Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 1 The Living World

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Question 1: Why are living organisms classified?
Answer: A large variety of plants, animals, and microbes are found on earth. All these living organisms differ in size, shape, colour, habitat, and many other characteristics. As there are millions of living organisms on earth, studying each of them is impossible. Therefore, scientists have devised mechanisms to classify all living organisms. These methods of classification are based on rules and principles that allow identification, nomenclature, and finally classification of an organism.

For example, based on certain principles, once an organism is identified as an insect, it will be given a scientific name and then grouped with other similar organisms. Thus, various groups or taxon include organisms based on their similarity and differences.
Therefore, the biological classification helps in revealing the relationship between various organisms. It also helps in making study of organisms easy and organized.

Question 2: Why are the classification systems changing every now and then?
Answer: Millions of plants, animals, and microorganisms are found on earth. Many of these have been identified by the scientists while many new species are still being discovered around the world. Therefore, to classify these newly discovered species, new systems of classification have to be devised every now and then. This creates the requirement to change the existing systems of classification.

Question 3: What different criteria would you choose to classify people that you meet often?
Answer: To classify a class of forty students, let us start the classification on the basis of sexes of the students. This classification will result in the formation of two major groups- boys and girls. Each of these two groups can be further classified on the basis of the names of the students falling in these groups.
Since it is possible that more than one student can have a particular name, these names can be further divided based on the surnames.
Since there is still some chance that more than one student can have the same surname, the final level of classification will be based on the roll numbers of each student.

Question 4: What do we learn from identification of individuals and populations?
Answer: The knowledge of characteristics of an individual or its entire population helps in the identification of similarities and dissimilarities among the individuals of same kind or between different types of organisms. It helps the scientists to classify organisms in various categories.

Question 5: Given below is the scientific name of Mango. Identify the correctly written name.
Mangifera Indica
Mangifera indica
Answer: In binomial system of nomenclature, the generic name of a species always starts with a capital letter whereas the specific name starts with a small letter. Therefore, the correct scientific name of Mango is Mangifera indica.

Question 6: Define a taxon. Give some examples of taxa at different hierarchical levels.
Answer: Each unit or category of classification is termed as a taxon. It represents a rank. For example, the basic level of classification is species, followed by genus, family, order, class, phylum or division, in ascending order. The highest level of classification is known as kingdom.

Question 7: Can you identify the correct sequence of taxonomical categories?
(a) Species → Order → Phylum → Kingdom
(b) Genus → Species → Order → Kingdom
(c) Species → Genus → Order → Phylum
Answer: The correct hierarchical arrangement of taxonomic categories in ascending order is Species → Genus → Family → Order → Class → Phylum → Kingdom
Therefore, both (a) and (c) represent correct sequences of taxonomic categories.
In sequence (b), species should be followed by genus. Therefore, it does not represent the correct sequence.

Question 8: Try to collect all the currently accepted meanings for the word 'species'. Discuss with your teacher the meaning of species in case of higher plants and animals on one hand and bacteria on the other hand.
Answer: In biological terms, species is the basic taxonomical rank. It can be defined as a group of similar organisms that are capable of interbreeding under natural conditions to produce fertile offsprings.
Therefore, a group of similar individuals that are respectively isolated form a species. Species can also be defined as group of individuals that share the same gene pool.

Question 9: Define and understand the following terms:
(i) Phylum (ii) Class (iii) Family (iv) Order (v) Genus
Answer:(i) Phylum
Phylum is the primary division of kingdom. It includes one or more related classes of animals. In plants, instead of phylum, the term 'division' is used.
(ii) Class
Class is a taxonomic group consisting of one or more related orders. For example, the class, Mammalia, includes many orders.
(iii) Family
Family is a taxonomic group containing one or more related genera. In plants, families are categorized on the basis of vegetative and reproductive features.
(iv) Order
Order is a taxonomic group containing one or more families. For example, the order, carnivore, includes many families.
(v) Genus
Genus is a taxonomic group including closely related species. For example, the genus, Solanum, includes many species such as nigrum, melongena, tuberosum,etc.

Question 10: How is a key helpful in the identification and classification of an organism?
Answer: Key is another taxonomical aid that helps in identification of plant and animal species. These keys are based on similarities and dissimilarities in characters, generally in a pair called couplet.
Each statement in a taxonomic key is referred to as a lead. For categorizing each taxonomic rank, such as family, genus, species, etc., different keys are used. It is also useful in identification of unknown organisms.
Keys are of two types- indented and bracketed keys. Indented key provides a sequence of choices

between two or more statements while in bracketed key, a pair of contrasting characters are used.

(i) Indented key to identify different species of Rhododendron.

1. Leaves evergreen
2. leaves densely hairy below, orange or white hair; flower appears to have separate petals
..... Rhododendron groenlandicum
2. hair absent on leaves, flower has five petals fused in a shallow tube
..... Rhododendron maximus
1. Leaves deciduous
3. pink flowers with two free petals and three fused petals
..... Rhododendron canadense
3. white to pink flowers with all petals fused together

(ii) Bracketed key to identify different species of Rhododendron.

1. Leaves evergreen————————————————2
1. Leaves deciduous————————————————3
2. Leaves densely hairy below, orange or white hair; flower appears to have separate petals
..... Rhododendron groenlandicum
2. Hair absent on leaves, flower has five petals fused in shallow tube
.....Rhododendron maximus
3. Pink flowers with two free petals and three fused petals
..... Rhododendron canadense
3. White to pink flowers with all petals fused together——4

Question 11: Illustrate the taxonomical hierarchy with suitable examples of a plant and an animal.

Answer: The arrangement of various taxa in a hierarchical order is called taxonomic hierarchy.
In this hierarchy, species is present at the lowest level whereas kingdom is present at the highest level.

Kingdom
↑
Phylum or division
↑
Class
↑
Order
↑
Family
↑
Genus
↑
Species

A Taxonomic hierarchy

Classification of a plant

As an example, let us classify Solanum melongena (Brinjal).

Kingdom – Plantae
Division – Angiospermae
Class – Dicotyledonae
Order – Solanales
Family – Solanaceae
Genus – Solanum
Species – melongena

Classification of an animal

As an example, let us classify Columba livia (Blue rock Dove).

Kingdom – Animalia
Phylum – Chordata
Class – Aves
Order – Columbiformes
Family – Columbidae
Genus – Columba
Species – livia

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 2 Biological Classifications

Class 11 Biology Solutions Chapter 2 Biological Classifications

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 2 Biological Classifications

Question 1: Discuss how classification systems have undergone several changes over a period of time?
Answer The classification systems have undergone several changes with time. The first attempt of classification was made by Aristotle. He classified plants as herbs, shrubs, and trees. Animals, on the other hand, were classified on the basis of presence or absence of red blood cells. This system of classification failed to classify all the known organisms.
Therefore, Linnaeus gave a two kingdom system of classification. It consists of kingdom Plantae and kingdom Animalia. However, this system did not differentiate between unicellular and multicellular organisms and between eukaryotes and prokaryotes. Therefore, there were large numbers of organisms that could not be classified under the two kingdoms.
To solve these problems, a five kingdom system of classification was proposed by R.H Whittaker in 1969. On the basis of characteristics, such as cell structure, mode of nutrition, presence of cell wall, etc., five kingdoms, Monera, Protista, Fungi, Plantae, and Animalia were formed.

Question 2:: State two economically important uses of:
Heterotrophic bacteria
Archaebacteria
Answer (a) Heterotrophic bacteria
They act as decomposers and help in the formation of humus.
They help in the production of curd from milk.
Many antibiotics are obtained from some species of bacteria.
Many soil bacteria help in fixation of atmospheric nitrogen.

