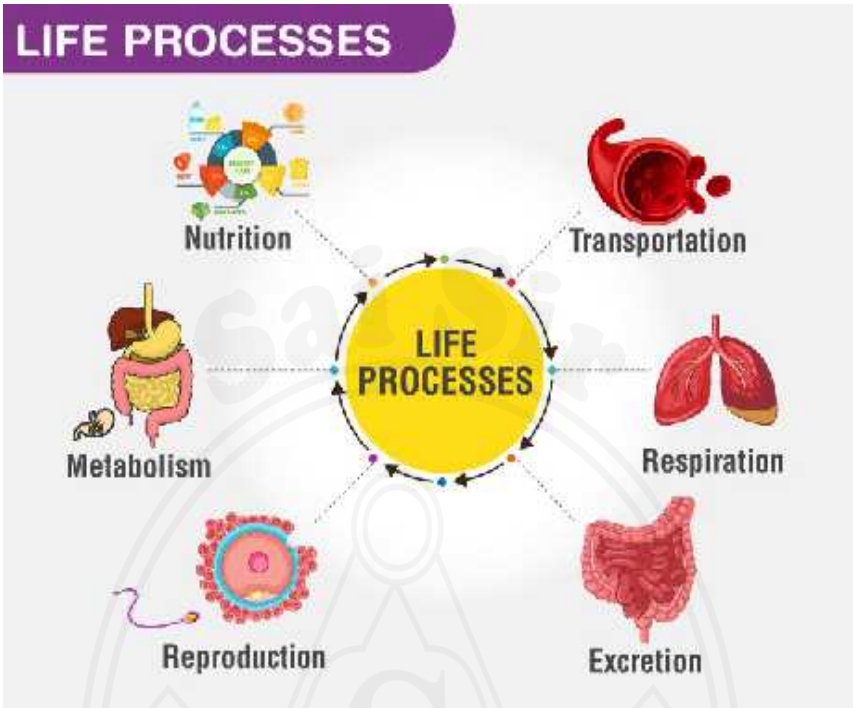
Development of human brain

Q.16 Complete the following diagram.



2. Life Processes in living organisms Part -1

Introduction to Living Organisms and Life Processes involved



Various organ-systems are continuously performing their functions in human body.
Along with the various systems like digestive, respiratory, circulatory, excretory and control systems, different external and internal organs are performing their functions independently but through a complete co-ordination.
This overall system is in action in more or less same way in all the organisms.
Those are in need of continuous source of energy for this purpose.
Carbohydrates, fats and lipids are the main sources of this energy and it is harvested by the mitochondria present in each cell.
It is not like that only foodstuff is sufficient for energy production but oxygen is also necessary.
All these i.e. food stuffs and oxygen are transported up to the cell via circulatory system.
Besides, it is coordinated by the control system of the
body. i.e. each life process contributes in its own way in the process of energy production.
Functioning of all these life processes also requires the energy.
Human and other animals consume the fruits and vegetables.
Plants are autotrophs. They prepare their own food.
They utilize some of the food for themselves whereas remaining is stored in various parts like fruits, leaves, stem, roots, etc.
We consume all these various plant materials and obtain different nutrients
like carbohydrates, fats, proteins, vitamins,
minerals, etc. We get 4Kcal energy per gram of carbohydrates.
We obtain the carbohydrates from milk, fruits, jaggary, cane sugar, vegetables,
potatoes, sweet potatoes, sweet meats and cereals like wheat, maize, ragi, jowar, millet,
rice, etc.

Q.1 How all the life processes contribute to the growth and development of the body?

1. Various life processes like nutrition, digestion, respiration, excretion, circulation and control & coordination are essential for the growth and development of the body.
2. Essential nutrients like carbohydrates, proteins, fats etc. are obtained through digestion of food and are transported to the various cells of the body through blood circulation.
3. Oxygen inspired also enters the blood and is transferred to the various parts of the body, where it is utilized for cellular respiration by oxidation of food to generate energy for various life processes.
4. Harmful metabolic waste generated is eliminated from the body by the process of excretion.
5. All these various life processes along with movement and locomotion are controlled and coordinated by the nervous system and endocrine system.

Q.2 How are the foodstuffs and their nutrient contents useful for body?

Foodstuffs and their nutrients are required for normal functioning of our body.
Foodstuffs are broken down during digestion to convert them into soluble nutrients which are carried by the blood to various cells of the body.
The nutrients are oxidized by cellular respiration to release energy.
Importance of some major nutrients is as follows:
a. Nutrients like carbohydrates and fats provide energy to perform various activities.
b. Proteins are the major structural components of the cells.
They are called body building nutrients, as they are responsible for building and repairing the body tissues. In our body, proteins are used to make amino acids, hormones and other body chemicals.
c. Vitamins and minerals act as the protective and regulating nutrients in our body.

Q.3 What is the importance of Balanced diet for the body.

The importance of Balanced diet is as follows:
a. It helps in proper growth of body.
b. It increases immune system to fight/ resist disease.
c. It increases capacity of work by providing energy.
d. It is essential for physical and mental health.

Q.4 Which different functions are performed by muscle in the body.

Muscles are mainly responsible for the movement of/ in the human body:
There are three main types of muscles:
a. striated(voluntary) muscles:
These muscles are attached to the bones hence also called as skeletal muscles and also bring about movements of arms, legs.
b. Non-striated(involuntary) muscles:
These muscles bring about movement of eyelids, passage of food through alimentary canal contraction and relaxation of blood vessels.
c. Cardiac muscles:
Cardiac muscles bring about contraction and relaxation of heart.

Q.5 What is the importance of digestive juices in digestive system.

Digestive juices contains various enzymes which help in digestion of different types of food.
Thus, they convert complex food molecules into simpler form,
For example proteins are converted to amino acids, complex carbohydrates to glucose and lipids to fatty acids and alcohols.
The digested food is then absorbed by the walls of small intestine and taken to every cell of the body through blood vessels.

Q.6 Which system is in action for removal of waste material produced in human body.

Waste materials produced in human body are removed by excretory system.

Q.7 What is the role of circulatory system in energy production.

In circulatory system arteries carry oxygen rich blood from heart two different parts of the body.
Along with oxygen this blood also contains energy rich nutrients such as glucose, fatty acids which are used by the cells to produce energy.

Q. 8 How are the various processes occurring and human body controlled? In how many ways?

In human being different body activities are controlled by two mechanisms, nervous control and chemical control.
Nervous control is brought about with the help of brain, spinal cord and nerves.
Chemical control is brought about with the help of chemical substances called hormones(endocrine system)

Q. 9 Many players are seen consuming some foodstuffs during breaks of the game. Why may be players consuming these foodstuffs?

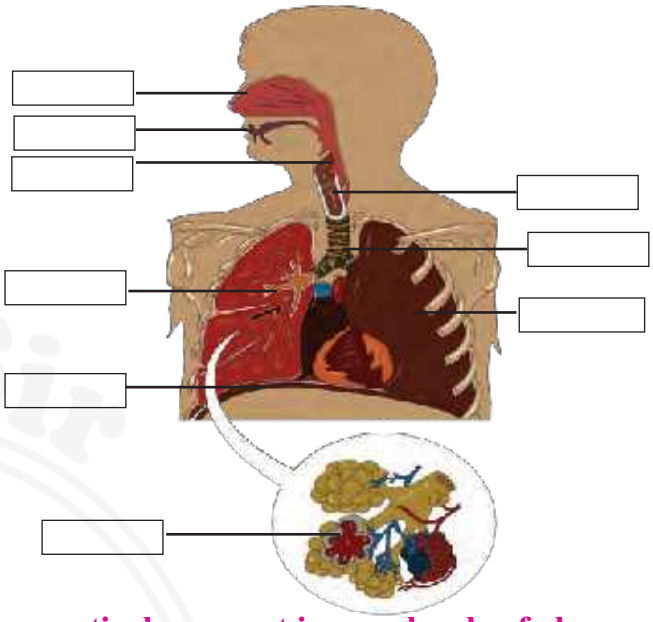
Many players eat some food during break time.
Such food is generally rich in proteins(protein bars) or carbohydrates(banana) which is which source of energy and helps player to stay energetic.
Also drinking water, glucose or electrolytes keep them hydrated, does preventing them from feeling thirsty while playing and restores their energy back.

Q. 10 What is respiration? How does it occur?

Respiration involves release of energy by oxidation of food.
Respiration involves taking in oxygen rich air and giving out air containing carbon dioxide with the help of respiratory organs.
The oxygen inhaled during respiration is used for cellular respiration to oxidize food and release energy in the form of ATP.

Q. 11 Observe and Label the diagram given beside. Also explain in short the processes of respiration in living organisms

In living organisms, respiration occurs at two levels as body and cellular level. Oxygen and carbon dioxide are exchanged between body and surrounding in case of respiration occurring at body level. In case of respiration at cellular level, foodstuffs are oxidized either with or without help of oxygen.



Q. 12 (A) How many atoms of C, H and O are respectively present in a molecule of glucose.

One molecule of glucose contains 6 atoms of carbon, 12 atoms of hydrogen and 6 atoms of oxygen.

Q. 12 (B) Which type of chemical bonds are present between all these atoms.

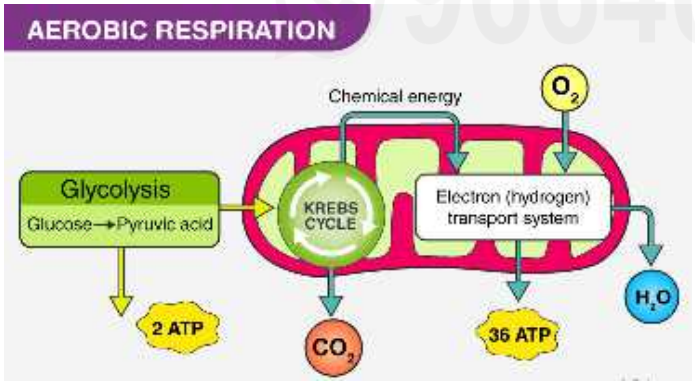
In glucose molecule, atoms of carbon, hydrogen and oxygen are held together by covalent bonds.

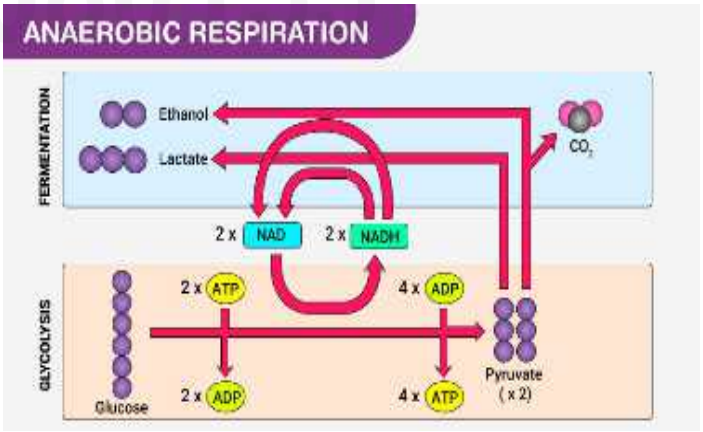
Q. 12 (C) In terms of Chemistry what happens actually when a molecule is oxidized?

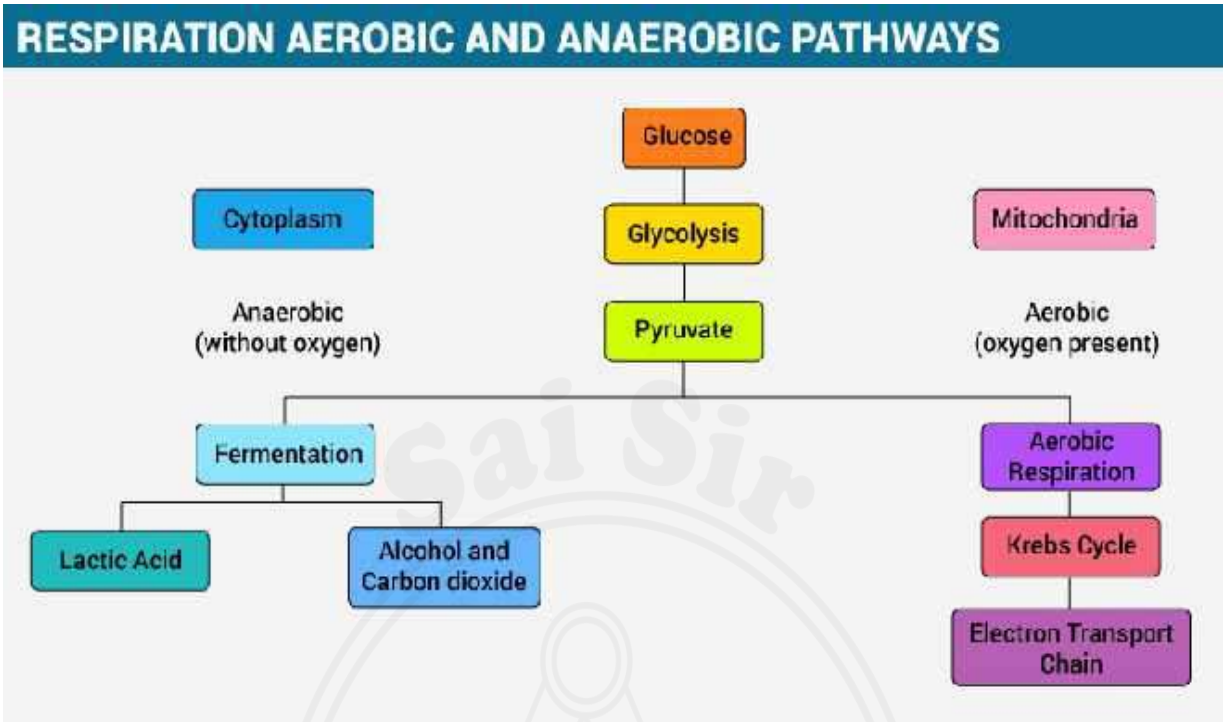
When an element is oxidized, in chemical terms it loses electrons and gains a positive charge.

Q. 13 What is Cellular Respiration. Give its two types

Carbohydrates of the food that we consume everyday are mainly utilized for production of energy required for daily need.
This energy is obtained in the form of ATP.
For this purpose, glucose, a type of carbohydrates is oxidized step by step in the cells.
This is called as cellular respiration.
Cellular respiration occurs among the living organisms by two methods.
Those two methods are aerobic respiration (oxygen is involved) and anaerobic respiration (oxygen is not involved).







Find the full forms of
FAD : Flavin Adenine Dinucleotide
FMN : Flavin Mononucleotide
NAD/NADH2 : Nicotinamide Adenine Dinucleotide
NADP : Nicotinamide Adenine Dinucleotide Phosphate
ADP : Adenine Dinucleotide Phosphate
ATP : Adenosine Triphosphate
Co- enzymes: Coenzymes are non-protein compounds that bind with enzymes to catalyze reactions.
Pi = Inorganic phosphates

Q. 14 Explain the 3 main steps involved in oxidation of glucose in aerobic respiration.

1. Glycolysis

Process of glycolysis occurs in cytoplasm. A molecule of glucose is oxidized step by step in this process and two molecules of each i.e. pyruvic acid, ATP, $NADH_2$ and water are formed.

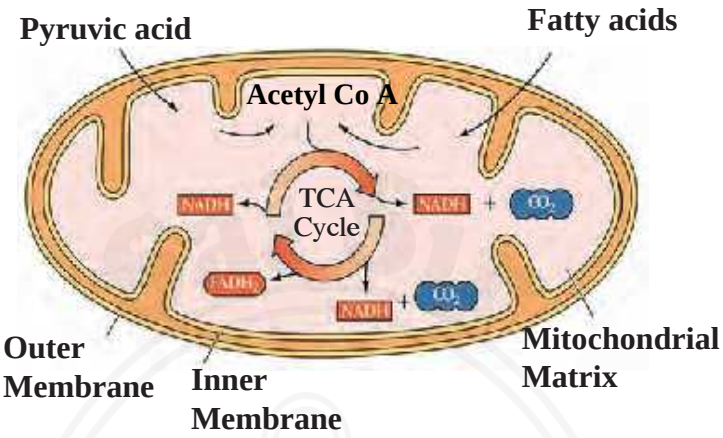
Molecules of pyruvic acid formed in this process are converted into molecules of Acetyl-Coenzyme-A. Two molecules of $NADH_2$ and two molecules of CO_2 are released during this process.

This Acetyl-Coenzyme-A then enters the kreb cycle.

$$2Pyruvate + 2NAD^+ + 2CoA \xrightarrow{Pyruvate\ dehydrogenase} 2AcetylCoA + 2NADH + CO_2$$

2. Tricarboxylic acid cycle (Krebs cycle)

Both molecules of acetyl-CoA enter the mitochondria. Cyclic chain of reactions called as tricarboxylic acid cycle is operated on it in the mitochondria. Acetyl part of acetyl-CoA is completely oxidized through this cyclical process and molecules CO_2, H_2O, $NADH_2$, $FADH_2$ are derived.



Mitochondria and Tri-carboxylic acid cycle

Krebs cycle equation

To Sum up

$$2Acetyl\ CoA + 6NAD^+ + 2\ FAD + 2\ ADP + 2\ P_i + 2\ H_2O \rightarrow 4\ CO_2 + 6\ NADH + 2\ FADH_2 + 2\ ATP + 2\ CoA$$

Q. Krebs cycle is also known as citric acid cycle

Acetyl-Co A enters the mitocondria to combine with oxaloacetic acid and form a six carbon compound i.e citric acid

This is the first stable compound formed, hence kerbs cycle is called as citric acid cycle.

3. Electron transfer chain reaction

Molecules of $NADH_2$ and $FADH_2$ formed during all above processes participate in electron transfer chain reaction. Due to this, 3 molecules of ATP are obtained from each $NADH_2$ molecule and 2 molecules of ATP from each $FADH_2$ molecule.

Besides ATP, water molecules are also formed in this reaction.

Electron transfer chain reaction is operated in mitochondria only.

Thus, a molecule of glucose is completely oxidized in aerobic respiration and molecules of CO_2 and H_2O are produced along with energy.

Q. 15 Mention any four molecules synthesized during aerobic respiration.

ATP(Adenosine triphosphate), $FADH_2$ (Flavin adenine dinucleotide), $NADH_2$ (Nicotinamide adenine dinucleotide), CO_2 and H_2O.

Introduction To Scientists

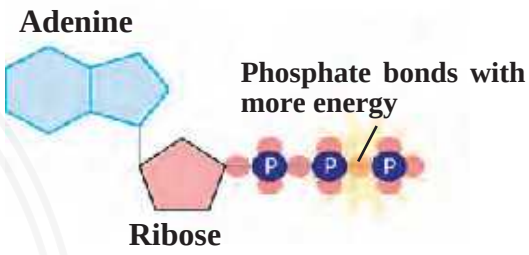
Process of glycolysis was discovered by three scientists Gustav Embden, Otto Meyerhof, and Jacob Parnas along with their colleagues. For this purpose, they performed experiments on muscles. Hence, glycolysis is also called as Embden-Meyerhof-Parnas pathway (EMP pathway).

The cyclical reactions of tricarboxylic acid cycle were discovered by Sir Hans Krebs. Hence, this cyclical process is also called as Krebs cycle. He has been awarded the Nobel Prize in 1953 for this discovery.

Sir Hans Krebs (1900-1981)

Q. 16 What is ATP composed of ?

ATP is composed of a nitrogenous compound (adenine), pentose sugar (ribose) and three phosphate groups.



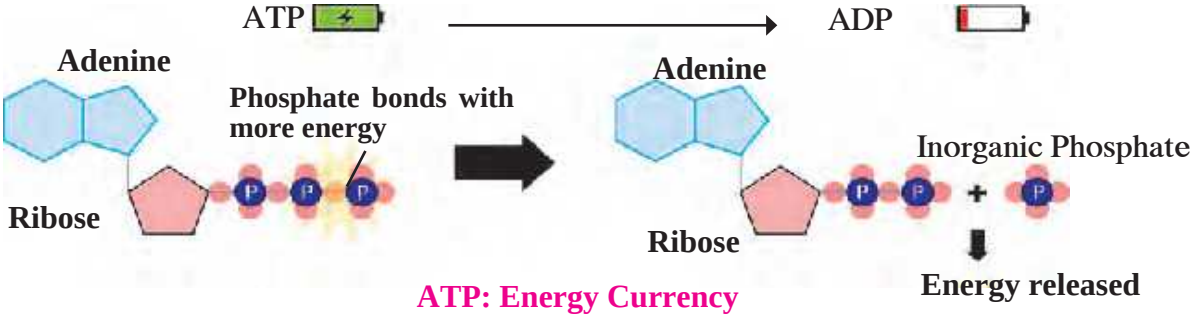
ATP

Q. 17 How energy us obtained in exceptional conditions like fasting and hunger

If there is insufficient amount of carbohydrates in body due to exceptional conditions like fasting and hunger, then lipids and proteins are used for energy production. In case of lipids, they are converted into fatty acids whereas proteins into amino acids. Fatty acids and amino acids are converted into acetyl-CoA and energy is obtained through complete oxidation of acetyl-CoA by the process of Krebs cycle in mitochondria.

Q. 18 Explain the importance of ATP in a cell with diagram

ATP: Adenosine triphosphate is energy-rich molecule and energy is stored in the bonds by which phosphate groups are attached to each other. These molecules are stored in the cells as per need. Chemically, ATP is triphosphate molecule formed from adenosine ribonucleoside. It contains a nitrogenous compound-adenine, pentose sugar- ribose and three phosphate groups. As per the need, energy is derived by breaking the phosphate bond of ATP; hence ATP is called as 'energy currency' of the cell.

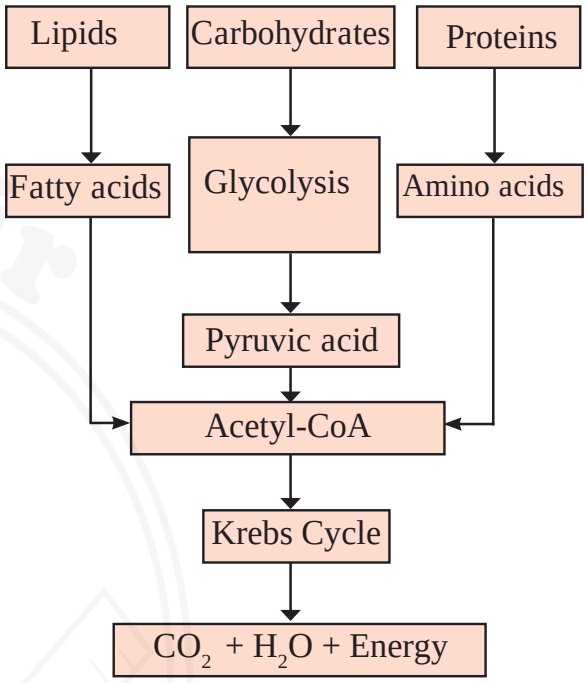


ATP: Energy Currency

Q. 19 How energy is formed from oxidation of carbohydrates, fats and proteins?

1. Carbohydrates are used as the first source of energy. Oxidation of carbohydrates like glucose, yieelds two molecules each of pyruvic acid, ATP, $NADH_2$ and water.
2. In conditions of insufficieent carbohydrates like fasting hunger, lipids and proteins are used for energy production.
Lipids are converted to fatty acids, whereas proteins are broken down into amino acids.
3. These simpler molecules formed are then converted into acetyl-CoA.
4. Acetyl group of acetyl-CoA is completely oxidized in the mitochondria through the krebs cycle to produce CO_2, H_2O, $NADH_2$ and $FADH_2$.
5. Molecules $NADH_2$ and $FADH_2$ formed participate in electron transfer chain and syntheesize energy in the form of ATP.
38 ATP are generated at the end of aerobic respiration.
Thus, CO_2, H_2O and energy are formed at the end of aerobic respiration.

Process of energy production through aerobic respiration of carbohydrates, proteins and Fats.



Q. 20 (A) Oxygen is necessary for complete oxidation of glucose.

A molecule of glucose is completely oxidized in aerobic respiration (i.e in presence of oxygen) to form CO_2, H_2O and energy (38 ATP), via three steps namely glycolysis, Krebs cycle and electron transfer chain.
However in anaerobic respiration (i.e in absence of oxygen), glucose is incompletely oxidized via. glycolysis and fermentation, resulting in the formation of organic acids or alcohols and lesser amount of energy is obtained.
Hence oxygen is necessary for complete oxidation of glucose.

Q. 20 (B) Which type of cellular respiration performs complete oxidation of glucose?

Complete oxidation of glucose occurs during aerobic respiration.

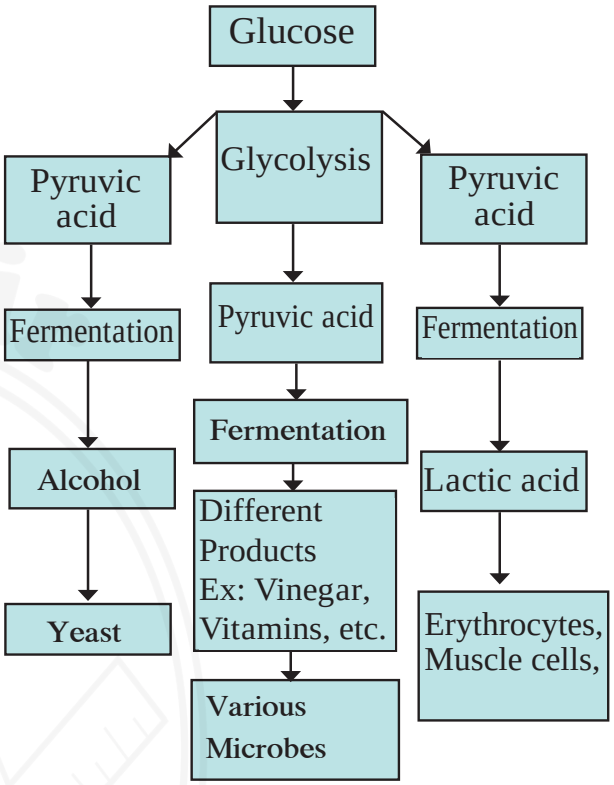
Q. 20 (C) Which cell organelle is necessary for complete oxidation of glucose?

Mitochondria are required for complete oxidation of glucose.

Q.21 Explain Energy Production in Microorganisms through Anaerobic Respiration

Some organisms cannot live in presence of oxygen.
Ex. Many bacteria.
Such living organisms have to perform anaerobic espiration for energy production.
Glycolysis and fermentation are two steps of anaerobic respiration.
Glucose is incompletely oxidized and less amount of energy is obtained in this type of respiration.
Pyruvic acid produced through glycolysis is converted into other organic acids or alcohol with the help of some enzymes in this process.
This is called as fermentation.
Some higher plants, animals and aerobic microorganisms also perform anaerobic respiration instead of aerobic respiration if there is depletion in oxygen level in the surrounding.
Ex. Seeds perform anaerobic respiration if the soil is submerged under water during germination.

Anaerobic respiration in living organisms/ cells



Similarly, our muscle cells also perform anaerobic respiration while performing the exercise. Due to this, less amount of energy is produced in our body and lactic acid accumulates due to which we feel tired.

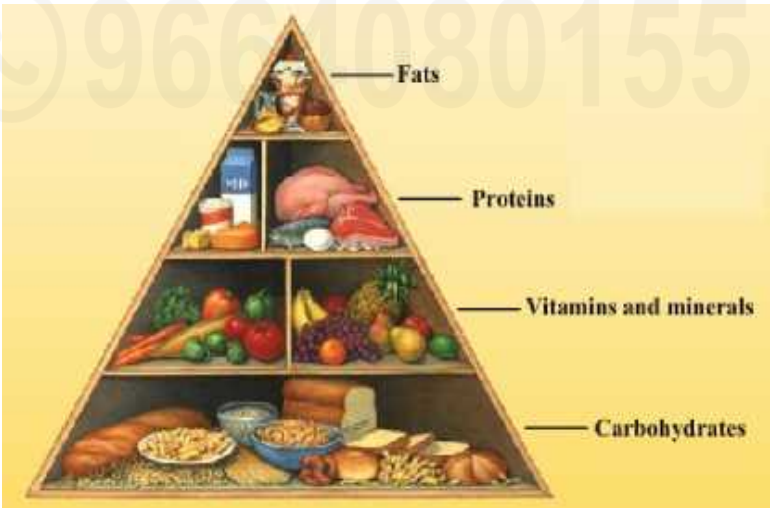
Q.22 (A) What happpens to excess of the carbohydrates produced in body ?

Excess of the carbohydrates are stored in liver and muscles in the form of glycogen.

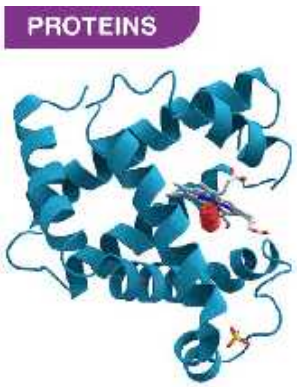
Q.22 (B) What is fermentation?

Fermentation is a process of conversion of pyruvic acid into organic acids or alcohols by anaerobic respiration.

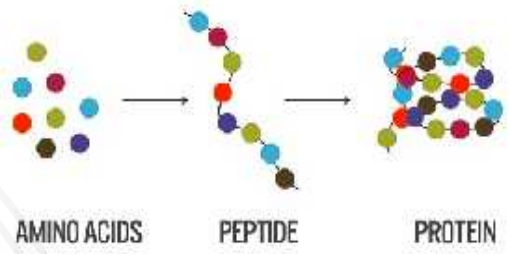
Energy from different food components

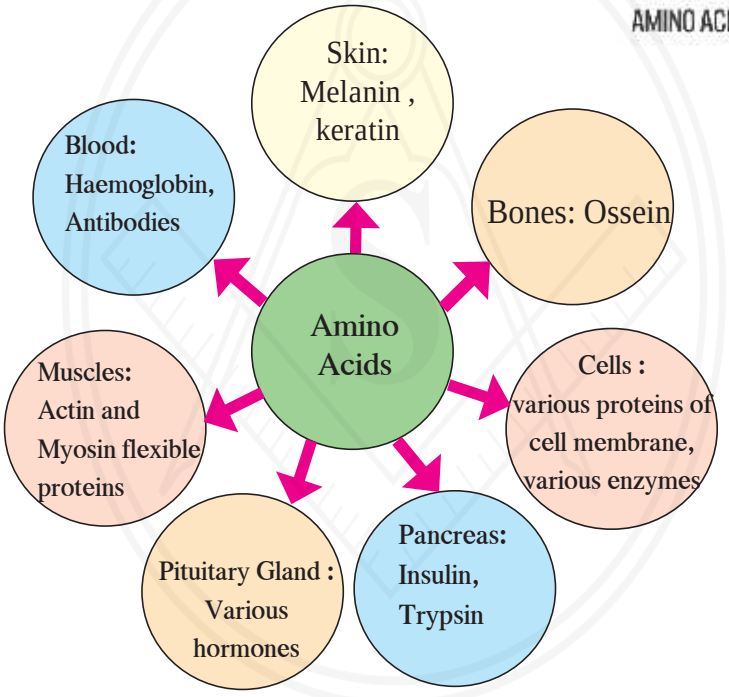


Q.23 Describe what are Proteins?



Proteins are the macromolecules formed by bonding together many amino acids.
Proteins of animal origin are called as 'first class' proteins.
We get 4 Kcal of energy per gram of proteins.
Amino acids are obtained after digestion of proteins.
Those amino acids are absorbed in the body and transported up to each organ and cell via blood.
From these amino acids, organs and cells produce various proteins necessary for themselves and the whole body.
Those examples are given in the following diagram.





Proteins and different amino acids obtained

The fate of excess amino acids present in the body:

Excess of amino acids obtained from proteins are not stored in the body. They are broken down and the ammonia formed is eliminated out of the body.
If necessary, excess of proteins are converted into other useful substances like glucose through the process of gluconeogenesis.

In case of plants:

Plants produce the necessary amino acids from minerals denovo and thereby produce different proteins. An enzyme RUBISCO present in the plant chloroplasts is most abundant protein found in nature.

Functions of Proteins:

Functions of Protein

Proteins play multiple functions in the body and its structure gives it its functionality.

Some prominent functions are:-

Digestion – Digestion is carried out by the digestive enzymes which are basically proteinaceous in nature.

Movement – Myosin is a protein found in muscles which enables the contraction of muscles making movement possible.

Structure and Support – Keratin is the structural protein which makes our hair, nails, and horns in animals.

Cellular communication – Cells communicate with other cells and the external environment via receptors present on the surface of cells. These receptors are made of proteins.

Act as a messenger – These proteins function as the chemical messengers, which help in the communication between the cells, tissues, and organs.

Q.24 Describe what are Lipids?

Lipids are obtained from food stuff like oil, ghee, butter, nuts, fish, meat, etc.

The substances formed by specific chemical bond between fatty acids and alcohol are called as lipids.

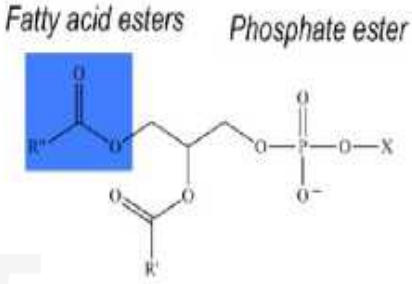
Digestion of lipids consumed by us is nothing but their conversion into fatty acids and alcohol.

Fatty acids are absorbed up and distributed everywhere within the body.

From those fatty acids, different cells produce various substances necessary to themselves.

Ex. the molecules called as phospholipids which are essential for producing plasma membrane are formed from fatty acids.

Phospholipids



Besides, fatty acids are used for producing hormones like progesterone, estrogen, testosterone, aldosterone, etc. and the covering around the axons of nerve cells.

We get 9 KCal of energy per gram of lipids.

Excess of lipids are stored in adipose connective tissue in the body.

How are lipids important to our body?

Lipids play a very important role in our body.

They are the structural component of the cell membrane.

They help in providing energy and produce hormones in our body.

They help in proper digestion and absorption of food.

They are a healthy part of our diet if taken in proper amounts.

They also play an important role in signalling.

Q.25 Describe what are Vitamins?

Vitamins are a group of heterogeneous compounds of which, each is essential for proper operation of various processes in the body.

There are main six types of vitamins, e.g. A, B, C, D, E and K.

Out of these, A, D, E and K are fat-soluble

whereas B and C are water-soluble.

We have seen that, $FADH_2$ and $NADH_2$ are produced in the processes like glycolysis and Krebs cycle.

Vitamins like riboflavin (Vitamin B_2) and nicotinamide (Vitamin B_3) respectively are necessary for their production.

Name	Solubility	Food Sources	Deficiency Diseases
Vitamin A	Fat	Green leafy vegetables, ripe yellow fruits, guava, milk, liver, nuts, tomatoes, oranges, carrots, broccoli, watermelon etc.	Hyperkeratosis, night blindness, and keratomalacia
Vitamin B1 (Thiamine)	Water	Fresh fruits, potatoes, sweet potatoes, peas, corn, cashew nuts, wheat, milk, black beans, dates etc.	Beriberi
Vitamin B2 (Riboflavin)	Water	Banana, dates, mushrooms, grapes, mangoes, peas, pumpkin, popcorn etc.	Slow growth, sore eyes
Vitamin B3 (Niacin)	Water	Meat, fish, eggs, milk products, cereals, mushroom, guava etc.	Pellagra
Vitamin C	Water	Fresh fruits, black currant, broccoli, goat milk and chestnuts.	Scurvy
Vitamin D	Fat	Fish, egg, liver, beef, cod, chicken breast etc.	Rickets and Osteomalacia
Vitamin E	Fat	Potatoes, pumpkin, guava, mango, milk, nuts, seeds etc.	Heart problems, Haemolysis and sterility
Vitamin K	Fat	Tomatoes, broccoli, chestnuts, cashew nuts, beef, lamb, mangoes, grapes etc.	Haemorrhage

Q.26 Describe why water is called as essential nutrient.

There is about 65 – 70% water in our body. Each cell contains 70% water weight by weight. Blood-plasma also contains 90% of water. Functioning of cells and thereby whole body disturbs even if there is a little loss of water from the body.
Hence, water is an essential nutrient.

Effects of intake of less water on body

Q.27 Describe how fibers are also essential nutrients.

Fibers are also essential nutrients. In fact, we cannot digest the fibers. However, they help in the digestion of other substances and egestion of undigested substances. We obtain the fibers from leafy vegetables, fruits, cereals, etc.

Few give reasons:

Q. Many times you cannot eat hot food due to inflammation/ ulceration in mouth.
Ulcer is caused due to various reasons such as tissue injury by accidental biting of cheek, stress, deficiency of Vitamin B12, zinc, folic acid or iron.
Eating hot or spicy food during inflammation and ulceration in mouth can irritate the injured cells tissues and cause discomfort.
Therefore many times we cannot eat hot food due to inflammation or ulceration in mouth.

Q. Some persons experience difficulty in night vision since childhood or adolescence.
Inability to see in dim light is known as night blindness.
It is caused due to deficiency of Vitamin A in the diet therefore some persons experience difficulty in night vision since childhood or adolescence.

Q. Many times we experience dryness in mouth.
Many times we experience dryness in mouth due to dehydration.

Q. While running, walking, playing or other activities our body loses water in the form of sweat.
Thus to maintain the water level in the body we feel thirsty or experience dryness in the mouth as a signal to consume more water.

Q. Oral rehydration solution(salt sugar water) is frequently given to person experiencing loose motion.
In loose motion/ diarrhoea, body loses excess amount of fluids and salts.
This causes dehydration which can be dangerous, especially in the case of children's.
In such cases the body can be dehydrated by giving a solution containing salt and sugar.
Drinking this solution helps to replace the Fluids and essential salts loss due to diarrhoea.
Also sugar(glucose) enable the intestine to absorb the fluid and salts more efficiently.
Therefore oral rehydration solution is frequently given to the person experiencing loose motion.

Q. We sweat during summer and heavy exercise.
During summer and heavy exercise, our body temperature rises.
Our body maintains its temperature by sweating.
The sweet intern operates and keeps our body cool.

Names of certain diseases and thier symptoms:
Night blindness
Inability to see in dim or low light.

Rickets
Softening of bones, causing pain and fractures.

Beriberi
Pain in limbs, shortness of breath and swollen feet or legs.

Neuritis:
Stabbing pain or loss of sensation.

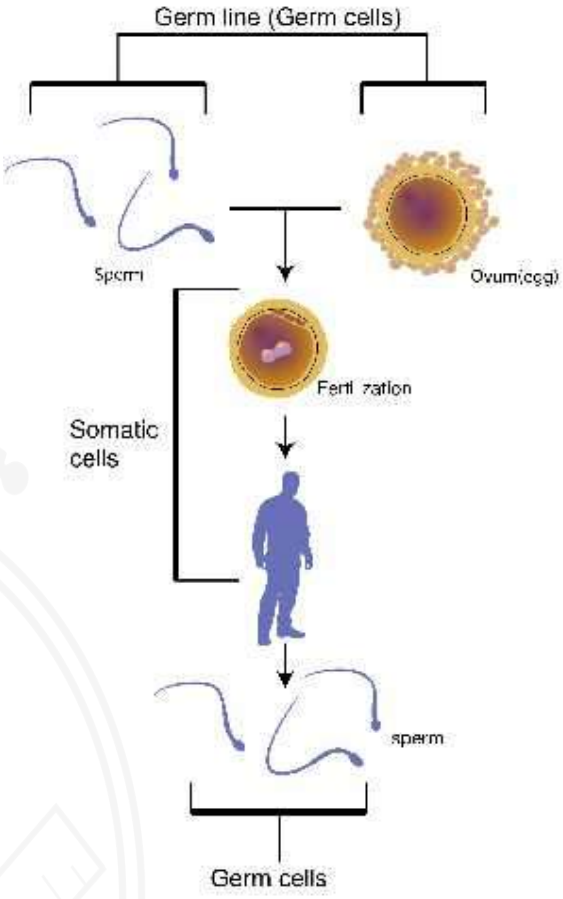
Pellagra
Find sensitivity to sunlight and resulting in inflamed and scaly skin sores.

Anemia
Dizziness, fatigue, weakness.

Scurvy
Bleeding of gums

Cell Division: An Essential Life Process

Cell division is one of the very important properties of cells and living organisms.
Due to this property only, a new organism is formed from existing one, a multicellular organism grows up and emaciated body can be restored.
There are two types of cell division as mitosis and meiosis.
Mitosis occurs in somatic cells and stem cells of the body whereas meiosis occurs in germ cells.



Few Questions:

Q. What happens to the cells of injured tissue.
When someone get injured, the cells in that particular tissue get damaged.
If the injury is too severe, then it may cause cell death, and the cells may lose their ability to repair themselves.

Q. Weather New cells are formed during healing of wound.
Yes, new cells are formed during healing of wounds.

Q. Do the plants get injured when we pluck the flowers? How are those wounds healed?
Yes, plants get injured when we pluck flowers.
Meristematic tissue present in plant give rise to new cells at the site of injury and help plants it to heal wound.

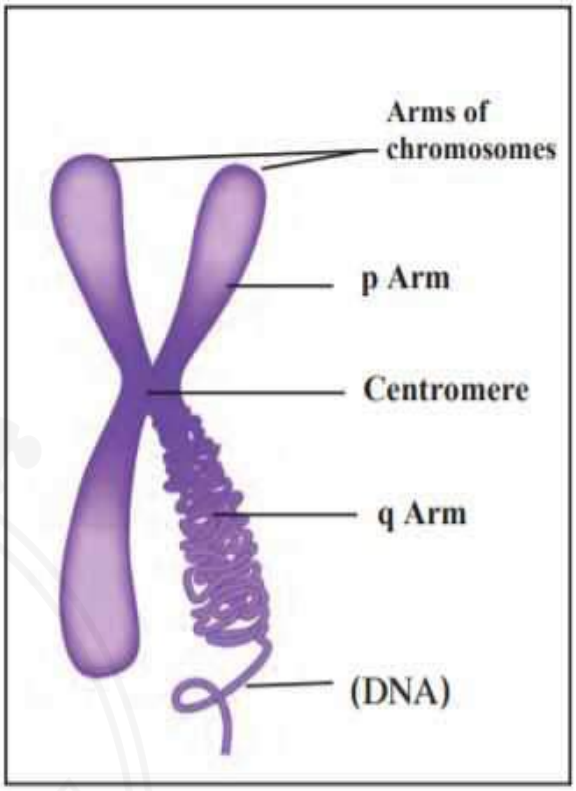
Q. How does the growth of any living organism occur?
Does the number of cells in their body increase? If yes, how?
The growth in Living organisms by cell division.
Yes, the number of cells in the organisms body increases over the time.
While growing, the number of cells in organisms body increased by mitotic cell division.

Q. How the new individual of a species is formed from existing one of same species.
Organisms of one species give rise to another organism of the same species by the process of reproduction.

Q. Give the structure of Chromosomes?

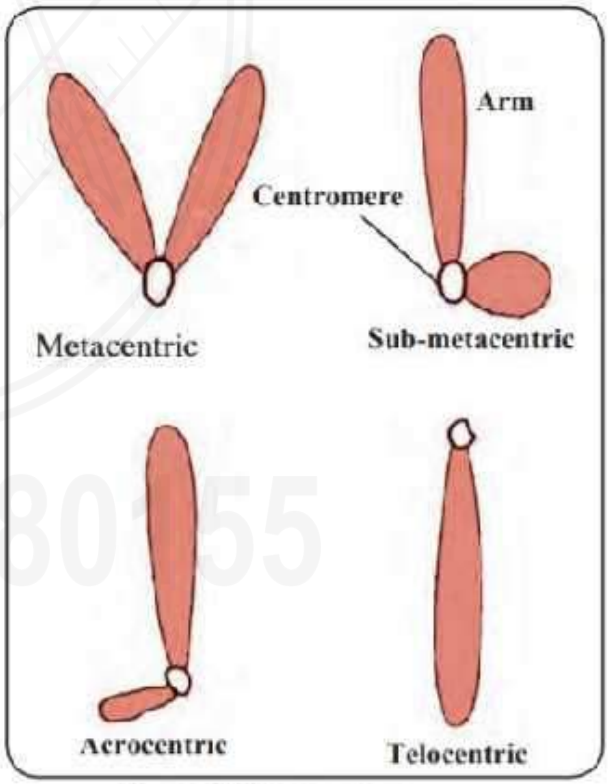
The structure in the nucleus of cells that carries the hereditary characteristics is called the chromosome. It is made up mainly of nucleic acids and proteins. During cell division chromosomes can be clearly seen under the compound microscope. 'Genes' which contain the information about hereditary characteristics in coded form are located on chromosomes. Each species has a specific number of chromosomes.

Each chromosome is made up of DNA and it appears dumbell-shaped midway during cell division. There is a constricted region on each chromosome. It is called the 'Primary constriction' or 'Centromere'. This divides the chromosome into two parts. Each part is called an 'arm'. The centromere has a specific position in each chromosome. Depending upon this, there are four types of chromosomes.



Chromosome number of some organisms has been given in the following table -

Sr. No.	Organism	No. of Chromosomes
1	Crab	200
2	Maize	20
3	Frog	26
4	Roundworm	04
5	Potato	48
6	Human	46



Types of chromosomes

Q. What do you mean by diploid(2n) cell.
The cell which has two sets of chromosome is called diploid(2n) cell.

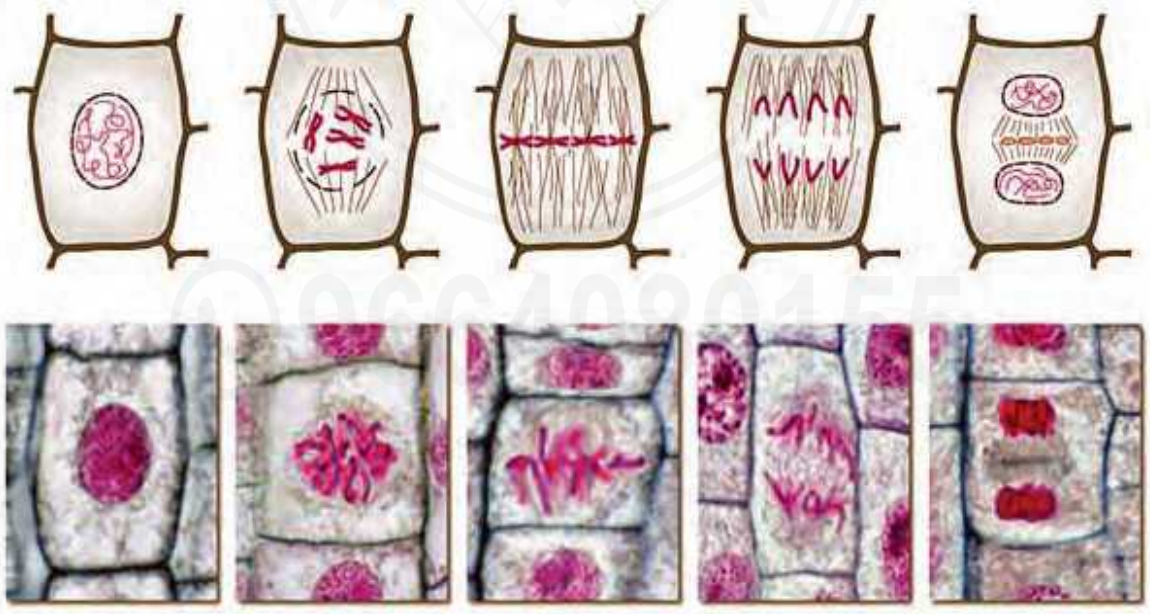
Q. What do you mean by haploid(n) cell.
The cell which has one set of chromosomes is called as a haploid(n) cell.