(b) Archaebacteria
(1) Methane gas is produced from the dung of ruminants by the methanogens.
(2) Methanogens are also involved in the formation of biogas and sewage treatment.

Question 3: What is the nature of cell-walls in diatoms?
AnswerThe cell walls of diatoms are made of silica. Their cell wall construction is known as frustule. It consists of two thin overlapping shells that fit into each other such as a soap box. When the diatoms die, the silica in their cell walls gets deposited in the form of diatomaceous earth. This diatomaceous earth is very soft and quite inert. It is used in filtration of oils, sugars, and for other industrial purposes.

Question 4: Find out what do the terms ‘algal bloom’ and ‘red-tides’ signify.
Answer Algal bloom
Algal bloom refers to an increase in the population of algae or blue-green algae in water, resulting in discoloration of the water body. This causes an increase in the biological oxygen demand (BOD), resulting in the death of fishes and other aquatic animals.
Red-tides

Red tides are caused by red dinoflagellates (Gonyaulax) that multiply rapidly. Due to their large numbers, the sea appears red in colour. They release large amounts of toxins in water that can cause death of a large number of fishes.

Question 5: How are viroids different from viruses?
Answer Viroids were discovered in 1917 by T.O. Denier. They cause potato spindle tuber disease. They are smaller in size than viruses. They also lack the protein coat and contain free RNA of low molecular weight.

Question 6 Describe briefly the four major groups of Protozoa.
Answer Protozoa are microscopic unicellular protists with heterotrophic mode of nutrition. They may be holozoic, saprobic, or parasitic. These are divided into four major groups.

(1) Amoeboid protozoa or sarcodines
They are unicellular, jelly-like protozoa found in fresh or sea water and in moist soil. Their body lacks a periplast. Therefore, they may be naked or covered by a calcareous shell. They usually lack flagella and have temporary protoplasmic outgrowths called pseudopodia. These pseudopodia or false feet help in movement and capturing prey. They include free living forms such as Amoeba or parasitic forms such as Entamoeba.

(2) Flagellated protozoa or zooflagellates
They are free living, non-photosynthetic flagellates without a cell wall. They possess flagella for locomotion and capturing prey. They include parasitic forms such as Trypanosoma, which causes sleeping sickness in human beings.

(3) Ciliated protozoa or ciliates
They are aquatic individuals that form a large group of protozoa. Their characteristic features are the presence of numerous cilia on the entire body surface and the presence of two types of nuclei. All the cilia beat in the same direction to move the water laden food inside a cavity called gullet. They include organisms such as
Paramoecium, Vorticella,etc.

(4) Sporozoans
They include disease causing endoparasites and other pathogens. They are uninucleate and their body is covered by a pellicle. They do not possess cilia or flagella. They include the malaria causing parasite Plasmodium.

Question 7: Plants are autotrophic. Can you think of some plants that are partially heterotrophic?
Answer Plants have autotrophic mode of nutrition as they contain chlorophyll pigment. Thus, they have the ability to prepare their own food by the process of photosynthesis. However, some insectivorous plants are partially heterotrophic. They have various means of capturing insects so as to supplement their diet with required nutrients derived from insects, causing proliferation of growth. The examples include pitcher plant (Nepenthes), Venus fly trap, bladderwort, and sundew plant.

Question 8: What do the terms phycobiont and mycobiont signify?
Answer Phycobiont refers to the algal component of the lichens and mycobiont refers to the fungal component. Algae contain chlorophyll and prepare food for fungi whereas the fungus provides shelter

to algae and absorbs water and nutrients from the soil. This type of relationship is referred to as symbiotic.

Question 9: Give a comparative account of the classes of Kingdom Fungi under the following:
Mode of nutrition
Mode of reproduction
Answer Phycomycetes- This group of fungi includes members such as Rhizopus, Albugo, etc.
(i) Mode of nutrition
They are obligate parasites on plants or are found on decaying matter such as wood.
(ii) Mode of reproduction
Asexual reproduction takes place through motile zoospores or non-motile aplanospores that are produced endogenously in sporangium.
Sexual reproduction may be of isogamous, anisogamous, or oogamous type. It results in the formation of thick-walled zygospore.

Ascomycetes- This group of fungi includes members such as Penicillium,
Aspergillus, Claviceps, and Neurospora.
(i) Mode of nutrition
They are sporophytic, decomposers, parasitic or coprophilous (growing on dung). (ii) Mode of reproduction
Asexual reproduction occurs through asexual spores produced exogenously, such as conidia produced on conidiophores.
Sexual reproduction takes place through ascospores produced endogenously in sac-like asci and arranged inside ascocarps.

Basidiomycetes- This group of fungi includes members such as Ustilago,
Agaricus and Puccinia.
(i) Mode of nutrition
They grow as decomposers in soil or on logs and tree stumps. They also occur as parasites in plants causing diseases such as rusts and smuts.
(ii) Mode of reproduction
Asexual reproduction takes place commonly through fragmentation. Asexual spores are absent.
Sex organs are absent but sexual reproduction takes place through plasmogamy. It involves fusion of two different strains of hyphae. The resulting dikaryon gives rise to a basidium. Four basidiospores are produced inside a basidium.

Deuteromycetes – This group of fungi includes members such as Alternaria, Trichoderma, and Colletotrichum.
(i) Mode of nutrition
Some members are saprophytes while others are parasites. However, a large number act as decomposers of leaf litter.
(ii) Mode of reproduction
Asexual reproduction is the only way of reproduction in deuteromycetes. It occurs through asexual spores called conidia.
Sexual reproduction is absent in deuteromycetes.

Question 10: What are the characteristic features of Euglenoids?
Answer Some characteristic features of Euglenoids are as follows.
Euglenoids (such as Euglena) are unicellular protists commonly found in fresh water.
Instead of cell wall, a protein-rich cell membrane known as pellicle is present.

They bear two flagella on the anterior end of the body.
A small light sensitive eye spot is present.
They contain photosynthetic pigments such as chlorophyll and can thus prepare their own food. However, in absence of light, they behave similar to heterotrophs by capturing other small aquatic organisms.
They have both plant and animal-like features, which makes them difficult to classify.

Question 11: Give a brief account of viruses with respect to their structure and nature of genetic material. Also name four common viral diseases.
Answer Viruses are sub-microscopic infectious agents that can infect all living organisms. A virus consists of genetic material surrounded by a protein coat. The genetic material may be present in the form of DNA or RNA.
Most of the viruses, infecting plants, have single stranded RNA as genetic material. On the other hand, the viruses infecting animals have single or double stranded RNA or double stranded DNA. Bacteriophages or viruses infecting bacteria mostly have double stranded DNA. Their protein coat called capsid is made up of capsomere subunits. These capsomeres are arranged in helical or polyhedral geometric forms.
A.I.D.S, small pox, mumps, and influenza are some common examples of viral diseases.

Question 12: Organise a discussion in your class on the topic- Are viruses living or non-living?
Answer Viruses are microscopic organisms that have characteristics of both living and non-living. A virus consists of a strand of DNA or RNA covered by a protein coat. This presence of nucleic acid (DNA or RNA) suggests that viruses are alive. In addition, they can also respond to their environment (inside the host cell) in a limited manner. However, some other characters, such as their inability to reproduce without using the host cell machinery and their acellular nature, indicate that viruses are non-living. Therefore, classifying viruses has remained a mystery for modern systematics.

Question 1: Name the parts of an angiosperm flower in which development of male and female gametophyte take place.
Answer The male gametophyte or the pollen grain develops inside the pollen chamber of the anther, whereas the female gametophyte (also known as the embryo sac) develops inside the nucellus of the ovule from the functional megaspore.