Q. What do you mean by homologous chromosome.
The morphological and structurally similar chromosomes present in a diploid cell are called homologous chromosomes.

Q. Whether the gametes are diploid or haploid? Why?
Gametes are haploid(n). It is because they are formed by mitotic division of germ cells .

Q. How are haploid cells formed?
Haploid cells are formed due to mitotic division of a diploid cell.

Q. What is the importance of haploid cells.
Haploid cells are required for sexual reproduction.
The gametes unite at the time of fertilization and thus chromosome number is restored in progeny.
The fusion of gametes introduce genetic recombination leading to variation which are important for the process of evolution.

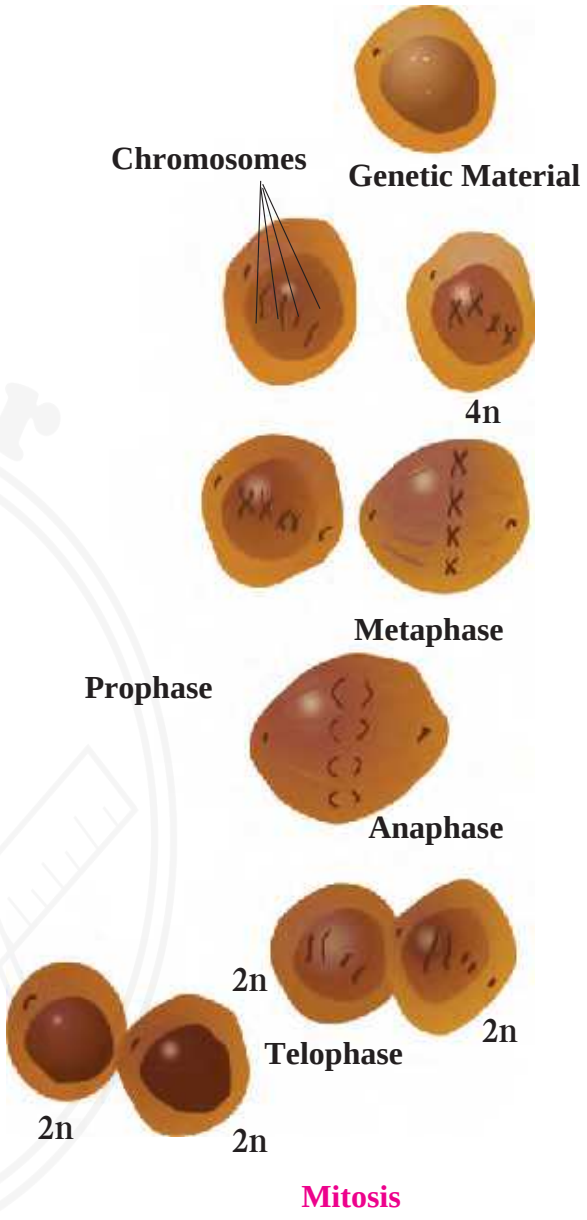


Phases of mitosis in onion root tip

Q.28 With the help of suitable diagram explain mitosis in details

Mitosis

Somatic cells and stem cells divide by mitosis. Mitosis is completed through two main steps. Those two steps are karyokinesis (nuclear division) and cytokinesis (cytoplasmic division). Karyokinesis is completed through four steps.



Mitosis

A. Prophase : In prophase, condensation of basically thin thread-like chromosomes starts. Due to this, they become short and thick and they start to appear along with their pairs of sister chromatids. Centrioles duplicate and each centriole moves to opposite poles of the cells. Nuclear membrane and nucleolus start to disappear.

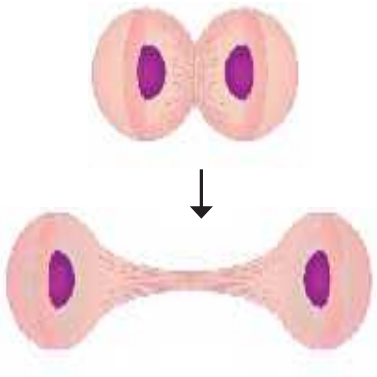
B. Metaphase : Nuclear membrane completely disappears in metaphase. Chromosomes complete their condensation and become clearly visible along with their sister chromatids. All chromosomes are arranged parallel to equatorial plane (central plane) of the cell. Special type of flexible protein fibers (spindle fibers) are formed between centromere of each chromosome and both centrioles.

C. Anaphase : In anaphase, centromeres split and thereby sister chromatids of each chromosome separate and they are pulled apart in opposite directions with the help of spindle fibers. Separated sister chromatids are called as daughter chromosomes. Chromosomes being pulled appear like bunch of bananas. In this way, each set of chromosomes reach at two opposite poles of the cell.

D. Telophase : The chromosomes which have reached at opposite poles of the cell now start to decondense due to which they again become thread-like thin and invisible. Nuclear membrane is formed around each set of chromosomes reached at poles. Thus, two daughter nuclei are formed in a cell. Nucleolus also appears in each daughter nucleus. Spindle fibers completely disappear.

In this way, karyokinesis completes and cytokinesis begins.

The cytoplasm divides by cytokinesis and two new cells are formed which are called as daughter cells. In this process, a notch is formed at the equatorial plane of the cell which deepens gradually and thereby two new cells are formed. However, in case of plant cells, instead of the notch, a cell plate is formed exactly along midline of the cell and thus cytokinesis is completed. Mitosis is essential for growth of the body. Besides, it is necessary for restoration of emaciated body, wound healing, formation of blood cells, etc.

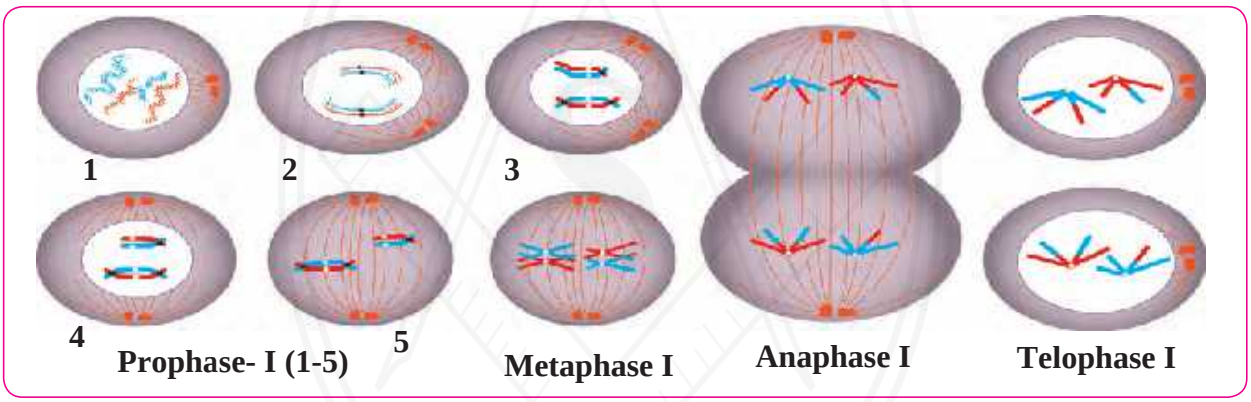


Cytokinesis

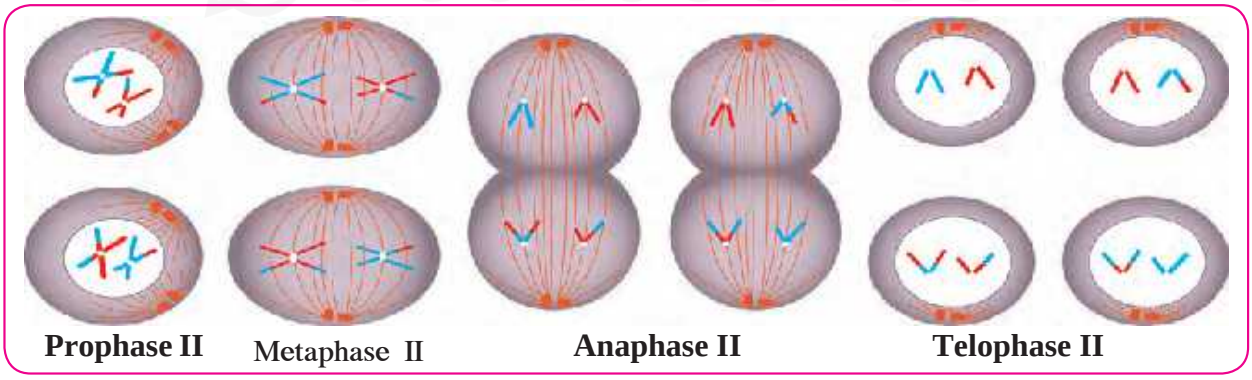
Q.29 With the help of suitable diagram explain meiosis in details

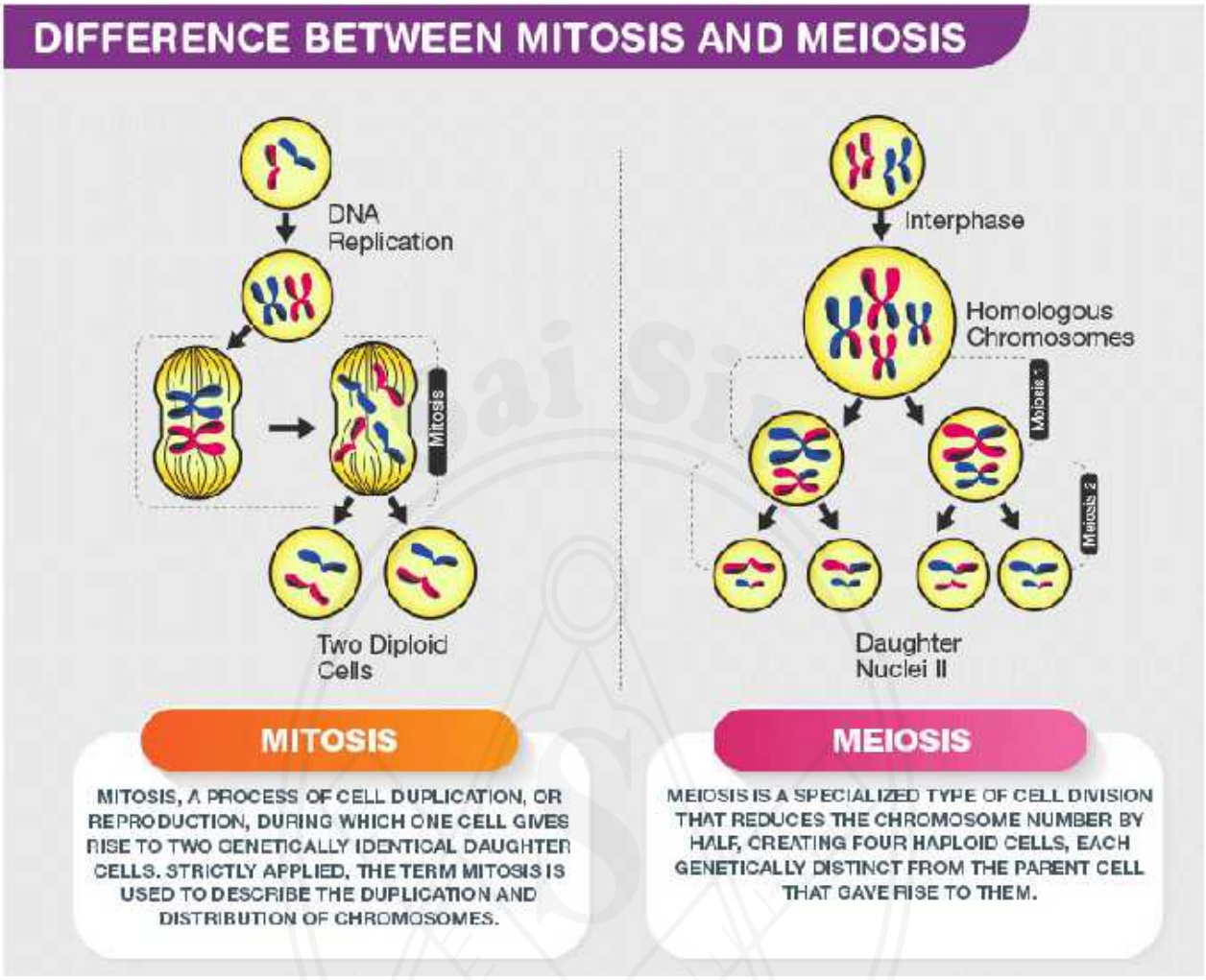
Meiosis:

Meiosis is completed through two stages. Those two stages are meiosis-I and meiosis- II. In meiosis-I, recombination / crossing over occur between homologous chromosomes and thereafter those homologous chromosomes (Not sister chromatids) are divided into two groups and thus two haploid cells are formed.



Meiosis-II is just like mitosis. In this stage, the two haploid daughter cells formed in meiosis-I undergo division by separation of recombined sister chromatids and four haploid daughter cells are formed. Process of gamete production and spore formation occurs by meiosis. In this type of cell division, four haploid (n) daughter cells are formed from one diploid (2n) cell. During this cell division, crossing over occurs between the homologous chromosomes and thereby genetic recombination occurs. Due to this, all the four daughter cells are genetically different from parent cell and from each other too.





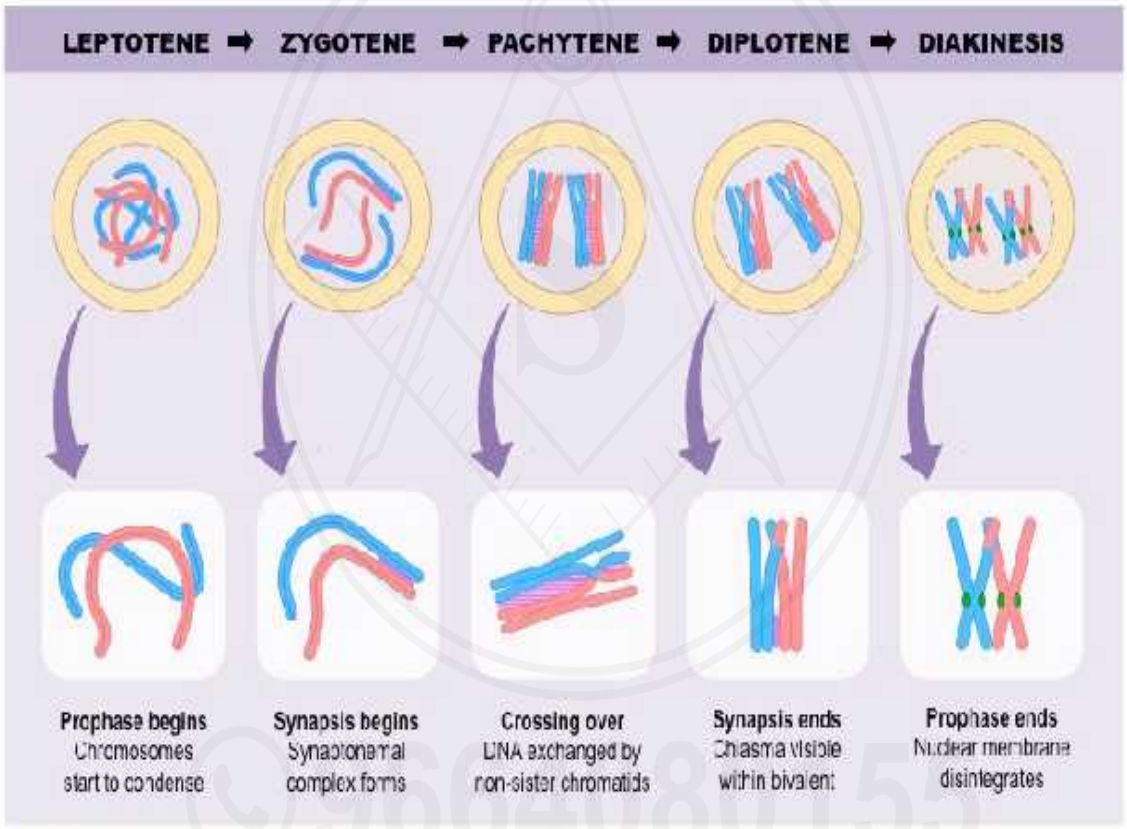
Differences between mitosis and meiosis:

Mitosis	Meiosis
1. It takes place in somatic cells.	1. It takes place in germ or reproductive cells.
2. Chromosome number of parent cell is maintained.	2. Chromosome number of parent cell is reduced to half.
3. No crossing over and no chiasmata formation.	3. Crossing over and chiasmata formation occur.
4. Cytokinesis is necessary after telophase I.	4. Cytokinesis is not necessary after telophase I.
5. Two daughter cells are formed at the end.	5. Four daughter cells are formed at the end.

Q.30 With the help of suitable diagram explain prophase - I of meiosis in details

Prophase - I is longer and more complex as compared to mitotic prophase and is subdivided into following 5 phases:

1. During the Leptotene stage, compaction of chromosome and chromosome become more visible.
2. During Zygotene stage, pairing of human organs chromosome (synapsis) occurs, is accompanied by bivalent or tetrad formation.
3. In the pachytene stage, recombination/ crossing over i.e exchange of genetic material take place between non sister chromatids of homologous chromosomes.
4. During Diplotene stage, the bivalents separate from each other except at the sites of crossover(chiasmata).
5. During Diakinesis, chromosomes are completely condensed and assembly of meiotic spindle occurs. The nucleolus and nuclear envelope start disappering.



3. Life Processes in Living Organisms Part – 2

All those life processes i.e. nutrition, respiration, excretion, sensation & response (control & co-ordination), etc. are essential to each living organism to remain alive. Besides these life processes, one more life process occurs in living organisms; it is reproduction. However, reproduction does not help the organism to remain alive but it helps to maintain the continuity of the species of that organism.

Formation of new organism of same species by earlier existing organism is called as reproduction. Reproduction is one of the various important characters of living organisms. It is also one of the various reasons responsible for evolution of each species. In living organisms, reproduction occurs mainly by two methods.

Those two methods are- asexual and sexual reproduction.

Some Life processes

1. Which are the important life processes in living organisms?

Nutrition, Respiration, Circulation, Excretion, Control and Co-ordination, etc., are the important life processes in organisms.

2. Which life processes are essential for production of energy required by body?

Life processes such as nutrition, respiration and circulation are required for production of energy in a body.

3. Which are main types of cell-division? What are the differences?

There are two types of cell division: Mitosis and meiosis.

Mitosis	Meiosis
1) It occurs in somatic cells.	1) It occurs in germ cells.
2) Nucleus divides only once.	2) Nucleus divides twice.
3) Two daughter cells are formed.	3) Four daughter cells are formed.
4) Daughter cells are diploid.	4) Daughter cells are haploid.
5) It occurs more frequently.	5) It occurs less frequently.
6) Daughter cells form somatic organs.	6) Daughter cells form gametes.
7) There is only one prophase, one metaphase one anaphase and one telophase.	7) There are two of each phase and five sub-phases in prophase - 1.
8) Number of chromosomes are not changed in the daughter cells.	8) Number of chromosomes are reduced to half.
9) Chromosome number doubles at the beginning of each cell division.	9) Chromosome number is not doubled. It doubles after the end of first meiotic division.
10) No crossing over in chromosomes.	10) Crossing over occurs chromosomes.
11) Equation division.	11) Reduction division.

4. What is the role of chromosomes in cell-division?
In cell division, chromosomes carry genetic information from parent cell to daughter cells.

5. What do we mean by maintenance of species?
During sexual reproduction, genetic material of two individuals is combined, thus offsprings produced are genetically didderent from their parents.
Such genetic variations give rise to diversity.
Genetic variation enables organisms to adjust with changing environment, thus it maintains species by presenting their extinction.

6. Whether the new organism is genetically exactly similar to earlier one that has produced it?
In case of asexual reproduction, the new organism formed is genetically identical to its parent.
In sexual reproduction, genetic constitution of offsprings is different from their parents, due to recombination of genes from both parents.

7. Who determines whether the two organism of a species will be exactly similar or not?
The similarity or difference between the organisms of a species depends upon whether these individuals are formed by sexual or asexual reproduction.

8. What is the relationship between the cell division and formation of new organism of same species by earlier existing organism?
Cell division by mitosis increases the number of cells. Since the cell copies its DNA before division, each daughter cell receives the same genetic material.
Thus, single celled organisms can reproduce asexually by mitosis to form new organisms of same species.

Q.1 Write a short note on asexual reproduction

Process of formation of new organism by an organism of same species without involvement of gametes is called as asexual reproduction.
As this reproduction does not involve union of two different gametes, the new organism has exact genetic similarity with the reproducing organism.
This is uniparental reproduction and it occurs by mitotic cell division.
Absence of genetic recombination is a drawback whereas fast process is advance of this reproductive method.

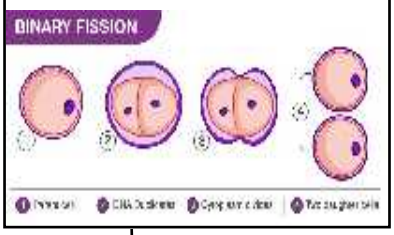
Q.2 Explain with example types of asexual reproduction in unicellular organism.

In this process, the parent cell divides to form two similar daughter cells.
1. Binary Fission: Binary fission occurs either by mitosis or amitosis.
Prokaryotes (Bacteria), Protists (Amoeba, Paramoecium, Euglena , etc.) and eukaryotic cell-organelle like mitochondria and chloroplasts perform asexual reproduction by binary fission.
Binary fission is usually performed by living organisms during favorable conditions i.e. availability of abundant food material.

Asexual reproduction in unicellular organism

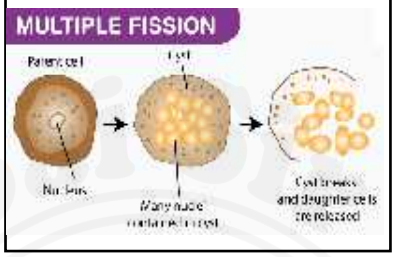
Binary Fission

Based on the axis of fission or division, binary fission is divided



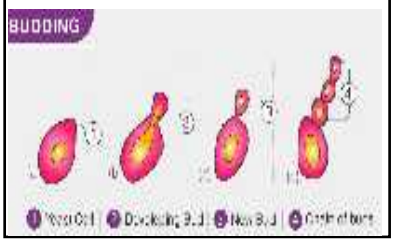
Multiple Fission

Multiple fission in Amoeba



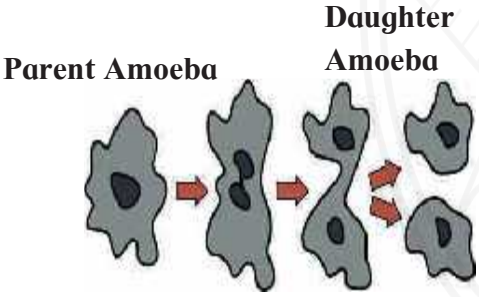
Budding

Budding in Yeast



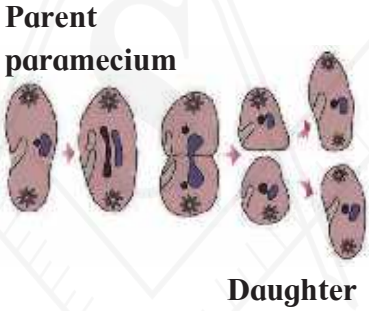
Simple Fission

E.g Amoeba divides in any plane due to lack of specific shape



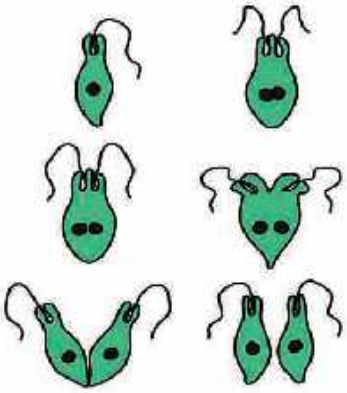
Transverse Fission

E.g Paramoecium



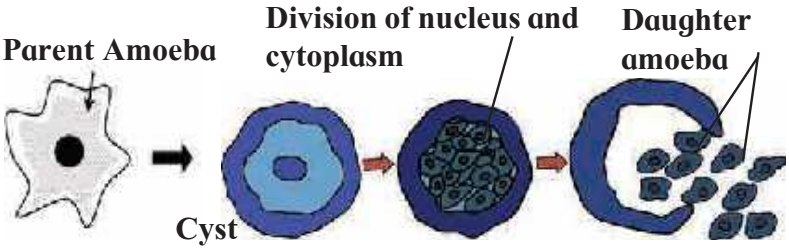
Longitudinal Fission

E.g Euglena



2. Multiple Fission:

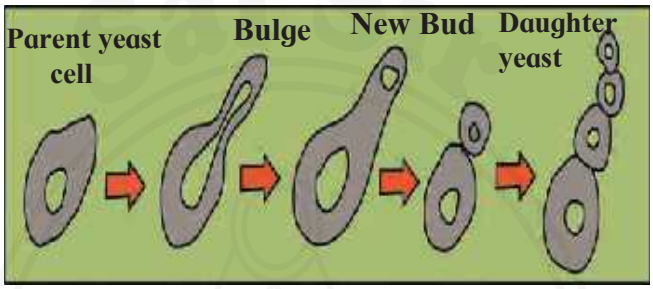
Asexual reproduction by multiple fission is performed by Amoeba and other similar protists. Amoeba stops the formation of pseudopodia and thereby movements whenever there is lack of food or any other type of adverse condition.
It becomes rounded and forms protective covering around plasma membrane.
Such encysted Amoeba or any other protist is called as 'Cyst'.



Multiple fission

Many nuclei are formed by repeated nuclear divisions in the cyst.
It is followed by cytoplasmic division and thus, many amoebulae are formed.
They remain encysted till there are adverse conditions.
Cyst breaks open on arrival of favorable conditions and many amoebulae are released.

3. Budding:
Yeast cells perfor budding i.e. a small bud coming out of many parent cells.
Asexual reproduction occurs by budding in yeast- a unicellular fungus.
Yeast cell produces two daughter nuclei by mitotic division, so as to reproduce by budding.
This yeast cell is called as parent cell.



Budding

A small bulge appears on the surface of parent cell.
This bulge is actually a bud. One of the two daughter nuclei enters this bud.
After sufficient growth, bud separates from the parent cell and starts to live independently as a daughter yeast cell.

Asexual Reproduction in Multicellar Organisms

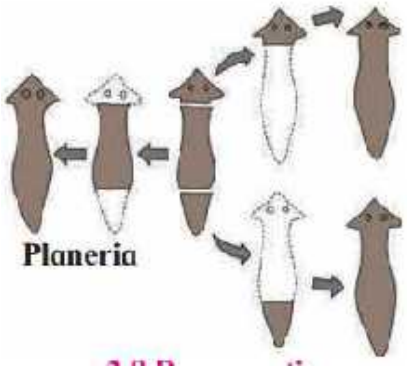
Fragmentation	Regeneration	Budding	Vegetative Propagation	Spore Formation
E.g Spirogyra, Sycon	E.g Planaria	E.g Hydra	E.g Potato, Bryophyllum	E.g Mucor (Mould)

Q.3 Write a short note on : Fragmentation

This type of asexual reproduction occurs in multicellular organisms.
In this type of reproduction, the body of parent organism breaks up into many fragments and each fragment starts to live as an independent new organism.
Whenever there is plenty of water and nutrients are available to Spirogyra, its filaments grow up very fast and break up into many small fragments. Each fragment starts to live independently as a new Spirogyra fiber.
This type of reproduction also occurs in algae like Sycon
If the body of Sycon breaks up accidentally into many fragments, each fragment develops into new Sycon.

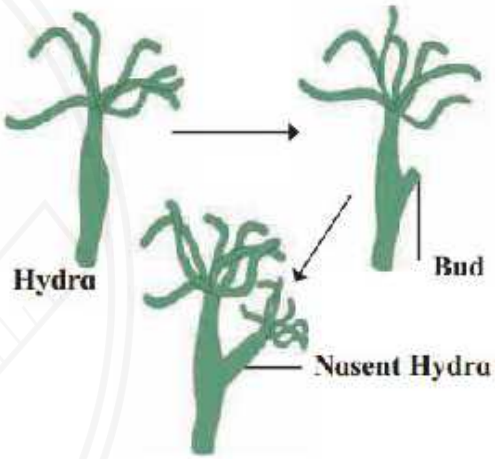
Fragmentation

Q.4 Write a short note on : Regeneration



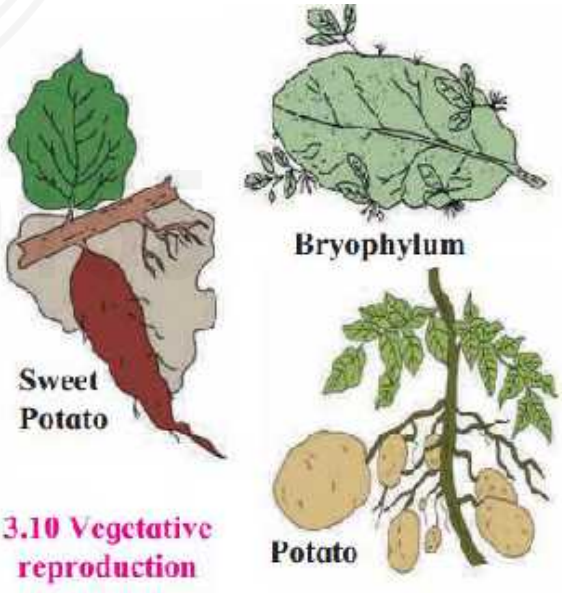
Regeneraton is a method of asexual reproduction in some multicellular organisms.
In this type of asexual reproduction, the body of an organism breaks into parts and thereafter each part regenerates the reamining part of the body and new organisms are formed.
Example:
In Planaria, when the body is cut, each part formed, develops into a whole new organism.
Wall Lizard breaks up and discards some part of its tail in emergency.
After a period of time, tail is regenerated. This is an example of limited regeneration

Q.5 Write a short note on : Budding



In case of Hydra, under favorable conditions, at specific part of its body, an outgrowth is formed by repeated divisions of regenerative cells of body wall. This outgrowth is called as bud.
Bud grows up progressively and finally forms a small hydra. Dermal layers and digestive cavity of the budding hydra are in continuity with those of parent hydra.
Parent hydra supplies nutrition to the budding hydra.
Budding hydra separates from parent hydra and starts to lead an independent life when it grows up and becomes able to lead an independent life.

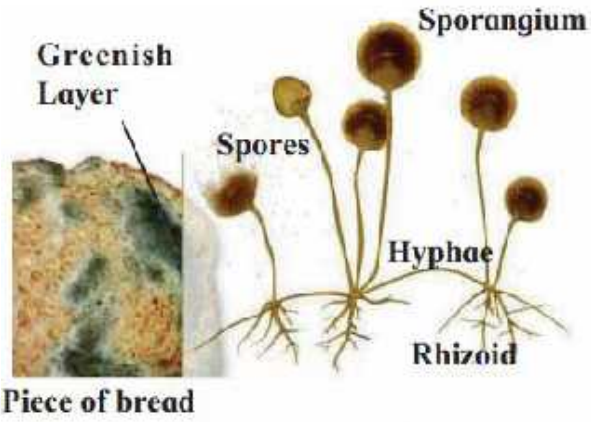
Q.6 Write a short note on : Vegetative Propagation



3.10 Vegetative reproduction

Reproduction in plants with the help of vegetative parts like root, stem, leaf and bud is called as vegetative reproduction.
Vegetative propagation in potatoes is preformed with the help of 'eyes' present on tuber whereas in Bryophyllum it is performed with the help of buds present on leaf margin.
In case of plants like sugarcane & grasses, vegetative propagation occurs with the help of buds present on nodes.
Plants like carrot and radish perform vegetative propagation with the help of roots.

Q.7 Write a short note on : Spore Formation



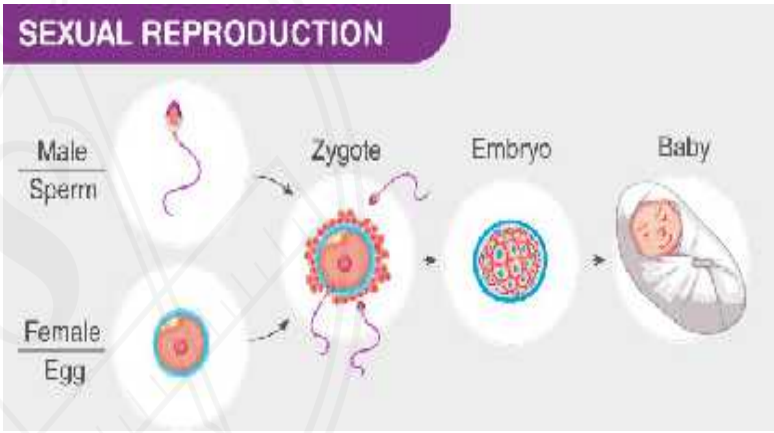
Fungi like Mucor have filamantous body.
They have sporangia.
Once the spores are formed, sporangia burst and spores are released. Spores germinate in moist and warm place and new fungal colony is formed.
For example when wet bread or 'bhakari' are keep in humid place. Fungus will grow on it within 2 – 3 days. .

Q.8 What is sexual reproduction? Explain two main steps involved in sexual reproduction.

Sexual reproduction always occurs with the help of two germ cells.
Female gamete and male gamete are those two germ cells.
Two main processes occur in the sexual reproduction.

1. Gamete formation:

Gametes are formed by the meiosis.
In meiosis, chromosome number is reduced to half;
hence haploid gametes are formed.



2. Fertilization:

A diploid zygote is formed in this process by union of haploid male and female gametes.
The zygote divides by mitosis and embryo is formed.
The embryo develops to form new individual.

Q.9 How do the plants and animals save themselves from being extinct

Two parents i.e. male parent and female parent are involved in sexual reproduction.
Fusion of male gamete of male parent and female gamete of female parent occurs.
Due to this, new individual always has the recombined genes of both the parents.
Hence, the new individual shows similarities with the parents for some characters and has some characters different than both parents.
Diversity in living organisms occurs due to genetic variation.
Genetic variation helps the organisms to adjust with the changing environment and thereby to maintain their existence.
Due to this, plants and animals can save themselves from being extinct.

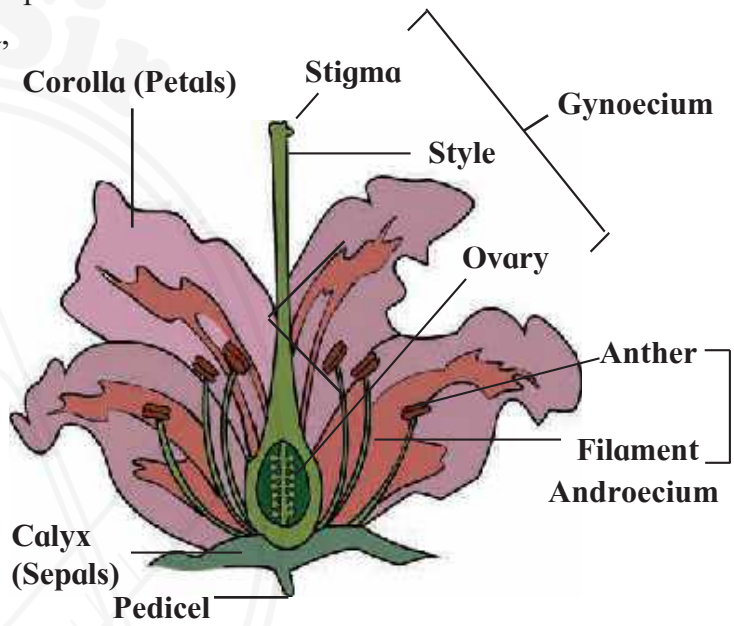
Q. What would have been happened if the male and female gametes had been diploid

If both male and female gametes had been diploid n, then after fertiliation tetraploid n offsprings will be formed which are genetically unstable and can result in abnormalities.

Q. What would have been happened if any of the cells in nature had not been divided by meiosis?
During meiosis reduction division produces four haploid cells
(gametes i.e human sperm cell and egg cell) from a single diploid cell.
Hence if, meiosis does not occur, it will result in doubling of chromosome
in each successive generation which will result in formation of abnormalities.
If meiosis does not occur, the chromosome number of parents and their offspring
will differ in every generation hence no species will hold its characteristics.

Q. 10 Explain the sexual reproduction in plants

Flower is structural unit of sexual reproduction in plants.
It consists of four floral whorls as calyx, corolla,
androecium and gynaecium; arranged in
sequence from outside to inside.



Androecium and gynoecium are called
'essential whorls' because they perform the
function of reproduction
whereas calyx and corolla are called
as 'accessory whorls'
because they are responsible for
protection of inner whorls.

Members of calyx are called as 'sepals' and
they are green colored.
Members of corolla are called as 'petals'
and they are variously colored.

A flower is called as 'bisexual' if both whorls i.e. androecium and gynoecium are present in the same flower. Ex. Hibiscus .
A flower is called as 'unisexual' if any one of the above mentioned two whorls is present in the flower.
If only androecium is present, it is 'male flower' and
if only gynoecium is present, flower is 'female flower'.
Ex. Papaya.


Male flower

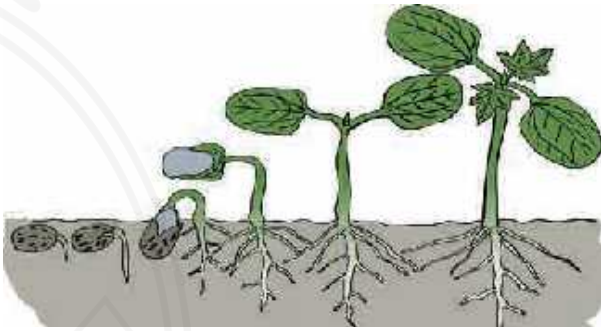

Female flower

Papaya Flower

Many flowers have the stalk for support, called as 'pedicel' and such flowers are called as 'pedicellate' whereas flower without stalk is called as 'sessile'.
Androecium is male whorl and its members are called as stamens.
Gynaecium is female whorl and its membranes are called as carpels.
These may be separate or united.

Ovary is present at the basal end of each carpel.
A hollow 'style' comes up from the ovary.
Stigma is present at the tip of style. Ovary contains one or many ovules.
Embryo sac is formed in each ovule by meiosis.
Each embryo sac consists of a haploid egg cell and two haploid polar nuclei.

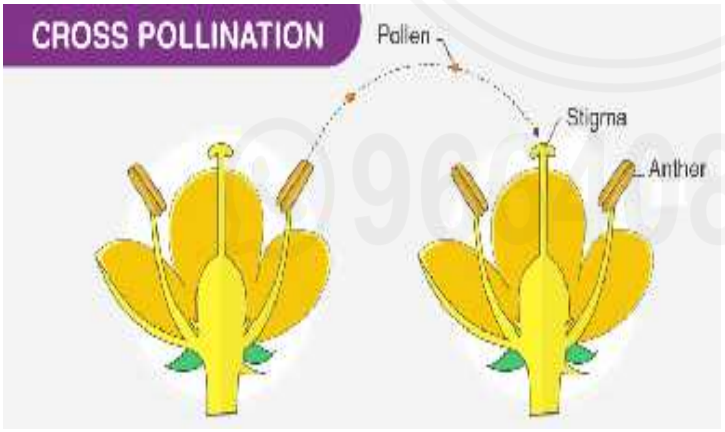
Ovule develops into seed and ovary into fruit after fertilization.
Seeds fall upon the ground when fruits break up and they germinate in the soil under favorable conditions.
Zygote develops at the cost of food stored in endosperm of seed and thus a new plantlet is formed.
This is called as seed germination.

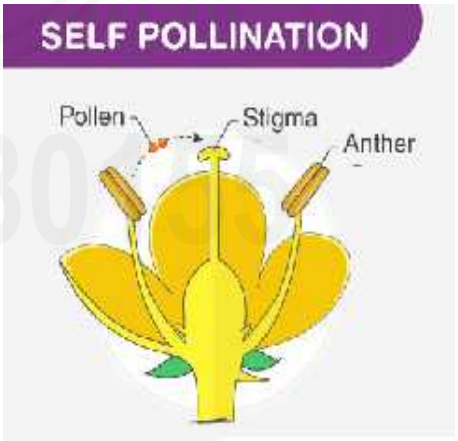


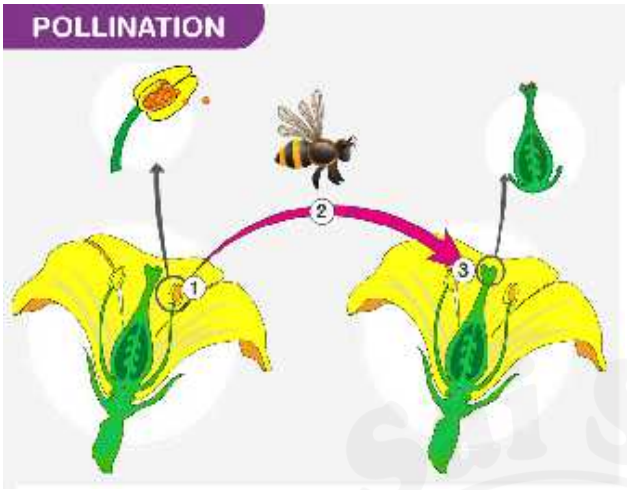
Seed germination

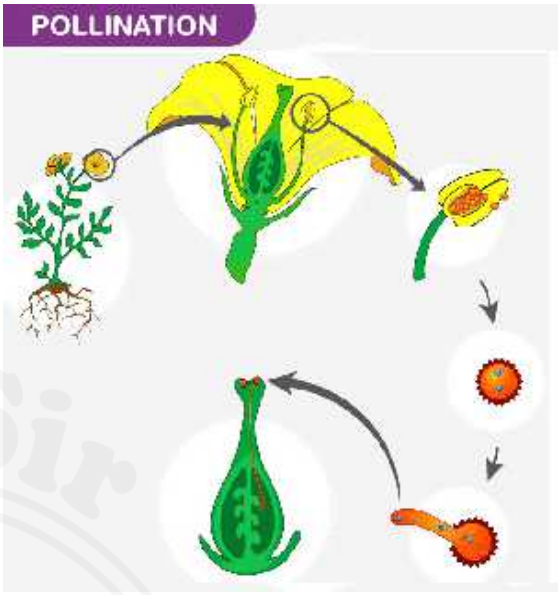
Q.11 Write a short note on Pollination and Double fertilization

Pollen grains from anther are transferred to the stigma. This is called as pollination.
When pollination involves only one flower or two flowers borne on same plant, it is called as self-pollination whereas if it involves two flowers borne on two plants of same species, it is cross-pollination.









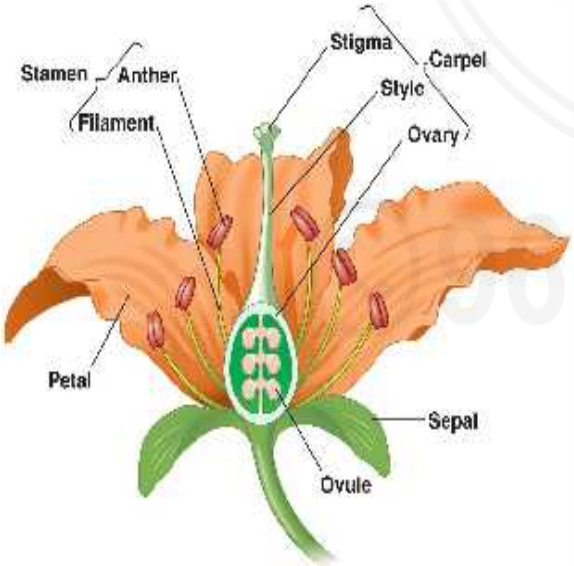
While discovering the new high yielding and resistant varieties of plants, scientists bring about the pollination with the help of brush.

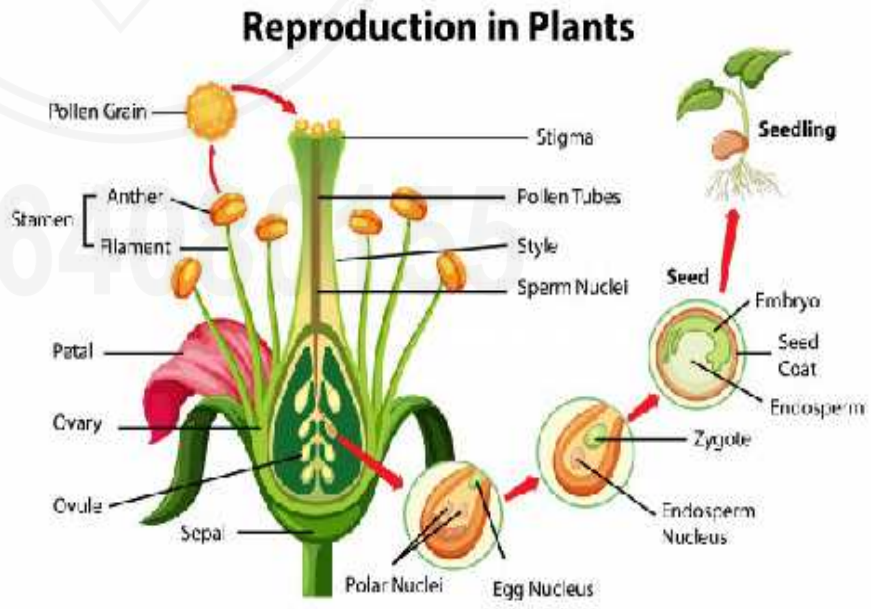
Pollination occurs with the help of abiotic agents (wind, water) and biotic agents (insects and other animals). Stigma becomes sticky during pollination Pollens germinate when they fall upon such sticky stigma i.e. a long pollen tube and two male gametes are formed.

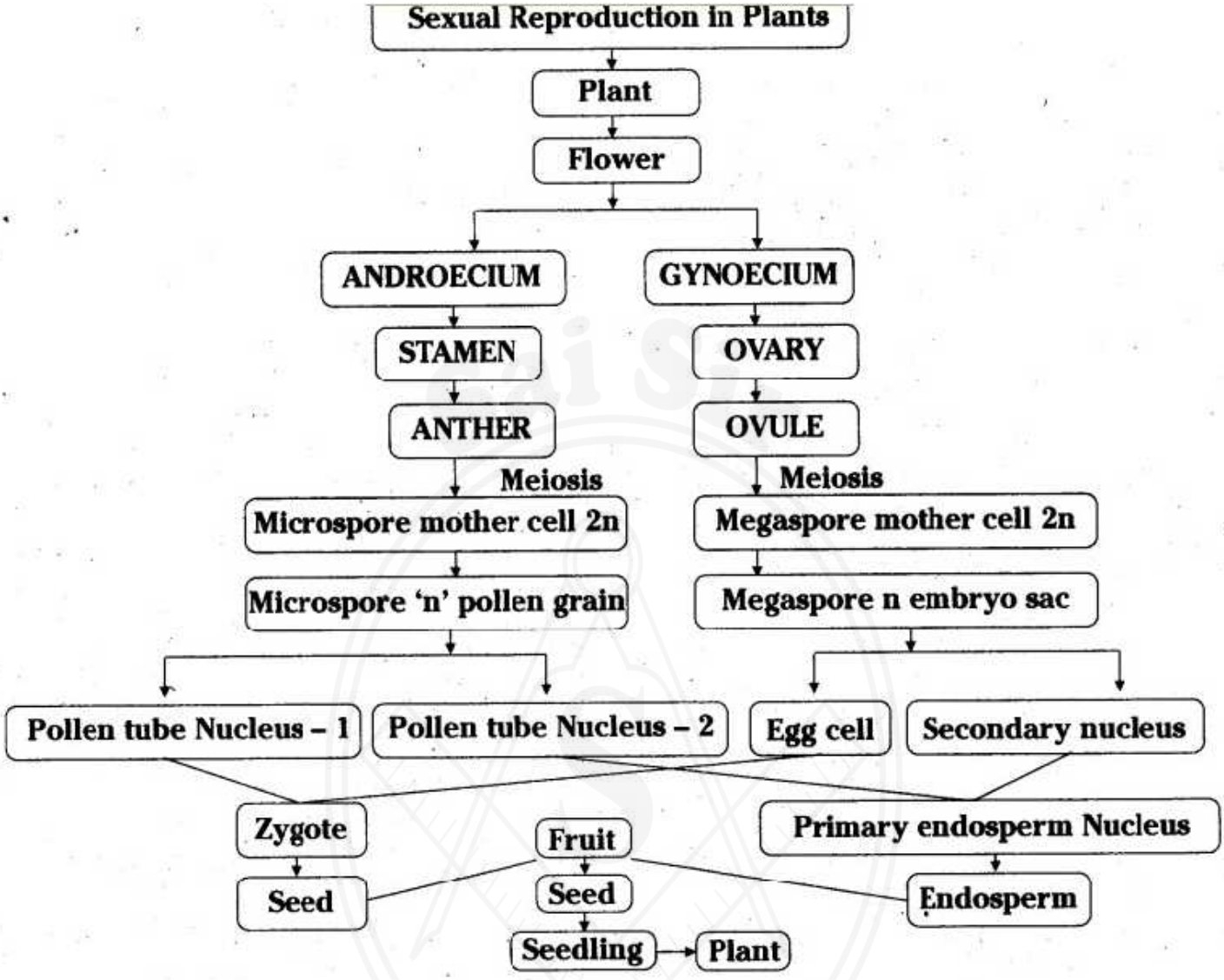
The pollen tube carries male gametes. Pollen tube reaches the embryo sac via style. Tip of the pollen tube bursts and two male gametes are released in embryo sac. One male gamete unites with the egg cell to form zygote. This is fertilization.

Second male gamete unites with two polar nuclei and endosperm is formed.

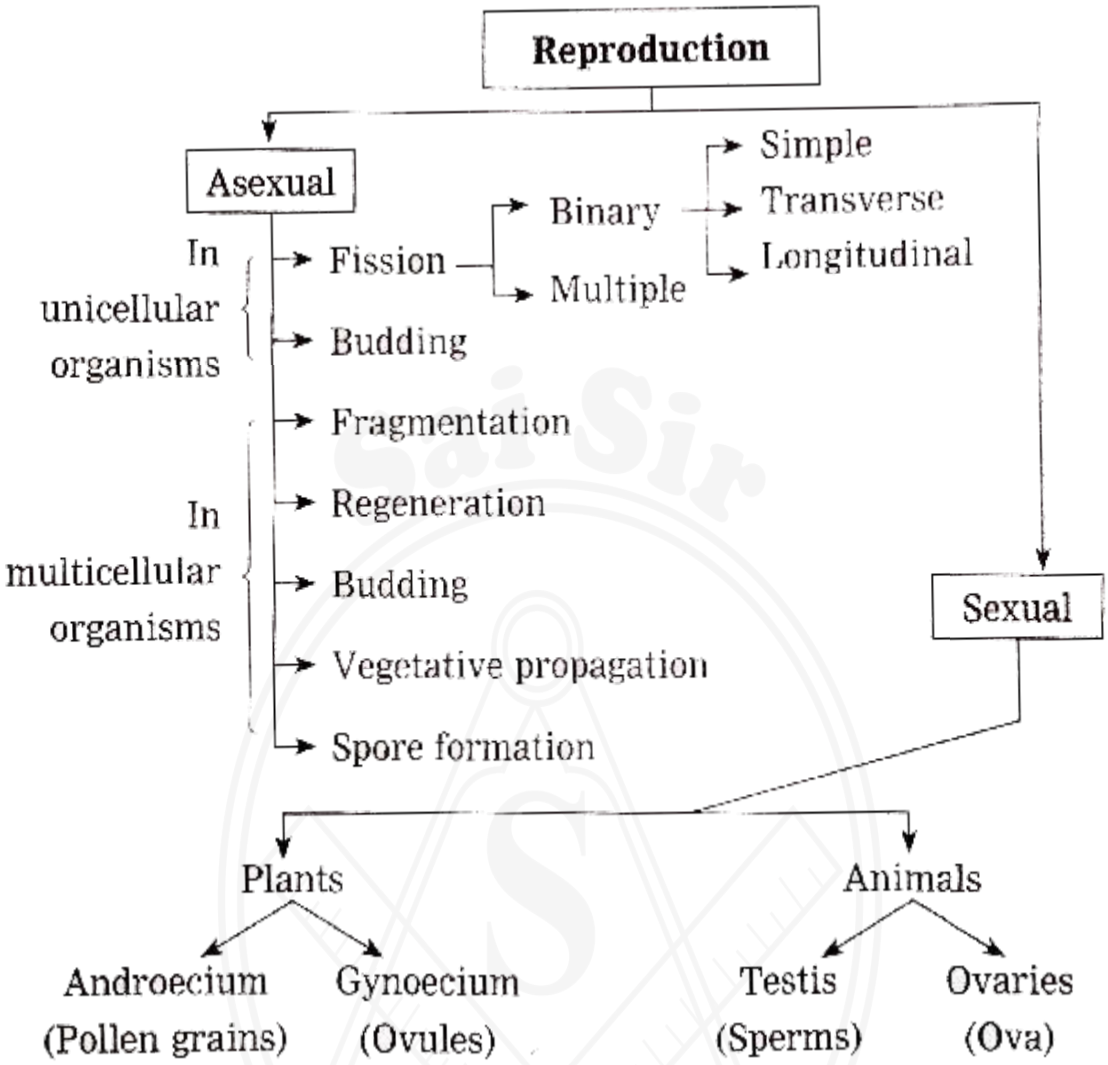
As two nuclei participate in this process, it is called as double fertilization.







Asexual reproduction	*Sexual reproduction*
(*a*) Only one parent plant is involved.	(*a*) Both male and female parents are involved.
(*b*) Occurs in unisexual plants.	(*b*) Occurs in bisexual plants.
(*c*) Occurs in lower plants.	(*c*) Occurs in higher plants.
(*d*) Reproductive organs are not present.	(*d*) Fully developed reproductive parts are present.
(*e*) In most of the methods the original parent disappears.	(*e*) Original parents remain alive after process of reproduction.
(*f*) Process like gamete formation or fertilization is not seen.	(*f*) Fertilization of gametes give rises to zygote.
(*g*) Characteristics of only one parent is inherited.	(*g*) Characteristics of both parents are inherited.
(*h*) No need of seeds.	(*h*) Seeds are used to get new plants from a flower.

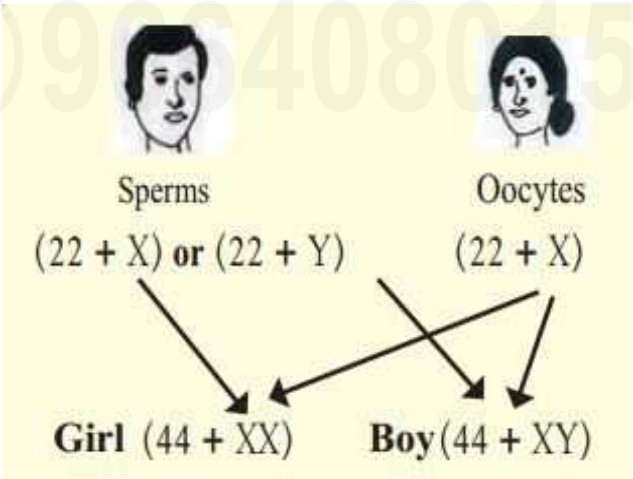


Sexual Reproduction in Human Being

In the chapter of heredity and variation we studied that men have XY sex- chromosomes and women have XX sex-chromosomes.

Reproductive system with specific organs develops in the body of men and women due to these sex-chromosomes only.

X-chromosome is present in men and women whereas Y-chromosome is present in men only.

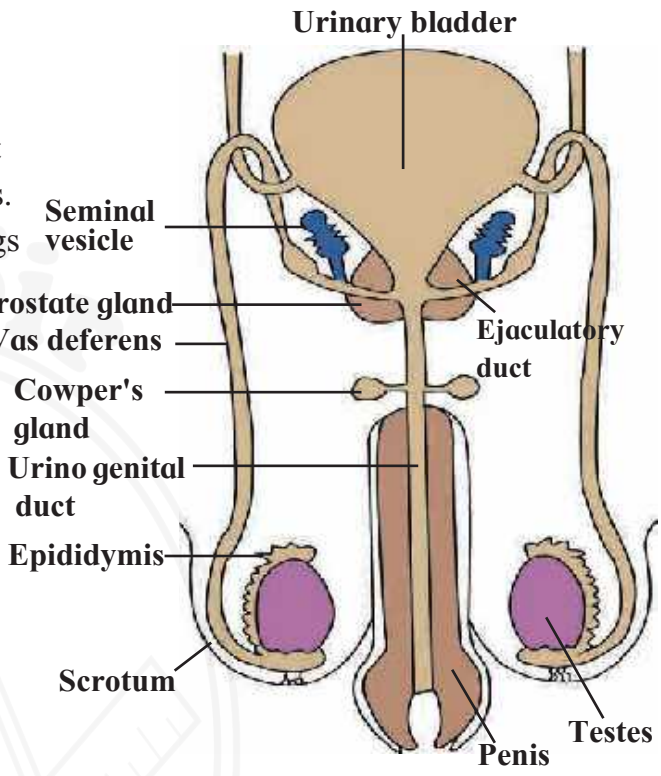


Q.12 Describe the male reproductive system

Male reproductive system of humans consists of testes, epididymis, vas deferens, vasa efferentia, seminal vesicles, prostate glands, Bulbourethral/Cowper's gland , penis.

a. Testes:

Testes are present in the scrotum, outside the abdominal cavity. Testes contain numerous seminiferous tubules. Germinal epithelium present in the tubules divide by meiosis to produce sperms. They secrete the harmone testosterone, which brings about changees in boys during puberty.



Male reproductive system

b. Epididymis:

Sperms are stored and matured in Epididymis.

Those sperms are sent forward through various tubules. Sequence of those tubules is as- rete testes, vas eferens, epididymis, vas deferens, ejaculatory duct and urinogenital duct. As the sperms are pushed forwards from one duct to next, they become mature and able to fertilize the ovum.

c. Vas deferens:

It is the passage through which the sperms travel towards the urethra.

d. Seminal vesicles, prostate gland, Cowper's gland:

Seminal vesicles secrete their secretion in ejaculatory ducts whereas prostate glands and Cowper's glands secrete their secretions in urinogenital duct.

Semen is formed of sperms and secretions of all these glands. Semen is ejaculated out through penis. All the organs of male reproductive system are paired except urinogenital duct, penis & scrotum.

e. Penis:

Semen is ejaculated out through penis. All the organs of male reproductive system are paired except urinogenital duct, penis & scrotum.

Surprising Facts

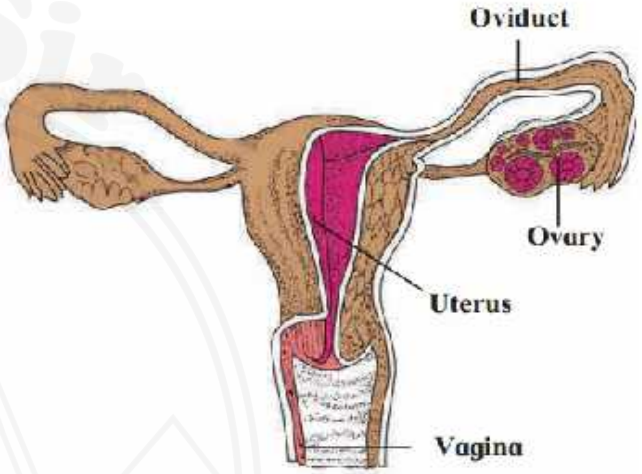
1. Length of each epididymis is about 6 meters.
2. Length of a sperm is about 60 micrometers.
3. Such a small sperm has to cross the distance of approximately 6.5 meter while passing out of male reproductive system.
4. Sperm needs large amount of energy. For this purpose, fructose is present in the semen.

Q.13 Describe the female reproductive system

All organs of female reproductive system are in abdominal cavity.
It includes a pair of ovaries, a pair of oviducts, single uterus and a vagina.
Besides, a pair of bulbo-urethral gland is also present.
Generally, every month, an ovum is released in abdominal cavity alternately from each ovary.
Free end of oviduct is funnel-like.
An opening is present at the center of it. Oocyte enters the oviduct through that opening.
Cilia are present on inner surface of oviduct. These cilia push the oocyte towards uterus.

a. Vagina:

It is a muscular tube.
It provides the route for the menstrual blood to leave the body during menstruation.
It acts as a pathway for thee entrance of sperms into the female body and also helps in child birth.



Human female reproductive system

b. Uterus:

It is a female muscular organ.
It can accommodate the growing foetus and contcats to push the baby during labour.

c. Oviduct:

It is the passage which connects uterus to ovary.

d. Ovaries:

Ovaries are the two oval shapped organs present in the upper right and left sides of the uterus.
They develop and release eggs.
Ovaries secrete estrogen, which brings about changes in girls during puberty.

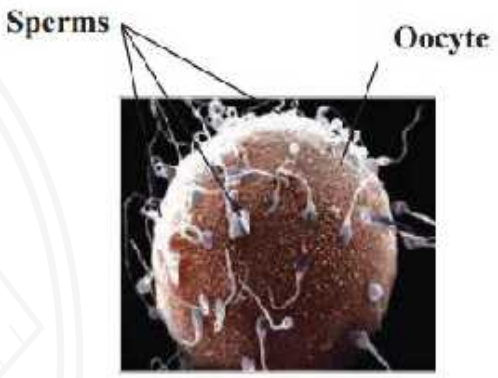
Q.14 Explain Gamete Formation in human beings

Both gametes i.e. sperm and ovum are formed by meiosis. Sperms are produced in testes of men from beginning of maturation (puberty) till death. However, in case of women, at the time of birth, there are 2 – 4 million immature oocytes in the ovary of female fetus. An oocyte matures and is released from ovary every month from the beginning of maturity up to the age of menopause (approximately 45 years of age).
The chromosome number in germ cells producing the gametes are diploid i.e. 2n.
It includes 22 pairs of autosomes and 1 pair of sex-chromosomes i.e. (44 + XX or 44 + XY).
These germ cells divide by meiosis. Due to this, gametes contain only haploid (n) number of chromosomes i.e. (22 + X or 22 + Y). Two types of sperms are produced as (22 + X) or (22 + Y) whereas oocytes are produced of only one type as (22 + X).
Both, sperms and oocytes are produced by meiosis.
In case of sperms, process of meiotic division is completed before the sperms leave male reproductive tract.
However, in case of oocytes, process of meiotic division completes after ovulation; during fertilization in oviduct.

Q.15 What is Menopause?

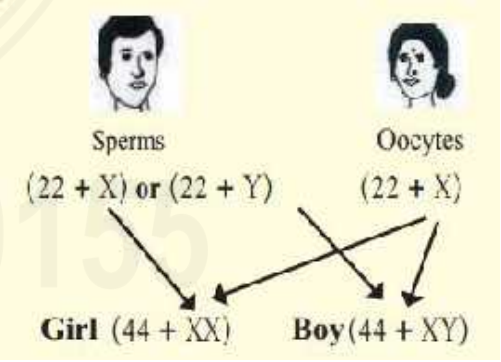
Menopause is the stoppage of functioning of female reproductive system.
At the age of about 45 – 50 years, secretion of hormones controlling the functions of female reproductive system either stops of becomes irregular. This causes the menopause.
Oocytes released from ovaries during last few months nearing the age of menopause are 40 – 50 years old. Their ability of division has been diminished till now.
Due to this, they cannot complete meiotic division properly.
If such oocytes are fertilized, the newborns produced from them may be with some abnormalities like Down's syndrome.
The age of menopause can vary according to socio economic and demographic factors.

Q.16 Explain Fertilization in human beings



Formation of zygote by union of sperm and ovum is called as fertilization.
Fertilization is internal in humans.
Semen is ejaculated in vagina during copulation.
Sperms, in the numbers of few millions start their journey by the route of vagina – uterus – oviduct.
One of those few million sperms fertilize the only ovum present in the oviduct.
From the age of puberty up the menopause (from 10 – 17 years of age up to 45 – 50 years) an ovum is released every month from the ovary. i.e. out of 2 – 4 million ova, approximately only 400 oocytes are released up to the age of menopause.
Remaining oocytes undergo degeneration.

Q.17 Gender of child is determined by the male partner of couple. Explain with reason whether this statement is true of false.



The man is totally responsible, whether the couple will have a boy or a girl child. During zygote formation, man contributes either X or Y chromosome to the next generation But females transfer only X-sex chromosome to the next generation. At the time of fertilization, if X-chromosomes comes from male, the child will be a girl and if Y-chromosomecomes then the child will be a boy.

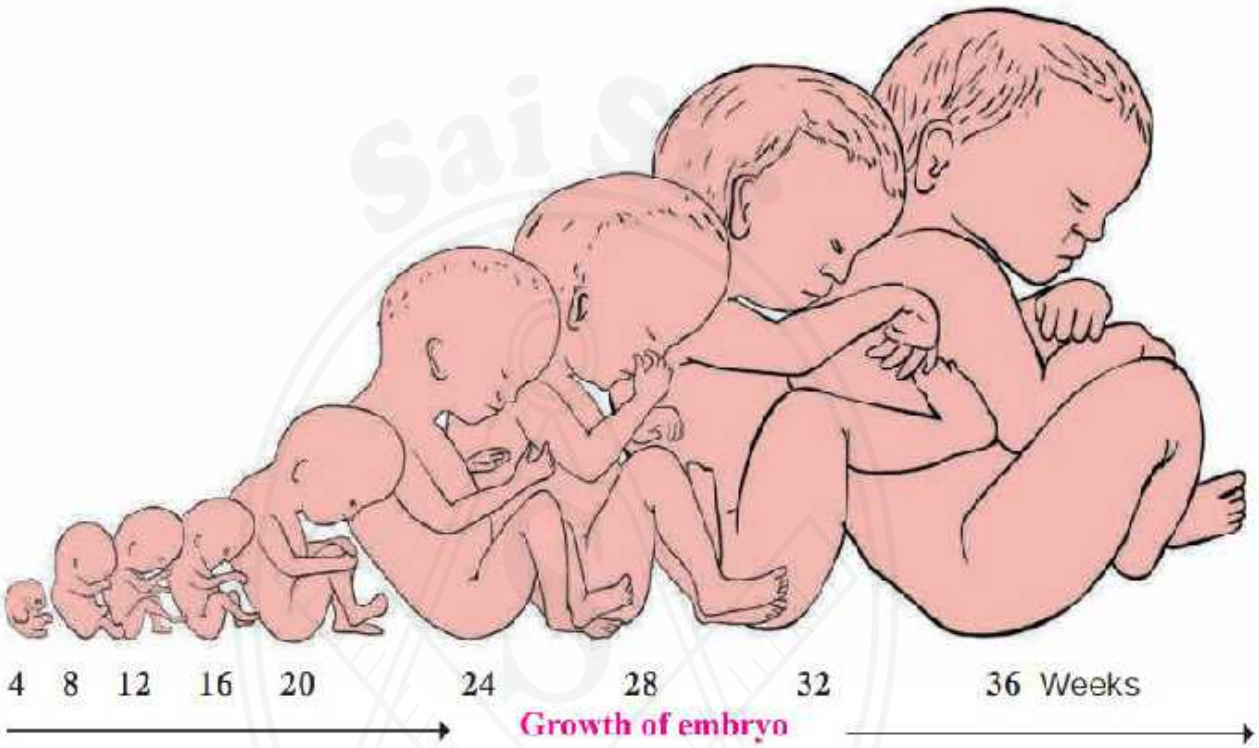
Q.18 Explain Development and Birth of a human child

The zygote formed after fertilization in the oviduct, undergoes repeated mitotic divisions and embryo is formed. Meanwhile, it is pushed towards uterus.

Once it reaches the uterus, it is implanted and further development occurs after implantation.

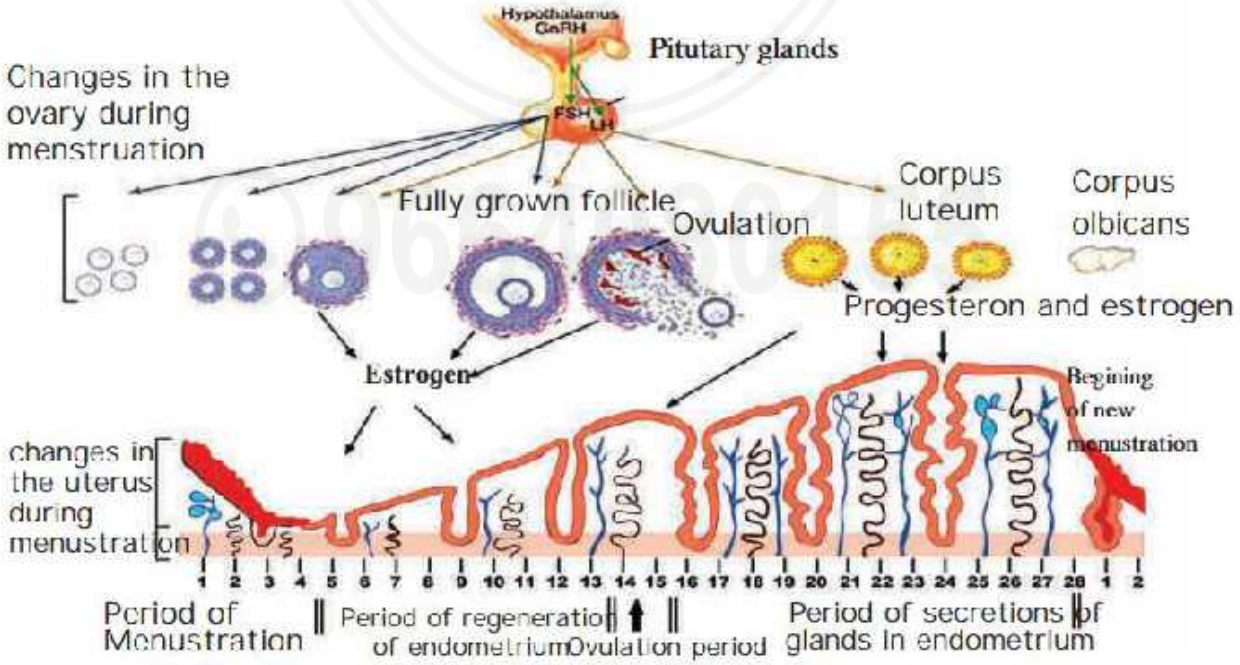
An organ called as placenta is formed for supply of food material during the growth in uterus.

Embryonic development is completed approximately within nine months after the fertilization.

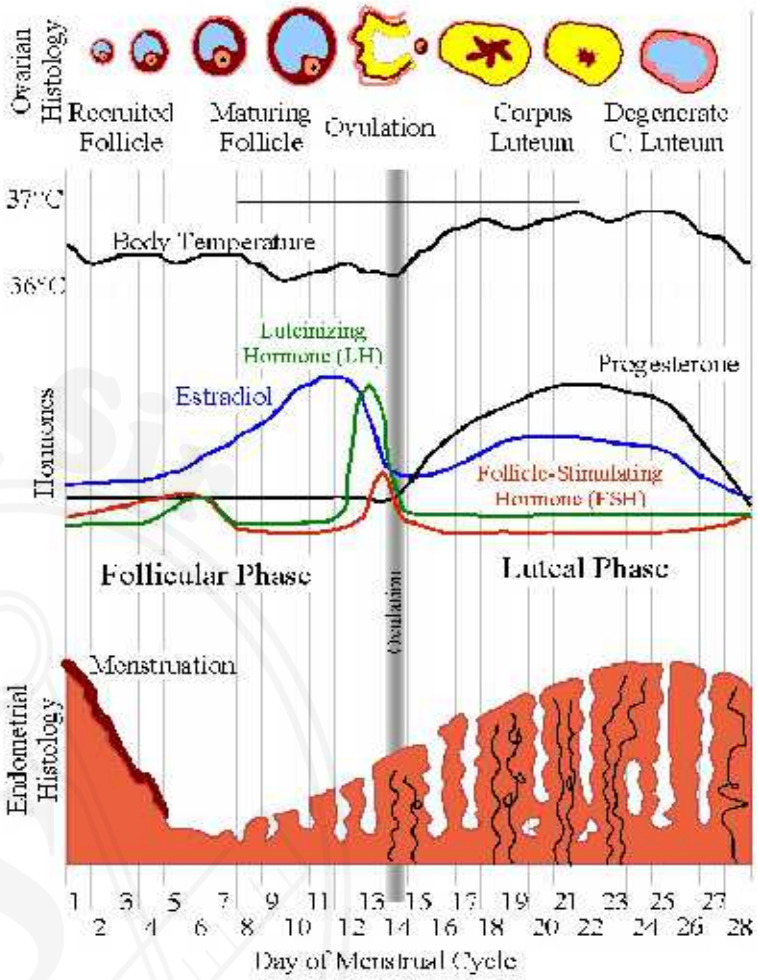


Q.19 Explain the Menstrual Cycle in females

Female reproductive system undergoes some changes at puberty and those changes repeat at the interval of every 28 – 30 days.These repetitive changes are called as menstrual cycle.



Menstrual cycle is a natural process, controlled by four hormones.
Those four hormones are follicle stimulating hormone (FSH), luteinizing hormone (LH), estrogen and progesterone.
One of the several follicles in the ovary starts to develop along with the oocyte present in it, under the effect of follicle stimulating hormone.
This developing follicle secretes estrogen.
Endometrium of the uterus starts to develop (during first cycle) or regenerate (during subsequent cycles) under the effect of estrogen.
Meanwhile, developing follicle completes its development.
It bursts under the effect of luteinizing hormone and oocyte is released. This is called as ovulation.



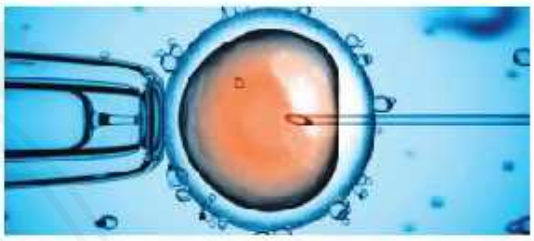
Remaining tissue of the burst follicle forms the corpus luteum.
Corpus luteum starts to secrete progesterone.
Endometrial glands secrete their secretion under the effect of progesterone.
Such endometrium is ready for implantation of embryo.
If oocyte is not fertilized within 24 hours, corpus luteum becomes inactive and transforms into corpus albicans.
Due to this, secretion of estrogen and progesterone stops completely.
Endometrium starts to degenerate in absence of these two hormones.
Tissues of degenerating endometrium and unfertilized ovum are discarded out through vagina.
This is accompanied with continuous bleeding.
Bleeding continues approximately for five days. This is called as menstruation.
Unless the oocyte is fertilized and embryo is implanted, this process is repeated every month.
If the embryo is implanted, repetition of this cycle is temporarily stopped till the parturition and thereafter period of breast feeding.
Menstrual cycle is a natural process and the women experience severe pains during this period.
Severe weakness is felt due to heavy bleeding.
There is higher possibility of infections too during this overall period.
Due to all such reasons, there is need of rest along with special personal hygiene.

Reproduction and Modern Technology

Many couples cannot have children due to various reasons. In case of women, irregularity in menstrual cycle, difficulties in oocyte production, obstacles in the oviduct, difficulties in implantation in uterus and many other reasons are responsible for this. Absence of sperms in the semen, slow movement of sperms, anomalies in the sperms are the reasons in case of males. But now with the help of advanced medical techniques like IVF, Surrogacy, Sperm bank the childless couples can have a child.

Q.20 Write a short note on IVF

In Vitro Fertilization (IVF)



In this technique, fertilization is brought about in the test-tube and the embryo formed is implanted in uterus of woman at appropriate time. IVF technique is used for having the child in case of those childless couples who have problems like less sperm count, obstacles in oviduct, etc.

Q.21 Write a short note on Surrogacy

Some women have problems in implantation of embryo in uterus. Such women can take the help of the modern remedial technique called as surrogacy. In this technique, oocyte is collected from the ovary of the woman having problem in implantation in uterus. That oocyte is fertilized in test-tube with the help of sperms collected from her husband. The embryo formed from such fertilization is implanted in the uterus of some other woman having normal uterus. Such a woman, in whose uterus the embryo is implanted, is called as surrogate mother.

Q.22 Write a short note on Sperm Bank / Semen Bank

There are various problems in sperm production as mentioned above, in case of many men. So as to have the children in case of such couples, new concept of sperm bank has been introduced. This concept is similar to blood bank. Semen ejaculated by the desired men is collected after their thorough physical and medical check-up and stored in the sperm bank.

As per the wish of needful couple, oocyte of woman of the concerned couple is fertilized by IVF technique using the semen from sperm bank. Resultant embryo is implanted in the uterus of same woman.

Name of the semen donor is strictly kept secret as per the law.

Q.23 What are twins. Give two main types of twins

Two embryos develop simultaneously in the same uterus and thus two offsprings are delivered simultaneously. Such offsprings are called as twins.
There are two main types of twins as- monozygotic twins and dizygotic twins.

Q.24 Short Note on Monozygotic twins

Monozygotic twins are formed from single embryo. During early period of embryonic development (within 8 days of zygote formation), cells of that embryo divide into two groups.
Those two groups develop as two separate embryos and thus monozygotic twins are formed.
Such twins are genetically exactly similar to each other.
Due to this, such twins are exactly similar in their appearance and their gender is also same i.e. both will be either boys or girls.

Twins girls

In case of monozygotic twins, if the embryonic cells are divided into two groups 8 days after the zygote formation; there is high possibility of formation of conjoined twins (Siamese twins).
Such twins are born with some parts of body joined to each other.
Some organs are common in such twins.

Q.25 Short Note on Dizygotic twins

Occasionally, two oocytes are released from the ovary of woman and both oocytes are fertilized by two separate sperms and thus two zygotes are formed.
Two embryos are formed from those two zygotes and both of those embryos are separately implanted in the uterus and thus dizygotic twins are delivered after complete development.
Such twins are genetically different and may be same of different by gender.

Q.26 Which precautions will you follow to maintain the reproductive health?

1. Keep private parts clean.
2. During menstrual cycle girls should maintain genitial hygiene.
3. Avoid situations, where there is a risk of being infeected with sexually transmitted diseases.
4. Study the relevent and scientific information about matters related to sexuality.
5. Seek help from reproductive health care facilities without any hesitation.

Q.27 Write any 4 symptoms of syphilis and gonorrhea

Symptoms of syhhilis: Chancre (patches) occuring on various parts of body including genitals, rash, fever, inflammation of joints etc.

Symptoms of gonorrhea: Painful and burning sensation during urination, oozing of pus through penis and vagina, inflammation of urinary tract, anus, throat etc.

Q.28 Short note on Family Planning

Family planning is the practice of controlling the number of children one has and the intervals between their births.
Family planning can be done by following common methods:

A. Temporary method
1. Use of Condoms
2. Oral Pills (birth control pills)
3. Copper - T

B. Permanent / Sterilization / Surgical method:
This method involves complete sterilization of male/female partner to prevent conception.
1. Vasectomy (for males): Vas deferens are tied and cut.
2. Tubectomy (for females): Fallopian tube is tied and cut.

4. Environmental management

Q.1 What is ecosystem? Which are its different components?

The Definite geographical area formed by biotic and abiotic factors and their interaction with each other constitutes the ecosystem.

Example: Pond ecosystem, forest ecosystem etc.

Q.2 Which are the types of consumers? What are the criteria for their classification?

The different types of consumers are

1. Primary consumers (herbivorous)
2. Secondary consumers(carnivores)
3. Tertiary or Apex consumer
4. Omnivores (mixed consumers)

The criteria for classification of consumers are

a. Mode of nutrition b. Food requirements

Q.3 What may be the relationship between lake and birds on tree?

The lake and the birds on the tree are related to aquatic ecosystem.

Apart from Terrestrial ecosystem birds also form a part of aquatic ecosystem example Ponds lakes etc.

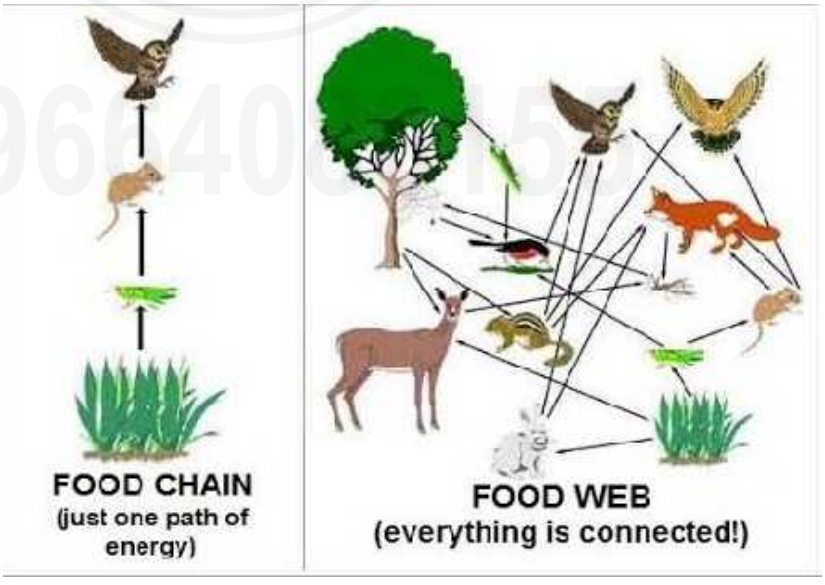
Photo planktons ----> zooplanktons ----> fishes ----> birds

Photo planktons growing in pond are food for zooplanktons, these zooplanktons are then eaten by fishes, birds feed on this fishes.

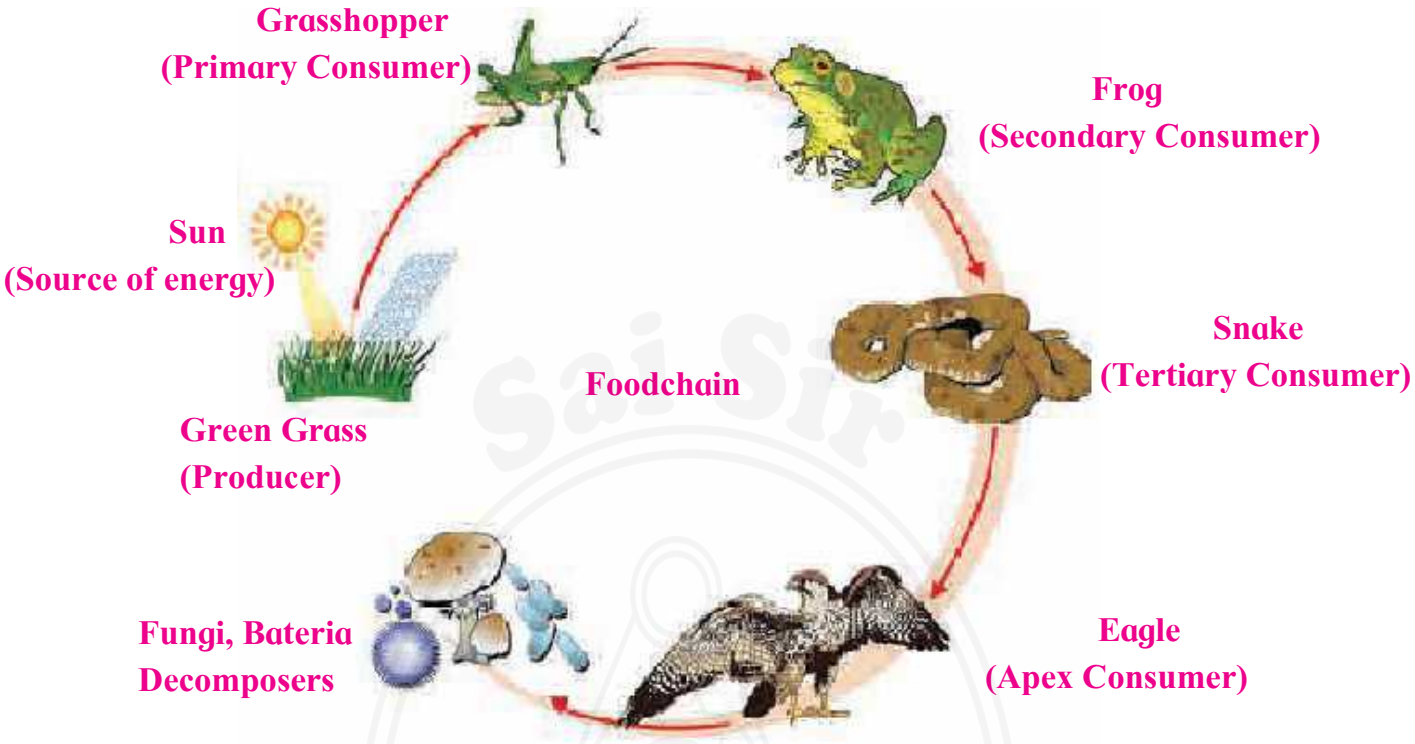
According to this food chain birds are also a part of Lake ecosystem.

Q.4 What is difference between food chain and food web?

Food chain is a definite sequence of interaction between producers, consumers, and decomposers(saprophytes), where is food web is a network of food chains which are interconnected at various levels forming an intricate web instead of a linear chain.



Q.5 Write the name and category of each of the component shown in picture.



In the given food chain energy absorbed from the sun by producers(grass/ plants) is converted into biochemical energy by the process of photosynthesis.
This energy is transported to the primary consumers(grasshopper) who feed on the grass.
Secondary consumers(frog) feed on the primary consumers and pass on the energy to the tertiary consumers(snake).
The Apex consumer(eagles) are present at the top of the food chain.
Decomposers like fungi, bacteria etc break down dead and decaying organic matter to recycle the nutrient back to the environment.
Disruption of any trophic level can create an imbalance in the ecosystem

Q.6 What is necessary to convert this picture into food web? Why?

For converting the above food chain into food web, more animals or links that may be present in the terrestrial ecosystem need to be added,
e.g bluebird, rabbit, rat, deer, tiger etc
It is necessary to include these animals because food web is an intricate network of food chains which are interconnected at various levels.
For instance if we include rat it would be a food source for snake as well as eagle.
Similarly if we include a bluebird it would be fed on grasshopper and the blue bird is eaten by Hawk.
Thus the food chain gets interconnected at various level forming a intricate web instead of a linear chain.

Q.7 Ecosystem: A review

Ecosystem is formed by biotic and abiotic factors and their interactions with each other. Each factor plays very important role in the ecosystem.
Producers like plants are important. Herbivores like deer, goats, sheep, cattle, horses, camels, etc. feeding upon producers are also important.
Predators like lion and tiger which prevent the overpopulation of herbivores are also equally important.
A question may arise in our mind that whether the caterpillars found in nature, organisms present in filthy places, termites, insects present in dung, are really useful?
However, those organisms are also important though they are dirty.
They are responsible for cleaning the environment.
It means that our existence is due to these factors present around us.
Hence, we should care for these factors.

Q.8 Which are different trophic levels in food chain? What is energy pyramid?

Trophic level

Each level in the food chain is called a trophic level. A trophic level is the step at which the organism obtains its food in the chain. The amount of matter and energy gradually decreases from producers at lowest level to top consumers at the highest level.

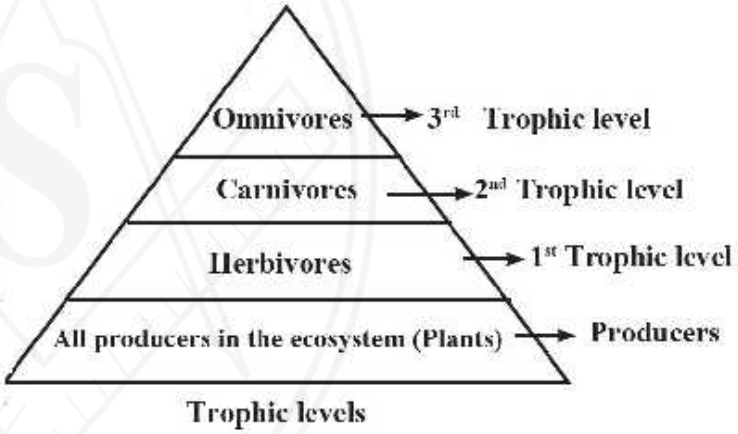
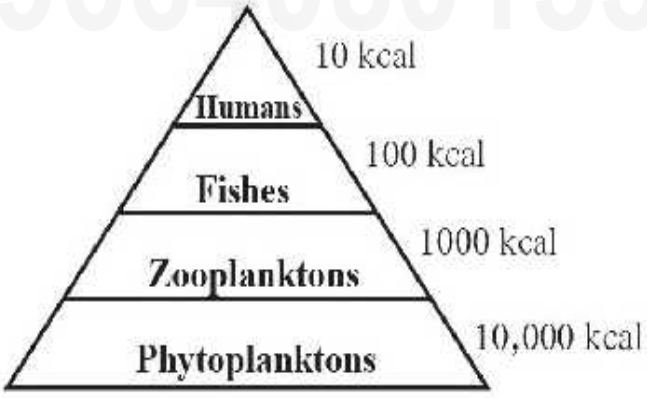
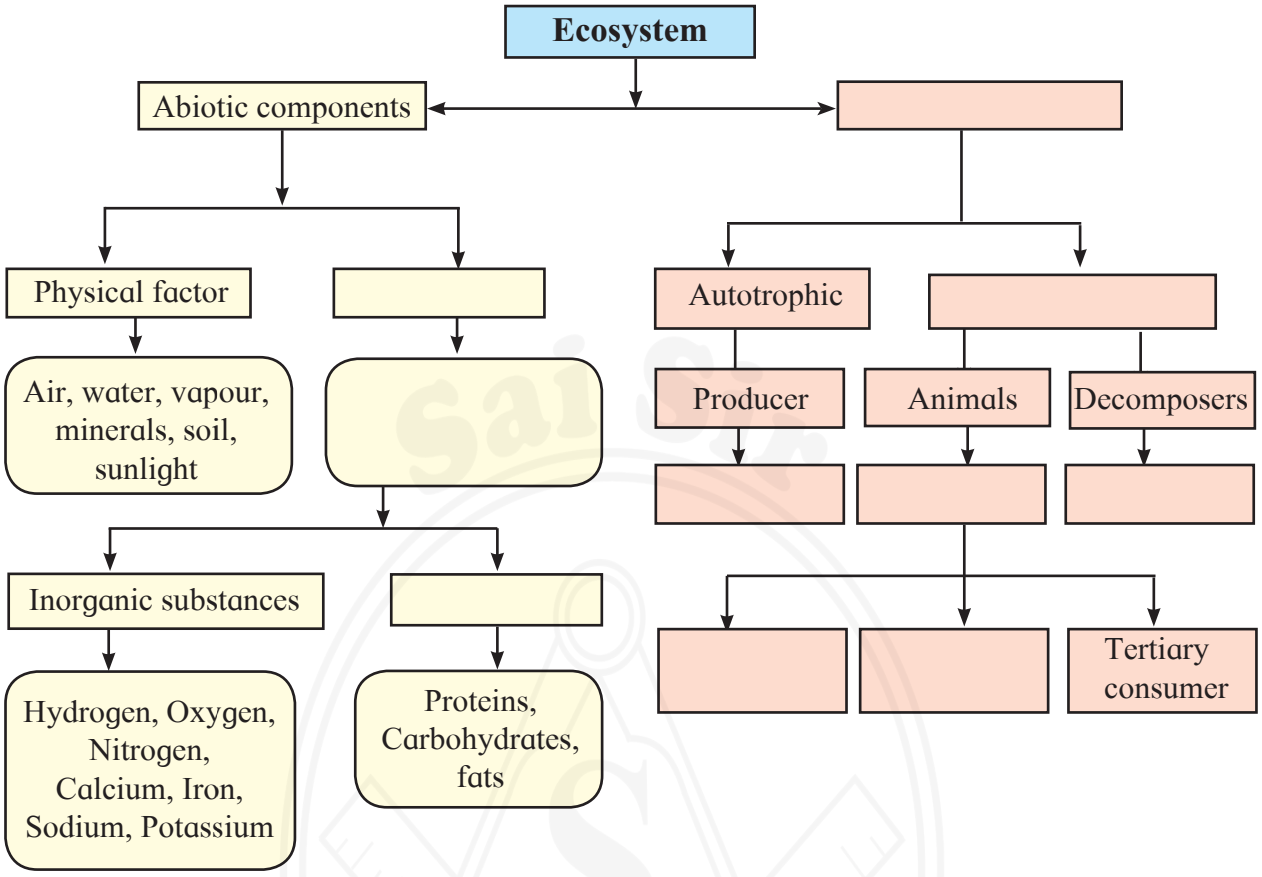


Figure shows the energy transfer that takes place at each trophic level. There are different levels of energy exchange in the food chain. The initial quantity of energy goes on decreasing at every level of energy exchange. Similarly, the number of organisms also decreases from the lowest level to the highest level. This pattern of energy exchange in an ecosystem is called a **'Pyramid of energy'**.



Q.9 Fill up the blank boxes and display the completed chart in classroom.



Q.10 Read the paragraph and answer the following questions

Paddy is cultivated on large scale in various states of South India.
Paddy fields are frequently attacked by grasshoppers.
Similarly, frogs are also present in large number in the mud of paddy fields, to feed upon grasshoppers and snakes are also present therein to feed upon their favourite food- frogs.
However, if frog population declines all of a sudden,

1. What will be the effect on paddy crop?

2. Number of which consumers will decline and which will increase?

3. What will be overall effect on that ecosystem?

4. Draw a food chain for above description, and what should be done to change the food chain in food web.

Q.11 Define environment
The physical, chemical and biological factors which influence and organism collectively is called as environment.

Q.12 State the types of environment
The two types of environment are natural environment and artificial environment.

Q.13 What is natural environment made up of?
Natural environment is made up of air, atmosphere, water, land, living organisms etc

Q.14 State the two factors that constitutes the environment.
The two factors that constitutes the environment are biotic and abiotic factors.

Q.15 What is ecology?
Ecology is the science which deals with the study of interaction between biotic and abiotic factors of the environment.

Q.16 How is environmental balance maintained.
Environmental balance is maintained in the following ways:
a. Continuous operation of environmental cycles like water cycle, gaseous cycle namely carbon cycle, nitrogen cycle, oxygen cycle.
b. Existence of food chain system in various ecosystems like terrestrial ecosystem, aquatic ecosystem etc.