Question 2: Differentiate between microsporogenesis and megasporogenesis. Which type of cell division occurs during these events? Name the structures formed at the end of these two events.
Answer(a)

Microsporogenesis	**Megasporogenesis**
It is the process of the formation of microspore tetrads from a microspore mother cell through meiosis	**It is the process of the formation of megaspore from a megaspore mother cell in the region of nucleus through meiosis**
It occurs inside the pollen sac of the anther.	**It occurs inside the ovule.**

Both events (microsporogenesis and megasporogenesis) involve the process of meiosis or reduction division which results in the formation of haploid gametes from the microspore and megaspore mother cells.
Microsporogenesis results in the formation of haploid microspores from a diploid microspore mother cell. On the other hand, megasporogenesis results in the formation of haploid megaspores from a diploid megaspore mother cell.

Question 3: Arrange the following terms in the correct developmental sequence:
Pollen grain, sporogenous tissue, microspore tetrad, pollen mother cell, male gametes
Answer The correct development sequence is as follows:
Sporogenous tissue – pollen mother cell – microspore tetrad – Pollen grain – male gamete
During the development of microsporangium, each cell of the sporogenous tissue acts as a pollen mother cell and gives rise to a microspore tetrad, containing four haploid microspores by the process of meiosis (microsporogenesis). As the anther matures, these microspores dissociate and develop into pollen grains. The pollen grains mature and give rise to male gametes.

Question 4: With a neat, labelled diagram, describe the parts of a typical angiosperm ovule.
Answer An ovule is a female megasporangium where the formation of megaspores takes place.

The various parts of an ovule are –
Funiculus – It is a stalk-like structure which represents the point of attachment of the ovule to the placenta of the ovary.
Hilum – It is the point where the body of the ovule is attached to the funiculus.
Integuments –They are the outer layers surrounding the ovule that provide protection to the developing embryo.
Micropyle – It is a narrow pore formed by the projection of integuments. It marks the point where the pollen tube enters the ovule at the time of fertilization.
Nucellus – It is a mass of the parenchymatous tissue surrounded by the integuments from the outside. The nucellus provides nutrition to the developing embryo. The embryo sac is located inside the nucellus.
Chalazal – It is the based swollen part of the nucellus from where the integuments originate.

Question 5: What is meant by monosporic development of female gametophyte?
Answer The female gametophyte or the embryo sac develops from a single functional megaspore. This is known as monosporic development of the female gametophyte. In most flowering plants, a single megaspore mother cell present at the micropylar pole of the nucellus region of the ovule undergoes meiosis to produce four haploid megaspores. Later, out of these four megaspores, only one functional megaspore develops into the female gametophyte, while the remaining three degenerate.

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 3 Plant Kingdom

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Question 1: What is the basis of classification of algae?

Answer Algae are classified into three main classes – Chlorophyceae, Phaeophyceae, and Rhodophyceae. These divisions are based on the following factors:

(a) Major photosynthetic pigments present

(b) Form of stored food
(c) Cell wall composition
(d) Number of flagella and position of insertion Class I – Chlorophyceae
Common name – Green algae
Major pigments – Chlorophylls a and b Stored food – Starch
Cell wall composition – Cellulose
Flagella number and position – 28; equal and apical Class II – Phaeophyceae
Common name– Brown algae
Major pigments – Chlorophylls a and c, and fucoxanthin Stored food – Mannitol and laminarin
Cell wall composition – Cellulose and algin
Flagella number and position – 2; unequal and lateral Class III – Rhodophyceae
Common name – Red algae
Major pigments – Chlorophylls a and b, and phycoerythrin Stored food – Floridean starch
Cell wall – Cellulose, pectin, and polysulphate esters Flagella number – Absent

Question 2: When and where does reduction division take place in the life cycle of a liverwort, a moss, a fern, a gymnosperm and an angiosperm?
Answer Liverwort – In liverworts, the main plant-body is haploid (gametophytic). It bears the male and female sex organs which produce gametes. These gametes fuse to form a zygote. The zygote develops on the gametophytic plant-body to form a sporophyte. The sporophyte is differentiated into the foot, seta, and capsule. Many haploid spores are produced as a result of the reduction division taking place inside the capsule.

Moss – In mosses, the primary protonema (developed in the first stage) develops into the secondary protonema. Both these stages are haploid or gametophytic. The secondary protonema bears the sex organs which produce gametes. These gametes fuse to form a zygote. The zygote develops into a sporophyte. Many spores are formed as a result of the reduction division taking place in the capsule of this sporophyte.
Fern – In ferns, the main plant-body is sporophytic. Its leaves are known as sporophylls and these bear the sporangia. Reduction division takes place in these sporangia, thereby producing many spores.
Gymnosperm – In gymnosperms, the main plant-body is sporophytic. They bear two types of leaves – microsporophylls and megasporophylls. Reduction division takes place in the microsporangia present on the microsporophylls (producing pollen grains) and on the megasporangia present on the megasporophylls (producing megaspores).
Angiosperm – In angiosperms, the main plant-body is sporophytic and bears flowers. The male sex organ in the flower is the stamen, while the female sex organ is the pistil. Reduction division takes place in the anthers of the stamen (producing haploid pollen grains) and in the ovary of the pistil (producing eggs).

Question 3: Name three groups of plants that bear archegonia. Briefly describe the life cycle of any one of them.
Answer Archegonium is the female sex organ that produces the female gamete or egg. It is present in the life cycles of bryophytes, pteridophytes, and gymnosperms.
Life cycle of a fern (Dryopteris)
Dryopteris is a common fern with pinnately-compound leaves. The main plant-body is sporophytic. Many sporangia are borne on the lower surfaces of its mature leaves. Each sporangium has spore mother cells which undergo meiosis to produce haploid spores. On maturing, these spores dehisce and germinate to give rise to a heart-shaped gametophyte called prothallus.
The prothallus bears the male and female sex organs called antheridia and archegonia respectively. The antheridia produce sperms that swim in water to reach the archegonia. The egg is produced by the archegonia. As a result of fertilisation, a zygote is formed. The zygote forms an embryo, which in turn develops into a new sporophyte. The young plant comes out of the archegonium of the parent gametophyte.

Question 4: Mention the ploidy of the following: protonemal cell of a moss; primary endosperm nucleus in dicot, leaf cell of a moss; prothallus cell of a fern; gemma cell in Marchantia; meristem cell of monocot, ovum of a liverwort, and zygote of a fern.
Answer
(a) Protonemal cell of a moss – Haploid
(b) Primary endosperm nucleus in a dicot – Triploid
(c) Leaf cell of a moss – Haploid
(d) Prothallus of a fern – Haploid
(e) Gemma cell in Marchantia – Haploid
(f) Meristem cell of a monocot – Diploid
(g) Ovum of a liverwort – Haploid
(h) Zygote of a fern – Diploid

Question 5: Write a note on economic importance of algae and gymnosperms.
Answer Economic importance of algae
Algae have diverse economic uses. They perform half of the total carbon dioxide-fixation on earth by

photosynthesis, acting as the primary producers in aquatic habitats.
(a) Food source: Many species of marine algae such as Porphyra, Sargassum, and Laminaria are edible. Chlorella and Spirulina are rich in proteins. Thus, they are used as food supplements.
(b) Commercial importance: Agar is used in the preparation of jellies and ice-cream. It is obtained from Gelidium and Gracilaria. Carrageenin is used as an emulsifier in chocolates, paints, and toothpastes. It is obtained from the red algae.
(c) Medicines: Many red algae such as Corallina are used in treating worm infections.

Economic importance of gymnosperms
(a) Construction purposes: Many conifers such as pine, cedar, etc., are sources of the soft wood used in construction and packing.
(b) Medicinal uses: An anticancer drug Taxol is obtained from Taxus. Many species of Ephedra produce ephedrine, which can be used in the treatment of asthma and bronchitis.
(c) Food source: The seeds of Pinus gerardiana (known as chilgoza) are edible.
(d) Source of resins: Resins are used commercially for manufacturing sealing waxes and water-proof paints. A type of resin known as turpentine is obtained from various species of Pinus.

Question 6: Both gymnosperms and angiosperms bear seeds, then why are they classified separately?
Answer Gymnosperms and angiosperms are seed-producing plants with diplontic life cycles. In gymnosperms, the sporophylls are aggregated to form compact cones. The microsporophylls are broad and are not distinguished into filaments and anthers. The megasporophylls are woody and lack the ovary, style, and stigma, because of which the ovules lie exposed. The female gametophyte consists of archegonia. The fertilisation process involves the fusion of a male gamete with the female gamete. Their endosperm is haploid. The produced seeds are naked as there is no fruit formation.
Angiosperms are also known as flowering plants. They have sporophylls that aggregate to form flowers with the perianth. The microsporophylls consist of stamens containing pollen sacs. These sacs bear the male gametes called pollen grains. The megasporophylls are delicate and rolled, forming carpels that contain the ovary, style, and stigma. The ovules are present inside the ovary. The archegonium is replaced by an egg apparatus. Two male gametes enter the egg apparatus at the time of fertilisation. One male gamete fertilises the egg and the other fuses with the diploid secondary nucleus to form an endosperm. The resulting endosperm is thus triploid. In addition, in angiosperms, the development of seeds takes place inside the fruits.

Question 7: What is heterospory? Briefly comment on its significance. Give two examples.
Answer Heterospory is a phenomenon in which two kinds of spores are borne by the same plant. These spores differ in size. The smaller one is known as microspore and the larger one is known as megaspore. The microspore germinates to form the male gametophyte and the megaspore germinates to form the female gametophyte. The male gametophyte releases the male gametes and these reach the female gametophyte to fuse with the egg. The development of the zygote takes place inside the female gametophyte.
This retention and germination of the megaspore within the megasporangium ensures proper development of the zygote. The zygote develops into the future sporophyte. The evolution of the seed habit is related to the retention of the megaspore.
Heterospory is thus considered an important step in evolution as it is a precursor to the seed habit. Heterospory evolved first in pteridophytes such as Selaginella and Salvinia.

Question 8: Explain briefly the following terms with suitable examples:-
(i) protonema
(ii) antheridium
(iii) archegonium
(iv) diplontic
(v) sporophyll
(vi) isogamy

Answer

(i) Protonema – It is the first stage in the life cycle of a moss, developing directly from the spore. It consists of creeping, green, branched, and often filamentous structures.
(ii) Antheridium – It is the male sex organ present in bryophytes and pteridophytes and is surrounded by a jacket of sterile cells. It encloses the sperm mother cells, which give rise to the male gametes.
(iii) Archegonium – It is the female sex organ present in bryophytes, pteridophytes, and gymnosperms. In bryophytes and pteridophytes, it generally has a swollen venter and a tubular neck, and contains the female gamete called the egg.
(iv) Diplontic – It is the term used for the life cycles of seed-bearing plants (gymnosperms and angiosperms). In these plants, the diploid sporophyte is dominant, photosynthetic, and independent. The gametophyte is represented by a single-celled (or a few-celled) structure.
(v) Sporophyll – In pteridophytes, the sporophytic plant body bears sporangia. These sporangia are subtended by leaf-like appendages known as sporophylls. In gymnosperms, microsporophylls and megasporophylls are found. These bear microspores and megaspores respectively.
(vi) Isogamy – It is a type of sexual reproduction involving the fusion of morphologically-similar gametes. This means that the gametes are of the same size, but perform different functions. This type of reproduction is commonly observed in Spirogyra.

Question 9: Differentiate between the following:-
(i)red algae and brown algae
(ii) liverworts and moss
(iii) homosporous and heterosporous pteridophyte
(iv) syngamy and triple fusion

Answer

Sr. No.	**Red algae**	**Brown algae**
1.	Red algae are grouped under theclass Rhodophyceae.	Brown algae are grouped underthe class Phaeophyceae.
2.	They contain floridean starch asstored food.	They contain mannitol or laminarin as stored food.
3.	They contain the photosyntheticpigments chlorophylls a and d, and phycoerythrin.	They contain the photosyntheticpigments chlorophylls a and c, and fucoxanthin.
4.	Their cell walls are composed ofcellulose, pectin, and phycocolloids.	Their cell walls are composed ofcellulose and algin.
5.	Flagella are absent	Two flagella are present

Liverworts	**Moss**
1. They have unicellular rhizoids.	1. They have multicellular rhizoids.
2. Scales are present very often	2. Scales are absent

3.	They are generally thalloid,With dichotomous branching.	3.	They are foliage, with lateralbranching.
4.	Gemma cups are present	4.	Gemma cups are absent
5.	Sporophyte has very little photosynthetic tissue	5.	Sporophyte has abundant photosynthetic tissue

Homosporous pteridophytes		**Heterosporous pteridophytes**	
1.	They bear spores that are of the same type.	1.	They bear two kinds of spores – microspores and megaspores.
2.	They produce bisexual gametophytes.	2.	They produce unisexual gametophytes.

Syngamy		**Triple fusion**	
1.	It is the process of fusion of the male gamete with the egg in an angiosperm.	1.	It is the process of fusion of the male gamete with the diploid secondary nucleus in an angiosperm.
2.	A diploid zygote is formed as a result of syngamy.	2.	A triploid primary endosperm is formed as a result of triple fusion.

Question 10: How would you distinguish monocots from dicots?
Answer Monocots and dicots can be differentiated through their morphological and anatomical characteristics.

Characteristic	**Monocot**	**Dicot**
Morphology		
Roots	Fibrous roots	Tap roots
Venation	Generally parallel venation	Generally reticulate venation
Flowers	Trimerous flowers	Pentamerous flowers
Cotyledons in seeds	One	Two
Anatomy		
No. of vascular bundles in stem	Numerous	Generally 2-6
Cambium	Absent	Present
Leaves	Isobilateral	Dorsiventral

Question11: Match the following(ColumnI and Column II)

Column I		Column II	
a	*Chlamydomonas*	i	Moss
b	*Cycas*	ii	Pteridophyte
c	*Selaginella*	iii	Algae
d	*Sphagnum*	iv	Gymnosperm

Answer

Column I	Column II

a	*Chlamydomonas*	iii	Algae
b	*Cycas*	iv	Gymnosperm
c	*Selaginella*	ii	Pteridophyte
d	*Sphagnum*	i	Moss

Question 12: Describe the important characteristics of gymnosperms.
Answer Important features of gymnosperms:
1. The term gymnosperm refers to plants with naked seeds (gymnos – naked, sperma – seeds), i.e., the seeds of these plants are not enclosed in fruits.
2. The plant-body ranges from medium to tall trees and shrubs. The giant redwood tree Sequoia is one of the tallest trees in the world.
3. The root system consists of tap roots. The coralloid roots present in Cycas are associated with nitrogen-fixing cyanobacteria.