Q.16 Which factors affect the environment. How ?
a. The factors affecting the environment are natural and artificial factors.
b. When natural or artificial factor affect the environment we create an imbalance in ecosystem and can affect the existence of biotic factors in the environment.
c. Natural factors such as earthquake, volcanoes, droughts can adversely affect the environment.
d. Also artificial or man made factors like environmental pollution caused due to population explosion fast industrialization and indiscriminate use of natural resources deforestation and unplanned urbanization can harm the environment.
c. Biotic and abiotic factors are related to each other in an ecosystem and if any one of these factors are change or remove, it can affect the entire ecosystem and further affect the environment.

"The Earth is sufficient to satisfy everyone's need but not the greed."
Mahatma Gandhi

Q.17 What will happen if the number of consumers in environment goes on increasing gradually

a. If the number of consumers in the environment goes on increasing gradually there would be decline in the number of prey they feed on.
b. A decline in the number of prey would eventually result in a decline in the number of consumer due to scarcity of food.

Q.18 What will be the effect of industry established on river bank on the river ecosystem

a. If an industry is established on river bank and the waste water from the industry is discharge into the river water, it will cause water pollution and affect the components of the ecosystem as well as human life.
b. The direct discharge of Industrial waste introduced high amounts of hazardous chemical in the water.
c. The water will not be fit to be used for drinking or other domestic purposes.
d. This might adversely affect both aquatic and Terrestrial Food Chain and disturb ecological balance.

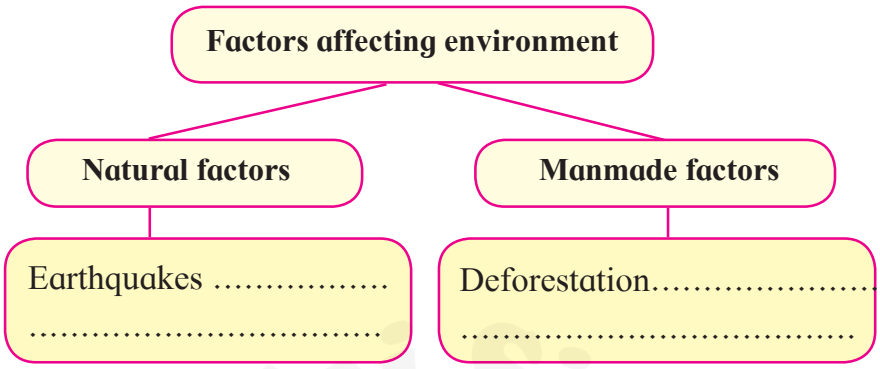
Q.19 Why do human beings have important place in environment

a. Human life is an integral part of nature and human survival is closely linked with environment.
b. Human population and industrialization humans have over utilize natural resources leading to degradation of environment.
c. The environment influences the life of human being and also human beings modify the environment as humans are the apex predators in the food chain.
d. Humans are capable of conserving and improving the quality of nature and us can play a major role in maintaining environmental balance.
Humans therefore have an important place in the environment.

Q.20 Explain the statement we have got this earth planet on lease from our future generations and not as an ancestral property from our ancestors.

a. Planet earth is not our ancestral property and one cannot make undue claims on it or inherit it.
b. Existence of humans completely depends on the existence of nature does it is our responsibility to preserve nature and maintain its balance.
c. Rational use of natural resources leads to their depletion.
d. Natural resources need to be taken care of as a borrowed property, as we have to sustain these resources for our future generations
e. Humans are entrusted with the responsibility of preserving the natural resources from coming generation and hence we have got this earth planet on lease from our future generations.

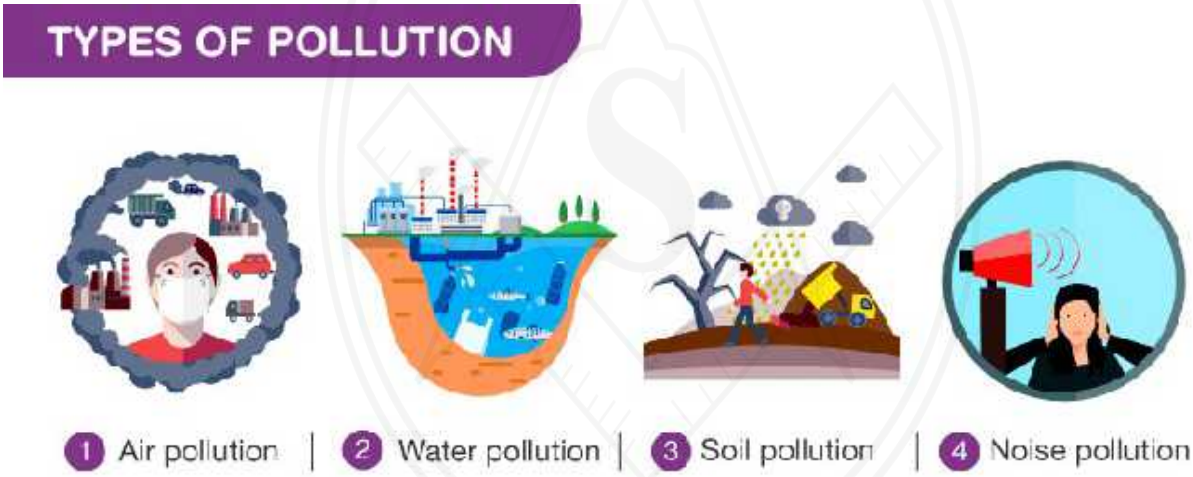
Q.21 Complete the following flow chart.



Q.22 What is environmental pollution. State the factors responsible for environmental pollution. What are different type of pollution.

Unnecessary and Unacceptable changes in the environment due to natural or human activities is known as environmental pollution.

Factors: Responsible for environmental pollution are population explosion, rapid industrialization, indiscriminate use of natural resources, deforestation and unplanned urbanization.



Q.23 What do we mean by natural and artificial pollution?

NATURAL POLLUTION

It originate from natural processes or sources such as hydrocarbons or sources such as hydrocarbons in atmosphere, radiation pollution coming from the sun or radio active materials found in nature, oxides of carbons,sulphur etc..coming out from volcanic activity.

ARTIFICIAL POLLUTION

It originates due to the activities of man such as lead aerosols in atmosphere coming from automobile exhaust, chlorinated hydrocarbons from excessive use of pesticides etc.

Q.24 Explain in detail radioactive pollution.

Radioactive pollution is the presence of radioactive substances in the environment.
The cause of radioactive pollution are natural and artificial.
Natural radiation include UV (ultravoilet) and IR (infrared),
whereas X-rays and nuclear radiation from atomic energy plants are types of artificial radiations.
The Chernobyl, Windscale and Three miles island incidents, are the major incidents of radioactive pollution of the world.
Radioactive pollution may result in Cancerous, ulceration due to exposure to high radiations of X-rays, destruction of tissues of the body, changes in genetic constitution, adverse effect on vision, etc

Q.25 Write a short note on environmental conservation.

Environmental conservation is protection, preservation, management or restoration of natural environment.
It is necessary to conserve our environment because any imbalance in the environment directly affects the existence of the biotic factors.
The environment fulfill our basic needs of food, clothing and shelter.
It constitutes our food chain, thus conserving it is necessary for sustenance of the life.
However, population explosion has led to overconsumption of natural resources.
Environmental conservation involves the use of natural resources rationally in order to avoid excessive degradation of environment.

Q.26 How will you justify that overcoming the pollution is a powerful way of environmental management.

Pollution affect the environment adversely. Environmental pollution is major concern because of harmful effects it has on the environment as well as on the health of humans.
The impact of pollution is severe in developing countries leading to ill health, death and disabilities in people. Developed countries have powerful ways of environmental management as they have resources as well as Technologies to combat pollution.
Reducing pollution will help reduce production of toxic waste, thereby saving the cost of disposal of waste. The ultimate effect of pollution is on the existence of Living Organism.
We as stakeholders of the environment need to come together to overcome pollution.
It will preserve our precious environmental resources and improve the environment quality.
Thus overcoming pollution is a powerful way of environmental management.

Q.26 Why is it said that pollution control is important.

Pollution affects the life of human beings and other living organism.
Also it affects other natural elements like air, soil, water etc.
Persistence of pollutants in nature has adverse effects on human health and environment.
Anthropogenic activities like mining etc., have a negative impact on the ecosystem, biodiversity, natural resources and habitats.
Pollution leads to loss of biodiversity global warming reduction in number of plants and animal species etc.
Human health is largely impacted by degradation of environment.
Reduction in quality of air, water and other resources causes threat to human life.
Hence, pollution control is extremely important.

Q.27.How can the people be made aware of need to conserve the environment.

Environmental problems can be resolved only if protection and conservation of environment becomes an effective public movement.
Values like positive attitude, affection towards environment, knowledge about the environment etc., can be inculcated in future generation.
This can be achieved by increasing Awareness through education.
Also many people are unaware about the rules of environment conservation.
Thus, spreading awareness about the importance of protection of environment is necessary.
For this purpose television, radio can be used effectively.
Street plays, poster can also be used for spreading awarness.
All the developed developing and underdeveloped countries have accepted the responsibility of conservation of environment.
We as responsible citizen should participate on large scale for environment conservation.

Q.28 Write a short note on chipko movement of Bishnoi

In 1731 Amrita Devi Bishnoi along with other 363 Bishnois sacrificed their life for protection of khejri trees in khejarli village near Jodhpur in Rajasthan.
These trees were being harm for construction of a new place.
Bishnois were dependent on various forest product for their survival.
Amrita Devi and other Bishnois showed courage by embracing the trees to protect them.
The Government of India has recently instituted Amrita Devi Bishnoi National Award for protection of wildlife.

Q.29 What do we learn from the story of Jadhav Molai Payeng?

Mr. Jadhav Molai Payeng single-handedly transform a barren land into forest.
It was due to his positive attitude, affection towards nature and hard work that he could achieve success in planting trees in over 1360 acres of land.
From the story of Jadhav Molai Payeng, we learn that we all need to make Earth a better place to live for us as well as for the coming generations.
From a story it is clear that if a large crowd cause harm to the environment even a single person can be if determined can established forest and benefit the environment in great ways.
Also one person can make such an impact, many people coming together in unity to take efforts for environment conservation can bring about a revolution.

The big story of a small man

Q.30 Give short note on biodiversity.

Biodiversity is the richness of living organisms in nature due to presence of varieties of organisms, ecosystems and genetic variation within a species.
Biodiversity occurs at three different levels.

Genetic Diversity

Occurrence of diversity among the organisms of same species is genetic diversity. Ex. Each human being is different from other. Possibility of wiping out the species arises if there is decrease in the diversity within the species whose members involve in sexual reproduction.

Species Diversity

Innumerable species of organisms occur in the nature. This is called as species diversity. Species diversity includes various types of plants, animals and microbes.

Ecosystem Diversity

Many ecosystems are present in each region. Ecosystem is formed through the interaction between plants, animals, their habitat and changes in the environment. Each ecosystem has its own characteristic animals, plants, microbes and abiotic factors. Ecosystems are also of two types are natural and artificial.

Q.31 Give short note on sacred groves.

The forest conserved in the name of god and considered to be sacred is called as sacred grove. These are in fact 'sanctuaries' conserved by the society and not by the government forest department. As it has been conserved in the name of god, it has special protection. These clusters of thick forests are present not only in Western Ghats of India but in the entire country.
More than 13000 sacred groves have been reported in India.

Sacred grove

Q.32 How can biodiversity be conserved?

1. Protecting the rare species of organisms.
2. Establishing national parks and sanctuaries.
3. Declaring some regions as 'bioreserves'.
4. Projects for conservation of special species.
5. Conserving all plants and animals.
6. Observing the rules.
7. Maintaining record of traditional knowledge.

Q.32 What are the meaning of following sysmbols? Write your role accordingly?







Many people in the society are voluntarily coming together to perform this noble work. Many institutes at state, national and international level are involved in this work.

Voluntary Organizations

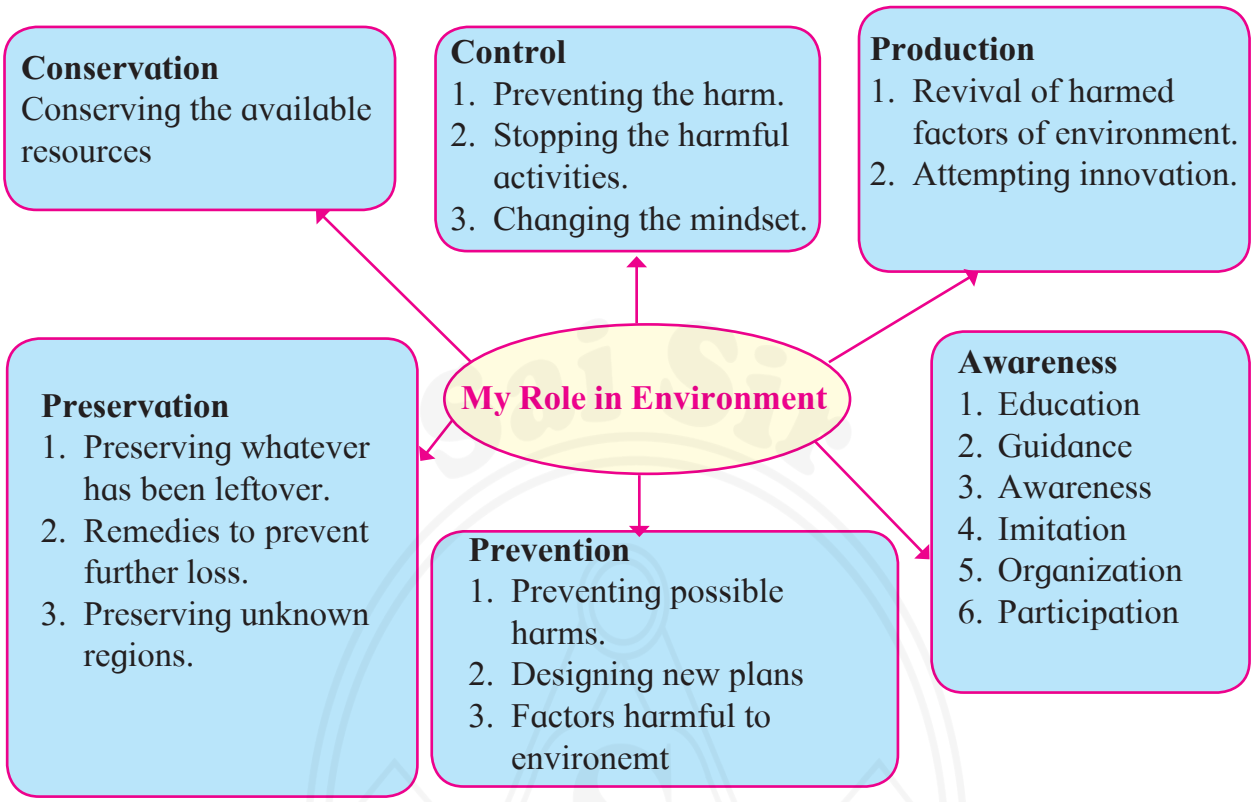
1. Bombay Natural History Society, Mumbai.
2. CPR environment group, New Chennai.
3. Gandhi Peace Foundation, Environment Cell, Delhi.
4. Chipko Centre, Tehri Garhwal.
5. Centre for Environment Education, Ahmadabad.
6. Kerala Science Literature Council, Trivandrum.
7. Indian Agro Industries Foundation, Pune.
8. Vikram Sarabhai Community Science Centre, Ahmadabad.

International Environment Organizations

1. International Union for Conservation of Nature (IUCN), Gland VD, Switzerland.
2. Intergovernmental Panel on Climate Change (IPCC), Geneva.
3. United Nations Environment Program, Geneva.
4. World Wildlife Fund, New York.
5. Bird Life International, Cambridge.
6. Green Climate Fund, Songdo, S. Korea

Green Peace is world's largest organization engaged in environmental activities. More thant 25 lakh people from 26 different countries are members of this organization. Collect more information about the work of above mentioned organizations.

My Role in Environment



Q.33 Short note on Hotspots of Biodiversity

34 highly sensitive biodiversity spots are reported all over the world. Such areas had once occupied 15.7% area of the Earth. At present, 86% of the sensitive areas are already destroyed. Presently, only 2.3% area of the Earth has been left over with sensitive spots. It includes 1,50,000 plant species which are 50% of the world count.

As far as India is considered, out of 135 species of animals, 85 species are found in the jungles of eastern region. About 1,500 endemic plant species are found in western ghat. Out of the total plant species in the entire world, 50,000 are endemic.

Three Endangered Heritage Places of the Country

The Western Ghat spread over the states of Gujarat, Maharashtra, Goa, Tamilnadu and Kerala has been endangered due to mining industry and search for natural gas. Habitats of Asiatic lion and wild bison of this region have been under threat.

Manas sanctuary of the Assam is under threat due to dams and indiscriminate use of water. Tiger and rhino of that region are under threat.

Sunderban sanctuary of West Bengal is reserved for tigers. However, the tiger population and overall local environment is seriously challenged by dams, deforestation, excessive fishing, trenches dug for same, etc.

Q.34 Give the Classification of Threatened Species

1. Endangered Species

Either number of these organisms is declined or their habitat is shrunk to such an extent that they can be extinct in near future if conservative measures are not implemented. Example, Lion tailed monkey, lesser florican.

2. Rare Species

Number of these organisms is considerably declined. Organisms of these species being endemic may become extinct very fast. Example, Red panda, Musk deer.

3. Vulnerable Species

Number of these organisms is extremely less and continues to decline. Continuous decline in their number is worrisome reason. Example, Tiger, Lion.

4. Indeterminate Species

These organisms appear to be endangered but due to their some behavioural habits (like shyness) there is no definite and substantial information. Example, Giant squirrel (Shekhru).

Exercise

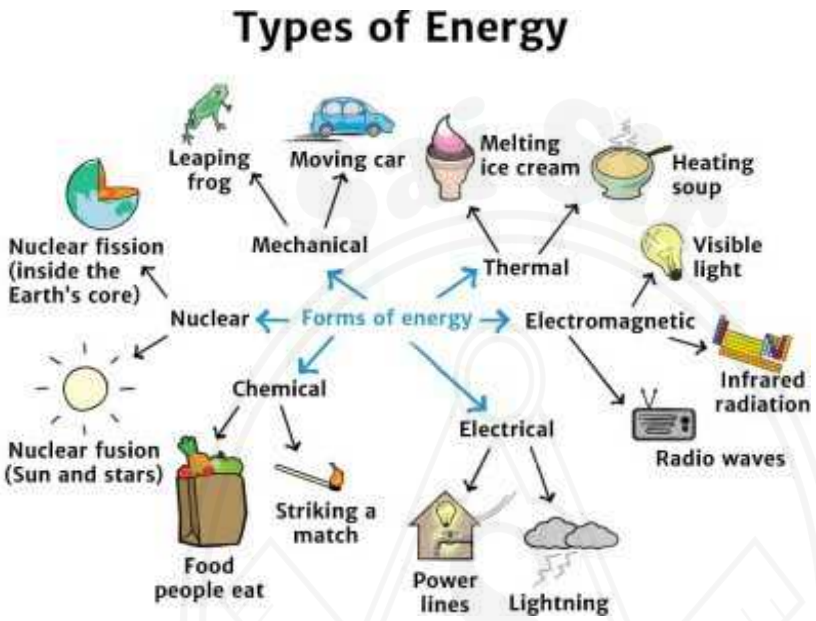
1. **Reorganize the following food chain. Describe the ecosystem to which it belongs.**
   Grasshopper – Snake – Paddy field – Eagle – Frog.
2. **Explain the statement-'we have got this Earth planet on lease from our future generations and not as an ancestral property from our ancestors.'**
3. **Write short notes.**
   a. Environmental Conservation.
   b. Chipko Movement of Bishnoi.
   c. Biodiversity.
   d. Sacred Groves.
   e. Disaster and its management.
4. **How will you justify that overcoming the pollution is a powerful way of environmental management?**
5. **Which projects will you run in relation to environmental conservation? How?**
6. **Answer the following.**
   a. Write the factors affecting environment.
   b. Why does the human beings have important place in environment?
   c. Write the types and examples of biodiversity.
   d. How the biodiversity can be conserved?
   e. What do we learn from the story of Jadav Molai Peyang?
   f. Write the names of biodiversity hot spots.
   f. Which are the reasons for endangering the many species of plants and animals? How can we save those?

5. Towards Green Energy

1. What is Energy?

It is the capacity to do work. Its SI unit is joules. Work and Energy have same units.

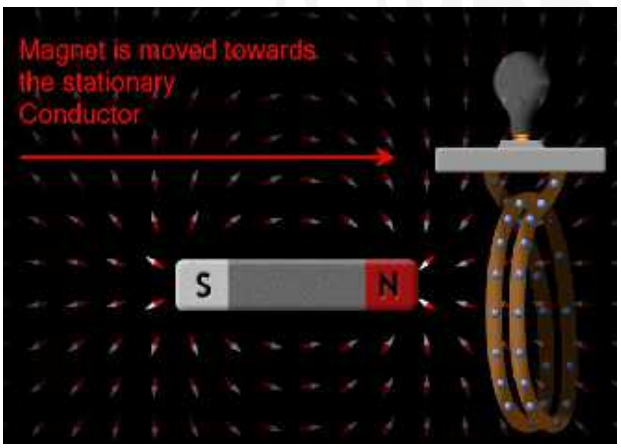
2. What are different types and forms of Energy?

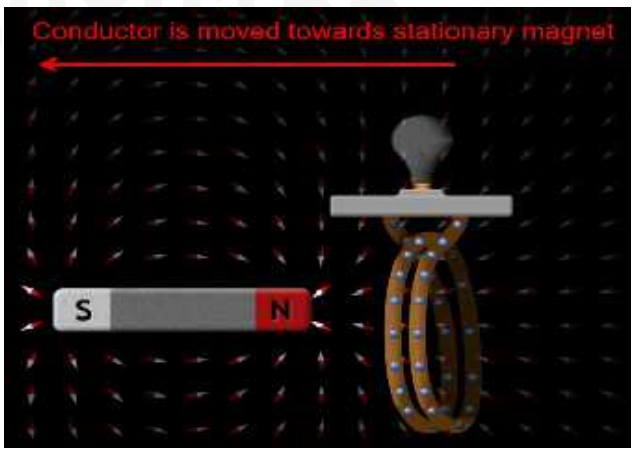


Q.1 Explain the principle of Generators for generating electrical energy

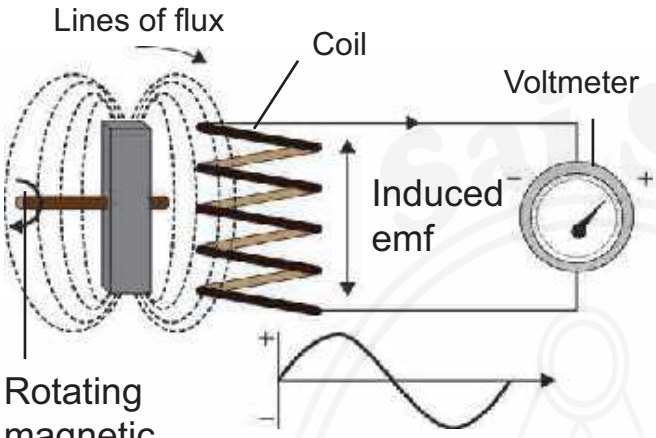
1. Most of the electric power plants are based on the principle of electromagnetic induction invented by Michael Faraday.
2. According to this principle, whenever magnetic field around a conductor changes, a potential difference is generated across the conductor.
3. The field around a conductor can be changed in two ways. If a conductor is stationary and magnet is rotating, the field around the conductor changes or if a magnet is stationary, but the conductor is moving then also the field around the conductor will change.
4. Thus, in both these cases, a potential difference is created across the conductor.

The electrical power generating machine based on this principle is called electric generator.

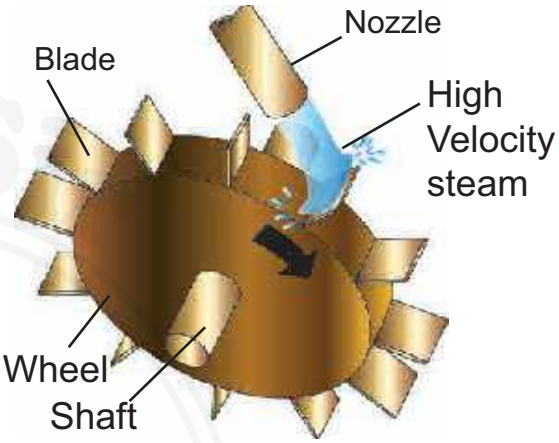




5. Such large generators are used in commercial power generation plants.
Turbine is used to rotate the magnet in the generator.
6. A turbine has blades, when a flow of liquid or gas is directed on the blades of the turbine, it rotates (see Figure 5.2). because of the kinetic energy of the flow.
7. This turbine is connected to electric generator. Thus the magnet in electric generator starts rotating and electric energy is produced (Fig.5.3)



5.1Electromagnetic Induction

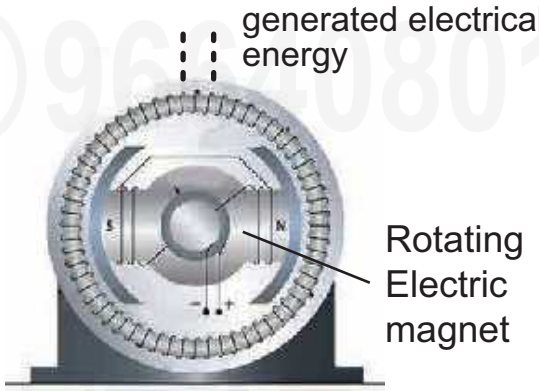


5.2 Steam turbine

This method of electric energy generation can be represented as below.

5.4 Flow chart showing generation of electrical energy

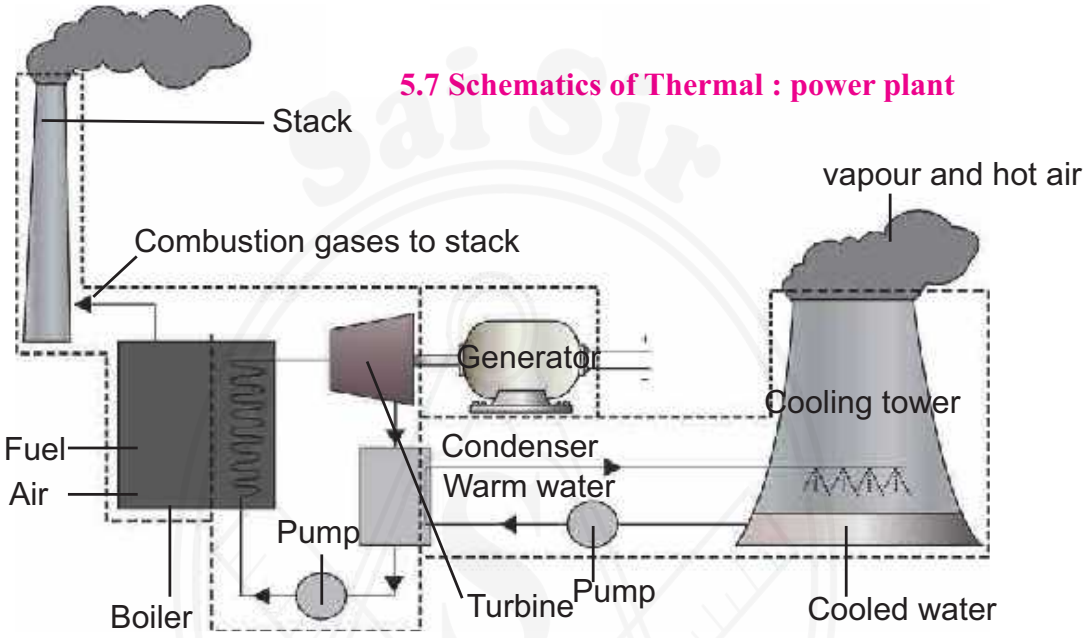
8. Thus, to generate electricity based on the principle of electromagnetic induction, we need a generator. To rotate the generator we need a turbine and to drive the turbine, we need an energy source.
9. Based on which type of energy source is used to rotate the turbine, there are different types of power generating stations.
10. The design of the turbine used in different types of power stations is also different.



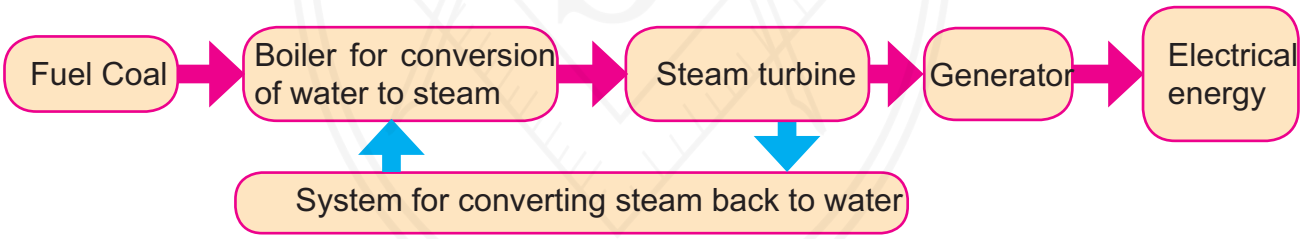
5.3 Schematic of electric generator

Q.2 Explain the working of Thermal energy based electric power station

In this the turbine is rotated using steam. Water is heated in a boiler. Using the thermal energy released due to burning of coal.
Steam of very high temperature and pressure is generated.
The energy in the steam drives the turbine.
Thus, the generator connected to the turbine rotates and electrical energy is produced.
The steam is converted back into water and the water is re-circulated to the boiler.
This is shown in flow chart in fig 5.5

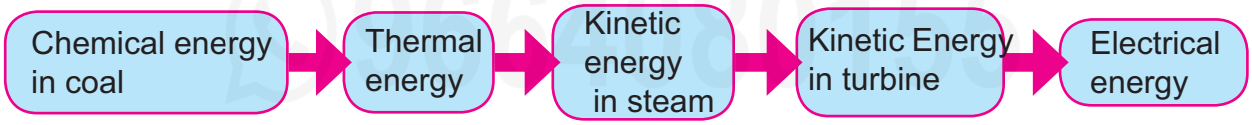


5.7 Schematics of Thermal : power plant



5.5 Flow chart showing generation of electrical energy using thermal energy

Since thermal energy is used here to generate electrical energy, such power plants are called thermal power plants. In thermal power plants, the chemical energy in the coal is converted into electrical energy through several steps which are shown in figure 5.6.



5.6 Energy transformation in thermal power plant

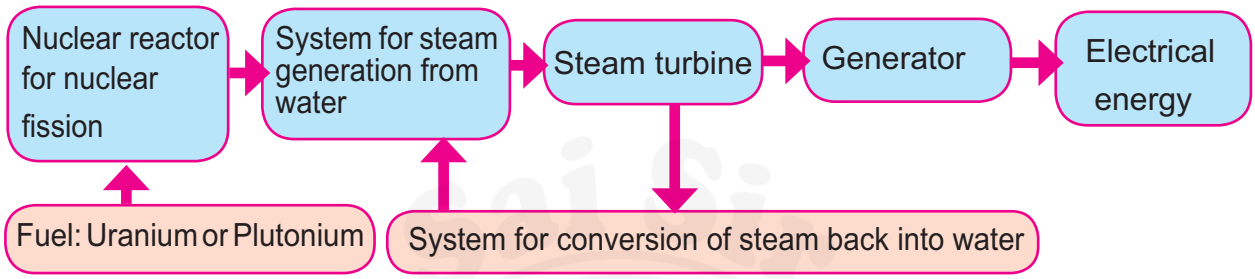
Problems

1. Air pollution due to burning of coal: Burning of coal results in emission of gases like carbon dioxide, sulphur oxide and nitrogen oxide which are harmful to the health.
2. Along with the emission of gases due to burning of coal, soot particles are also released into the environment.
3. This may cause serious health problems related to the respiratory system.

The reserves of fuel used in this method i.e. coal are limited.
Therefore, in future, there will be limitations on the availability of the coal.

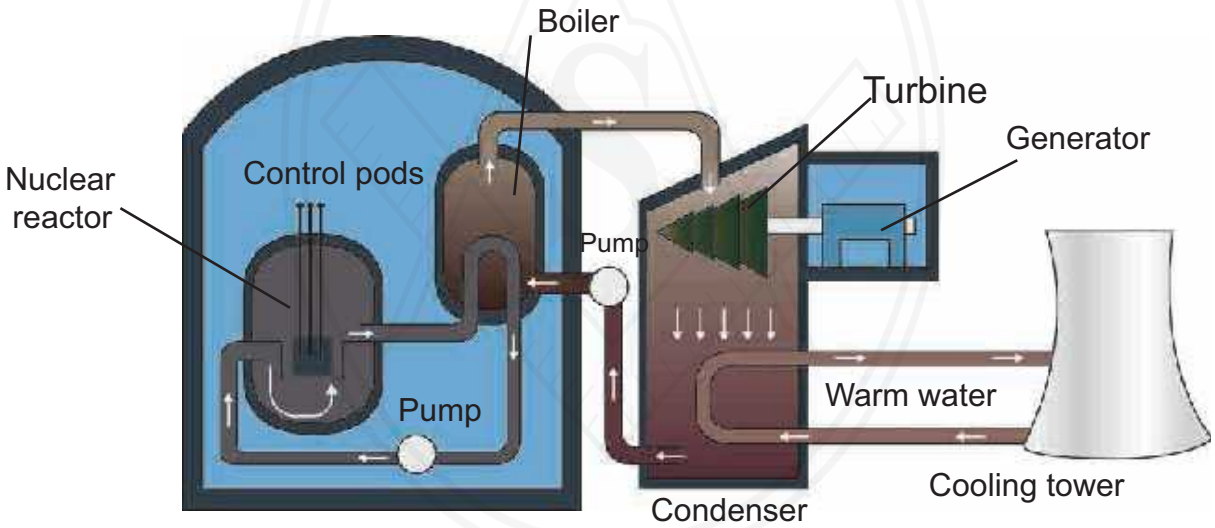
Q.3 Explain the Power plant based on Nuclear Energy

In the power plant based on nuclear energy also , steam turbine is used to rotate the generator. However, here, the energy released by fission of nuclei of atoms like Uranium or Plutonium is used to generate the steam of high temperature and high pressure. The energy in the steam rotates the turbine, which in turn drives the generator producing electricity. The flow chart of nuclear power plant is shown in fig 5.8 .

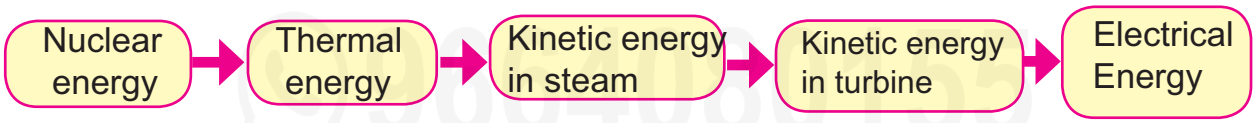


5.8 Nuclear power plant

Thus, here nuclear energy is converted into thermal energy, thermal energy is converted into kinetic energy of steam, kinetic energy of steam is converted into kinetic energy of turbine and finally the kinetic energy of the turbine is converted into electrical energy.
The step-by-step transformation of energy is shown in figure 5.5.



5.11 Schematic of nuclear power plant



5.9 Energy transformation in nuclear power plant

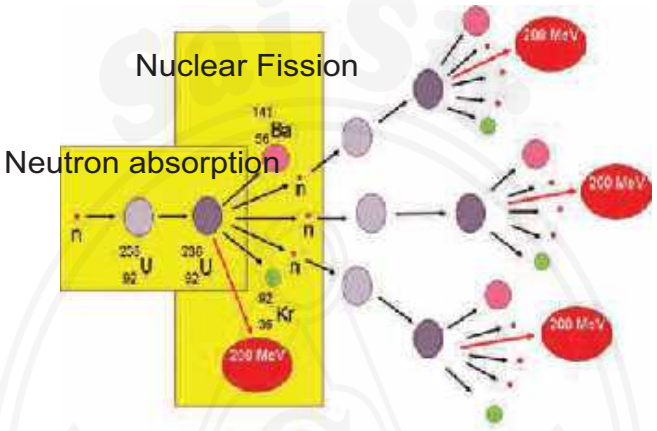
Problems:

1. A nuclear power plant does not use fossil fuel like coal. Therefore, problems like air pollution do not arise. Also, if sufficient nuclear fuel is available, this can be a good source of electrical energy. However, there are few problems associated with nuclear power generation.
2. The products after fission of nuclear fuel are also radioactive and emit harmful radiations. The products are called as nuclear waste. How to dispose the nuclear waste safely is a big challenge before the scientists.
3. An accident in nuclear power plant can be very fatal. This is because the accident may result in release of very harmful radiations.

Q.3 How does nuclear fission take place?

When neutron is bombarded on atom of Uranium - 235 , it absorbs the neutron and converts into its isotope Uranium - 236. Uranium - 236 being extremely unstable converts into atoms of Barium and Krypton through a process of fission releasing three neutrons and 200 MeV energy. The three neutrons generated in this process cause fission of three other Uranium - 235 atoms releasing more energy.

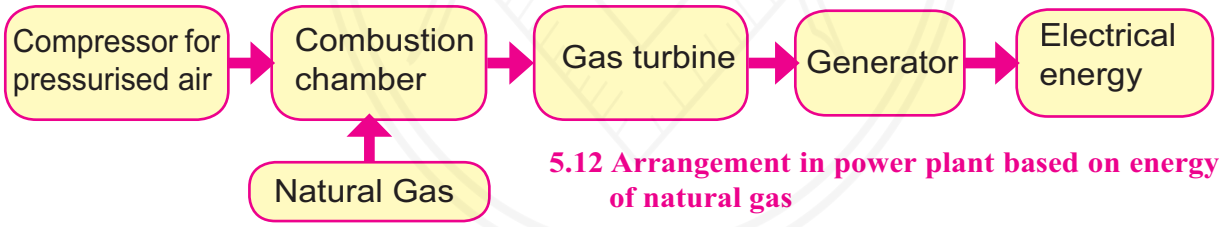
The neutrons released in this reaction release more energy through fission of more uranium nuclei. This process of fission of Uranium -235 atoms continues and is called the chain reaction. In nuclear power plants, a controlled chain reaction results in release of thermal energy, which is used for electric energy generation.



5.10 Nuclear fission (Chain reaction)

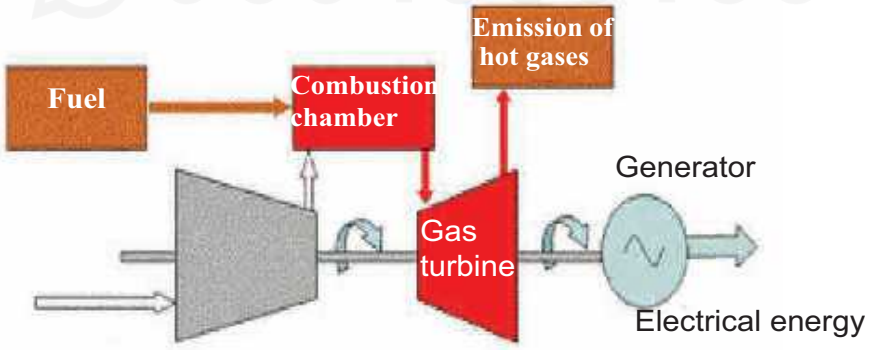
Q.4 Explain the Power generation plant based on energy of natural gas

In this plant, the turbine is run by a gas at very high temperature and pressure generated by combustion of natural gas. A flow chart showing various stages in the power generation plant based on natural gas energy is shown in figure 5.12.



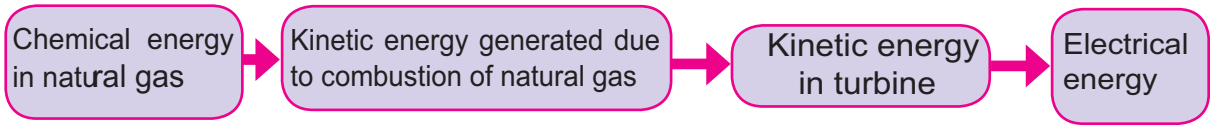
5.12 Arrangement in power plant based on energy of natural gas

There are three main sections in this type of plant. Pressurised air is introduced into the combustion chamber using a compressor. In the combustion chamber the natural gas burns in presence of the air. The gas at very high temperature and pressure generated in this chamber runs the turbine. The turbine then drives the generator to produce electricity. Step-by-step transformation of energy in this plant is shown in fig 5.13.



5.13 Schematic of power plant based on natural gas

The efficiency of this type of power generation plant is higher than that of power generation plant based on coal. Moreover, since the natural gas does not contain sulphur, burning of natural gas results in less pollution. The schematic of power plant based on natural gas is given in figure 5.14.

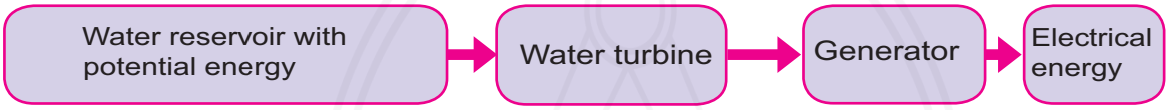


5.14 Transformation of energy in power plant using energy of natural gas

Q.5 Explain the Power generation plant based on Hydroelectric Energy.

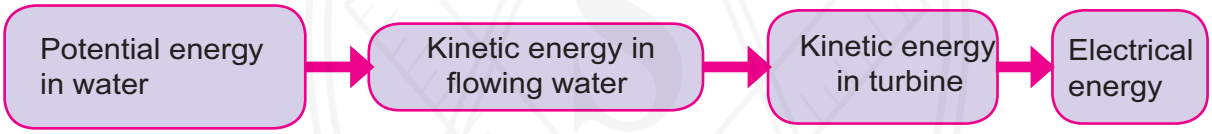
Kinetic energy in flowing water or the potential energy in water reservoir is a conventional source of energy. In hydroelectric power plant, the potential energy in water stored in dam is converted into kinetic energy of water. Fast flowing is brought from the dam to the turbine at the bottom of the dam. The kinetic energy of the flowing water drives the turbine. The turbine in turn drives the generator to generate electricity.

The block diagram showing different components of hydroelectric power plant is shown in figure 5.15

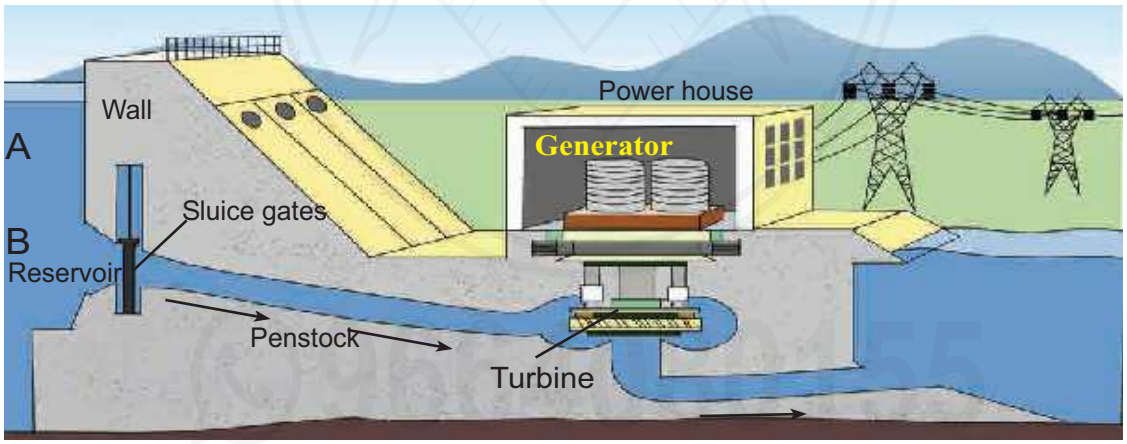


5.15 Different Stages in hydroelectric power plant

The schematic of hydroelectric plant is shown in Figure 5.17. Water from about middle of the total height of the dam is taken to the turbine, as shown by point B in the diagram.



5.16 Energy Transformation in hydroelectric powerplant



5.17 Schematic of Hydroelectric plant

Since no fuel is burnt in hydroelectric plant, no air pollution due to combustion of fuel results. However, considering the issues like forced migration of large community, submerging of forests and fertile land, adverse effect on living creatures in the river, it has always been a point of debate whether the hydroelectricity is environment friendly or not.

5.18 Koyana Dam

Advantages of hydroelectric power generation

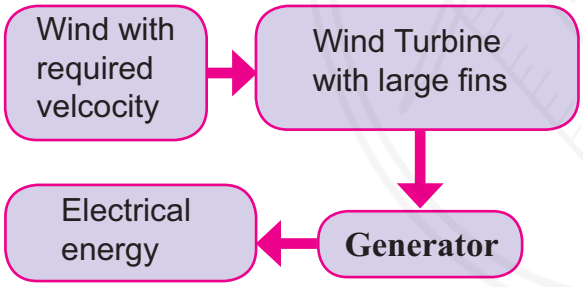
1. Since no fuel is burnt in hydroelectric power generation, there is no pollution resulting from combustion of fuels.
2. If there is sufficient water storage in the dam, it is possible to generate electricity as and when necessary.
3. Although water reservoir is used for power generation, it can be replenished during rainy season leading to uninterrupted power generation.

Problems associated with hydroelectric power plant

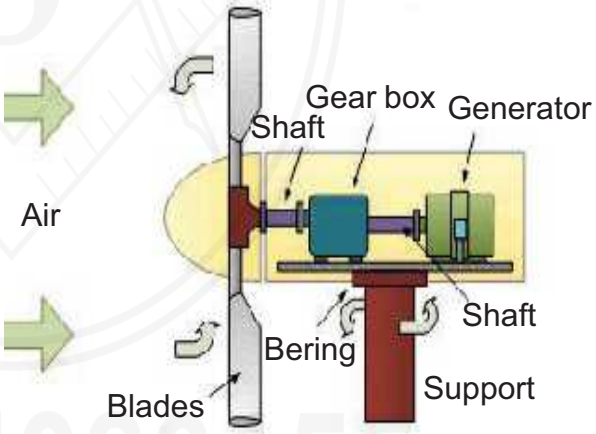
1. The back-water due to storage of water in dam may submerge villages or towns in that area. This leads to the problems of re-habitation of the displaced population. Moreover, this can also submerge forests as well as fertile land.
2. The obstruction of the flow of river water may have adverse effect on living world in the river.

Q.6 Explain the Power generation plant based on wind-energy.

The kinetic energy in wind has been used since long for lifting of water, for driving floor mill etc. The wind energy can also be used for electricity generation. The machine which converts the kinetic energy of wind to electrical energy is called wind-turbine. As the wind strikes the blades of the turbine, the blades rotate. The axel of the turbine is connected to electric generator through a gear-box. The function of the gear-box is to increase the rotations per unit time. Thus, the rotating blades drive the turbine and the turbine in turn drives the generator to generate electricity. Various stages in the \wind-energy generation system can be shown in figure 5.19 and schematics of a wind mill is shown in figure 5.20.



5.19 Stages in electric generator using wind energy



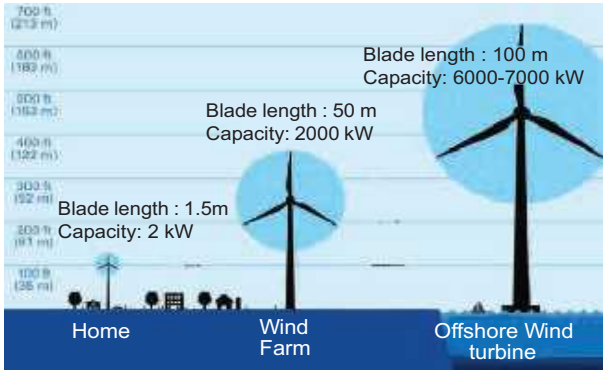
5.20 Schematic of wind mill

The energy conversion process is shown in figure 5.21.