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 4 Animal Kingdom

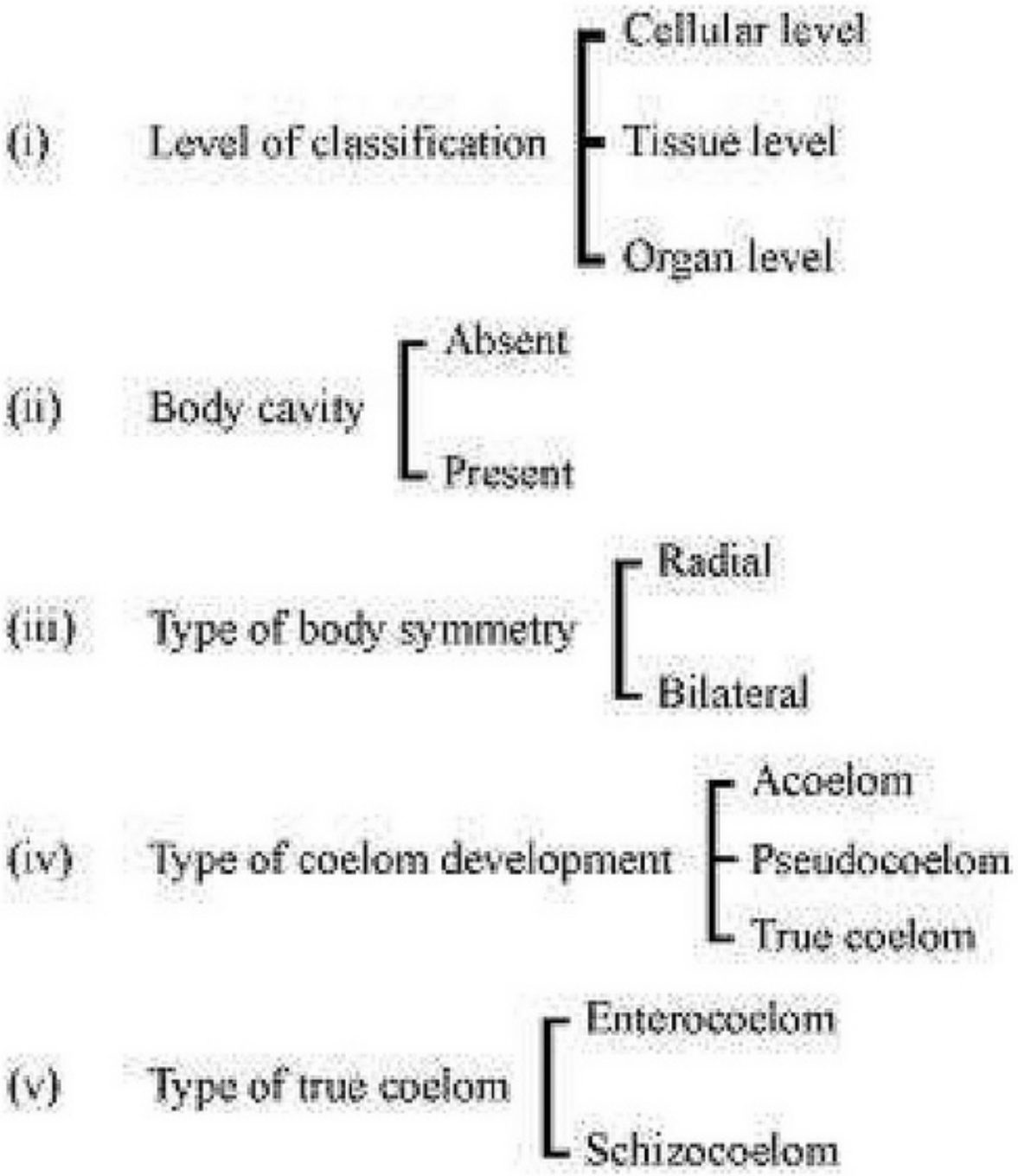
Class 11 Biology Solutions Chapter 4 Animal Kingdom

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 4 Animal Kingdom

Question 1: What are the difficulties that you would face in classification of animals, if common fundamental features are not taken into account?
Answer For the classification of living organisms, common fundamental characteristics are considered.

If we consider specific characteristics, then each organism will be placed in a separate group and the entire objective of classification would not be achieved. Classification of animals is also important in comparing different organisms and judging their individual evolutionary significance. If only a single characteristic is considered, then this objective would not be achieved.

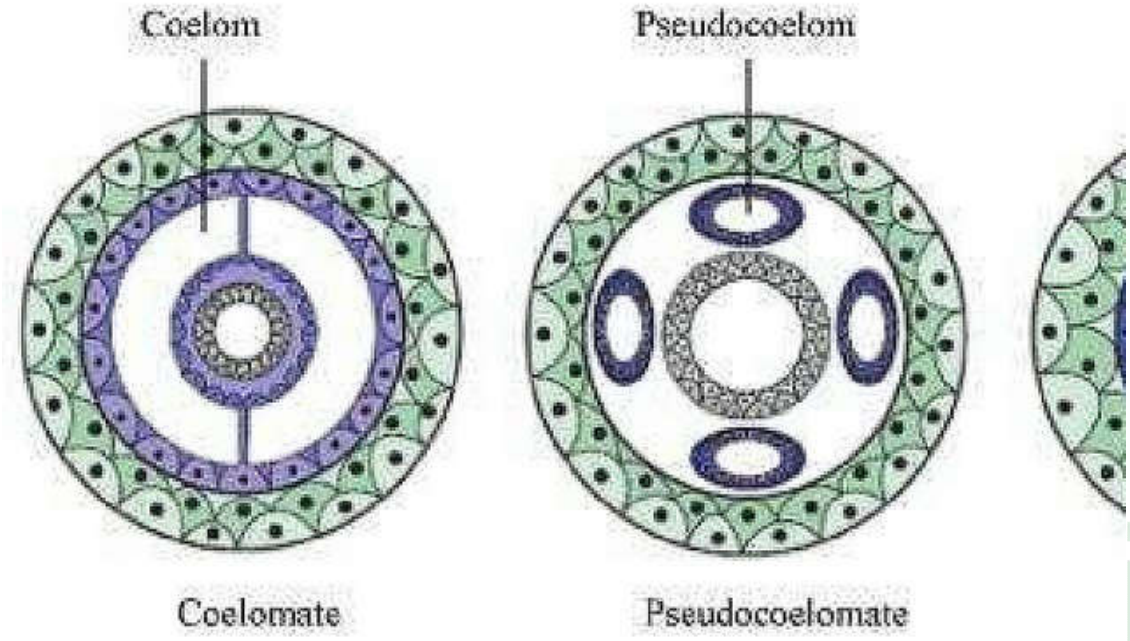
Question 2: If you are given a specimen, what are the steps that you would follow to classify it?
Answer There is a certain common fundamental feature that helps in classification of living organisms. The features that can be used in classification are as follows.



On the basis of above features, we can easily classify a specimen into its respective category.

Question 3: How useful is the study of the nature of body cavity and coelom in the classification of animals?
Answer Coelom is a fluid filled space between the body wall and digestive tract. The presence or absence of body cavity or coelom plays a very important role in the classification of animals. Animals that possess a fluid filled cavity between body wall and digestive tract are known as coelomates. Annelids, mollusks, arthropods, echinodermates, and chordates are examples of coelomates. On the other hand, the animals in which the body cavity is not lined by mesoderm are known as

pseudocoelomates. In such animals, mesoderm is scattered in between ectoderm and endoderm. Aschelminthes is an example of pseudocoelomates. In certain animals, the body cavity is absent. They are known as acoelomates. An example of acoelomates is platyhelminthes.



Question 4: Distinguish between intracellular and extracellular digestion?
Answer

	Intracellular digestion		Extracellular digestion
1.	The digestion of food occurs within the cell.	1.	The digestion occurs in the cavity of alimentary canal.
2.	Digestive enzymes are secreted by the surrounding cytoplasm into the food vacuole.	2.	Digestive enzymes are secreted by special cells into the cavity of alimentary canal.
3.	Digestive products are diffused into the cytoplasm.	3.	Digestive products diffuse across the intestinal wall into various parts of the body.
4.	It is a less efficient method.	4.	It is a more efficient method of digestion.
5.	It occurs in unicellular organisms.	5.	It occurs in multicellular organisms.

Question 5: What is the difference between direct and indirect development?
Answer

	Direct development		Indirect development
1.	It is a type of development in which an embryo develops into a mature individual without involving a larval stage.	1.	It is a type of development that involves a sexually-immature larval stage, having different food requirements than adults.
2.	Metamorphosis is absent.	2.	Metamorphosis involving development of larva to a sexually-mature adult is present.
3.	It occurs in fishes, reptiles, birds, and mammals.	3.	It occurs in most of the invertebrates and amphibians.

Question 6: What are the peculiar features that you find in parasitic platyhelminthes?
Answer Taenia (Tapeworm) and Fasciola (liver fluke) are examples of parasitic platyhelminthes. Peculiar features in parasitic platyhelminthes are as follows.
1. They have dorsiventrally flattened body and bear hooks and suckers to get attached inside the body of the host.
2. Their body is covered with thick tegument, which protects them from the action of digestive juices of the host.
3. The tegument also helps in absorbing nutrients from the host's body.

Question 7: What are the reasons that you can think of for the arthropods to constitute the largest group of the animal kingdom?
Answer The phylum, Arthropoda, consists of more than two-thirds of the animal species on earth. The reasons for the success of arthropods are as follows.
i. Jointed legs that allow more mobility on land
ii. Hard exoskeleton made of chitin that protects the body
iii. The hard exoskeleton also reduces water loss from the body of arthropods making them more adapted to terrestrial conditions.

Question 8: Water vascular system is the characteristic of which group of the following:
(a) Porifera (b) Ctenophora (c) Echinodermata (d) Chordata
Answer Water vascular system is a characteristic feature of the phylum, Echinodermata. It consists of an array of radiating channels, tube feet, and madreporite. The water vascular system helps in locomotion, food capturing, and respiration

Question 9: "All vertebrates are chordates but all chordates are not vertebrates". Justify the statement.
Answer The characteristic features of the phylum, Chordata, include the presence of a notochord and paired pharyngeal gill slits. In sub-phylum Vertebrata, the notochord present in embryos gets replaced by a cartilaginous or bony vertebral column in adults. Thus, it can be said that all vertebrates are chordates but all chordates are not vertebrates.

Question 10: How important is the presence of air bladder in Pisces?
Answer Gas bladder or air bladder is a gas filled sac present in fishes. It helps in maintaining buoyancy. Thus, it helps fishes to ascend or descend and stay in the water current.

Question 11: What are the modifications that are observed in birds that help them fly?
Answer Birds have undergone many structural adaptations to suit their aerial life. Some of these adaptations are as follows.
(i) Streamlined body for rapid and smooth movement
(ii) Covering of feathers for insulation
(iii) Forelimbs modified into wings and hind limbs used for walking, perching, and swimming
(iv) Presence of pneumatic bones to reduce weight
(v) Presence of additional air sacs to supplement respiration

Question 12: Could the number of eggs or young ones produced by an oviparous and viviparous mother be equal? Why?
Answer The numbers of eggs produced by an oviparous mother will be more than the young ones produced by a viviparous mother. This is because in oviparous animals, the development of young

ones takes place outside the mother's body. Their eggs are more prone to environmental conditions and predators. Therefore, to overcome the loss, more eggs are produced by mothers so that even under harsh environmental conditions, some eggs might be able to survive and produce young ones. On the other hand, in viviparous organisms, the development of young ones takes place in safe conditions inside the body of the mother. They are less exposed to environmental conditions and predators. Therefore, there are more chances of their survival and hence, less number of young ones is produced compared to the number of eggs.

Question 13: Segmentation in the body is first observed in which of the following:
(a) Platyhelminthes (b) Aschelminthes (c) Annelida (d) Arthropoda
Answer The body segmentation first appeared in the phylum, Annelida (annulus meaning little ring).

Question 14:
Match the following:

Answer

	Column I		Column II
(a)	Operculum	(viii)	Osteichthyes
(b)	Parapodia	(v)	Annelida
(c)	Scales	(iv)	Reptilia
(d)	Comb plates	(i)	Ctenophora
(e)	Radula	(ii)	Mollusca
(f)	Hairs	(vii)	Mammalia
(g)	Choanocytes	(iii)	Porifera
(h)	Gill slits	(vi)	Cyclostomata and Chondrichthyes

Question 15: Prepare a list of some animals that are found parasitic on human beings.
Answer

S. No.	Name of organism	Phylum
1	*Taenia solium*	Platyhelminthes
2	*Fasciola hepatica*	Platyhelminthes
3	*Ascaris lumbricoides*	Aschelminthes
4	*Wuchereria bancrofti*	Aschelminthes
5	*Ancyclostoma*	Aschelminthes

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 5 Morphology of Flowering Plants

Class 11 Biology Solutions Chapter 5 Morphology of Flowering Plants

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 5 Morphology of Flowering Plants

Question 1: What is meant by modification of root? What type of modification of root is found in the
(a) Banyan tree
(b) Turnip
(c) Mangrove trees
Answer Primarily, there are two types of root systems found in plants, namely the tap root system and fibrous root system. e main function of the roots is to absorb water and minerals from the soil. However, roots are also modified to perform various other functions. The roots of some plants act as storage sites for food, some provide support to massive plant structures, while others absorb oxygen from the atmosphere.
Roots and its modifications in various plants:
(a) Banyan tree
The banyan tree (Ficus benghalensis) has massive pillar-like adventitious roots arising from the aerial part of the stem. These roots grow towards the ground and provide support to the tree. Such roots are called prop roots.
(b) Turnip
The roots of turnip (Brassica rape) help in the storage of food. Similar food-storing roots are found in radishes, carrots, and sweet potatoes.
(c) Mangrove tree
The roots of mangrove plants grow vertically upwards from the soil for the absorption of oxygen from the atmosphere as the soil is poorly aerated. These types of roots are called pneumatophores.

Question 2: Justify the following statements on the basis of external features
(i) Underground parts of a plant are not always roots
(ii) Flower is a modified shoot
Answer (i) Various parts of plants are modified into underground structures to perform various functions such as stems, leaves, and even fruits.
The stems in ginger and banana are underground and swollen due to storage of food. They are called rhizomes. Similarly, corm is an underground stem in Colocasia and Zamin-khand. The tips of the underground stem in potato become swollen due to the accumulation of food and forms tuber. Tubers bear eyes, which are subtended by a leaf scar. Basal leaves in onions become fleshy because of the accumulation of food. In peanuts, the flower after fertilization gets pushed inside the soil by growing a flower stalk. The formation of fruits and seeds takes place inside the soil.
(ii) During the flowering season, the apical meristem gives rise to the floral meristem. The axis of the stem gets condensed, while the internodes lie near each other. Instead of leaves, various floral appendages arise from the node. Therefore, it can be said that the flower is a modified shoot.

Question 3: How is pinnately compound leaf different from palmately compound leaf?
Answer

vPinnately compound leaf	Palmately comp
The leaflets are attached to the common axis, called rachis.	The leaflets ar common point on
Examples include *neem* and *Cassia fistula*(also called golden shower plant)	Examples include) and *Cannabis*.

Question 4: Explain with suitable examples the different types of phyllotaxy?
Answer Phyllotaxy refers to the pattern or arrangement of leaves on the stem or branch of a plant. It is of three types, alternate, opposite, and whorled phyllotaxy.
In alternate phyllotaxy, a single leaf arises from the node of a branch. This type of phyllotaxy is observed in the sunflower, mustard, and peepal. Plants with opposite phyllotaxy have two leaves arising from the node in opposite directions. It is found in guava and jamun plants. Plants with whorled phyllotaxy have three or more leaves arising from the node. It is found in Alstonia.