5.21Transformation of energy in an electric generator using wind energy

Wind turbines with capacity right from less than 1 kW to about 7 MW (7000 kW) are commercially available. Depending on the wind velocity available at the site of installation, wind-turbine with specific capacity is selected. The wind velocity at specific location depends on many geographical factors.

Wind velocity is usually high on sea shores and that environment is appropriate for installation of wind turbine. Wind-energy is a clean energy source. However, the wind-velocity necessary for wind-energy generation is not available everywhere. In that sense, use of wind-energy is limited.



5.22 Wind turbines of different capacities

Q.7 Explain the methods of Electric Energy generation using solar energy

Using the energy in the Sunlight, electric energy can be generated in two ways:

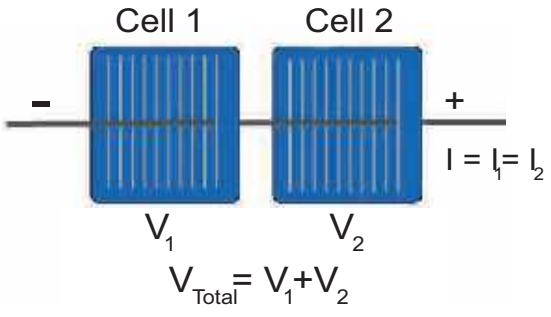
1. In all the above methods of electricity generation we have studied, the electric generator is driven by using some source of energy and electricity is generated by making use of the principle of electromagnetic induction. However, electrical energy can be generated directly from solar radiation without using generator and without using the principle of electromagnetic induction. This happens in solar photovoltaic cells. Solar photovoltaic cells convert the solar energy directly into electrical energy.
2. In the second method, the energy in solar radiation is converted into thermal energy first. Then a turbine-generator system is driven using that thermal energy to generate electricity.

Q.8 Write a note on Solar photovoltaic cell

Solar photovoltaic cell converts the solar radiation energy directly into electrical energy. This is called solar photovoltaic effect. The electrical energy generated through this energy transformation process is DC in nature. These solar cells are made of a special type of material called semiconductor (e.g. silicon). A silicon solar cell of dimension 1 cm^2 generates current of about 30 mA and potential difference of about 0.5 V. Thus, a silicon solar cell of dimension 100 cm^2 will generate about 3 A (30 mA/cm^2 X 100 cm^2=3000 mA= 3 A) current and 0.5 V. Remember that the potential difference available from a solar cell is independent of its area.

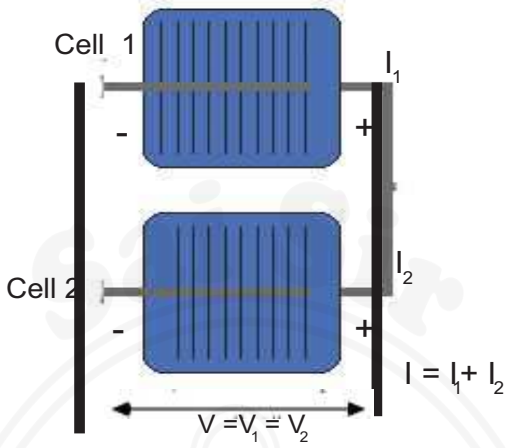
Energy in Sunlight —(Photovoltaic effect)→ **DC Electric power**

If two solar cells are connected in series as shown in figure 5.23, the potential difference obtained from this combination is addition of the potential differences of individual solar cells. However, the current generated from this combination is equal to the current from an individual cell. It means that when solar cells are connected in series, currents from the individual cells are not added.



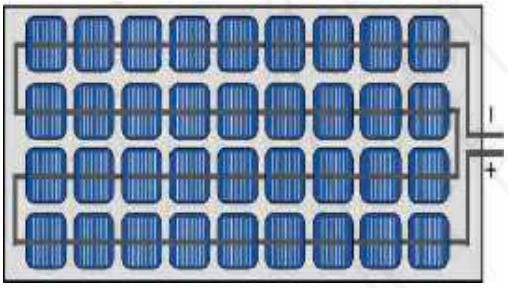
5. 23 Solar cells in series

Similarly as shown in figure 5.24, if two solar cells are connected in parallel, the current generated from this combination is the summation of the currents from an individual solar cells. However, the potential difference obtained from this combination is the same as the potential difference obtained from individual cell. Thus, if two solar cells are connected in parallel, the potential differences from the two cells are not added.

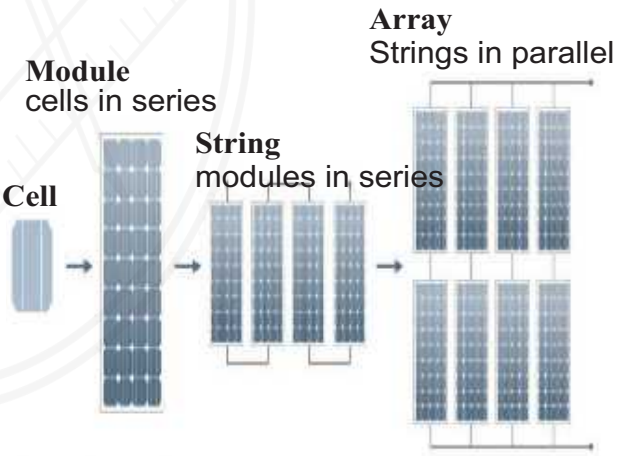


5.24 Solar cells in parallel

In this way, by connecting many solar cells in series and in parallel solar panels generating required current and potential difference are made. See Figure 5.25.
For example, if 36 solar cells, each of size 100 cm^2 are connectedin series in a solar panel, it will give potential difference of 18 V and current of 3 A.
Many such panels are connected together to generate electricity on larger scale.
A good solar cell can have an efficiency of around 15%. It means that if a solar panel receives power of 100 watt from solar radiation, the electrical power output from the panel will be 15 watt.



5.25 A solar panel made from 36 solar cells



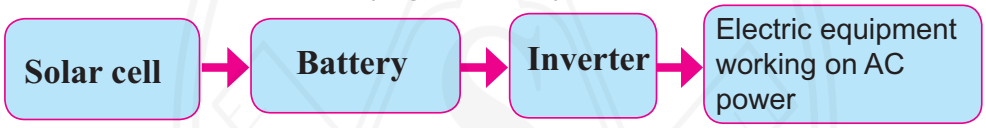
5.26 Solar cell to solar array

Many solar panels are connected in series and in parallel to generate required current and potential difference.
As shown in Figure 5.26, solar cell is the basic unit in solar electric plant .
Many solar cells come together to form a solar panel. Many solar panels connected in series form a solar strings, and, many solar strings connected in parallel form a solar array.
As we can obtain as much electrical power as needed, they are used in applications which need marginal power (e.g. calculators that run on solar energy) to power station of MW capacity.
The power available from the solar cells is DC. So, in applications which need DC power , e.g. electric lights based on Light Emitting Diodes, the energy can be directly used. However, since the energy from solar cell is available only in presence of sunlight, the energy has to be stored in batteries for use at later time.

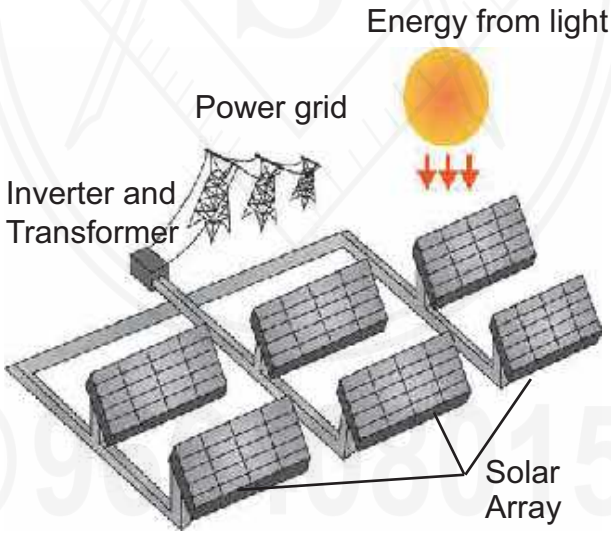
Ex.1 One solar panel produces a potential difference of 18 V and current of 3A. Describe how you can obtain a potential difference of 72 Volts and current of 9 A with a solar array using solar panels. You can use sign of a battery for a solar panel.

Q.9 Explain Solar photovoltaic power station

Most of the equipment in domestic as well as industrial use run on AC power. In such case, the DC solar power must be converted to AC power using an electronic device called inverter(Figure 5.27).



5.27 Conversion of energy generated by cells to AC form by using inverter

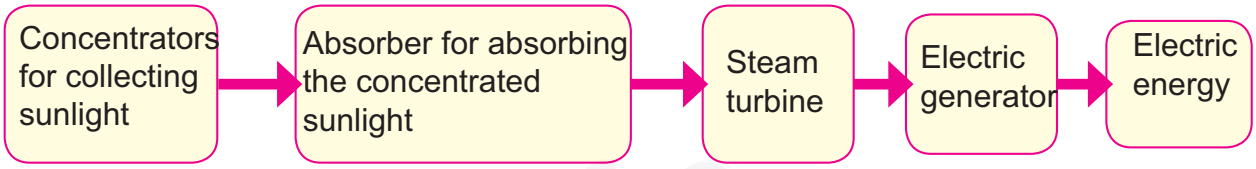


5.28 Schematic of solar photovoltaic station

Solar panels can be connected together to generate whatever energy we need. As shown in Figure 5.28, the DC power generated from these panels is first converted into AC power. A transformer transforms the voltage and current levels of the generated power and then it is fed into the electricity distribution network.
Figure 5.28 is a schematic diagram of solar photovoltaic power station.
In this way, electricity is generated without any fuel combustion and so with out any air pollution. However, since the energy is generated using solar radiation, solar cells can generate electricity during day-time only.

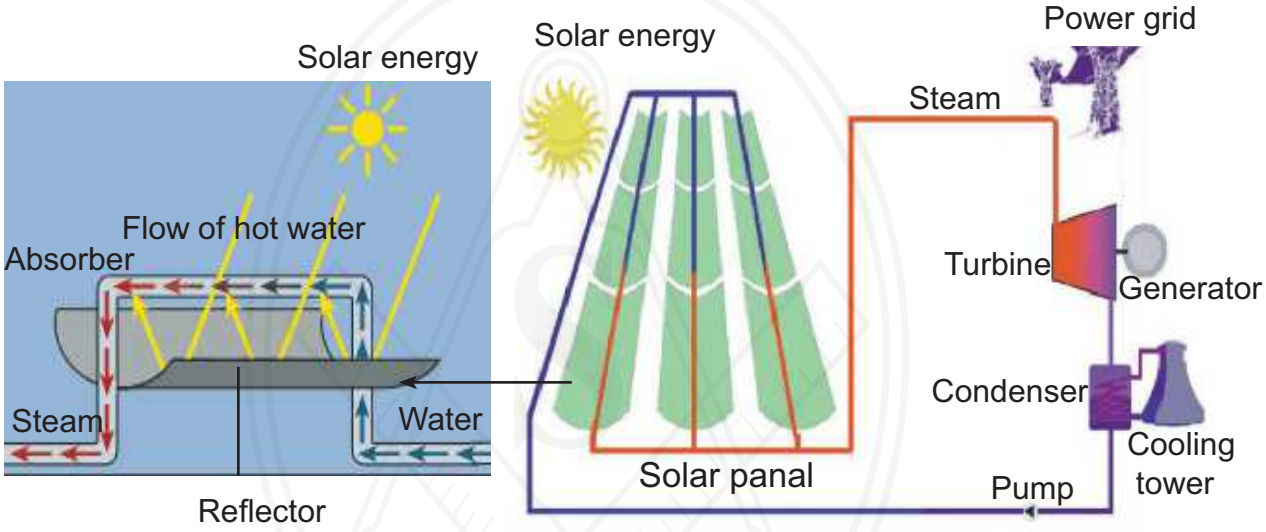
Q.10 Explain Solar Thermal power plant

Thermal energy generated from coal and nuclear fuel can be used to generate electricity. Thermal energy can also be generated from solar radiation and can be used for electricity production. Different stages in such solar thermal power plant are as shown in figure 5.29



5.29 Different stages in solar thermal power plant

As shown in Figure 5.30 , many reflectors reflect and concentrate solar radiation on absorbers. There solar energy is converted into heat energy. Using this heat energy steam is generated to drive the turbine and generator.



5.29 Schematic of solar thermal power plant

Energy sources use for electrical power generation in the world.

Souces	World (%)	India (%)
Coal	41	60
Natural Gas	22	08
Hydroelectric	16	14
Nuclear energy	11	02
Petrolium	04	0.3
Renewable sources (wind, solar etc)	06	15.7
Total	**100**	**100**

Q.11 What is meant by green energy? Which energy sources can be called as green energy sources and why? Give examples.

There are other ways of electricity production which avoids above problems. Electricity generation from water reservoir, wind, Sunlight, bio-fuels etc are the examples of such methods. The energy sources used in such options i.e. water -reservoir, wind, sunlight, biofuel are never-ending i.e are perpetual. Moreover, use of these sources do not lead to environmental problems discusses above. Therefore, electricity generation through these sources can be called environment friendly.
We can also call the energy generated by these processes as green energy.
Looking at the problems in electricity generation using fuels like coal, natural gas and nuclear fuels, the world is now heading towards environment friendly energy i.e. green energy.

Q.12 Write short note on
Electrical energy generation and environment.

Electricity generation based on fossil fuels like coal, natural gas and nuclear fuels like uranium and plutonium are not environment friendly. It means, that if electrical energy is generated using these fuels, it can lead to environmental degradation.

1. We have seen that burning of fossil fuels like coal, and natural gas leads to emission of certain gases and soot particles. This results in air pollution. Incomplete combustion of fuels leads to formation of carbon monoxide.
It adversely affects our health. Increase in percentage of carbon dioxide in the air due to burning of fuels affects environment severely. The phenomena of global warming is an example of this. Nitrogen dioxide generated due to burning of fuels like coal, diesel, petrol, etc. lead to problems like acid-rain.
Soot particles generated due to incomplete burning of fossil fuel cause air pollution. It can lead to problems related to respiratory system, like asthma.

2. It took millions of years for formation of fossil fuels like coal, crude oils and natural gases (LPG and CNG). Also, the reserves of these fuels are limited. They are going to deplete in future. It is said that with the current speed of their use, the coal reserves in the world would last for another about 200 years or so and the natural gas reserves for about 200- 300 years.

3. We have also discussed above about the problems in use of nuclear energy like the disposal of nuclear waste and possibility of disaster due to accident in nuclear power plant.

Considering all these points, it can be said that the energy generation from fossil fuels and nuclear fuels are not environment friendly.

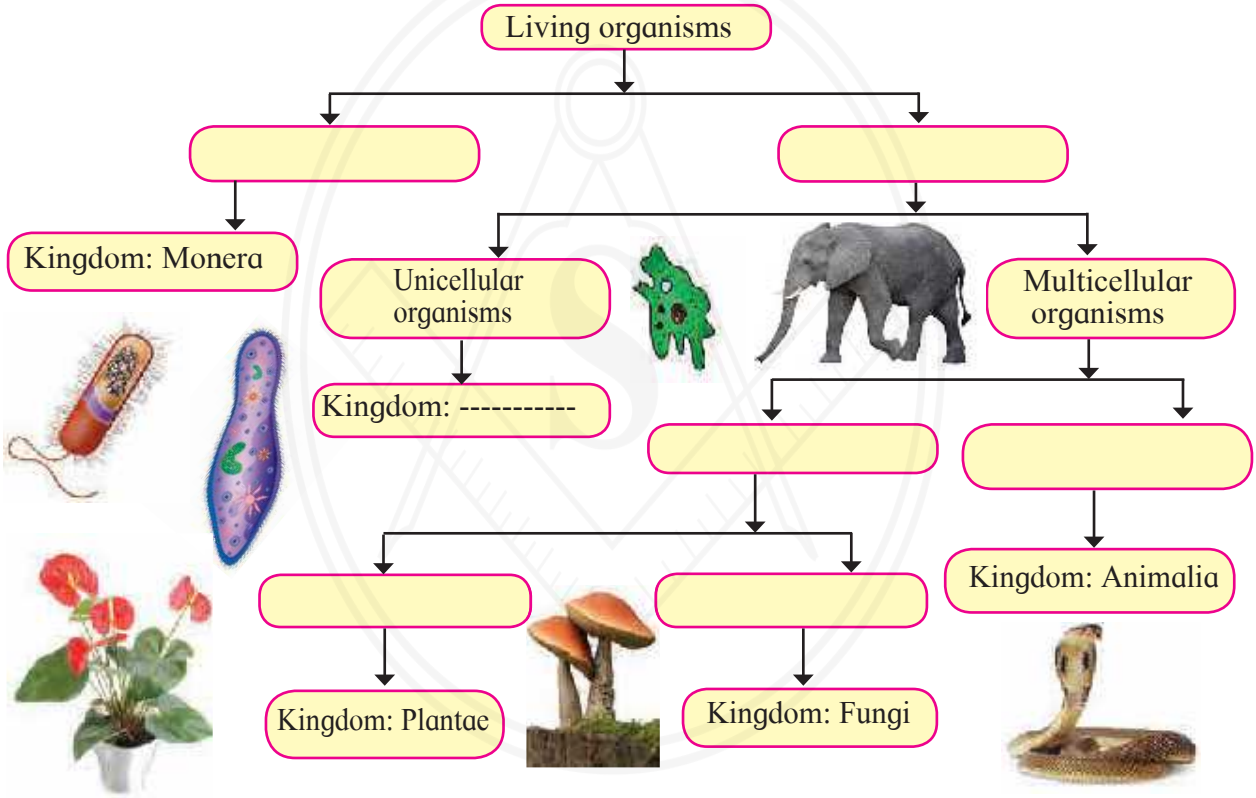
6. Animal Classification

Q.1 Which criteria are used for classification of organisms?

Some of the criteria used to classify organisms are as follows
Complexity of cell structure: Prokaryotic, Eukaryotic
Complexity of body organization: Unicellular, Multicellular
Presence/ absence of cell wall: Plant cell(with cell wall), Animal cell(without cell wall)
Mode of nutrition: Autotrophic, Heterotrophic and Saprotrophic
Mode of reproduction: Asexual, Sexual

Q.2 Complete the following chart.

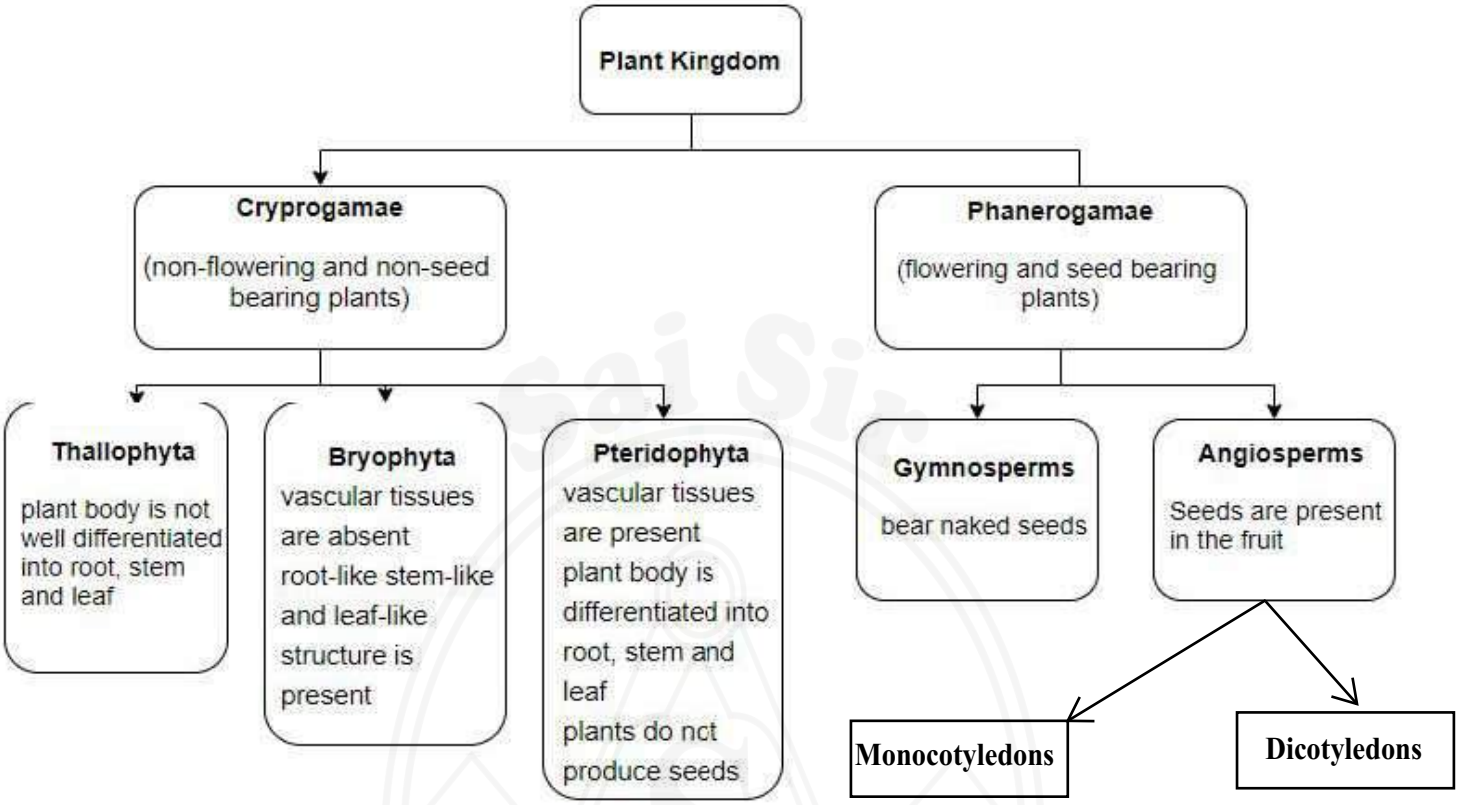
Classification of living organisms



Q.3 Define animal classification

Formation of groups and sub-groups of animals depending upon similarities and differences among animals is called as animal classification.

Q.4 How are plants classified.



Q.5 Write in brief about progressive changes in animal classification.

Time to time, different scientists have tried to classify the animals.
Greek philosopher Aristotle was the first to perform the animal classification.
Aristotle classified the animals according to the criteria like body size, habits and habitats.
Further, as per the new developments in sciences, references were changed and thereby the criteria of animal classification too.
Classification proposed by Aristotle is known as 'Artificial method'.

Besides Aristotle, artificial method of classification was followed by Theophrastus, Pliny, John Ray, Linnaeus, etc. Later on, 'Natural system of classification' was followed.
Natural system of classification was based on various criteria like body organization, types of cells, chromosomes, bio-chemical properties, etc.
By the time, system of classification based on evolution was also brought into practice.
It was used by Dobzhansky and Meyer.
Recently, Carl Woese has also proposed the animal classification.

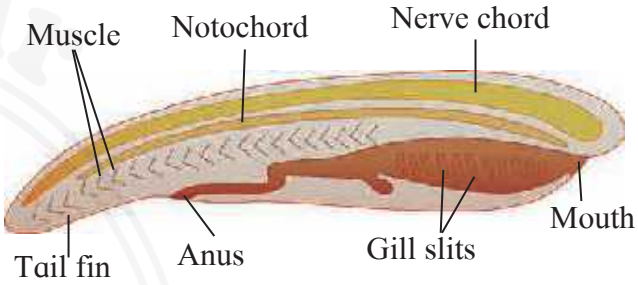
At present, according to the five kingdom classification system of Robert Whittaker, all multicellular animals are included in Kingdom: Animalia.
This system of classification is based upon some criteria like Body organization, Body symmetry, Body cavity, Germinal layers, Segmentation, etc.

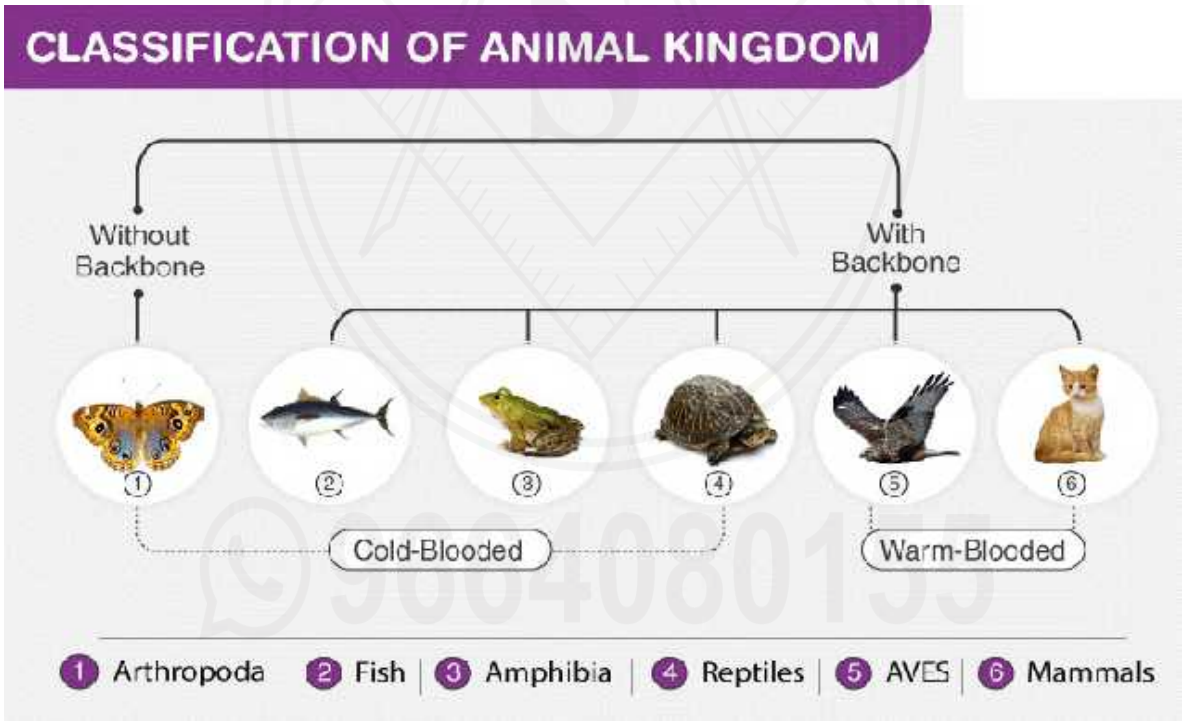
Q.5 Write in brief Traditional method of animal classification.

Traditionally, depending upon presence or absence of the notochord, the animal kingdom has been divided into two groups- **Non-chordates and Chordates.**

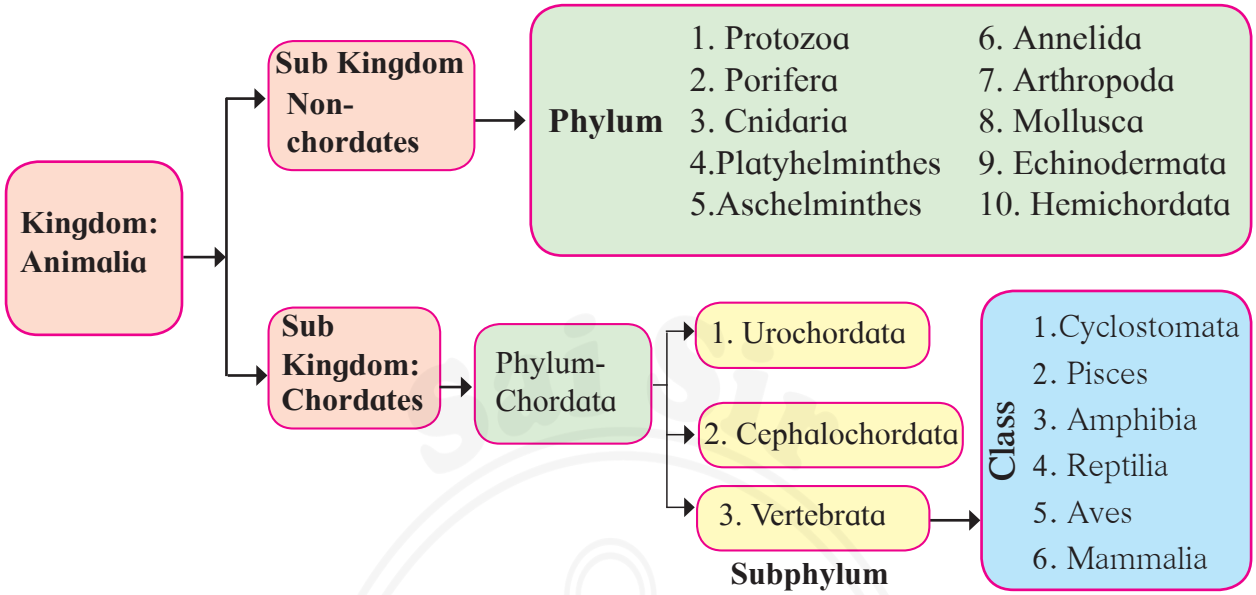
A. Non-Chordates: Characters of non-chordate are as follows
1. Body is not supported by rod-like notochord.
2. Pharyngeal gill-slits are absent.
3. Nerve cord; if present, it is on ventral side. It is solid & paired.
4. Heart, if present, it is on dorsal side.

B. Chordates: Characters of Chordate animals are as follows
1. Body is supported by notochord.Notochord is a long rod like supporting structure present on orsal side of animal body. It keeps the nerve tissue isolated from remaining body.
2. Pharyngeal gill-slits or lungs are present for respiration.
3. Nerve cord is present on dorsal side of body. It is hollow.
4. Heart is present on ventral side of body.





Q.6 Give the convectional system of animal classifcation.

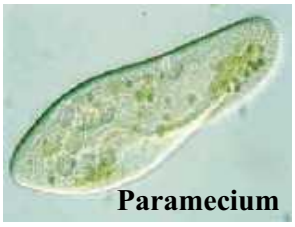


Q.7 What are the benefits of animal classification

1.Study of animals becomes convenient.
2.Study of few animals from a group helps to understand about that entire animal group.
3.It gives idea about animal evolution.
4.Animals can be easily identified with great accuracy.
5.It helps to understand the relationship of animals with other living organisms.
6.It helps to understand the habitat of each animal and it's exact role in the nature.
7.It helps to understand various adaptations shown by animals.

Q.8 Explain in details the types of grades of organization

1. Protoplasmic grade organization:
It is seen in unicellular animals.
Their body is composed of single cell, which performs all functions.
Example: Phylum:-Protozoa.



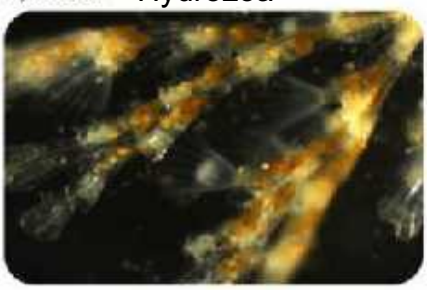
2. Cellular grade organization:
It is seen in multicellular animals in which tissues are not formed.
Example: Phylum:- Porifera.

3. Cell tissue grade organization:
It is seen in some animals, in which cells come together to form tissues and perform different body functions.
Example: Phylum:- Cnidaria.

Jellyfish

Coral

Hydrozoa



4. Tissue organ grade organization:
In this type of organization, tissues are organized to form some organs. Although, complete organs systems are not formed.
Example: Phylum:- Platyhelminthes - Flatworms

tapeworm

planaria

parasitic fluke

5. Organ system grade organization:
It is seen in animals in which different organs come together to form organ systems that perform specific functions.
Example: Crab, frog, humans etc.

Q.9 Explain briefly how animals can be classified based on body symmetry.

1. Asymmetrical Body :
In case of such body, there is no any such imaginary axis of the body through which we can get two equal halves.
Ex. Amoeba, Paramoecium, some sponges.

Sponge

2. Radial symmetry :
In this type of body, if imaginary cut passes through central axis but any plane of body, it gives two equal halves. Ex. Star fish.
In case of this animal, there are five different planes passing through central axis of body through which we can get two equal halves.

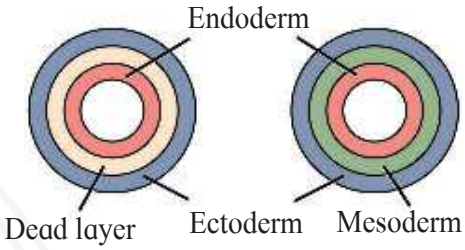
Star fish

3. Bilateral symmetry:
In this type of body, there is only one such imaginary axis of body through which we can get two equal halves.
Ex. Insects, fishes, frog, birds, goat, human, etc.

Goat

Q.10 Explain briefly how animals can be classified based Germ Layers

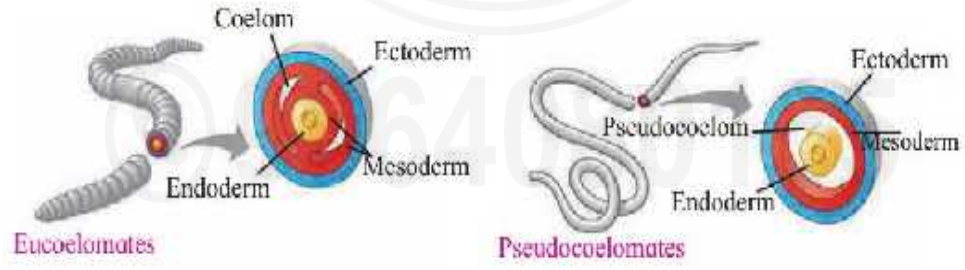
In case of multicellular animals, germ layers are formed during initial period of their embryonic development and from those germ layers only, different tissues are formed in the body. In case of some animals, only two germ layers [Endoderm & Ectoderm] are formed.
Ex.: All Cnidarians.
In most of all the remaining animals, three germ layers are formed i.e. mesoderm besides endoderm & ectoderm.

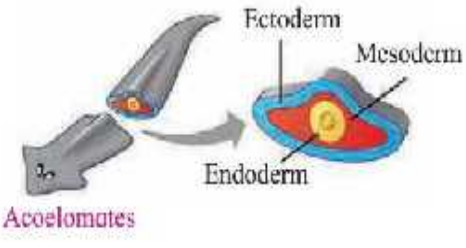


Diploblastic and triploblastic

Q.10 Explain briefly how animals can be classified based body cavity

Cavity between the body and internal organs is called as body cavity/coelom.
In case of multicellular animals, during initial period of their embryonic development body cavity is formed from either mesoderm or gut.
Such type of body cavity is present in animals of phylum Annelida and all phyla coming after Annelida. Such animals are called as eucoelomate (animals with true body cavity).
Body cavity is absent in case of animals from phyla Porifera, Cnidaria and Platyhelminthes. Such animals are called as acoelomate.
In case of animals from phylum Aschelminthes, they have body cavity but it is not formed by the above mentioned two ways.
Hence those animals are called as pseudocoelomates.

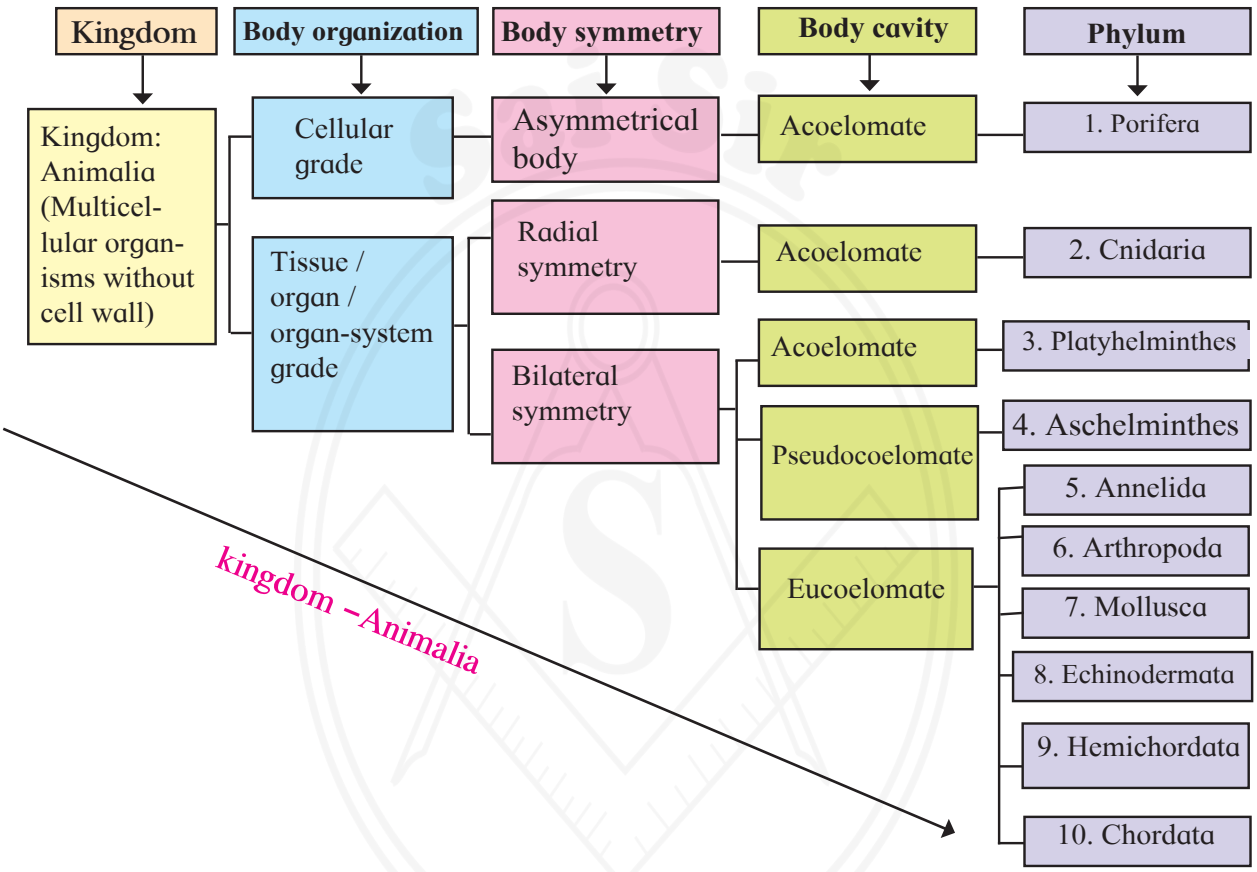




Q.11 Explain briefly how animals can be classified based on body segmentation

If the body of animals is divided into small, similar units, then such body is called as segmented and each small unit is called as segment.
Ex. Animals like earthworm from phylum Annelida.

Classification of Kingdom Animalia

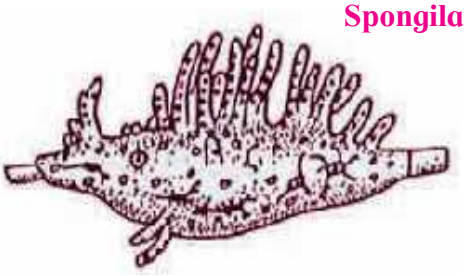


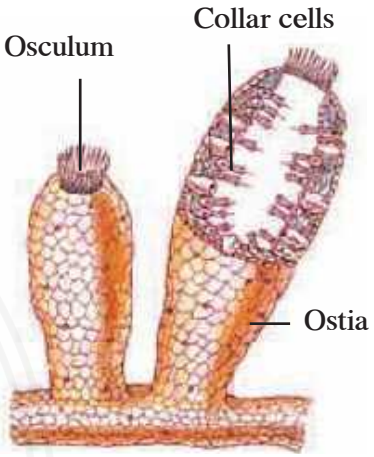
Q.12 State the characteristics of animals belonging to phylum Porifera.

Phylum- Porifera

1. These animals are with simplest body plan and are called as 'Sponges'. They bear numerous pores on their body. Those pores are called as 'Ostia' and 'Oscula'.
2. These are aquatic animals. Most of them are marine and few are fresh water dwellers.
3. Most of the animals have asymmetrical body.
4. These animals have special types of cells- collar cells.
5. These animals are always attached to substratum, hence do not show locomotion. Hence, they are referred as sedentary animals.
6. Their spongy body is supported by spicules or spongin fibres. Spicules are made up of calcium carbonate or silica.
7. These animals feed upon small organisms taken in their body along with water. Water is taken in through ostia and given out through oscula.
8. These animals reproduce by budding, an asexual method and / or by sexual method. Besides, they have good ability of regeneration.
   Examples: *Sycon, Euspongia* (Bath sponge), *Hyalonema, Euplectella*, etc.

Spongila

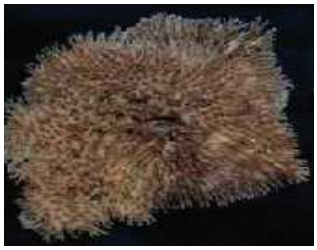


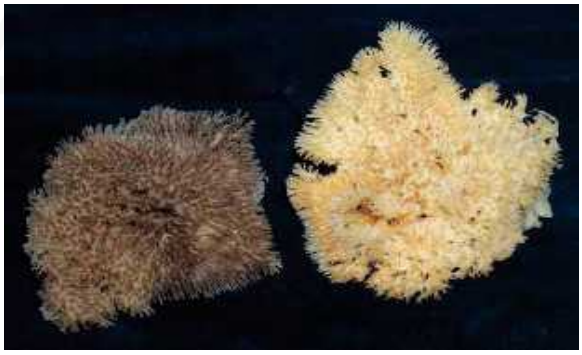


Sycon sponge

Q.13 Write a short note on Bath Sponge

Bath sponge: This is black coloured and somewhat round-shaped animal. Its body is mainly made up of fibers of a protein- spongin and due to this, they have good water-holding capacity. It was used for bathing during old days. Besides, it was also used for manufacturing of pillows and cushions. These were also used as wetting material for sticking postal stamps and counting the currency notes.

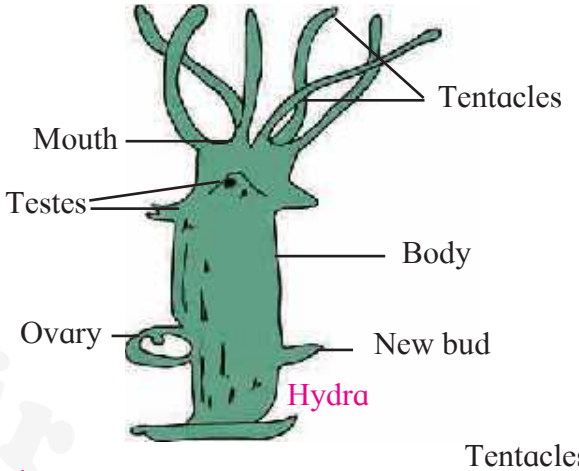




Q.14 State the characteristics of animals belonging to phylum Coelenterata/Cnidaria

Phylum - Coelenterata/Cnidaria

1. Body of these animals is cylindrical or umbrella-like. If it is cylindrical, it is called as 'Polyp' and if it is umbrella like called as 'Medusa'.
2. Most of these animals are marine. Only few are fresh-water dwellers.
3. Body of these animals is radially symmetrical & diploblastic.
4. Cnidoblast bearing tentacles are present around the mouth. Tentacles are useful for capturing the prey whereas cnidoblasts inject the toxin in the body of prey. Those are useful for protection too. Examples: *Hydra, Adamsia* (Sea anemone), *Physalia* (Portuguese- man-of war), *Aurelia* (Jelly fish), Corals, etc.



Coral

Sea anemone

Q.15 Define corals reefs. State its use.

Coral reefs are present in ocean. These reefs are actually colonies of specific cnidarians. A precious stone called 'Coral' and the coral powder (प्रवाळ भस्म) used in ayurveda is derived from these reefs.

Q.16 State the characteristics of animals belonging to phylum Platyhelmenthis

Phylum - Platyhelminthes

1. Body of these animals is slender & flat like a leaf or strip. Hence, they are called as 'flatworms'.
2. Most of these animals are endoparasites. Few are free-living & aquatic.
3. Body is acoelomate & bilaterally symmetrical.
4. These are triploblastic i.e. their body is made up of three germ layers- endoderm, ectoderm & mesoderm.
5. These animals are hermaphrodite i.e. male and female reproductive systems are present in the same animal body. Examples: Planaria, Liverfluke, Tapeworm, etc.

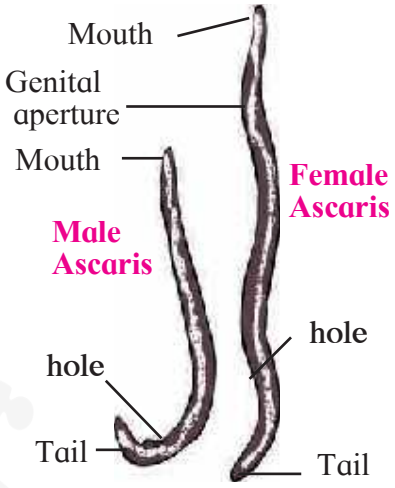
Tape worm

Planaria

Q.17 State the characteristics of animals belonging to phylum Aschelminthes

Phylum- Aschelminthes

1. Body of these animals is long thread-like or cylindrical. Hence, they are called as round worms.
2. These animals are either free living or endoparasites. Free living animals are either aquatic or terrestrial.
3. Body of these animals is triploblastic and pseudocoelomate.
4. Body of these animals is non-segmented and covered with tough cuticle.
5. These animals are unisexual.
   Examples: *Ascaris* (Intestinal worm), Filarial worm, *Loa loa* (Eye worm), etc.



Q.18 State the characteristics of animals belonging to phylum Annelida

Phylum - Annelida

1. Body of these animals is long, cylindrical & metamerically segmented.
2. Most of the animals are free-living, but few are ectoparasites. Free-living animals may be marine or fresh water dwellers or terrestrial.
3. These animals are triploblastic, bilaterally symmetrical and eucoelomate.
4. They have setae or parapodia or suckers for locomotion.
5. Their body is covered with special cuticle.
6. These animals are either hermaphrodite or unisexual.
   Examples: Earthworm, Leech, *Nereis*, etc.

How may be the leech used in ayurvedic system of treatment

Q.19 State the characteristics of animals belonging to phylum Arthropoda

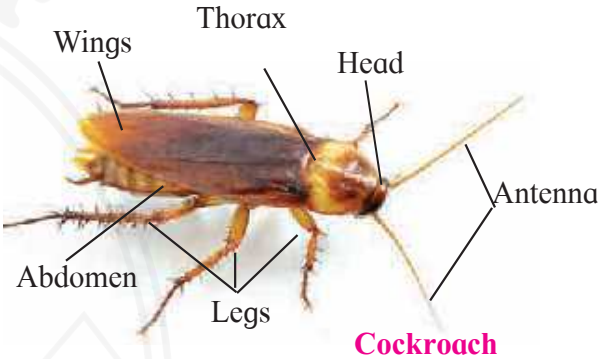
Phylum- Arthropoda

1. These animals have jointed appendages. Hence they are called as arthropods.
2. Planet Earth has highest number of animals from this phylum. Hence, this is largest phylum with highly successful animals in animal kingdom.
3. These animals are found in all types of habitats ranging from deepest oceans to highest mountains.
4. Body of these animals is triploblastic, eucoelomate, bilaterally symmetrical and segmented.
5. Chitinous exoskeleton is present around their body.
6. These animals are unisexual.

Examples: Crab, spider, scorpion, millipede, centipede, cockroach, butterfly, honey bee, etc

Butterfly

Centipede



Cockroach

Scorpion

What is chitin?

Chitin is a polysaccharide. It is the major constituent of exoskeleton of arthropods. It is also found in cell walls of fungi.

What are the benefits and hamr occur to human from animals of phylum - arthropods

Benefits: 1. Pollinate crops (Bees, wasps, butterflies, moths, beetles)
2. Act as predators of pests (Dragonflies, millipedes, scorpians)
3. Silk Production (Silk worm)
4. Honey Production(Honey Bees)
5. Used as food (Crabs, lobsters, shrimp, prawns)

Harm: 1.Sting or bite people (Scorpions, spider, bed bugs, ants)
2. Cause damage to wooden structure (Termites)
3. Transmit diseases (Cockroach, flies)
4. Eat food crops (Grasshoppers)
5. Live as parasites (Lice, ticks)

Which are the animals from phylum Arthropoda those have shortest & longest lifespan?

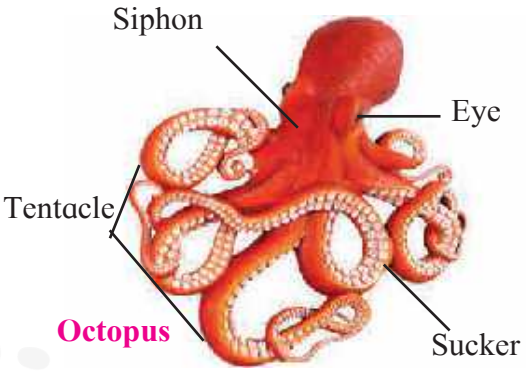
Mayfly has shortest life span of 24 hours.

Lobsters have longest life span. Female lobster : 54 years, Male lobster: 31 years

Q.20 State the characteristics of animals belonging to phylum Mollusca

Phylum- Mollusca

1. Body of these animals is soft and slimy. Hence they are referred as mollusc.
2. This is second largest phylum in animal kingdom.
3. These animals are aquatic or terrestrial. Most of the aquatic molluscs are marine, but few are fresh water dwellers too.
4. Body of these animals is triploblastic, eucoelomate, non-segmented and soft. Except animals like snail, their body shows bilateral symmetry. Their body is divided into three divisions like head, foot and visceral mass.
5. Visceral mass is covered with mantle. This mantle secretes a hard, calcareous shell. This shell may be external or internal or even absent in some cases.
6. These animals are unisexual.
   Examples: Bivalve, Snail, Octopus, etc.



Octopus


Bivalve


Snail

Q.21 State the characteristics of animals belonging to phylum Echinodermata

Phylum- Echinodermata

1. Calcareous spines are present on the body of these animals; hence they are called as echinoderms.
2. These animals are found only in ocean.
3. Their body is triploblastic, eucoelomate. And it is radially symmetrical in adult stage. However, they show bilateral symmetry in larval stage.
4. They perform locomotion with the help of tube-feet. Tube feet are also useful for capturing the prey. Some animals are sedentary.
5. They have skeleton made up of calcareous spines and / or ossicles (plates).
6. These animals have good ability of regeneration.
7. These animals are mostly unisexual.
   Examples: Star fish, sea-urchin, brittle star, sea-cucumber, etc.


Star fish


Sea-cucumber

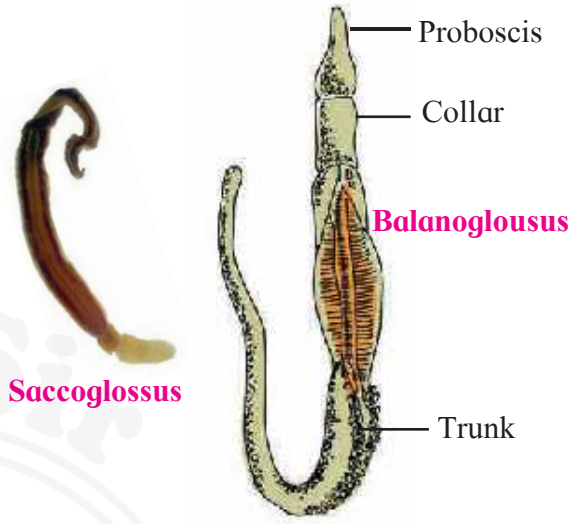

Sea-urchin

Q.22 State the characteristics of animals belonging to phylum Hemichordata

Phylum- Hemichordata

1. Body of these animals is divided into three parts as proboscis, collar & trunk.
2. Notochord is present in proboscis region only. Hence, they are called as hemichordates.
3. These animals are also called as 'acorn worms'.
4. These are marine animals, live in burrows in sand.
5. They have one to many pharyngeal gill slits.
6. They are unisexual or some may be hermaphrodite.

Ex.: *Balanoglossus, Saccoglossus.*



Balanoglossus is considered as connecting link between non-chordates and chordates. This animal shows the characters of both the groups.

Q.23 State the characteristics of animals belonging to phylum Chordata

Phylum- Chordata

These animals have supporting notochord in their body. All chordates are included in the same phylum. The phylum Chordata is classified in to three subphyla. Following are important characters of phylum Chordata

1. Notochord is present in the body during at least any developmental stage.
2. Pharyngeal gill slits are present in the body during at least any developmental stage.
3. Single, tubular spinal cord is present on dorsal side of body.
4. Heart is present on ventral side of body.

Phylum Chordata is divided in following sub phylum

A. Sub phylum - Urochordata **B. Sub phylum - Cephalochordata**
C. Sub phylum - Vertebrata/Craniata

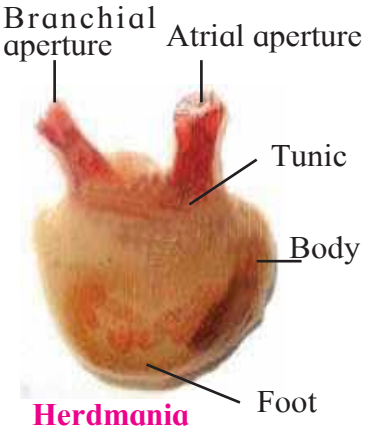
Q.24 State the characteristics of animals belonging to sub phylum Urochordata

Sub phylum - Urochordata

1. These are marine animals.
2. Their body is covered by skin-like test or tunic.
3. Larvae of these animals are freely swimming and notochord is present in only tail region of larvae. Hence, they are called as Urochordata.
4. Larvae metamorphose into adults after settling down at bottom of the sea.
5. Generally, these animals are hermaphrodite. (Hermaphrodite: A person or animal having both male and female sex organs or other sexual characteristics, either abnormally or (in the case of some organisms) as the natural condition.)

Examples: *Herdmania, Doliolum, Oikopleura,* etc.


Doliolum

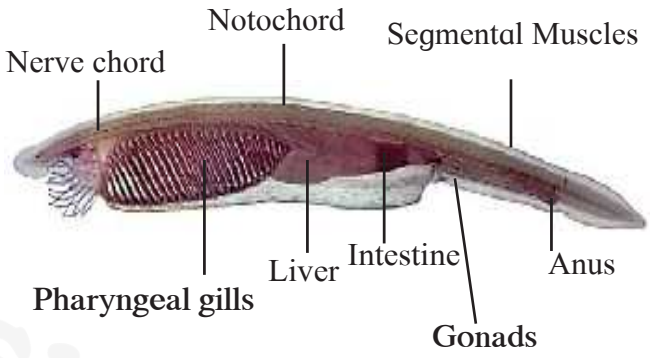


Herdmania

Q.25 State the characteristics of animals belonging to sub phylum Cephalochordata

Sub phylum -Cephalochordata

1. These are small, fish-like, marine animals.
2. Notochord is present throughout the body length.
3. Pharynx is very large and contains gill-slits.
4. These animals are unisexual.
   Ex.: *Amphioxus*.



Q.25 State the characteristics of animals belonging to sub phylum Vertebrata/Craniata

Sub phylum - Vertebrata/Craniata

1. In these animals, notochord is replaced by vertebral column.
2. In these animals, head is well developed.
3. Brain is protected by cranium.
4. Endoskeleton is either cartilaginous or bony.
5. Some chordates are jaw-less (Agnatha) whereas some are with jaws (Gnathostomata).

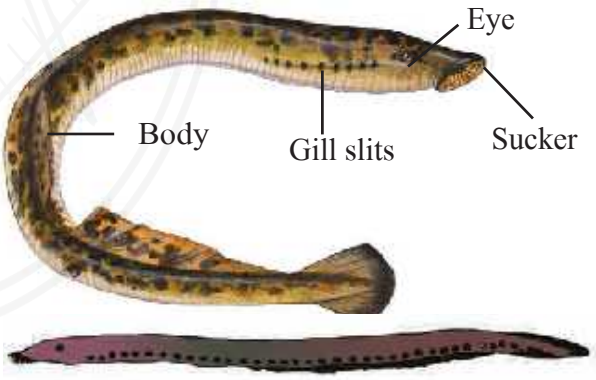
Subphylum- Vertebrata is divided into six classes as follows-

a. Class- Cyclostomata **b. Class- Pisces** **c. Class- Amphibia**
d. Class- Reptilia **e. Class- Aves** **f. Class- Mammalia**

Q.26 State the characteristics of animal belong to Class Cyclostomata

Class- Cyclostomata

1. These animals have jaw-less mouth provided with sucker.
2. Their skin is soft and without any scale.
3. Paired appendages are absent.
4. Endoskeleton is cartilaginous.
5. Most of the animals are ectoparasites.
   Examples: Petromyzon, Myxine, etc.



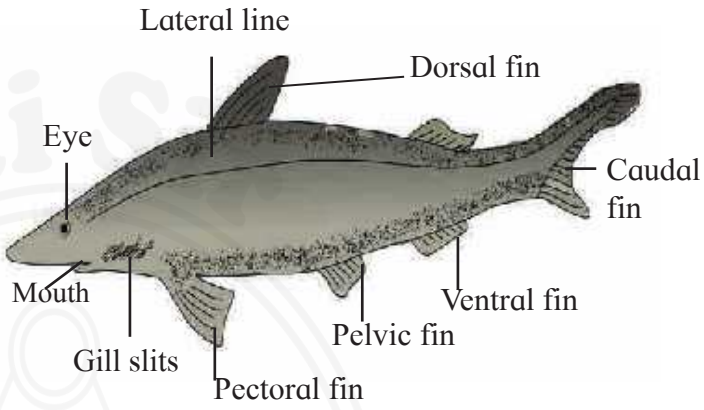
Class Cyclostomata-Petromyzon

Q.27 State the characteristics of animal belong to Class Pisces

Class- Pisces

1. These are cold blooded (Poikilotherms) aquatic animals living in marine and fresh waters.
2. Body is spindle shaped to minimize water-resistance.
3. They have paired & un-paired fins for swimming. Tail fin is useful as a steering organ during swimming.
4. Exoskeleton is in the form of scales & endoskeleton is either cartilaginous or bony.
5. Respiration occurs with gills.

   Examples.: Rohu, Pomfret, Sea horse, Shark, Electric ray, Sting ray, etc.



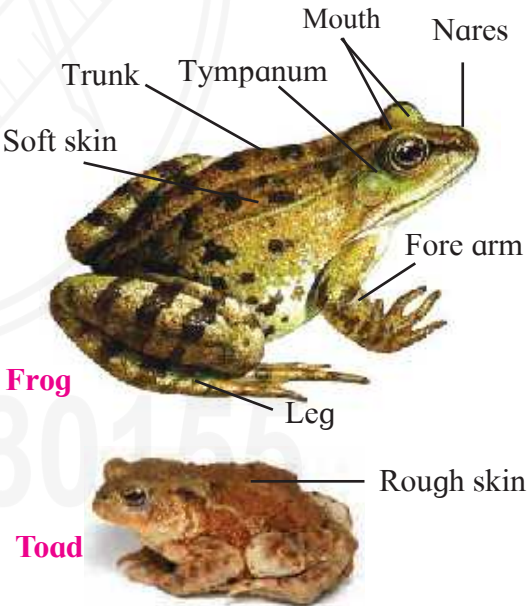
Class Pisces : Scoliodon (Dog fish)

Q.27 State the characteristics of animal belong to Class Pisces

Class- Amphibia

1. These animals are strictly aquatic during larval life and perform only aquatic respiration whereas they can live in water as well as on land during adult life and can perform aquatic as well as aerial respiration.
2. They have two pairs of appendages. Digits are without claws.
3. Exoskeleton is absent. Skin is without any derivative and usually kept moist for respiration.
4. External ear is absent but tympanum is present.
5. Neck is absent. Eyes are prominent with eye lids.

   Ex.: Frog, Toad, Salamander, etc.

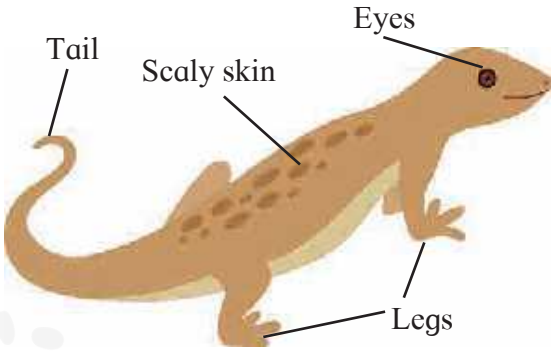


Class Amphibia: Frog and Toad

Q.28 State the characteristics of animal belong to Class Reptilia, Aves and Mammalia.

Class- Reptilia

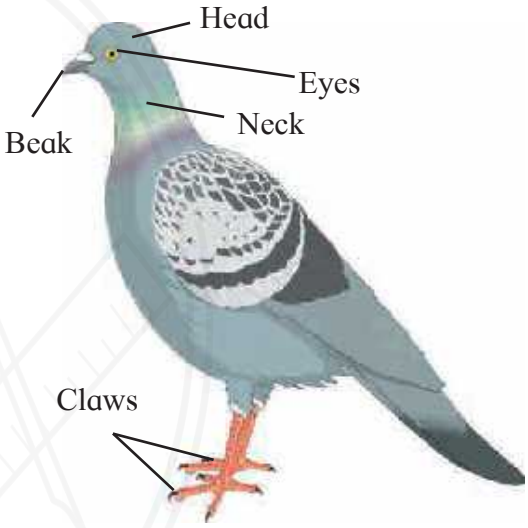
1. According to the course of animal evolution, these are first true terrestrial animals with creeping movement.
2. These are cold blooded (poikilotherms) animals.
3. They creep on the land as their body cannot be lifted up.
4. Their skin is dry and scaly.
5. Neck is present between head & trunk.
6. External ear is absent.
7. Digits are provided with claws.
   Examples: Tortoise, Lizard, Snake, etc.



Class-Reptilia : Wall lizard

Class- Aves

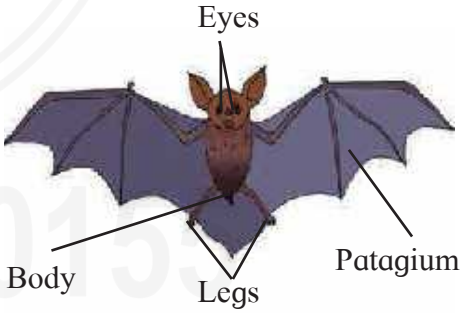
1. These vertebrates are completely adapted for aerial life.
2. These are warm blooded (Homeotherms) i.e. they can maintain their body temperature constant.
3. Their body is spindle-shaped to minimize air resistance during flight.
4. Forelimbs are modified into wings. Digits are covered with scales and bear claws.
5. Exoskeleton is present in the form of feathers.
6. Neck is present between head and trunk.
7. Jaws are modified into beak.
   Examples: Peacock, Parrot, Pigeon, Duck, Penguin, etc



Class- Aves: Pigeon

Class- Mammalia

1. Presence of mammary glands is typical character of mammalia.
2. These animals are warm blooded.
3. Body is divided into head, neck, trunk and tail.
4. Digits are provided with nails, claws, or hooves.
5. Exoskeleton is in the form of hairs or fur.
   Examples: Elephant, Human, Kangaroo, Dolphin, Bat, etc.



Class-Mammalia: Bat

Exercise

1. Identify me.

a. I am diploblastic & acoelomate. Which phylum do I belong to?

b. My body is radially symmetrical. Water vascular system is present in my body. I am referred as fish though I am not. What is my name?

c. I live in your small intestine. Pseudocoelom is present in my thread like body. In which phylum will you include me?

d. Though I am multicellular, there are no tissues in my body. What is the name of my phylum?

2. Write the characters of each of the following animals with the help of classification chart.

Bath sponge, grasshopper, rohu, penguin, frog, lizard, elephant, jellyfish.

3. Write in brief about progressive changes in animal classification.

4. What is the exact difference between grades of organization and symmetry? explain win examples.

5. Answer in brief.

a. Give scientific classification of shark upto class.

b. Write four distinguishing characters of phylum- Echinodermata.

c. Distinguish between butterfly and bat with the help of four distinguishing properties.

d. To which phylum does Cockroach belong? Justify your answer with scientific reasons.

6. Give scientific reasons.

a. Though tortoise lives on land as well as in water, it cannot be included in class- Amphibia.

b. Our body irritates if it comes in contact with jelly fish.

c. All vertebrates are chordates but all chordates are not vertebrates.

d. Balanoglossus is connecting link between non-chordates & chordates.

e. Body temperature of reptiles in not constant.

7. Answer the following questions by choosing correct option.

a. Which special cells are present in the body of sponges (Porifera)?
1. Collar cells. 2. Cnidoblasts.
3. Germ cells. 4. Ectodermal cells.

b. Which of the following animals' body shows bilateral symmetry?
1. Star fish. 2. Jelly fish.
3. Earthworm. 4. Sponge.

c. Which of the following animals can regenerate it's broken body part?
1. Cockroach. 2. Frog.
3. Sparrow. 4. Star fish.

d. Bat is included in which class?
1. Amphibia. 2. Reptilia.
3. Aves. 4. Mammalia.

8. Complete the following chart.

Body cavity	Germ Layer	Phylum
Absent	----------	Porifera
Absent	Triploblastic	----------
Pseudocoelom	----------	Aschel-minthes.
Present	----------	Arthropoda

9. Complete the following chart.

Type	Character	Example
Cyclostomata		
	Gill respiration	
Amphibia		
		Whale
	Poikilotherms	

Animals	Kingdom	Phylum	Class	Body organization	Body symmetry	Body cavity	Germ layer	Characters
Bath sponge	Animalia	Porifera		Cellular Grade	Asymmetric	Acoelomate		Numerous pores on the body Special type of cells known as collar cells Ability of regeneration Do not show locomotion Reproduction by budding
Grasshopper	Animalia	Arthropoda	Insecta	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Chitinous exoskeleton Body divided into head, thorax and abdomen Two pairs of wings Three pairs of jointed appendages
Rohu	Animalia	Chordata	Pisces	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Found in freshwater Bony Fish Presence of scales on body Respiration through gills
Penguin	Animalia	Chordata	Aves	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Exoskeleton in form of feathers Warm blooded Oviparous Neck present between head and trunk
Frog	Animalia	Chordata	Amphibia	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Can live on land as well as water Skin without exoskeleton Digits without claws External ear is absent Tympanum present
Lizard	Animalia	Chordata	Reptilia	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Cold blooded Body divisible into head, neck and trunk Ability to regenerate External ear is abseent
Elephant	Animalia	Chordata	Mammalia	Organ – system Grade	Bilateral	Eucoelomate	Triplobastic	Heart is four chambered It is viviparous Body is divided into head, neck , trunk and tail
Jellyfish	Animalia	Cnidaria		Cell Tissue Grade	Radial	Acoelomate	Diplobastoic	Its body medusa shaped Tentacles are used for catching prey Tentacles have Cnidoblasts or stinging cells which secrete toxin, paralyzing the prey.

7. Introduction to Microbiology

Q.1 What is Applied Microbiology ?

Branch of biology in which study of the enzymes related to some prokaryotes and eukaryotic microbes, proteins, applied genetics, molecular biology, etc is called as applied microbiology.
This study is used for the society and various products like food and medicines are produced on large scale with the help of microorganisms.

Q.2 Define Industrial microbiology. Give any two examples of products formed by fermentation process in industrial microbiolgy

The science related to commercial use of microbes in which various economic, social and environment related processes and products are included. Various microbial processes useful for this purpose are carried out.
Example: Bread, Cheese, Wine, Raw Material for chemicals, enzymes, nutrients, medicines. etc
Use of microbes for garbage management and pollution control.

Q.3 Short Note on: Dairy Products

Dairy Products

Since ancient days, milk is converted into various products for its preservation purpose. Ex. Cheese, butter, cream, kefir, yoghurt, etc. Water content and acidity of the milk changes during formation of these products and texture, taste and flavour is improved.
These processes are performed on large scale with more skill. For production of most of the milk products, bacteria in milk itself are used; only cheese is produced with the help of fungi. Basic process for production of yoghurt, cheese and cream is same. Milk is pasteurized at the beginning to destroy unwanted microbes. It is then fermented with the help of lactobacilli. In this process, lactose sugar of the milk is converted into lactic acid and milk proteins are coagulated with the help of lactic acid. Besides, compounds with taste and flavour are also formed. Ex. Diacetyl has the flavour of butter.

Milk, Fresh Cream, Cheese, Butter & Dairy Products

Q.4 Short Note on: Yoghurt Products

Yoghurt Products

Yoghurt is a milk product produced with the help of lactobacilli (inoculant). For maintaining the protein content, condensed milk powder is mixed with milk to be fermented for industrial production of yoghurt. Milk is boiled and once it cools to warm temperature, bacterial strains of Streptococcus thermophilus and Lactobacillus delbrueckii are added to it in 1:1 proportion. Lactic acid is formed due to Streptococcus that makes the proteins to gel out that gives dense consistency to the yoghurt.

Acetaldehyde like compounds are formed due to lactobacilli that gives characteristic taste to the yoghurt.

Now a day, various fruit juices are mixed with yoghurt to impart different flavours.

Ex. Strawberry yoghurt, banana yoghurt, etc.

Shelf life of yoghurt and its probiotic properties can be improved by pasteurization.

Q.5 What are different types of butter

Butter

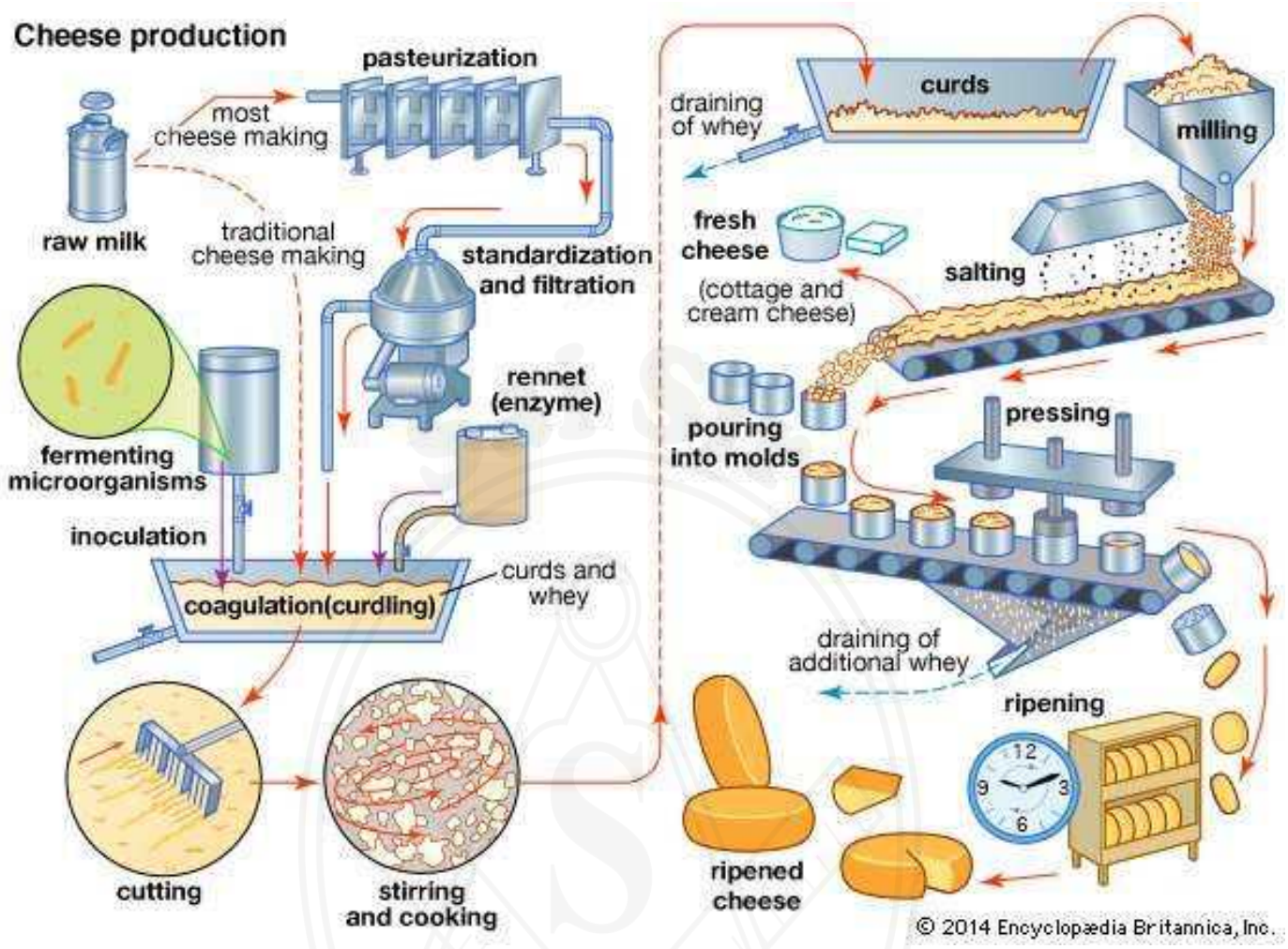
Two types of butter like sweet cream and cultured are produced on large scale. Microbes are used for production of cultured variety.

Q.6 Short Note on: Cheese Production

Cheese Production

Cheese is produced on large scale from the abundantly available cow milk all over the world. First, chemical and microbiological tests of milk are performed. Some colours and microbes like Lactobacillus lactis, Lactobacillus cremoris, and Streptococcus thermophilus are mixed with milk. It imparts sourness to the milk. After this, to impart the dense texture, whey (water in yoghurt) needs to be removed.

An enzyme, rennet obtained from alimentary canal of cattle was being traditionally used earlier. However, an enzyme protease obtained from fungi is used at present to produce vegetarian cheese. The whey is separated from yoghurt (which has some other uses). Then, process of production of cheese is started through steps like cutting the solid yoghurt into pieces, washing, rubbing, salting, and mixing of essential microbes, pigments and flavours. Then, cheese is pressed and cut in to pieces and stored for ripening.



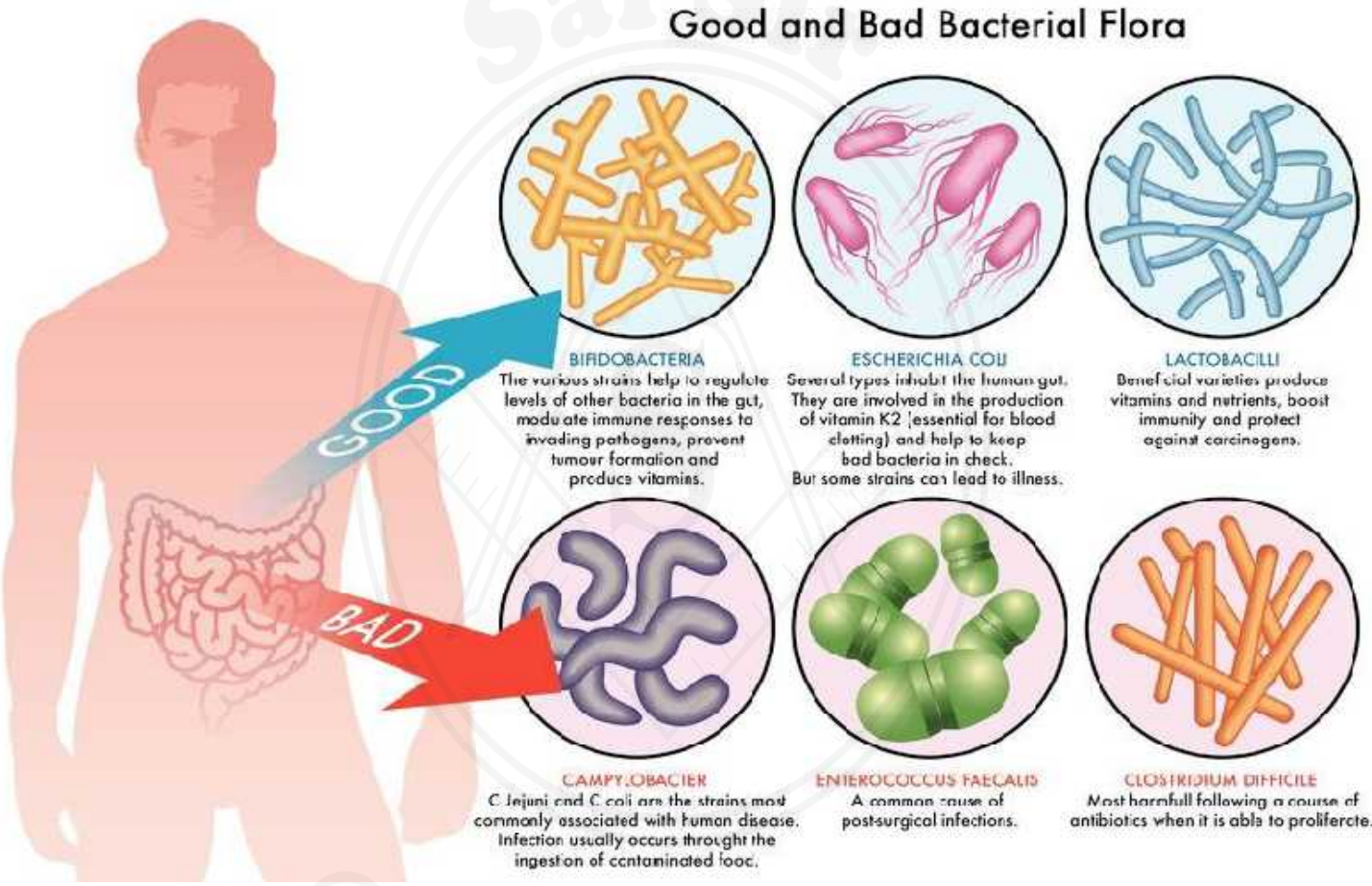
During industrial production of milk products, strict cleanliness and sterilization is essential as bacteria can be attacked by viruses. Hence, virus-resistant varieties of bacteria are developed. Recently, use of mutant varieties of bacteria has been increased. Artificially, some strains are developed that will help to avoid unnecessary steps / materials.

Freshly prepared cheese is always soft e.g. cottage cheese, cream cheese, mozzarella cheese. On storing for 3 to 12 months, semi-hard cheddar cheese is formed whereas after ripening for 12 – 18 months, very hard cheese called parmesan cheese is formed.

Q.7 Short Note on: Probiotics

Probiotics

These are also milk products, but contain active bacteria e.g. *Lactobacillus, Acidophilus, Lactobacillus casei, Bifidobacterium bifidum,* etc. These microbes maintain the balance of intestinal microorganisms i.e. increase the population of microbes helping the digestion and decrease the population of harmful microbes (ex. *Clostridium*). Probiotic products are available in various forms like yoghurt, kefir, sauerkraut (pickle of cabbage), dark chocolate, miso soup, pickles, oils, corn syrup, artificial sweeteners, microalgae (Sea food like *Spirulina, Chlorella*, Blue green algae, etc.).

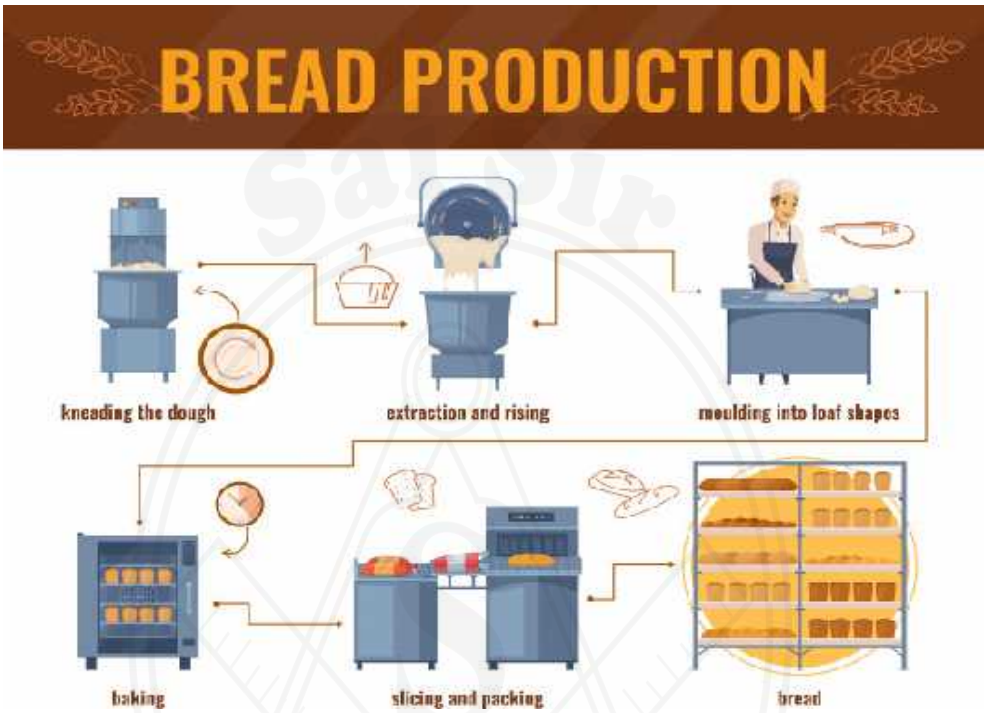


Benefits of Probiotic Drinks:These products form the colonies of useful microbes in alimentary canal and control other microbes and their metabolic activities, improve resistance and lower the ill-effects of harmful substances formed during metabolic activities. Useful microbes become inactive due to antibiotics; probiotics make them active again.
Nowaday, probiotics are used for treatment of diarrhoea and treatment of poultry also.

Q.8 Short Note on: Bread Production

Bread

Different types of breads are produced from flour of cereals. Dough is formed by mixing of baker's yeast – *Saccharomyces cerevisiae*, water, salt and other necessary materials with flour. Due to fermentation of carbohydrates by yeast, sugar is converted in to carbondioxide (CO_2) and ethanol. Dough rises up due to CO_2 and the bread becomes spongy.



Compressed yeast is used in commercial bakery industry. It is available in dry, granular form for domestic use. Yeast produced for commercial use contains various useful contents like carbohydrates, fats, proteins, various vitamins, and minerals. Due to this, bread and other products produced with the help of yeast become nutritive. Ingredients like vinegar, soya sauce and monosodium glutamate (ajinomoto) that are used in presently popular chinese food are produced by microbial fermentation.

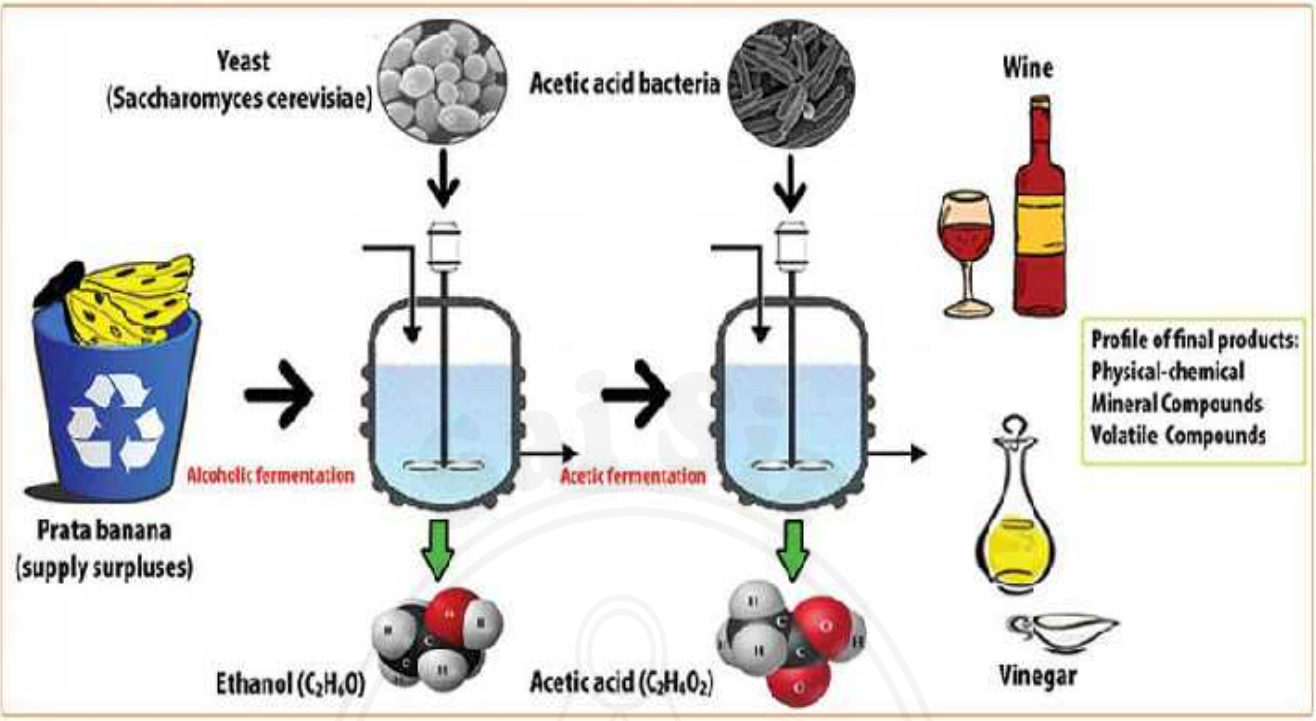
Q.9 Short Note on: Vinegar Production

Vinegar Production

Vinegar is used in each country of the world to impart sour taste to food materials and for preservation of pickles, sauce, ketch-up, chutneys, etc. Chemically, vinegar is 4% acetic acid (CH_3COOH).

Ethanol, an alcohol is obtained by fermentation of carbon compounds like fruit juices, maple syrup, sugar molasses, starch of the roots; with the help of yeast *Saccharomyces cerevisiae*.

Mixture of bacterial strains like *Acetobacter* and *Glucanobacter* is mixed with ethanol for its microbial degradation.
Acetic acid and other by-products are obtained through it.



Acetic acid is separated from mixture by rarefaction.
Acetic acid is bleached with the help of potassium ferrocynide.
Then, it is pasteurized.
Finally, very small quantity of SO_2 gas is mixed to produce vinegar.
Soya sauce is produced by fermentation of the mixture of flour of wheat or rice and soyabean with the help of the fungus *Aspergillus oryzae*.


Aspergillus oryzae

Q.10 Short Note on: Role of few microbes in Production of few beverages

Production of beverages

Sr. No.	Fruit	Microbe used	Role of microbe	Name of beverage
1	*Caffea arabica*	*Lactobacillus brevis*	Separating seeds from fruit	Coffee
2	*Theobroma cacao*	*Candida, Hansenula, Pichia, Saccharomyces.*	Separating seeds from fruit	Cocoa
3	Grapes	*Saccharomyces cerevisiae*	Fermentation of juice	Wine
4.	Apple	*Saccharomyces cerevisiae*	Fermentation of juice	Cider

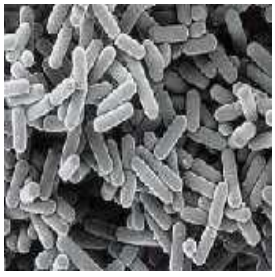


Fruit and seeds of coffee

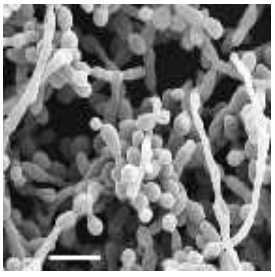
Cocoa seeds


Grapes


Apple



Lactobacillus brevis



Candida

Hansenula

Pichia

Saccharomyces cerevisiae

Q.11 Explain the use of Microbial Enzymes

Microbial Enzymes

Instead of chemical catalysts, microbial enzymes are used in chemical industry.
These enzymes are active at low temperature, pH and pressure;
due to which energy is saved and erosion-proof instruments are also not necessary.
Enzymes carry out specific processes; hence unnecessary by- products are not formed due to which expenses on purification are minimised.
In case of microbial enzymatic reactions, elimination and decomposition of waste material is avoided and enzymes can be reused.
Hence, such enzymes are eco-friendly.
Some examples of microbial enzymes are
oxido- reductases, transferases, hydrolases, lyases, isomerases, ligases, etc.
Process of dirt / muck removal occurs at low temperature too due to mixing of enzymes with detergents.
Glucose and fructose syrup can be obtained from corn flour by action of enzymes obtained from bacilli and streptomyces.
Microbial enzymes are used in various industries like cheese, plant extracts, textile, leather, paper, etc.

Organic acids used in various commercial products and microbes useful for the same

Source	Microbe	Amino acid	Use
Sugar and beet molasses, ammonia salt	*Brevibacterium, Corynobacterium*	L-glutamic acid	Production of monosodium glutamate (Ajinomoto)
Sugar molasses, salt	*Aspergillus niger*	Citric acid	Drinks, toffees, chocolate production
Glucose, corn steep liquor	*Aspergillus niger*	Gluconic acid	Production of minerals used as supplement for calcium and iron
Molasses, corn steep liquor	*Lactobacillus delbrueckii*	Lactic acid	Source of nitrogen, production of vitamins.
Molasses, corn steep liquor	*Aspergillus itaconius*	Itaconic acid	Paper, textile, plastic industry, gum production


Aspergilus niger

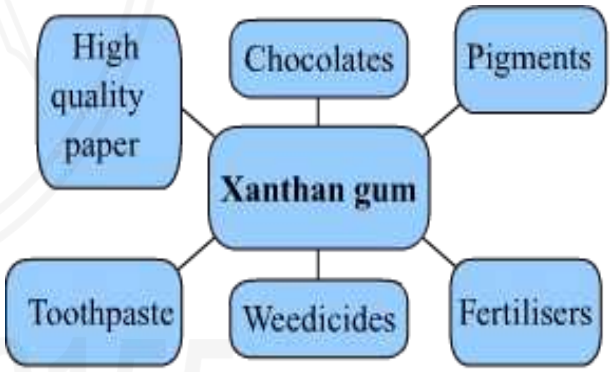

Brevibacterium

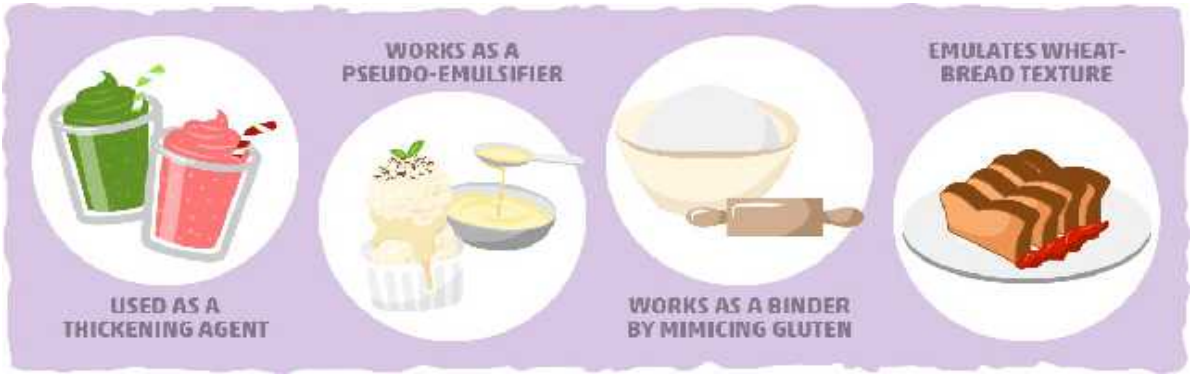

Corynobacterium


Lactobacillus delbrueckii

Q.12 What is Xanthum Gum

Xanthum gum is obtained by fermentation of starch and molasses with the help of Xanthomonas species. Xanthan gum that imparts thickness to your favourite ice creams, puddings, chocolates, milk shakes, chocolate drinks, instant soups, etc.
It is variously useful due to properties like solubility in hot and cold water, high density, etc.
It is used for production of pigments, fertilizers, weedicides, textile pigments, tooth pastes, high quality paper, etc.





Substances obtained by microbial processing and their roles

Substances obtained by microbial processing	Roles
Citirc, Malic and Lactic acid	To impart acidity
Glutamic acid, Lysine, Tryptophan	Protein binding
Nycin and natamycin	Microbial restrictor
Ascorbic acid (Vit. C), B_{12}, B_2	Antioxidants, vitamins.
Beta carotene, lycopenes, xanthenes, lutein	Edible colours
Polysaccharides, glycolipids	Emulsifiers
Vanillin, Ethyl butyrate (fruit flavour), peppermint flavour, essence of various fruits and flowers	Essence
Xylitol, aspartame	Artificial sweetener (low calorie)

Q.13 What are Antibiotics

Antibiotics are antimicrobial drugs obtained from other organisms (such as moulds, fungus and some soil bacteria) to combat harmful microorganisms.
However, they are not very useful against certain microbes such as viruses.
Antibiotics are produced on a large scale by the fermentation process. This is a chemical process which is induced by the microorganisms in a large tank.
A large tank contains the growth medium that provides nutrition for the microorganism's growth.
Optimization of temperature, pH levels, oxygen and nutrient parameter in the fermentation tank is very crucial to produce antibiotics.
After the completion of antibiotics production, they are extracted and purified through multiple physical processes. Finally, the purified antibiotics are converted into crystal form.
Many diseases of human and other animals have been controlled due to antibiotics obtained from different types of bacteria and fungi. Antibiotics like penicillin, cephalosporins, monobactam, bacitracin, erythromycin, gentamycin, neomycin, streptomycin, tetracyclins, vancomycin, etc. are used against various strains of gram positive and gram negative bacteria.
Rifamycin is effective against tuberculosis.

Q.14 Explain the use of microbes in fuels.

Microbes and Fuels

1. Gaseous fuel- methane can be obtained by microbial anaerobic decomposition of urban agricultural and industrial waste.
2. Ethanol, an alcohol is a clean (smokeless) fuel obtained during fermentation of molasses by the yeast- Saccharomyces.
3. Hydrogen gas is considered to be the fuel of future.
   Hydrogen gas is released during bio-photolysis of water in which bacteria perform the photoreduction.
4. Similar to fuels, various industrial chemicals are also produced through microbial process. Ex. various alcohols, acetone, organic acids, fatty acids, polysaccharides, that are useful as raw materials in chemical industry. Some of these are useful as raw materials for plastic and food products.