Question 5: Define the following terms:
(a) Aestivation
(b) Placentation
(c) Actinomorphic
(d) Zygomorphic
(e) Superior ovary
(f) Perigynous flower
(g) Epipetalous Stamen
Answer (a) Aestivation
The term 'aestivation' refers to the mode in which sepals or petals are arranged in a floral bud with respect to other floral members. There are four types of aestivation in plants i.e., valvate, twisted, imbricate, and vexillary.
(b) Placentation
The term 'placentation' refers to the arrangement of ovules within the ovary of a flower. It is primarily of five types, namely marginal, basal, parietal, axile, and free central.
(c) Actinomorphic
Actinomorphic flowers can be divided into two radial halves by any radial plane passing through its centre. Examples of these flowers include chilly and mustard.
(d)Zygomorphic
Zygomorphic flowers are those flowers which can be divided into two similar halves by a single vertical plane. Examples of these flowers include pea and beans.
(e) Superior ovary
Superior ovary flowers are those flowers in which the gynoecium is present at the highest position,

while other floral parts are arranged below it. A flower with this arrangement is described as hypogynous. Examples include brinjal and mustard.
(f) Perigynous flower
In perigynous flowers, the gynoecium is present in the centre and the rest of the floral parts are arranged at the rim of the thalamus at the same level. Examples include plum and rose.
(g) Epipetalous Stamen
Epipetalous stamens are stamens attached to the petals. They are found in brinjal.

Question 6: Differentiate between
(a) Racemose and cymose inflorescence
(b) Fibrous roots and adventitious roots
(c) Apocarpous and syncarpous ovary

Racemose inflorescence	Cymose inflorescence
1) Younger flowers are present at the tip while older flowers are arranged at the base of this inflorescence. Such an arrangement is called acropetal succession. 2) The main axis in racemose inflorescence continues to grow and produce flowers laterally.	1) Younger flowers are present at the base of the inflorescence, while older flowers are present at the top. Such an arrangement is called basipetal succession. 2) The main axis in cymose inflorescence has limited growth, which later terminates into a flower.

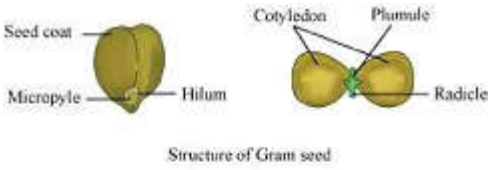
Fibrous root	Adventitious root
1) In monocots, the primary root which develops from the radicle of the seed is short-lived and is replaced by a large number of roots arising from the base of the stem. 2) It is found in wheat and other cereals.	1) These roots arise from any part of the plant other than the radicle of seeds. 2) It is found in banyan, *Monstera*, and other plants.

Apocarpous ovary	Syncarpous ovary
1) The flowers with apocarpus ovary have more than one carpel. These carpels are free. 2) It is found in lotus and rose flowers.	1) The flowers with syncarpous ovary have more than one carpel. However, these carpels are fused. 2) It is found in the flowers of tomato and mustard.

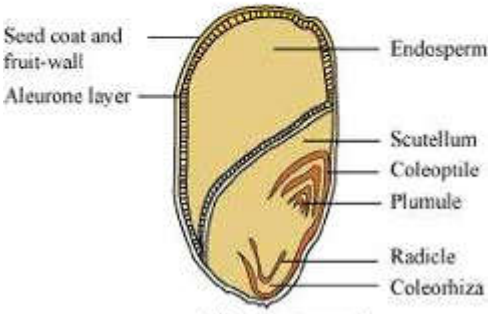
Question 7: Draw the labelled diagram of the following:
(i) Gram seed

(ii) V.S. of maize seed

Answer



Structure of Gram seed



V.S. of maize seed

Question 8: Describe modifications of stem with suitable examples

Answer Stems of various plants have undergone modifications to perform different functions.

Underground stems or storage stems: Examples: Rhizomes, Corms, tubers

In ginger and banana, the underground stem is called a rhizome. The underground stem in Colocasia (arvi) is known as corm. Rhizomes and corms are underground stems, modified for the storage of food. Also, these stems help in vegetative

reproduction of these plants. The tips of the underground stem in potato plants become swollen due to the accumulation of food. The potato is a tuber that helps in the storage of food and bears eyes on it. Subtended by a leaf scar, these eyes bear buds that give rise to new plants.

Supportive stems

Example: tendril

The stem in some weak plants bear thin, slender, and spirally-coiled structures called tendrils that help the plant get attached to nearby structures for support. Tendrils are found in cucumbers, melons, and other members of the family Cucurbitaceae.

Protective stems

Example: Thorns

The stem in bougainvillea and citrus plants (like lemon and orange) bear sharp, pointed structures called thorns, which provide protection to the plant from herbivores.

Photosynthetic stems

Example: Opuntia

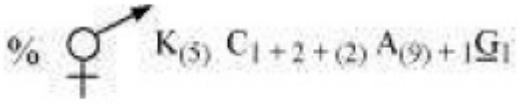
The stem in the Opuntia is green. It carries out the process of photosynthesis in the absence of leaves.

Others stem modifications

In some plants, underground stems such as grasses spread in the soil and help in perenation. These stems are called runners.

The short lateral stem called the offset in some aquatic plants (such as Eichhornia) bears leaves and tufts of roots at the node and gives rise to new plants.

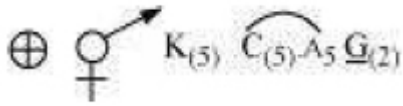
Question 9: Take one flower each of families Fabaceae and Solanaceae and write its semi-technical description. Also draw their floral diagrams after studying them.
Answer (1) Family Fabaceae/Papilionaceae (pea plant)
Fabaceae/Papilionaceae is a sub-family of the Leguminoseae family.
Vegetative features:
Habit: Pinnately compound, alternately arranged with leaf tendrils with the pulvinus present at the leaf base along folacious stipules.
Root: Tap root system with root nodules.
Floral features:
Inflorescence: Racemose, generally axial than terminal Flower: Zygomorphic and bisexual flowers are found
Calyx: It contains five sepals which are gamosepalous while aestivation is imbricate. Corolla: It contains five petals (polypetalous) with vexillary aestivation. Androecium: It consists of ten anthers that are diadelphous with dithecous anthers. Gynoecium: Monocarpellary superior ovary which is unilocular with marginal placentation.
Fruit: Legume pod with non-endospermic seeds



Floral formula:
Economic importance: Peas are used as vegetables for making various culinary preparations.