Q.15 Short Note : Bio - fuel

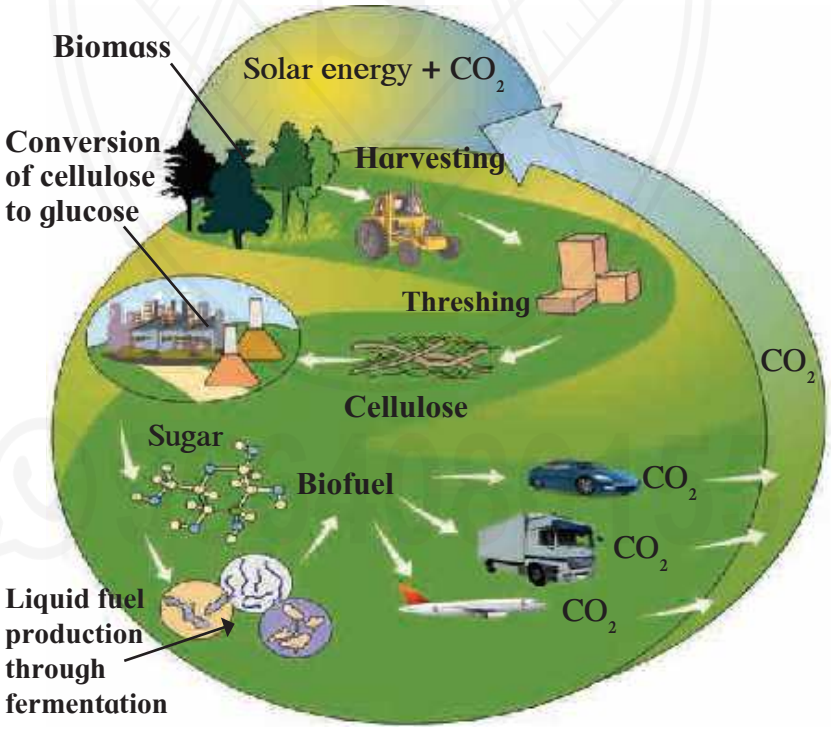
Bio-fuel :

Biofuel is important among the renewable source of good energy.

These fuels are available in solid (coal, dung, crop residue), liquid (vegetable oils, alcohol), gaseous (gobar gas, coal gas) forms.

These fuels are easily available and in plenty of quantity.

These are reliable fuels of the future.

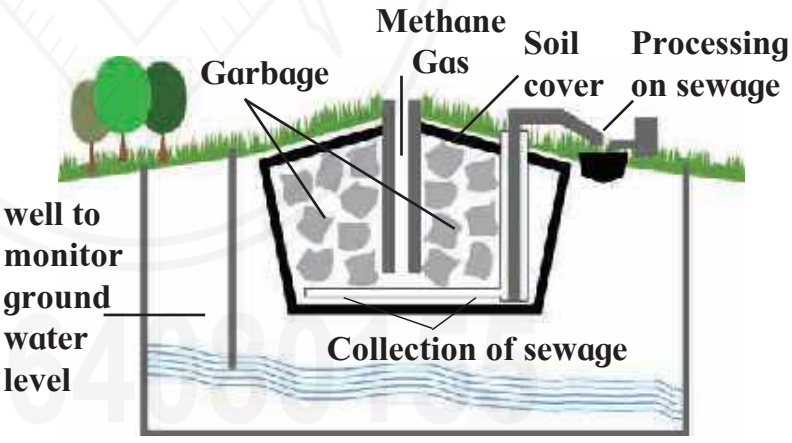


Q.16 How waste segregation should be done at source

Q.17 What are land filling sites

Land-filling sites

Degradable waste being accumulated in urban areas is used for this purpose. Large pits are dug in open spaces far away from the residential area and those pits are lined with plastic sheets as a precaution against pollution of soil due to leaching of toxic and harmful materials.



Compressed waste is dumped in the pit. It is covered with layers of soil, saw dust, leafy waste and specific biochemicals. Bioreactors are mixed at some places. Microbes present in soil and other top layers decompose the waste.

Completely filled pit is sealed with soil slurry.

Best quality compost is formed after few days.

Such land filling sites can be reused after removal of compost.

Q.17 Write a short note on Sewage Management

Sewage Management

In villages, domestic sewage is disposed off either in nearby soil or in biogas plant. However, in cities, sewage needs to be carried to processing unit and acted upon by microbial processes.

Microbes which can decompose any compound as well as destroy the pathogens of cholera, typhoid, etc. are mixed with sewage. They release methane and CO_2 by decomposition of the carbon compounds present in sewage. Phenol oxidizing bacteria decompose the xenobiotic chemicals present in sewage.

The sludge that settles down in this process can again be used as fertilizer.

Water released after microbial treatment is environmentally safe.

Microbes are used for bioremediation of environment polluted due to sewage.

Q.18 Write a short note on Clean Technology

Clean Technology

Human being has made a very fast progress in technology.

However, environmental pollution is also increasing with same speed.

Microbes can play a major role in the control over air-, soil- and water pollution.

Microbes have natural ability of decomposing the manmade chemicals.

Hydrocarbons and other chemicals are transformed with the help of these abilities.

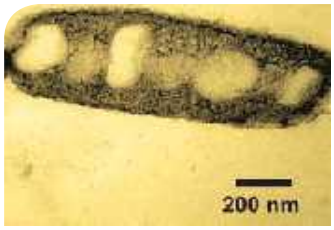
1. Some microbes remove the sulphur from fuels.
2. Metals like copper, iron, uranium, zinc, etc. leach into environment from low quality metalloids.

These are converted into compounds before leaching, with the help of thiobacilli and sulphobacilli.

Q.19 Give the examples of use of microbes in Clean Technology

1. Alcanovorax borkumensis and Pseudomonas

Spilling of petroleum oil occurs in ocean due to various reasons. This oil may prove fatal and toxic to aquatic organisms. It is not easy to remove the oil layer from surface of water by mechanical method. However, bacteria like *Pseudomonas* and *Alcanovorax borkumensis* have the ability to destroy the pyridines and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called as hydrocarbonoclastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with oxygen. CO_2 and water is formed in this process.



Alcanovorax borkumensis

Pseudomonas

2. Vibrio, Ideonella sakaiensis and fungi like Actinomycetes, Streptomyces,

Plastic bottles are formed from the chemical substance PET (Polyethylene Terephthalate Polyester). Now a day, most of the urban garbage consists of plastic. It has been observed that species like Vibrio, Ideonella sakaiensis can decompose the PET. Similarly, species of fungi like *Actinomycetes, Streptomyces, Nocardia, Actinoplanes* have ability of decomposing rubber from garbage.

3. Acidobacillus

Acidobacillus

Sulphuric acid is present in the acid rain and materials coming out of mines. Erosion of metals present in statues, bridges and buildings occurs due to it. Sulphuric acid is source of energy for some species of bacteria like *Acidophillium* spp. and *Acidobacillus ferroxidens*. Hence, these bacteria can control the soil pollution occurring due to acid rain.

4. Geobacter

Geobacter

Water soluble salts of uranium are present in the wastes produced during electroplating and in effluent released in environment from the atomic energy plant.
Geobacter convert these salts of uranium into insoluble salts and thereby prevent those salts from mixing with ground water sources.

Q.20 What are Microbial Inoculants

Microbial Inoculants

Some microbes-containing inoculants are produced by process of fermentation. These inoculants are sprayed on seeds before sowing and some of the inoculants are released into plants. Microbes in the inoculants help in plant growth by supplying nutrients. They improve the quality of vegetarian food. Solution containing *Azotobacter* and artificial nitrogenase is used in organic farming. Soil pollution occurring due to chemical fertilizers is prevented due to use of these solutions. Fluoroacetamide-like chemicals are mixed with soil due to use of chemical pesticides in agriculture.
These prove to be harmful to other plants and animals as well as cause skin diseases to human. These pesticides in the soil can be destroyed with the help of microbes.

Q.20 What are Bioinsecticides

Bioinsecticides

Bacterial and fungal toxins which can destroy pests and pathogens can be directly integrated into plants with the help of biotechnology.

Being toxic to insects, they do not consume the plants.

Similar to bacteria, some species of fungi and viruses are useful as pesticides.

Spinosad, a by- product of fermentation is a biopesticide.

Caterpillar feeding on leaf

Exercise

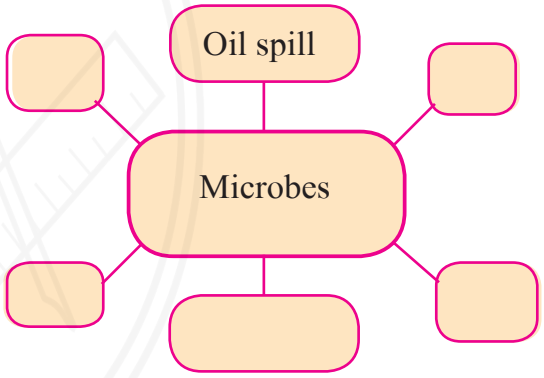
1. Rewrite the following statements using correct of the options and explain the completed statements.

(gluconic acid, coagulation, amino acid, acetic acid, clostridium, lactobacilli)

a. Process of -- -- -- -- of milk proteins occurs due to lactic acid.
b. Harmful bacteria in like -- -- -- in the intestine are destroyed due to probiotics.
c. Chemically, vinegar is -- -- --.
d. Salts which can be used as supplement of calcium and iron are obtained from -------- acid.

2. Match the pairs

'A' group	'B' group
a. Xylitol	1. Pigment
b. Citric acid	2. To impart sweetness
c. Lycopene	3. Microbial restrictor
d. Nycin	4. Protein binding emulsifier
	5. To impart acidity



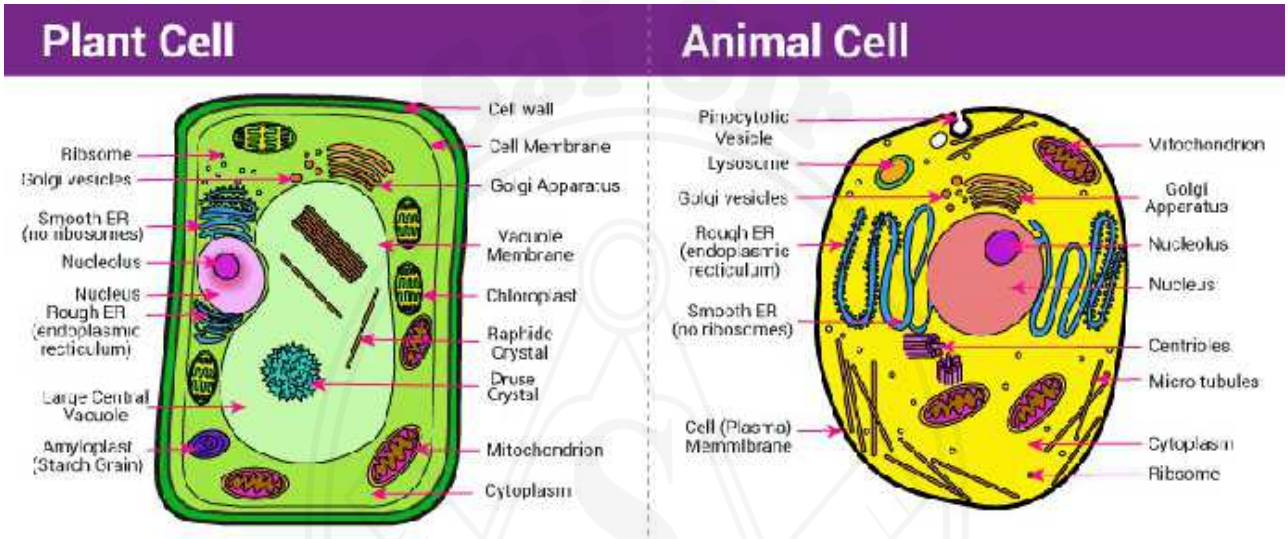
3. Answer the following.

a. Which fuels can be obtained by microbial processes? Why is it necessary to increase the use of such fuels?
b. How can the oil spills of rivers and oceans be cleaned?
c. How can the soil polluted by acid rain be made fertile again?
d. Explain the importance of biopesticides in or ganic farming.
e. Which are the reasons for increasing the popularity of probiotic products?
f. How the bread and other products produced using baker's yeast are nutritious?
g. Which precautions are necessary for proper decomposition of domestic waste?
h. Why is it necessary to ban the use of plastic bags?
i. What is role of microbes in compost production?
j. What are the benefits of mixing ethanol with petrol and diesel?
k. Which plants are cultivated to obtain the fuel?
l. Which fuels are obtained from biomass?
m. How does the bread become spongy?
n. Use of mutant strains has been increased in industrial microbiology.
o. Enzymes obtained by microbial process are mixed with detergents.
p. Microbial enzymes are used instead of chemical catalysts in chemical industry.

8. Cell Biology and Biotechnology

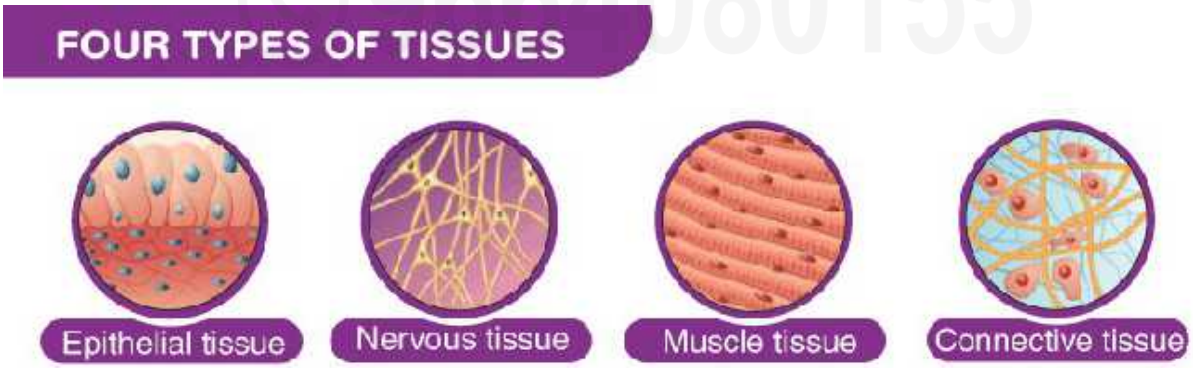
Q.1 What is cell?

Cells are the basic building blocks of all living things.
Cells also contain the body's hereditary material and can make copies of themselves.
Cells have many parts, each with a different function.
Some of these parts, called organelles, are specialized structures that perform certain tasks within the cell.



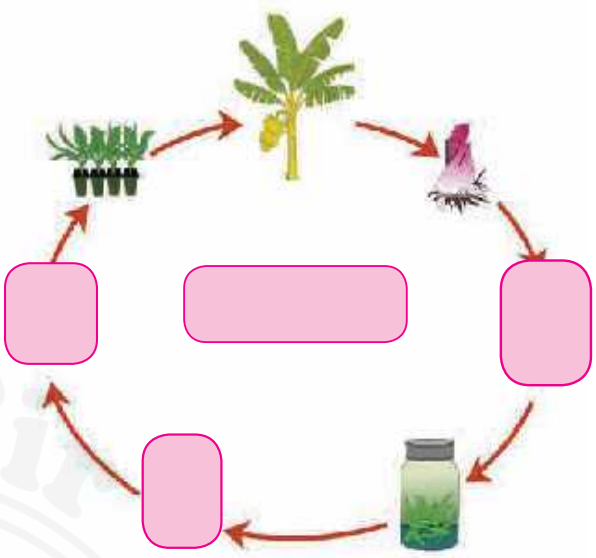
Q.2 What is tissue? Which are the functions of tissue?

In simple terms, tissue can be defined as a group of cells with similar shape and function are termed as tissues.
They form a cellular organizational level, intermediate between the cells and organ system.
Organs are then created by combining the functional groups of tissues.
Functions of tissues:
The structure of each tissue of the body is organised to carry out its own specific functions.
The five major functions of tissues, are namely:
1. secretion 2. movement 3. strength 4. excretion 5.communication.
Following are the types of Animal Tissues:



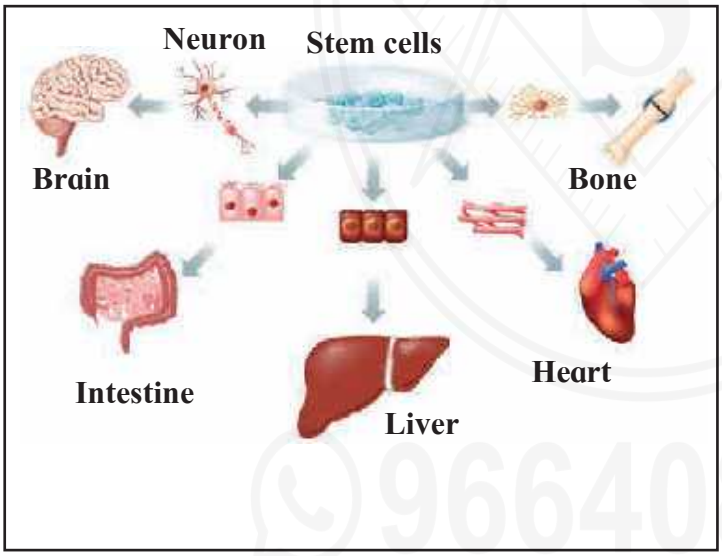
Q.3 Write a short note on: Cytology

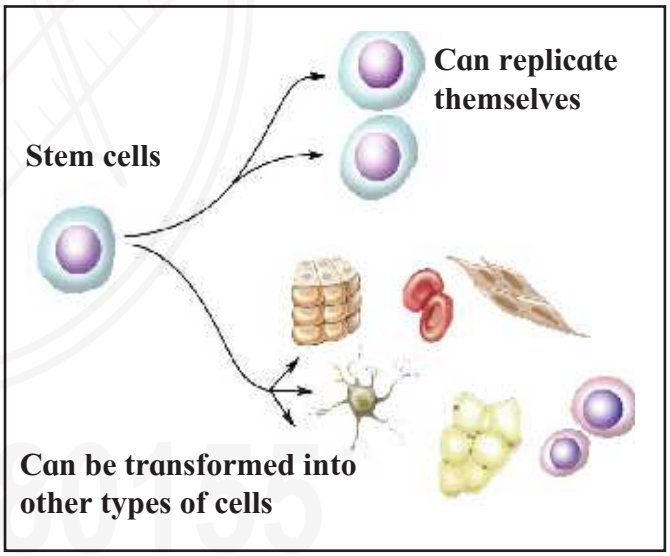
The study of structure, types and organelles of the cell is called as cell biology / cytology. It also includes the study of cell division and many other aspects of the cell.
There are revolutionary changes in the field of human health due to cell biology.
Research institutes specially dedicated for research on cells are established at Pune and Bengaluru, India.
National Center for Cell Science at Pune and 'Instem' at Bengaluru are involved in valuable research.



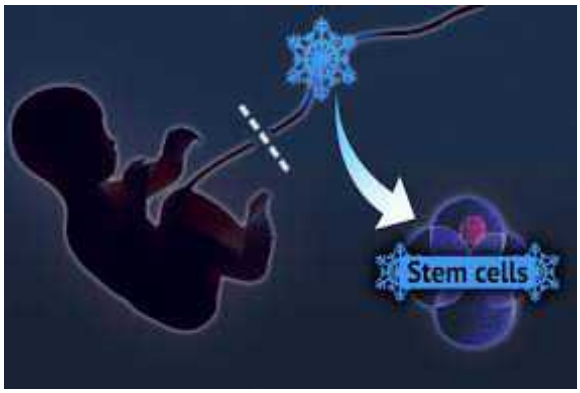
Q.4 Write a short note on: Steam Cells

"Stem cells are special human cells that can develop into many different types of cells, from muscle cells to brain cells."
These are special types of cells present in the body of multicellular organisms.
These cells give rise to all other types of cells present in the body of multicellular organisms.
Stem cells also have the ability to repair the damaged cells.
These cells have strong healing power. They can evolve into any types of cell.





New organism is formed from the zygote that is formed by union of male and female gamete. At the earliest stage of development, organism is in the form of a mass of cells. All the cells in that mass are almost alike. Those cells are called as stem cells.
During further development, these cells form any type of cell, different types of tissues and perform different functions in the body. This is the differentiation of stem cells. However, once the tissues are formed, the cells in those tissues, at the most, can form same types of cells only. This is the case in each part of the body. However, stem cells are present for longer duration in some parts of the body.



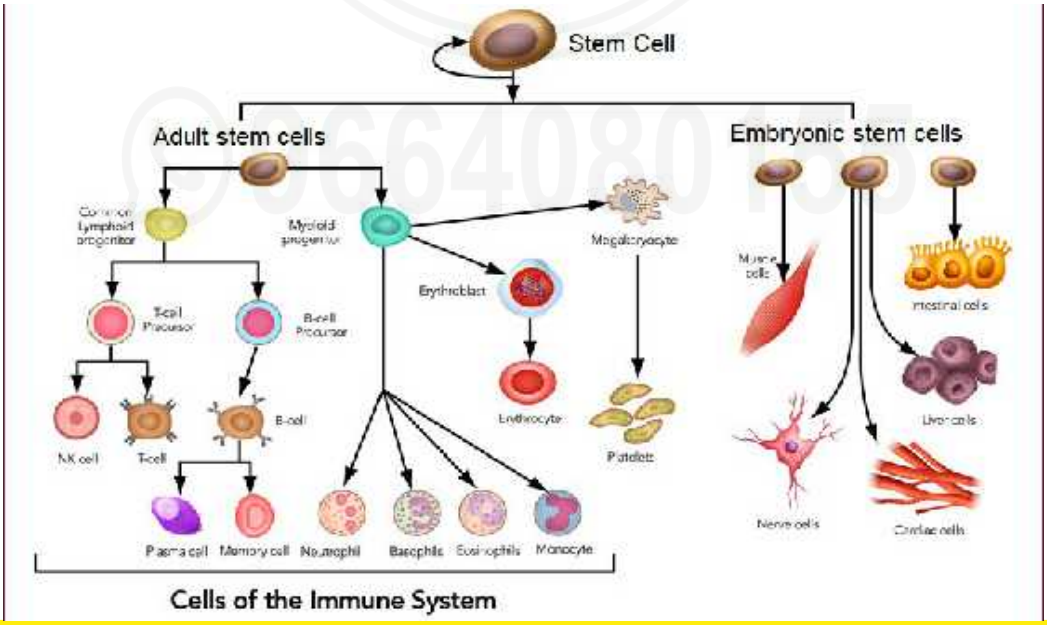
Stem cells are present in the umbilical cord by which the fetus is joined to the uterus of the mother.
Stem cells are also present in the blastocyst stage of embryonic development.
Stem cells are present in red bone marrow and adipose connective tissue of adult human beings.
It has become possible to produce different types of tissues and the degenerated part of any organ with the help of these stem cells.
Stem cell banking or preservation is the extraction, processing and storage of stem cells, so that they may be used for treatment in the future, when required.
Stem Cells have the amazing power to transform into any tissue or organ in your body.

Q.5 What is Stem Cell Banking and Stem Cell Preservation

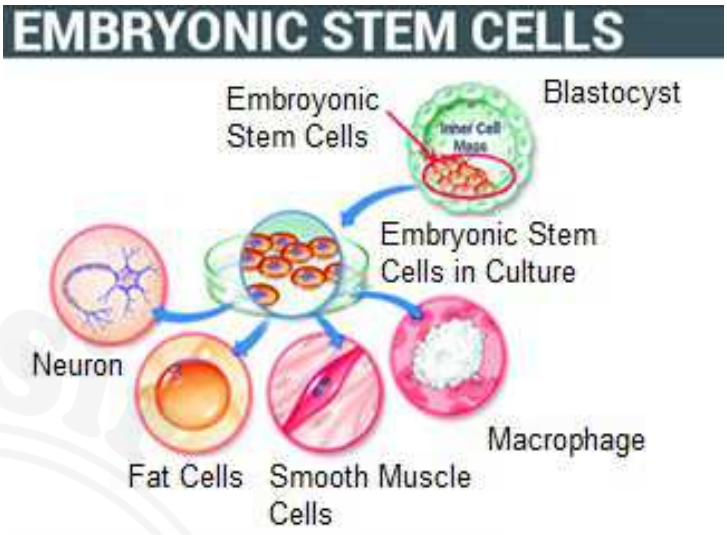
Stem cell banking or preservation is the extraction, processing and storage of stem cells, so that they may be used for treatment in the future, when required.
Stem Cells have the amazing power to transform into any tissue or organ in your body.
For the purpose of preservation, stem cell samples are carefully collected from sources
like cord blood, red bone marrow or embryo (blastocyst) and are kept in small, sterile vials.
Those vials are kept in liquid nitrogen at -135 C to -190 C.

Q.6 Depending upon source, what the types of stem cells

In biotechnology, stem cell research is a revolutionary event after cloning. This technique has the potential of bringing about the fundamental changes in the medical science.
Depending upon source, stem cells are of two types as embryonic stem cells and adult stem cells.



Q.7 Write the short note on: Embryonic stem cells



Division of the zygote starts and thereby it is converted into embryo.
Cells of embryo undergo repeated mitotic divisions.
Cell differentiation starts from 14 day of conception.
Cells of different organs like osteocytes (bone cells),
hepatocytes (liver cells), and neurons are formed due to differentiation.
Embryonic cells before differentiation are called as embryonic stem cells.
220 different types of cells in human body are formed from single type cells i.e. embryonic stem cells.
Thus, stem cells are primary type of undifferentiated cells with self-multiplying ability and they are parent cells of all types of human cells.
This property of stem cells is called as pleuripotency.
It has been found that if these stem cells are collected well before the beginning of differentiation on 14 day i.e. during 5 – 7 day and cultured with certain biochemical stimulus in laboratory, as per the stimulus, they can transform themselves into desired type of cells, thereby tissues and finally into organs.

Q.8 Write the short note on: Adult stem cells

Stem cells can be obtained from the body of adult person too. There are three main sources of stem cells in the body of adult persons. Stem cells can be obtained from red bone marrow, adipose connective tissue and blood. Besides, stem cells can be obtained from cord blood immediate after birth.

Q.9 Give the uses of stem cells

Uses of Stem Cells

1. Regenerative Therapy

A. Cell Therapy: Stem cells are used to replace the dead cells in case of conditions like diabetes, myocardial infarction, Alzheimer's disease, Parkinson's disease, etc.
B. To produce blood cells required in conditions like anemia, thalassaemia, leukemia, etc.

2. Organ Transplantation:

In case of failure of organs like kidney and liver, those can be produced with the help of stem cells and transplanted.

Q.10 Write a short note on: Organ Transplantation

Various organs in the human body either become less efficient or completely functionless due to various reasons like aging, accidents, infections, disorders, etc. Life of such person becomes difficult or even fatality may occur under such conditions. However, if a person gets the necessary organ under such conditions, its life can be saved.

Availability of donor is an important requirement in organ transplantation.
Each person has a pair of kidneys. As the process of excretion can occur with the help of single kidney, person can donate another one.
Similarly, skin from certain parts of the body can also be donated.
Various factors like blood group, diseases, disorders, age, etc. of the donor and recipient need to be paid attention during transplantation.
However, other organs cannot be donated during life time.
Organs like liver, heart, eyes can be donated after death only.
This has lead to the emergence of concepts like posthumous (after death) donation of body and organs.
Organ donation and transplantation is under the control of 'Transplantation human organs act, 1994' and subsequent amendments of 2009, 2011 and 2014 so that overall process would be transparent and any person would not be cheated.

Q.11 Write a short note on: Organ and Body Donation

Organ and Body Donation:

Human bodies are disposed off after death as per traditional customs.

However due to progress in science, it has been realized that many organs remain functional for certain period even after death occurrs under specific conditions.

Concepts like organ donation and body donation have emerged recently after realization that such organs can be used to save the life of other needful persons.

A liberal view behind the concept of organ and body donation is that after death, our body should be useful to other needful persons so that their miserable life would become comfortable.

Awareness about these concepts is increasing in our country and people are voluntarily donating their bodies. Life of many people can be saved by organ and body donation.

Blinds can regain the vision. Life of many people can be rendered comfortable by donation of organs like liver, kidneys, heart, heart valves, skin, etc.

Similarly, body can be made available for research in medical studies.

Many government and social organizations are working towards increasing the awareness about body donation.

Q.12 What is Biotechnology. In which various fields biotechnology is useful.

Biotechnology is a combination of biology and technology for our betterment and sustainable development.

Modern biotechnology includes genetic engineering, bioinformatics and bioprocess engineering.

Biotechnology is bringing about artificial genetic changes and hybridization in organisms for human welfare.

Various branches of science like cytology, biochemistry, molecular biology, and genetic engineering are included in biotechnology.

There is considerable progress mainly in the field of agriculture and pharmacy due to biotechnology.

New experiments are being performed for improving the agricultural yield.

In pharmacy, experiments for production of antibodies, vitamins, and hormones like insulin have been successful.

High-class varieties of crops have been developed through the technique of tissue-culture.

Q.13 What are the main areas included in biotechnology

Biotechnology includes following main areas

1. Use of various abilities of microbes like yoghurt production from milk and alcohol from molasses.
   Use of productivity of the cells. Ex. – Production of antibiotics and vaccines, etc. with the help of specific cells.
3. Use of bio-molecules like DNA and proteins in human welfare.
4. Development of plants, animals and products of desired quality by gene manipulation.
   Production of human growth hormone with the help of genetically modified bacteria.
5. Use of genetic and non-genetic technique. Non-genetic biotechnology involves use of either cell or tissue. Ex. Tissue culture, production of hybrid seeds, etc.

Q.14 What are the Benefits of Biotechnology

Benefits of Biotechnology

1. It has become possible to increase the per hectare yield irrespective of the limitations of crop-land area.
2. Expenses on disease control have minimized since development of resistant varieties.
3. Due to development of fast fruit setting varieties, yield per annum has been increased
4. Development of stress resistant varieties which can withstand variable temperature, water-stress, changing fertility of soil, etc. has become possible.

Development of Biotechnology in India

Government of India had established the National Biotechnology Board in 1982. This board was transformed into department of biotechnology under the ministry of science and technology, in 1986. Various institutes in India are working under the control of this department of biotechnology. It includes National Institute of Immunology, National Facility for Animal Tissue and Cell Culture, National Centre for Cell Science, National Brain Research Centre, Central Institute of Medicinal and Aromatic Plants. There are facilities of higher education and research in these institutes from where thousands of students have pursued Ph.D. degrees and are contributing to the progress of country in the field of biotechnology.

Commercial Applications of Biotechnology

Q.15 Explain what is Crop Biotechnology

Biotechnology is used in agricultural field to improve yield and variety of crop is called as Crop Biotechnology. Biotechnology can be used for:


a. Hybrid Seeds: Genes of two different crops are recombined to form hybrids of various crops. This is especially useful for fruits.

b. Genetically Modified Crops: Crops developed with desired characters by integrating foreign gene with their genome are called as genetically modified crops. High yielding varieties with resistance to diseases, alkalinity, weeds other stresses like cold and drought.

c. Biofertilizers

Due to use of biofertilizers instead of chemical fertilizers, nitrogen fixation and phosphate solubilization abilities of the plants are improved. Mainly the bacteria like Rhizobium, Azotobacter, Nostoc, Anabaena and plants like Azolla are used as biofertilizers.

Azolla

Q.16 What are the examples of Genetically Modified Crops.

BT Cotton: A gene had been isolated from the bacterium Bacillus thuringiensis and integrated with the gene of cotton. Due to this, the toxin which is fatal for bollworm was produced in leaves and bolls of cotton. If bollworm feeds on leaves, the toxin destroys its alimentary canal and the bollworm dies.

BT Brinjal: BT Brinjal variety is developed by using the gene isolated from Bacillus thuringiensis. This improved variety of brinjal kills the pest in same way as the BT cotton does.

Golden Rice: A gene synthesizing the vitamin A (Beta carotene) has been introduced in this variety of rice. As compared to the normal variety, this variety which has been developed in 2005 contains 23 times more amount of beta carotene.

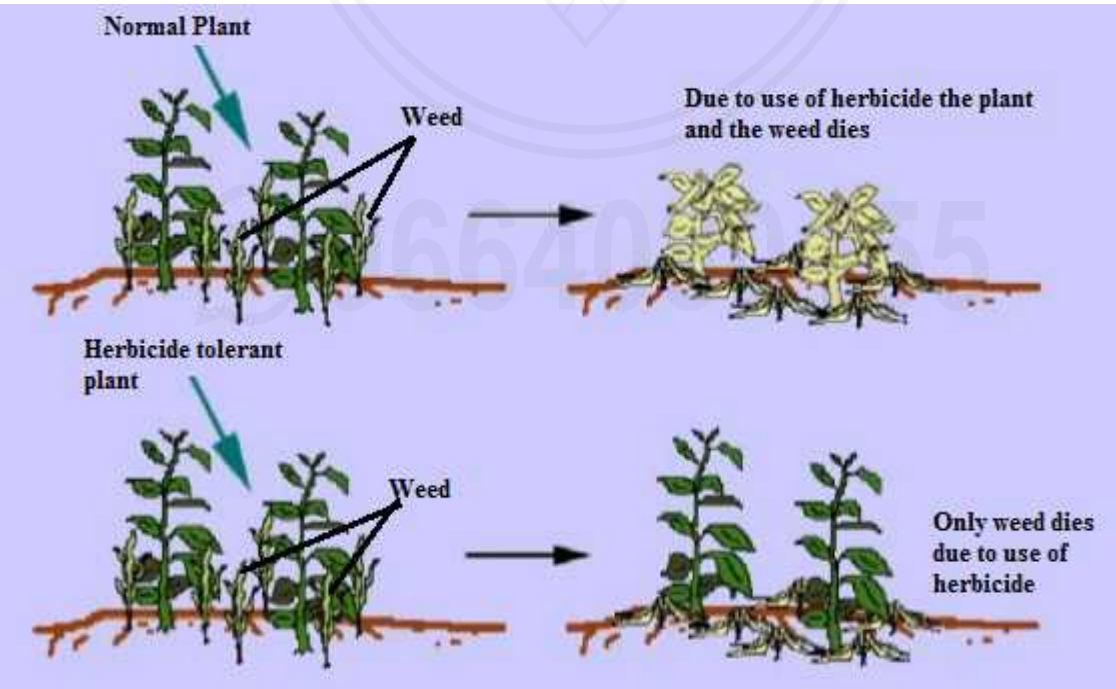
Herbicide tolerant plants:

Weeds always affect the growth of main crop.

If herbicides are used to destroy the weeds, it affects the main crop too.

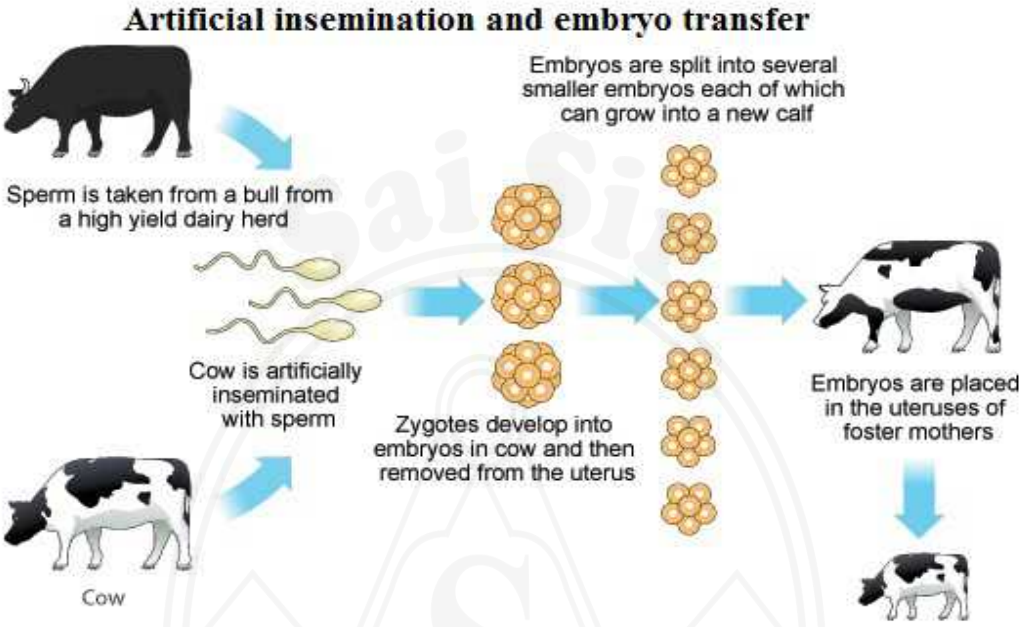
Due to this, Herbicide tolerant plants varieties of crops are being developed.

Due to this, it has become possible to selectively destroy the weeds.



Q.17 Give the use of Biotechnology in Animal Husbandary.

Two main methods as artificial insemination and embryo transfer are used in animal husbandry. It helps to improve both, the quantity and quality of animal products. Ex. Milk, meat, wool, etc. Similarly, animals with more strength have been developed for hard work.



Q.18 Explain how Biotechnology is useful to Human Health

1. Diagnosis and treatment of the diseases are two important aspects of the human health management. Biotechnology helps to identify the role of gene, if any, in disease of a person.
2. Diagnosis of diabetes and heart diseases has become possible even before the onset of symptoms, with the help of biotechnology.
3. Diagnosis of the diseases like AIDS, dengue can be done within few minutes. Hence, treatment can be done at the earliest.
4. Various medicines are used for the treatment of diseases. Ex. The hormone insulin is used in treatment of diabetes. Earlier, insulin was being collected from the pancreas of horses. However, nowadays, due to biotechnology, insulin can be prepared with the help of bacteria.
5. For this purpose, human insulin gene has been inserted into the genome of bacteria. Various vaccines and antibiotics are also produced in the same way.
6. Biotechnology in Treatment :

Biotechnology is useful for production of hormones like insulin, somatotropin and blood clotting factors.

7. Biotechnology in Production of Interferon:

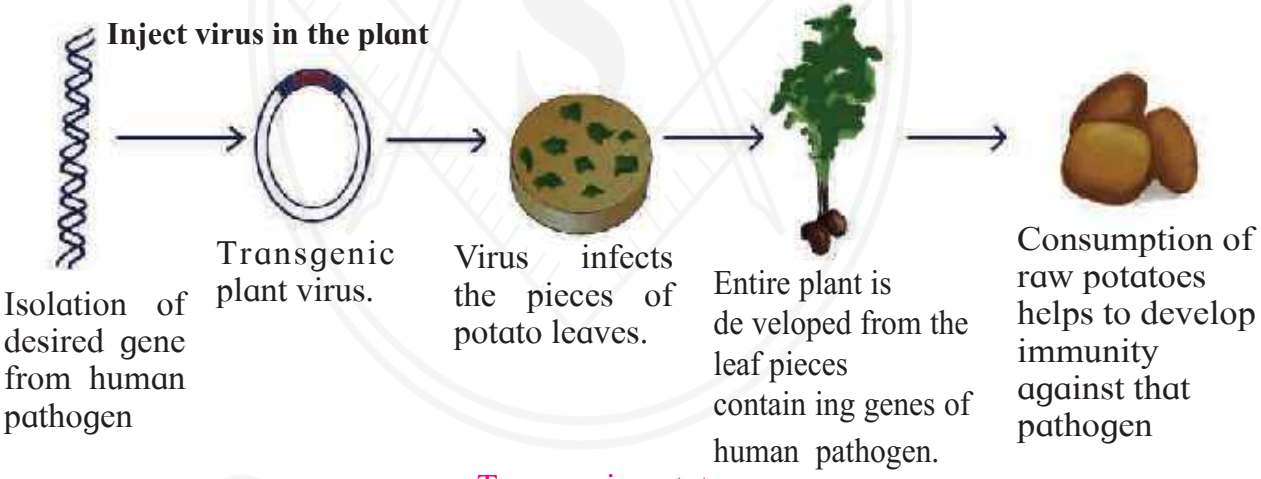
This is a group of small sized protein molecule used in treatment of viral diseases. These are produced in blood. However, nowadays, with the help of biotechnology, transgenic E. coli are used for production of interferon.

Q.19 Explain meaning of Vaccine and Vaccination

1. Vaccine is the 'antigen' containing material given to acquire either permanent or temporary immunity against a specific pathogen or disease.
2. Traditionally, vaccines were prepared with the help of pathogens. Completely or partially killed pathogens were used as vaccines.
3. However, due to this, there were chances of contracting the disease in case of some persons.
4. Hence, as an alternative, scientists tried to artificially produce vaccines with the help of biotechnology.
5. For this purpose, scientists produced the antigen in laboratory with the help of gene isolated from the pathogen and used it as vaccine. Thus, safer vaccines are being produced.
6. Nowadays, proteins which act as antigen are injected in pure form instead of injecting the killed or semi-killed pathogens.
7. These proteins keep the persons away from the diseases by keeping the mmune system active.
8. Thus, injecting the antigens is safest way in vaccination.

Vaccines produced with the help of biotechnology are more thermo-stable and remain active for longer duration. Ex. Vaccines of polio, hepatitis,

Q.20 Explain the process of production of edible vaccines with a neat diagram



Transgenic potatoes

1. Work on production of edible vaccines is in progress and presently, potatoes are being produced with the help of biotechnology.
2. These potatoes are called as transgenic potatoes.
3. These potatoes will act against bacteria like Vibrio cholerae, Escherichia coli.
4. Consumption of these raw potatoes generates the immunity against cholera and the disease caused due to E. coli.

Note: Indian Institute of Science has developed a transgenic variety of tobacco. If cattles feed upon leaves of this plant, they do not contract a viral disease- rinderpest.

Note: Various industrial chemicals can be produced through less expensive processes. with help of biotechnology Example: Alcohol production from sugar molasses with the help of transgenic yeast. This is called as Industrial White Biotechnology

What will happen if these potatoes are cooked for consumption?
If transgenic potatoes produced as edible vaccine are cooked for consumption, heating at high temperature would cause denauturation of the protien(antigen) and reduce the potential and the effectivity of the vaccines, Hence, these potatoes need to be consumed raw.

Q.21 Explain the somatic cell gene therapy with an example.

Gene therapy: Gene therapy to treat genetic disorders in somatic cells has become possible due to biotechnology.
Ex. Phenylketonuria (PKT) arises due to genetic changes in hepatocytes (liver cells).
It has become possible to treat it with gene therapy.
This method is called as somatic cell gene therapy.
All the cells except sperms and ova in the body are called as somatic cells.

Q.22 Write a short note on cloning.

Cloning

Production of replica of any cell or organ or entire organism is called cloning.

Reproductive cloning:
A clone can be produced by fusion of a nucleus of somatic cell with the enucleated ovum of anybody.
Thus, there is no need of sperm to produce the new organism.

Therapeutic cloning:
Stem cells can be derived from the cell formed in laboratory by the union of somatic cell nucleus with the enucleated egg cell.
This is known as therapeutic cloning.
Various diseases can be treated with the help of these stem cells.

Similar to cells, genes can also be cloned and millions of copies of same gene can be produced. Those can be used for gene therapy and other purposes.
Controlling the inheritance of hereditary diseases, continuation of generations, enhancing the specific tendency may become possible due to cloning tech nique.
However, there is world-wide opposition to human cloning on various issues.

Q.23 Write a short note on cloning of sheep, 'Dolly'.

1. A sheep 'Dolly' was born in Scotland by cloning technique on 5th July 1996.
2. Nucleus from the udder cell of sheep of 'Finn Dorset' variety had been introduced into enucleated ovum of Scottish sheep.
3. Then, the ovum was allowed to develop in the uterus of Scottish sheep and thereby the 'Dolly' had been born.
4. It was showing the characters as per the chromosomes in nucleus and any character of Scottish sheep was not visible.

Dolly (Clone)

Q.24 Write a short note on Environment and Biotechnology

It has become possible to solve environment related various problems with the help of biotechnology.

Microbial techniques are already in use for treatment on sewage and solid waste.

Sewage is rich in organic matter.

If such sewage is released in natural water bodies like rivers, the organic matter in it gets oxidized with the help of dissolved oxygen.

Due to this, level of dissolved oxygen in water decreases, adversely affecting the aquatic life.

As a remedy on this, sewage should be released in to rivers only after oxidation with the help of microbial technique.

Microbes are useful on large scale while production of compost by treatment on solid organic waste material.

Bio-remediation, biopesticides, biofertilizers, biosensors, etc, are some new concepts in biotechnological methods.

Q.25 Write a short note on Bioremediation

Bioremediation means either absorption or destruction of toxic chemicals and harmful pollutants with the help of plants and microorganisms. If plants are used for this purpose, it called as 'phyto-remediation'.

Some examples of bioremediation are as follows:

1. The Pseudomonas bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water.
2. The fern Pteris vitata can absorb the arsenic from the soil.
3. Genetically modified variety of Indian mustard can absorb selenium from soil.
4. Sunflower can absorb uranium and arsenic.
5. The bacterium Deinococcus radiodurans is highly radiation resistant organism. It has been genetically modified and used to absorb the radiations from radioactive debris.
6. Grasses like alfalfa, clover and rye are used in phyto-remediation.

Q.26 Write a short note on Food Biotechnology

Food items like bread, cheese, wine, beer, yoghurt, vinegar are produced with the help of microorganisms. These food items are probably the oldest ones produced with the help of biotechnology.

Q.27 Write a short note on DNA Fingerprinting

1. DNA sequence of each person is unique as that of the fingerprints.
2. Due to this, identity of any person can be established with the help of its available DNA. This is called as DNA fingerprinting.
3. It is mainly useful in forensic sciences.
4. Identity of the criminal can be established with the help of any part of its body found at the site of crime.
5. Similarly, identity of father of any child can be established.
6. This research is performed in Center for DNA fingerprinting and Diagnostics, Hyderabad.

Q.27 Explain Cleaning of oil spillage in ocean with help of Biotechnology

1. If oil spillage occurs, it adversely affects the marine life.
2. Now, cleaning the ocean without any harm to environment in cheaper way has become possible with the help of oil-digesting and fast multiplying bacteria.
3. India born American citizen and scientist Dr. Anand Mohan Chakravarti had for the first time suggested the use of such microbes.
4. Naturally, the credit for this discovery goes to him.

Q.28 Write a Short Note on Green Revolution

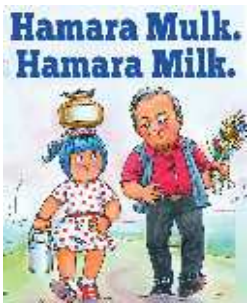
1. Problems of population explosion were started to appear at the beginning of 20th century.
2. Almost all the countries, especially underdeveloped and developing countries had been badly affected by the effects of poor quality and quantity of food.
3. Various methods applied for harvesting maximum yield from minimum land are collectively called as green revolution.
4. Improvised dwarf varieties of wheat and rice, proper use of fertilizers and pesticides and water management has led to the increased production of food grains and thereby large population had been saved from hunger.
5. Dr. Norman Borlaug (USA) and Dr. M. S. Swaminathan (India) have valuable contribution in green revolution.


Dr.M.S Swaminathan

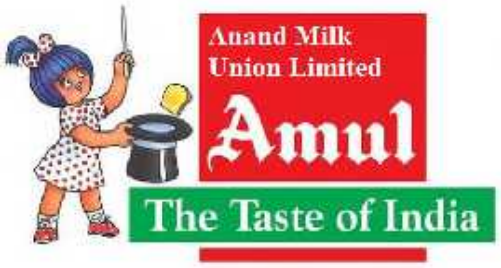

Dr. Norman Borlog

6. Various research institutes and laboratories are engaged in development of new varieties of various crops through research. Ex. Indian Agricultural Research Institute (IARI), New Delhi, National Citrus Research Institute, Nagpur and allied branches, Indian Institute of Sciences, National Pomegranate Research Institute, Solapur.

Q.29 Write a Short Note on White Revolution



1. Various parts of India were rich in milk and milk products.
2. However, those products were not sufficient to meet the needs of far-flung regions.
3. Dr. Verghese Kurien proved through the cooperative movement and use of biotechnology that, Dairy cannot be allied but it will be a mainstream business.
4. He put the cooperative dairy movement of Anand, Gujarat at all time high status.
5. While achieving the self-sufficiency in dairy business, various experiments were performed for quality control, newer dairy products and their preservation.



Q.30 Write a Short Note on Blue Revolution

1. Production of various useful aquatic organisms with the help of water is called as blue revolution.
2. Farm ponds and the fishes are very common in East Asian countries. However, people are not only thinking of cultivating the fishes and shrimps but other aquatic plants and animals too.
3. Government of India has vowed to increase the production by encouraging the people for pisciculture by launching the program 'Nil-Kranti Mission-2016' (NKM-16). 50% to 100% subsidies are offered in this case.
4. Marine and fresh water fishery is possible on large scale. Fresh water fishes like rohu, catla and other fishery products like shrimp and lobsters are being cultured on large scale.

Pisciculture : Prawns

Q.31 Write a Short Note on Fertilizers made with the help of Biotechnology

Two types of fertilizers are used in agriculture. One of those is organic manure and others are chemical fertilizers. Water holding capacity of the soil improves with soil conservation due to use of manures.

Upper layer of the soil essential in agriculture is formed due to humus formation. Various essential elements like N, P, K can be available to crops due to earthworms and fungi. In soil-less farming i.e. hydroponics, liquid chemical fertilizers are used. However, there are more harmful effects of liberal use of chemical fertilizers. It includes decrease in fertility of soil.

Fertilizers

Q.32 Write a Short Note on Insecticides.

Insecticides

1. Though the natural immunity of plants can prevent the infections, use of insecticides is not under control.
2. Irrespective of the natural friends of farmers like frogs and insectivorous birds, pesticides are used on large scale for increase in yield.
3. Pesticides are in fact a type of poison.
4. This poison enters the food-web through water and food and its bio-magnification occurs.
5. Various pesticides like DDT, malathion, chloropyriphos, etc. have been proved to be dangerous.
6. Use of less harmful or oraganic pesticides should be encouraged to reduce the level of toxicity.
7. To reduce environmental pollution, chemical pesticides should be sprayed specifically only when required.

Q.33 Oraganic farming is a currently preferred apporach in agriculture.

1. The liberal use of chemical fertilizers and pesticides used on large scale in agriculture is toxic for environment.
2. These Chemicals have been found to enter the food web and water sources and causes harmful effects on human and the environment.
3. Due to increasing problems of soil fertility and pest infestation an alternative solution is required to sustain agricultural yields.
4. Hence farmers are opting for organic farming i.e. the use of local, sturdy varieties with a complete ban on chemical use in order to maintain the natural balance of the ecosystem.

Oil cake

Vermiculture

Apiculture

What is apiculture and how it is done?
Apiculture is the act of rearing honeybees.
In this method, the bees are bred commercially in apiaries.
Apiary is an area where a large number of beehives can be placed.
Here, the bees are taken care of and managed to produce wax and honey.

What are the products obtained from apiculture?
The main products obtained from apiculture are honey and wax.
These products are used in cosmetic industries, polishing industries and pharmaceutical industries. Honey has medicinal values and is also used as a food additive.

What is the importance of apiculture?
Apiculture is important for the following reasons:
Apiculture provides products such as honey and wax that are used commercially.
Honeybees are responsible for pollination and thus help in increasing the yield of the several plants.
Some recent researches have proven that honeybees venom comprises a mixture of proteins that has the capability of destroying the AIDS virus.

How are the bees divided in a beehive? What work does each of them do?
The bees are divided into queen, drone and worker.
The queen bee lays thousands of eggs, the worker bee collects nectar and the drone bee fertilizes the eggs laid by the queen bee.

Name the varieties of bees reared by the beekeepers.
The beekeepers rear only the following varieties of bees because only they can produce honey:
Apis florea, Apis indica, Apis dorsata, Apis mellifera

Cultivation of Medicinal Plants

India has been gifted with a great biodiversity.
Indian citizens have established the humble and strong relation with the nature.
We have a great tradition of ayurveda that cures the diseases with the help of natural sources.
Medicinal plants are considered as rich resources as they can be used to treat diseases through age-old traditions like Ayurveda with minimum side effects.

Some important Medicinal Plants are as follows:

Local Name of Plant	Name of the active ingredient	Uses
 Adulsa (Adhatoda Vasica)	Vasicine is essential oil present in leaves	Cough, Respiratory Disorders
 Ashwagandha (Winter Cherry)	Alkaloids, Steroidal lactones and saponins	Increase strength, provides nourishment, improves immune system
 Haldi (Turmeric)	Sesquiterpene ketone, turmerone, curcumins	Purifies Blood, improves liver function, beneficial for healthy skin, prevents parasitic infections and skin diseases
 Suntha (Dry Ginger)	Volatile oils, Sesquiterpene hydrocarbons and phenolic compounds	Helps in digestion, facilitates release of gases and passing of stool, improves voice, relieves cough, vomitting and loose motions
 Jyeshthamadh (Licorice)	Glycyrrhizin	Reduce constipation, beneficial for healthy skin
 Nagarmotha (Nut Grass)	Essential oils, flavonoids, terepenoids and sesquiterpenes	Facilitates digestion and has anti helminthic properties.

Some important Medicinal Plants are as follows:

Local Name of Plant	Name of the active ingredient	Uses
 **Hirda (Myrobalan)**	**Gallic Acid**	**Stimulates appetite and liver function, improves digestion and bowel movements, eliminates worms.**
 **Vekhand (Sweet Flag)**	**Acorenone, Acorin**	**It prevents cough, cold and parasitic infection.**
 **Kuda (Kurchi/Conessi Bark)**	**Alkaloids (Conessine, Conimine)**	**Works as an appetizier, ensure digestion, prevents loose motion.**

Q.34 Explain the importance of fruit processing in human life.

1. Fruit processing includes the preparation of various food products using naturally grown fruits.
2. Fruits are perishable agro products and hence they need to be process in order to be used throughout the year.
3. Seasonal fruit products can be made throughout the year by using process fruits.
4. Fruit processing includes various methods ranging from storage in cold storage to drying, salting, air tight packing, preparing murabba, evaporating, etc.
4. Various products used in daily life such as chocolates, jams, juices and jellies are prepared by processing fruits.
5. Fruit processing plants also generate employment for local people residing in the vicinity of the industries.
6. Rural women are encouraged to be part of such Industries does giving them a source of earning their own money.

Mango processing Unit

9. Social health

Elders always instruct you to get out of the home to interact with relatives and others and play outdoor games but not to spend time continuously with television, phone and internet

Why the children of your age are instructed same in each home? Our lifestyle has been changed to some extent in this age of technology. Each person is busy with own daily routine work and favorite job only. How much is it scientifically correct?

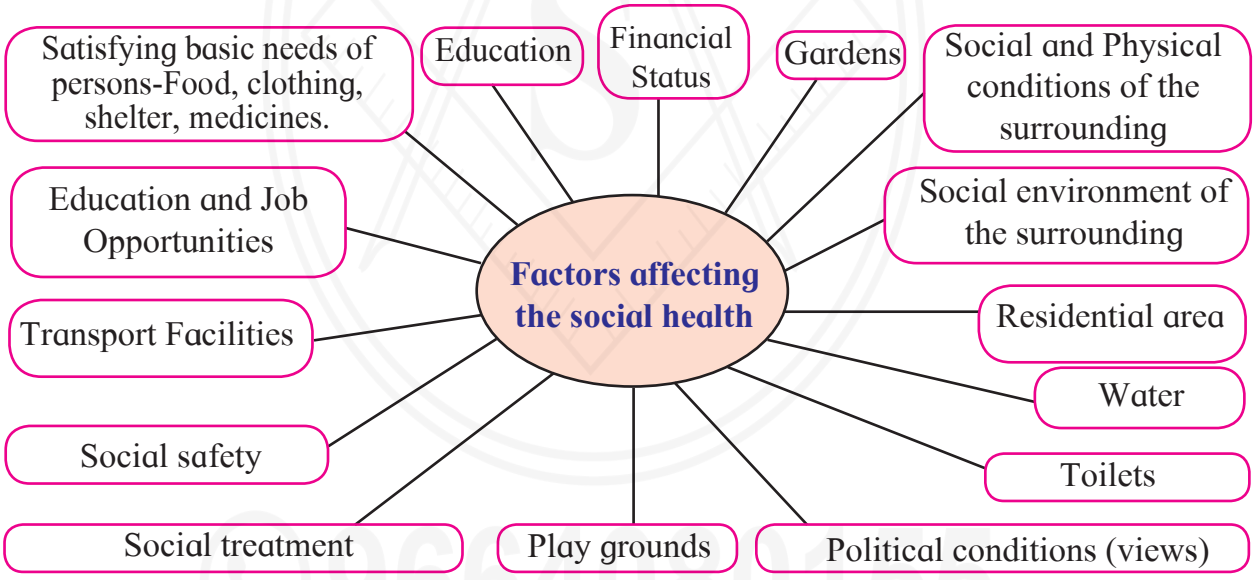
Earlier, we have studied the importance of physical health, cleanliness and staying healthy. However, the concept of health does not end with it only.

Classify your classmates into following groups depending upon the observation for a week.

1. Highly interactive. 2. Occasionally interactive. 3. Non-interactive

Social health

Observe the following chart. Discuss about the relationship of various factors shown therein with the social health.



Out of the various aspects of social health, we thought about only one in the above mentioned activity. Social health is the ability of a person to establish relationship with other persons. Ability to change one's own behavior according to changing social conditions is an important characteristic of social health. Various factors like strong personality, having large number of friends and relatives, proper use of time during loneliness and with peer-group, trust in others, respect and acceptance for others are important for good social health. We have seen that various factors affect the social health.

Factors disturbing the social health

1) Mental Stress

Competition has increased in opportunities for education, employment and business due to increase in population.

Children are facing the problems of loneliness and mental stress due to reasons like nuclear family and parents staying outdoors due to job.

There are many bindings on girls and excessive freedom for boys in some families.

Boys enjoy the concession from their domestic duties where as girls have compulsion for the same on the pretext that 'should be used to it'.

Do you see the advertisements about increasing awareness on avoiding the discrimination between girls and boys or sister and brother in same family on choice for fresh/left-over food, learning medium?

Mental Stress

In society too, adolescent girls have to unnecessarily face the problems like teasing and molestation.

Girls are facing the problem of stress due to such gender inequality.

Now a days, everyone has to face the stress due to ever increasing disorder, crime and violence.

At the same time, people looking at this as 'fast and easy way of making money' may become scapegoats and become part of such system.

This is the deadly effect of social illness.

2) Addiction

Peer-group influence is stronger in case of adolescents. Adolescents always prefer the company of friends and follow their good or bad habits instead of following advice of parents and teachers. Children in their early age try upon tobacco, cigarette, gutkha, alcoholic drinks, drugs, etc. due to either peer--group pressure or symbol of high standard living or as an imitation of elders. However, it may lead to addiction to such deadly substances. Temporarily intoxicating drugs of plant origin and some chemicals may permanently damage the human nervous system, muscle system, heart, etc. Earlier, we have studied the carcinogenic effect of tobacco containing substances on mouth and lungs.

Addiction control

Have you ever seen the persons inebriated with drugs or liquor loitering on dirty places? Whether such a pitiful condition of most intelligent human being is acceptable?

You must have read the news about many deaths due to poisonous liquor. Why does it happen?

Liquor is produced from alcohol obtained through fermentation of substances. However, if this process is performed in a wrong way, poisonous liquor is produced and proves fatal for many at a time. Efficiency of nervous system (especially brain) and liver as well as lifespan of person decreases due to alcoholism. Brain development in adolescents is hindered due to alcoholism and thereby ability of memorization and learning becomes slow. Addictive person cannot think rationally. Due to this, the person has to face the social, mental and familial illness along with physical illness.

3) Incurable disease

Factors like ignorance towards the people with incurable diseases like AIDS, T. B., leprosy and mental disorders as well as old persons leads to increase in old age homes and such factors also may cause harm to social health.

Whether the incidence shown in the following picture is rational? Express your opinion.

Communication Media and excessive use of Modern Technology

Two caricatures presenting the situations of the year 1998 and 2017 about playing on playground are given below. Observe those caricatures.

Express your opinion about arising of such different situations

Now a days, excessive, unnecessary and irrational use of modern technology and communication media is becoming a sensitive issue through the view point of social health. Persons spending the time with cell phones for several hours are usually unaware of the surrounding.

This is also a sort of addiction and leading to endangering of the social health.

Various physical problems like tiredness, headache, insomnia, forgetfulness, tinnitus, joint pains and problems in vision may arise due to radiation of cell phones.

More serious fact is those radiations penetrate the bones of children more effectively than the bones of adults.

Persons continuously using the computers and internet become solitary.

They cannot establish harmonious relations with relatives and other members of the society.

Habitually, they become self-centered and thereby they may develop problems like autism and selfishness.

They become less sensitive towards others.

Chronic effect of such tendency is that they are not ready to help others in need and hence they also do not get it in need.

1. Do you recall the sudden closing of any cartoon serial of foreign origin being telecast on television?
2. Explain details on happenings about blue whale game.

Children who watch the cartoon films may imitate the characters of those films. Tendency and behavior of the children who play the games like virtual war and car races (especially deliberately brought about virtual accidents in games) gradually become negative. Some games available on cell phones and computers are extremely time-consuming and also cause economic losses, to lose concentration on some essential subjects and may also prove fatal.

Along with some useful purpose, huge information available on internet is used for viewing some inappropriate videos too. However, there is a governmental regulation over such media. Website, movies and cartoon films inappropriate for children are banned by the government.

- Why is there increase in news of death by drowning in ocean, falling in deep valleys or under trains during catching the cell phone selfie?
- There is increasing competition to upload the videos of road accidents instead of helping the victims. What is the mentality of such people?
- Why are the video-clips of parents threatening or hitting the children not studying as per their wish or domestic helpers beating the children are very common on social media nowadays?

Observe the above images Is it rational? Why?

Pedestrian making a video-clip of the accident scene

Person indulging in such destructive and unnatural activities is usually under stress and such activities are bursting of stress. Medical science has declared such activities as mental illness.

Person indulging in selfie is not aware about the world around and the risks.

This is called as selfiecide. Persons indulging in domestic violence, sending messages to others before committing suicide or those who send the video clips of suicidal act are mentally ill and they do so to win the sympathy.

Hence, make the constructive use of communication media like television, phone, and internet for essential needs and entertainment only but do not go into the clutches by spending hours with those media.

Cyber crimes

- Banks continuously spread the message on mobile phones about not to disclose the aadhar / PAN / credit card / debit card number and other personal information if demanded by any person.
- Do not disclose your PIN to anyone while withdrawing cash from ATM machine or purchasing through card payment. Why such instructions are given?
- Consumers are deceived by showing superior items on websites but actually selling the items of either inferior quality or impaired ones.
- Bank transactions are done using PIN without the knowledge of consumers.
- Confidential information about government, institutes and companies is obtained from internet with the help of computer programs or other ideas and misused. This is called as hacking of information.
- Nowadays, crimes like opening a fake account on Facebook and displaying false information and thereby teasing the girls or exploiting them financially.
- Misuse or illegal sale of the written literature, software, photos, videos, music, etc. of others by obtaining from internet is called as piracy.
- Electronic media is also misused by sending derogatory messages, spreading vulgar pictures and inflammatory statements.
- Exchange of information through media like email, Facebook and Whatsapp occurs very fast. However, our personal information and phone numbers are automatically spread and thereby reaches the unwanted persons which leads to malpractices like incoming of unnecessary messages. Some of such messages either impair of shut down the mobiles and computers.

All the above mentioned incidences are examples of cyber crime. Committing such crimes is also a mental illness. Later on, the criminal also has to face the mental stress. 'Cyber crime unit' has been newly launched in police department. Cyber crime experts collect the details, investigate the cyber crime and thereby find the criminal with the help of internet.

Visit the website www.cyberswachhtakendra.gov.in

IT Act-2000: This act has been enacted since 17th October 2000 and been amended in 2008. Person committing the cyber crime has to face the punishment like imprisonment for 3 years and fine up to 5 lakh. Maharashtra is at forefront in controlling the cybercrimes and it has been proved to be a first state to start a separate cyber crime unit.

Stress management

Laughter Club

Have you seen the loudly laughing citizens in morning in public gardens? Name of this newly popularized concept is 'laughter club'. These people relieve their mental stress by laughing loudly.

Various ways of expression like establishing communication with friends, peers, cousins, teachers and more importantly parents, noting down our feelings, expressing our feeling with near and dear ones help us to relieve the stress.

Fostering the hobbies like material collection, photography, reading, cooking, sculpturing, drawing, rangoli, dancing, etc. help us to properly utilize the free hours. By diverting the energy and mind towards the positive thinking, negative thoughts are automatically neutralized.

Why do you wait for periods of music, P.T., drawing in the classroom?

Learning and listening to the music, singing keeps us happy and drives away the stress. Music has the power of changing the mindset. Importance of outdoor games is unparallel. There are various benefits of sports like it causes physical exercise, improves discipline, interaction and tendency of unity, loneliness is driven away and person becomes more social.

Nature is closest friend of human being. Hobbies like gardening, bird watching, lingering in nature, rearing domestic animal, etc. helps to create positive mindset, improves confidence. Social health can be maintained by keeping ourselves aware about happenings around us, neutralizing the negative thoughts (ex. revenge), etc.

Regular exercising, massaging, visiting the spa too help to relive the stress.

Yoga is not limited for asanas and pranayam but it includes discipline, balanced and good food, and meditation also. Deep breathing, yogic sleep, yogasanas, etc. are good for health.

Meditation helps to improve the ability of concentration.

It imparts positivity in our temperament. Meditation helps the students to improve concentration in their studies. Deliberate inculcation of characters like time management, planning of our own duties and decision power is nothing but cultivating the socially strong and ideal personality.

We have all the ways to manage our stress. However, if those are not successful due to certain reasons, it leads to some more serious problems like depression and frustration. Medical advice, counselling and psychotherapy are available for such persons. Similarly, many NGOs also provide helping hand. Let us see the information about some of those.

1. Unified Movement against Tobacco.

This movement has been started by 45 different well-known organizations like WHO, Tata trust, etc. This movement is active for controlling the tobacco consumption and providing guidance to activists against tobacco.

2. Salaam Mumbai Foundation

This organization runs programs in various schools in Mumbai to inpower the children living in slum area in the field of education, sports, arts and busines. This organization encourages the children to take education by helping them to improve their health and lifestyle. This trust has made some districts in Maharashtra completely tobacco-free through hard work. Since the year 2002 theis organiration is working with various school in urban and rural area for making the society tobacco-free. This programme is being implemented with the help of Government in about 200 schools in Mumbai and 14000 schools in the rest of Maharashtra. The oath of freedom from tobacco is taken in every school as per the Government letter.

Counselling

Government Schemes

Phone number / helpline numbers are published in newspaper to help the children in distress or facing any type of problem. Children contact the helpline to narrate their problems. Proper help and guidelines are offered to children.

Exercise

1. Fill in the blanks with appropriate word.

a. Laughter club is a remedy to drive away -- -- -- --.

b. Alcohol consumption mainly affects -- -- -- -- system.

c. The act -- -- -- -- is to curb the cyber crimes.

2. Answer the following.

a. Which factors affect the social health?

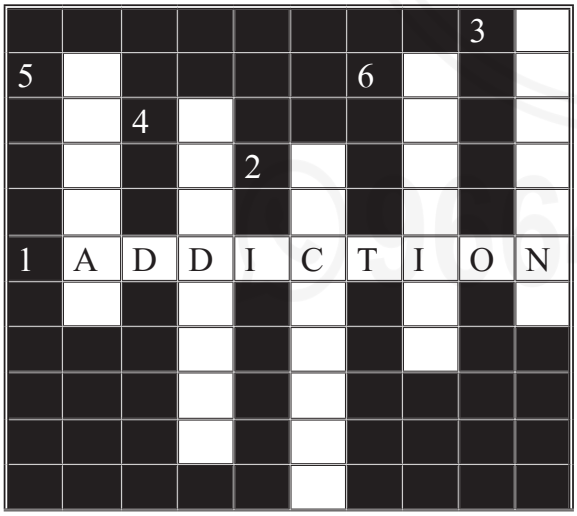
b. Which changes occur in persons continuously using internet and mobile phones?

c. Which problems do the common man faces due to incidences of cyber crime?

d. Explain the importance of good communication with others.

3. Solve the following cross-word

1. Continuous consumption of alcoholic and tobacco-materials.
2. This app may cause the cyber crimes.
3. A remedy to resolve stress.
4. Requirement for stress free life.
5. Various factors affect -- -- -- health.
6. Art of preparing food items.



4. Which are various ways to minimize stress?

5. Give three examples of each.

a. Hobbies to reduce stress.

b. Diseases endangering the social health.

c. Physical problems arising due to excessive use of mobile phones.

d. Activities under the jurisdiction of cyber crime laws.

6. What will you do? Why?

a. You are spending more time in internet/mobile games, phone, etc.

b. Child of your neighbor is addicted to tobacco chewing.

c. Your sister has become incommunicative. She prefers to remain alone.

d. You have to use free space around your home for good purpose.

e. Your friend has developed the hobby of snapping selfies.

f. Your brother studying in XII has developed the stress.

7. What type of changes occurs in a home having chronically ill old person? How will you help to maintain good atmosphere?

10. Disaster Management

1. What is disaster?
2. Which disasters have you experienced in your area?
3. What are the effects of that disaster on local and surrounding conditions?

Disaster

Variously dangerous events occur many times in the environment. Those are called as disasters. Some of the main natural disasters are floods, wet and dry famine, cyclones, earthquakes, volcanoes, etc. These are 'all of a sudden' troubles to the mankind. Such events cause sudden changes in the environment and thereby cause the damage to it. Environment is also damaged due to use of natural resources for our development. This leads to sudden disasters, unexpected to human. These can be called as man-made disasters.

United Nations has defined the disaster as 'the sudden event that leads to the huge loss of life and property. Words like 'huge' and 'sudden' are important in the definition. As the disaster occurs suddenly, it cannot be predicted. Hence, precautions are not possible. Huge losses to the property occur in the area of disaster. There are long term effects on society due to incidences of life and property loss. Various areas of life like economic, social, cultural, political, law and administration, etc. are affected by it. The life in the area of disaster disturbs totally. There is loss to life and property of the people in distress.

Earlier, we have studied various types of disasters and the measures to be taken. None of the different disasters are similar. Period of each disaster is not same. Some disasters are short term where as some are long term. Reasons behind each disaster are also different. Depending upon the nature of disaster, it can be determined that which component of the environment will be affected more.

Earlier, we have studied the effects of various types of disasters and the precautionary measures to be taken in case any disaster happens. We can classify the disasters in other ways too; like catastrophic disasters. Ex. Cyclones in Odisha, catastrophic earthquakes of Gujarat and Latur, frequently buzzing cyclones in coastal Andhra Pradesh, etc. which lead to total chaos, huge loss of life and property in respective region. However, irrespective of all these, life has always returned to normal within short time. Disasters making the impact for long duration are those whose after-effects are either severe or severity increases with time. Ex. Famine, various problems of crop, strikes of workers, rising levels of oceans, desertification, etc.

1. Which are the destructive effects of flood?
2. Which are the effects of dry famine?
3. Which are the destructive effects of earthquake?
4. What is forest fire? What is its effect on environment?

Identify the Disasters









Types of Disasters

- (Geophysical)
  - Geological — Ex. Earth quake, volcano, tsunami, land-slides, land-fall, erosion, alkalization, flooding, etc.
  - Atmospharic — Ex. Hot and cold waves, snow-storms, snow fall, cyclones, hail storm, drought, flood, meteorite, sun spots, etc.
- (Biological)
  - Plant — Ex. Forest fire, fungal dis-ease spreading (Blister), weed, (aquatic, carrot grass, common grass)
  - Animal — Infectious viruses, bacteria (cholera, malaria, hepatitis, plague), insects, bite of poisonous animals,etc.
- (Man Made)
  - Unknown poisonous gases. Atomic test. Unplanned action Accident..
  - International — War, fire, bomb blast, forced migration, terrorism, rapes, child labour.

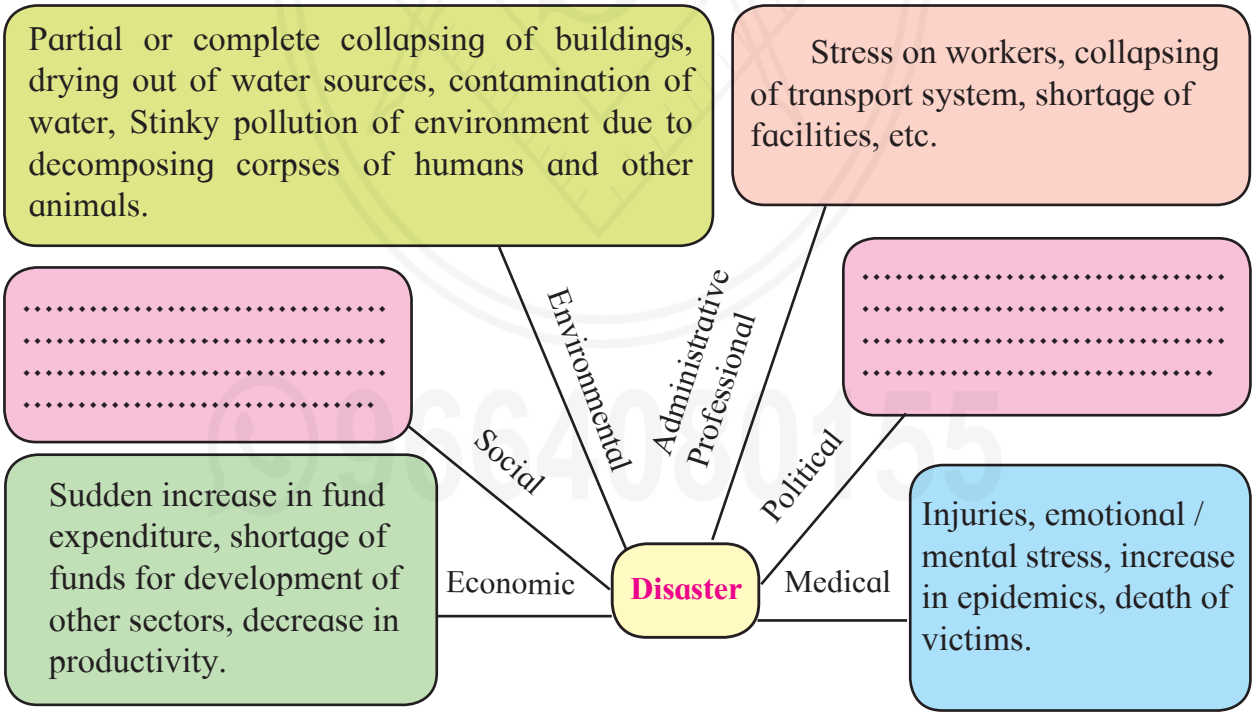
Effects of disaster

We have understood the serious effects of disaster with the help of above-mentioned questions. Collapsing of bridges, flooding of coastal villages, shortage of food are some of the problems of floods. Collapsing of houses, developing cracks in land are some of the effects of earthquake. Disasters like forest fire and drought also adversely affect the environment.

However, what is exact nature of these disasters? Whether there are any changes in nature before the occurrence of disasters? For how long the effects occur after the occurrence of disaster? How? It needs to be think over all these aspects. This helps us to understand the nature and gravity of the disaster.

Disasters definitely affect the economy of the nation. That effect is always relative to disaster and economy i.e. if any port is destroyed, there are long lasting effects on econo my due to huge expenses on its reconstruction. An effect of disaster on social leadership is that if local leadership is not strong enough, citizen become confused. It affects their par ticipation in rescue and rehabilitation activities. Administrative problems arise during the disaster. If local governing bodies are affected by disasters, related departments cannot answer the problems of disaster efficiently. All the concerned departments are affected by disaster and thereby entire system collapses.

Different problems occurs with disasters. in the concept map different effects are mentioned. Read it and fill the blank places



Nature and scope of disaster

Taking into consideration the scope of disaster, some of the important facts must be thought over, as follows

1.	Pre-disaster phase	2.	Warning phase	3.	Emergency phase
4.	Rehabilitation phase	5.	Recovery phase	6.	Reconstruction phase

Taking into consideration the nature and scope of disaster, only three aspects of disaster are important for common citizens.

1. Phase of emergency: Important character of this phase is that maximum lives can be saved by quick actions during this phase only. Various actions like search and rescue operations, medical assistance, first aid, restoring communication services, removing the people from affected area are expected in this phase. Gravity of disaster can be estimated in this phase only.

2. Transitional Phase: Rehabilitation work is started in this phase, after the subsidence of any type of disaster. It includes clearing of debris, restoring water supply, repairing roads, etc. so that it will help to bring normalcy in public life. Rehabilitation of the victims is important aspect of this phase. Generally, different institutes offer the monetary and other type of help to such people. It helps to soothe the mental stress at the earliest if these victims are offered with the permanent mean of earning livelihood and this is true rehabilitation.

3. Reconstruction Phase: This is highly complicated phase. This phase begins in transitional phase. People reconstruct their buildings and facilities like roads and water supply are restored. Farming practices are restarted. However, it takes long time for reconstruction.

In 2014, there had been a huge land slide in the village Malin, Tal. Ambegaon, Dist. Pune. Following is the image of the school reconstructed after the disaster.

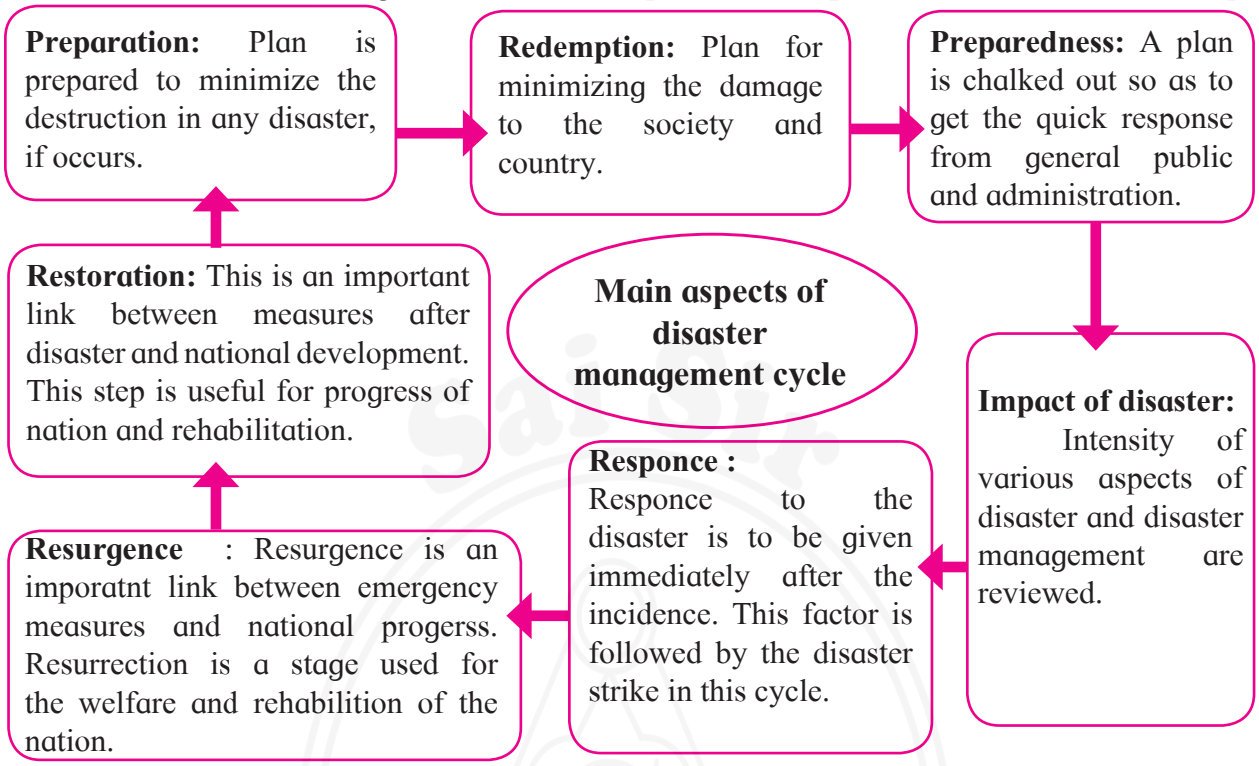
Planet Earth has experienced many natural disasters. Listening to the description of those disasters brings numbness to the mind. Most of the disasters and related unprecedented situations have been occurred in the Asian continent and region of Pacific Ocean. Huge loss to the life and the planet Earth has been occurred due to such disasters. Generally, such conditions of natural imbalance have been arisen due to greed of economic progress of human being.

In reality, old problems of several years have become fierce. Ex. Increasing population, its increasing needs emerging problems out of it are now at the extreme end. Such disasters have been increased after the world war-II. Condition of instability arises in the country due to various reasons like economic inequality, racial and religious differences, etc. Incidences like terrorism, abduction, social differences have been a routine now.

Production and use of harmful chemicals is under ban in developed countries. However, production of either same or those chemicals which can wipe out the human race is common in developing and poor countries.

Another such threat to human being is from the atomic energy plants. Ex. Radiation leakage occurred after a blast in atomic energy plant at Chernobyl, Russia. Its ill-effects are still experienced in the region. This atomic energy plant was only used for electricity generation. Now a day, many countries are equipped with atomic energy. Out of this, risk of radiation leakage is increasing due to carelessness. Hence, importance of disaster management has become the foremost need of almost all the nations. In fact, it is most necessary for citizens of all countries, because they are the main sufferers in any type of disaster. Hence, direct participation of citizens in disaster management is highly necessary. Similarly, disaster management schemes should be changed with respect to location, time and nature of the disaster. It should not be restricted for a particular period. Overall, there may be any type of disaster, it should be overcome. Concept of disaster management has been arisen out of this only.

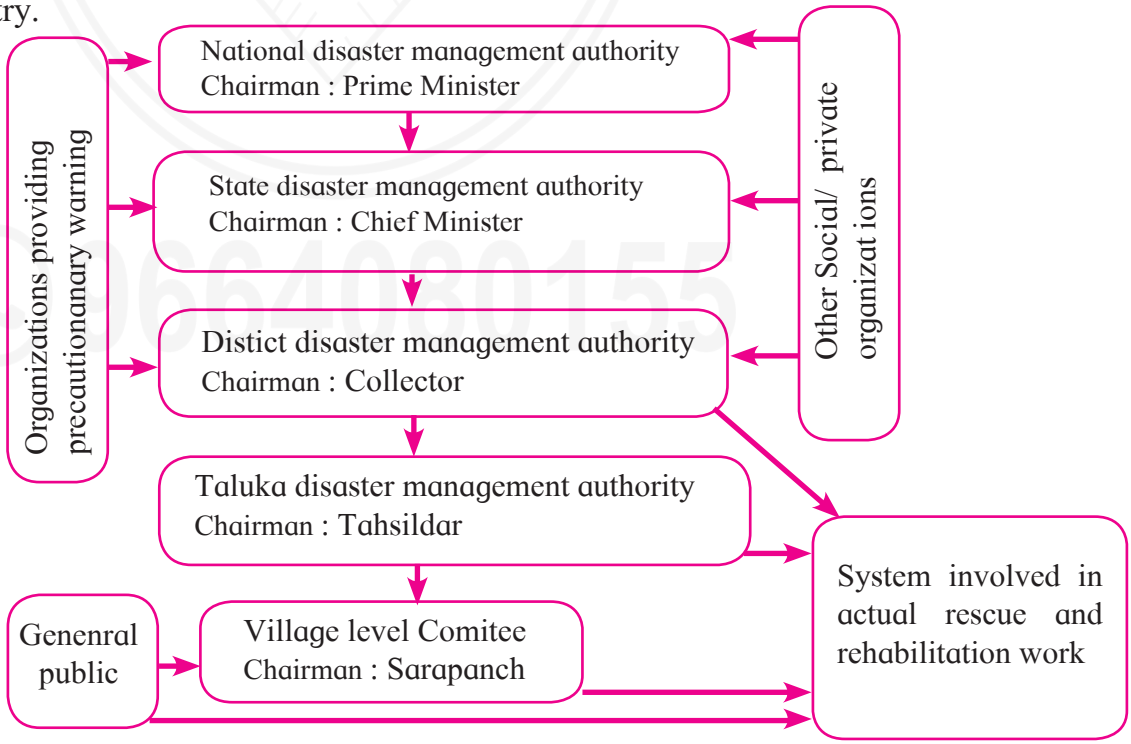
Observe the disaster cycle given below and explain each aspect of the disaster of earthquake.



Though avoidance of natural disaster is impossible, loss out of it can be minimized. However man-made disasters can be avoided. Helping each other in the crisis of disaster is our ethical responsibility.

Structure of Disaster Management Authority

In case of disaster, an authority has been established at the level of government. Following flow chart indicates the function of control and coordination under the disaster management from national to village level. Disaster Management Act, 2005 has been passed in our country.



District Disaster Management Authority:

At the district level, district collector is responsible for disaster management and implementation of rehabilitation schemes. Collector is planning, coordinating and controlling the implementation of rehabilitation programme, gives out necessary instructions and reviews the entire system. District collector is also responsible for designing the schemes for each district, separately for each type of disaster and getting those sanctioned from state-level authorities.

District-wise Disaster Control Unit:

District control unit is established immediately either after the impact of disaster or getting intimation about it. It reviews about various aspects of disaster, keeps continuous contact with various agencies like army, air force, navy, telecommunication department, paramilitary forces, etc. for getting help. It is also responsible for coordinating with various voluntary organizations for their help in disaster management.

List of International Organizations that work for disaster management.

1. United Nations Disaster Relief Organization
2. United Nations Centre for Human Settlements
3. Asian Disaster Reduction Centre.
4. Asian Disaster Preparedness Centre.
5. World Health Organization.
6. United Nations Educational, Scientific and Cultural Organization.

About NDRF

National Disaster Response Force has been established as per the Disaster management Act, 2005. Divisions of this force are working in army. Overall, 12 divisions are working in the country. Its headquarter is in Delhi and it is in action all over the country with the help of army. In Maharashtra, National Disaster Response Force is in action through State Reserve Police Force. Personnel of this force have substantial contribution in rescue work in disasters like cyclones, cliff-sliding, building collapse, etc. Website: http://www.ndrf.gov.in

What is first aid?

First aid is the first and immediate assistance given to any person suffering from either a minor or serious illness or injury, with care provided to preserve life, prevent the condition from worsening, or to promote recovery.

First Aid Kit

It is essential to have material necessary for first aid with us. That material is available in the first aid kit. You can also prepare a first aid kit. It is also important to use whatever the material available in the given condition for first aid.

The necessary material in first aid box

1. Bandage strips of different size
2. Wound gauze.
3. Triangular and circular bandage.
4. Medicated cotton
5. Hand gloves
6. Clean and dry cloth pieces.
7. Soap
8. Antiseptic (Dettol/ Savlon)
9. Safety pins
10. Blade
11. Small pins
12. Needle
13. Band aid
14. Torch
15. Scissor
16. Thermometer
17. Petroleum jelly

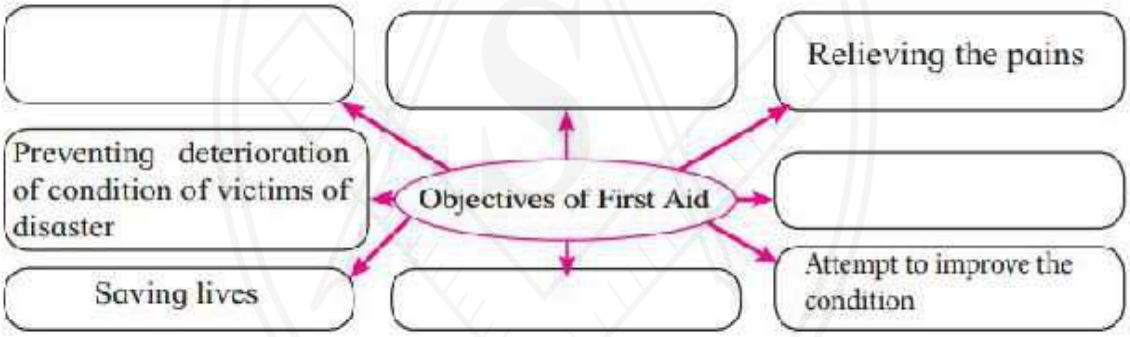
First Aid and Emergency Action:

Give the reference of following pictures and explain importance of each of those in disaster management. Which are other such activities?

Various activities

In emergency condition, various transportation methods like cradle method, carrying on back, carrying on two hands are to be followed. Those methods depend upon the condition of victim. We face different types of major or minor disasters in our daily life. Varieties of disasters like accidents, stampede, injuries in fighting, electric shock, burns, heat shock, snake bite, dog bite, fire due to electric short circuit, epidemic of any disease, etc. happen around us. Victims of disaster need to be offered some primary help before actual medical treatment. First aid is useful in such circumstances.

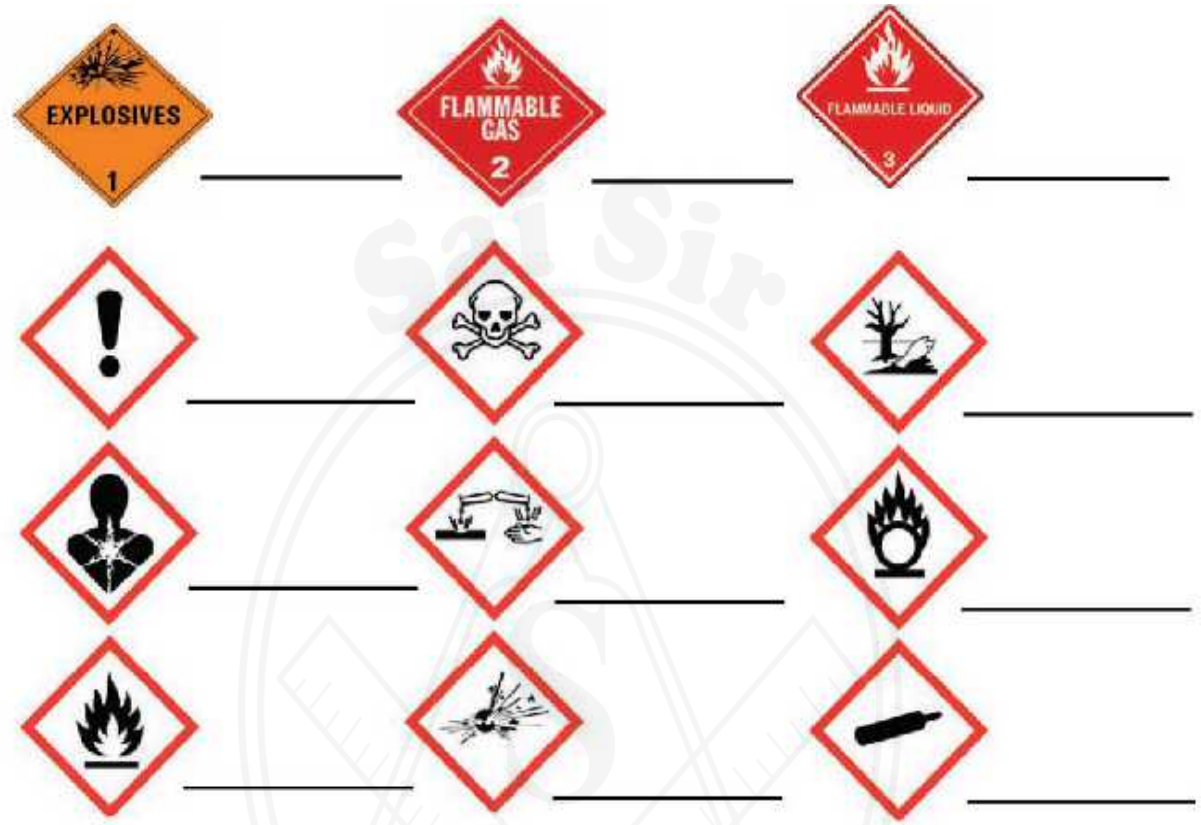
Complete the chart as per the objectives of Firs taid.



Following are some pictures of disasters. Which precautions would you take during these disasters?

Warning Signs

Sometimes, we have to face the disaster due to our own unawareness.
Some symbols given beside are seen used around us. Those symbols can be ignored.
Such symbols are useful to avoid the mishaps.



Mock Drill

It is a practice to check the preparedness of facing the disaster as early as possible. Virtual / Apparent situation of disaster is created to check the reaction time for any type of disaster. Trained personnel observe their responsibilities to check execution of plan designed for disaster redressal. This helps to check the efficacy of the system prepared for disaster redressal.

Mock drill is arranged on disaster of fire in various schools by the fire fighters.
It includes the demonstrations like extinguishing the fire, rescuing the people trapped at higher floors of buildings, rescuing the persons whose clothing have catched the fire, etc.
Such activities are also arranged by police force and voluntary organizations.

Objectives of Mock Drill

1. Evaluating the response to the disaster.
2. Improving the coordination between various departments of disaster control.
3. Identification of own abilities.
4. Improving the ability of quick response to disaster.
5. Checking the competency of the planned actions.
6. Identifying the possible errors and risks.

Always remember

1. Do not chaos and push each other while using staircase in the school.
2. Remind important help-lines and use as per need. Ex. Police 100, Fire fighting force 101, Disaster Control Unit 108, Ambulance 102, etc.
3. Follow the traffic rules. Look at left and right sides while crossing the road and ensure that any vehicle in not passing by.
4. Do not touch any unclaimed object. Do not spread rumors.
5. Do not make chaos at the crowded places.
6. In pandemic like coronavirus, wear mask, wash hands regularly, keep personal hygiene, obey social distance rules.

Exercise

1. Complete the table.

(Motor accident, land sliding, forest fire, theft, riot, war, epidemic, drought, locust attack, financial crisis, flood, famine)

Disaster	Symptoms	Effects	Remedy

2. Write notes.

a. Disaster management Authority

b. Nature of disaster management

c. Mock drill

d. Disaster Management Act, 2005

3. Answer the following questions.

a. Explain the role of district disaster control unit after occurrence of any disaster.

b. Give the reasons for increase in human disasters after the World War-II.

c. Which are the objectives of disaster management?

d. Why is it essential to get the training of first aid?

e. Which different methods are used for transportation of patients? Why?

4. On the basis of the structure of disaster-management authority, form the same for your school.

5. Write down the reasons, effects and remedial measures taken for any two disasters experienced by you.

6. Which different aspects of disaster management would you check for your school? Why?

7. Identify the type of disaster.

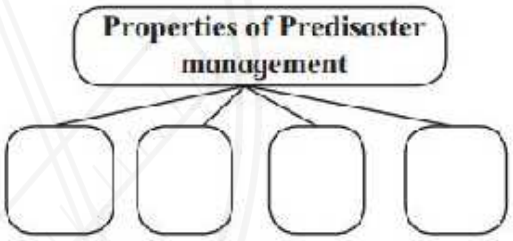
a. Terrorism b. Soil erosion
c. Hepatitis d. Forest fire
e. Famine f. Theft

8. Explain that why is it said like that?

A] Mock drill is useful

B] Effective disaster management makes us well prepared for future.

9. Complete the following chart.



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