Floral diagram of family Papilionaceae

(2) Flowers of Solanum nigrum
Family Solanaceae
Vegetative features:
Habit: Erect, herbaceous plant
Leaves: Simple, exstipulate leaves with reticulate venation Stem: Erect stem with numerous branches.
Floral features:
Inflorescence: Solitary and axillary Flowers: Actinomorphic, bisexual flowers
Calyx: Calyx is composed of five sepals that are united and persistent. Aestivation is valvate.
Corolla: Corolla consists of five united petals with valvate aestivation. Androecium: It consists of five epipetalous stamens.
Gynoecium: It consists of bicarpellary syncarpous superior ovary with axile placentation.
Fruits: Berry
Seeds: Numerous, endospermous

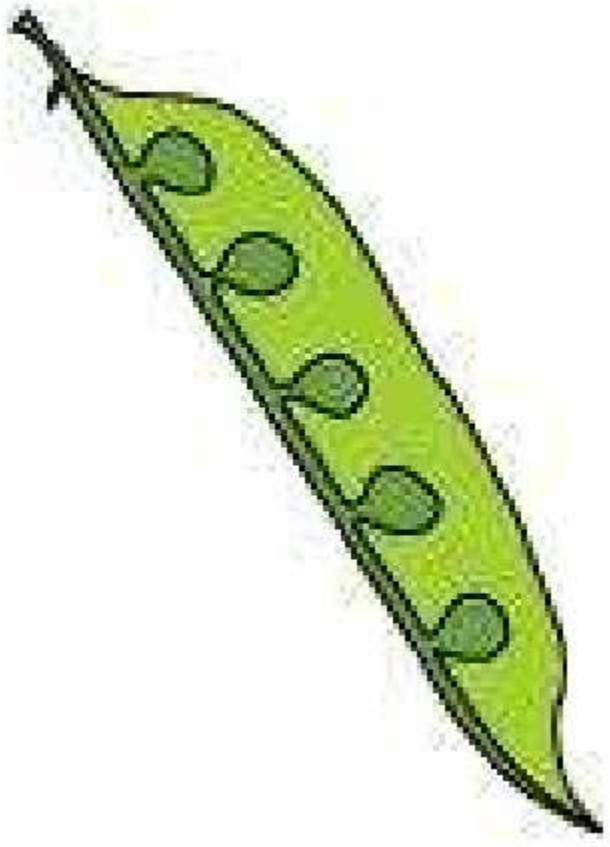


Floral formula:

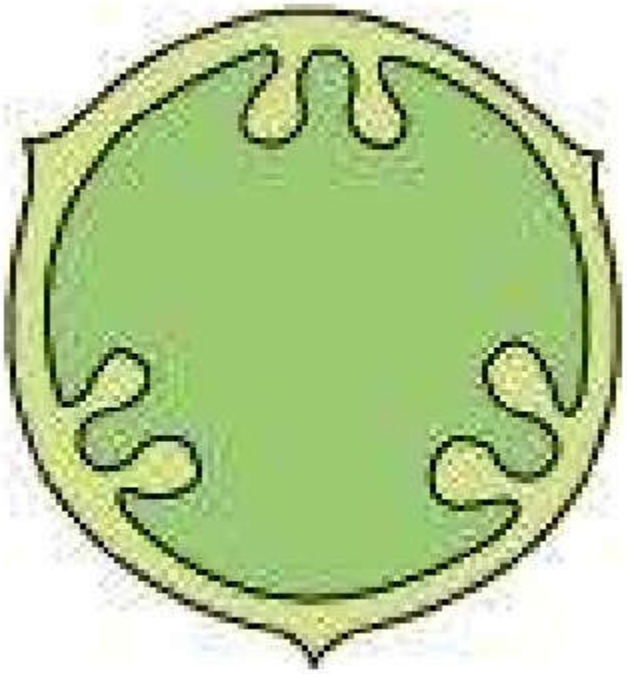
Economic importance: Peas are used as vegetables for making various culinary preparations.

Floral diagram of family Solanaceae

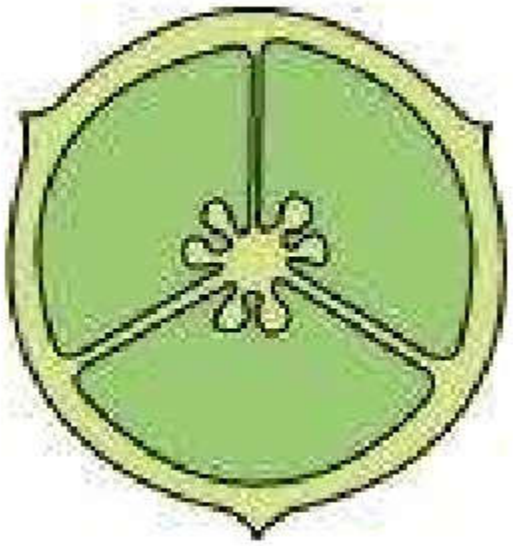
Question 10: Describe the various types of placentations found in flowering plants.
Answer Placentation refers to the arrangement of ovules inside the ovary. It is of five basic types.
(A) Marginal placentation:
The ovary in which the placenta forms a ridge along the ventral suture of the ovary and the ovules develop on two separate rows is known to have marginal placentation. This type of placentation is found in peas.



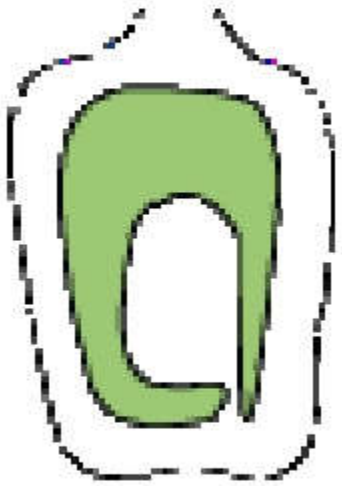
(B) Parietal placentation
When the ovules develop on the inner walls of the ovary, the ovary is said to have parietal placentation.



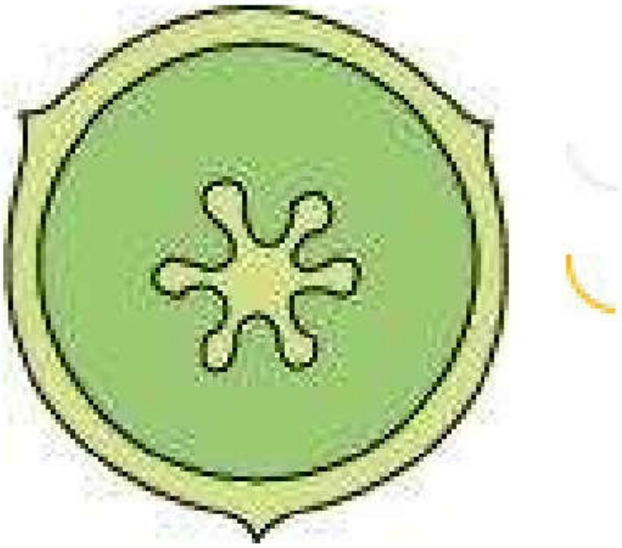
C) Axile placentation
In axile placentation, the placenta is axial and ovules are attached to it. Examples include China rose, lemon, and tomato.



(D) Basal placentation
The ovary in which the placenta develops from its base and a single ovule is found attached to the base is said to have basal placentation. It is found in marigold and sunflower.



(E) Free central placentation
In free central placentation, the ovules develop on the central axis while the septa are absent. This type of placentation is found in Dianthus and primrose.



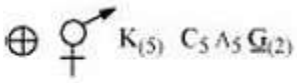
Question 11: What is a flower? Describe the parts of a typical angiosperm flower?
Answer A flower can be defined as the reproductive unit of any flowering plant (angiosperms).

Flowers carry out sexual reproduction in angiosperms. A typical flower is a modified stem with a condensed axis. A flower has four different parts i.e., the calyx, corolla, androecium, and gynoecium. Androecium and gynoecium represent the male and female reproductive organs of a flower (respectively). Bisexual flowers are those which contain both androecium and gynoecium, while unisexual flowers contain either gynoecium or androecium. The corolla and the calyx are generally distinct, but may sometimes be fused (called perianth). A flower that contains all four floral parts is called a complete flower.
Parts of flowers
(A) The calyx forms the outermost whorl of a flower, which contains sepals. They are green, leaf–like structures that cover and protect the flowers during the bud stage. When the sepals of a flower are free, they are called polysepalous, while fused sepals of a flower are called gamosepalous.
(B) The corolla of a flower is a layer that lies inside the calyx. It contains beautifully coloured petals, which help in attracting insects for pollination. When the petals are free, they are called polypetalous, while fused petals are called gamopetalous.
(C) The androecium or the stamen is the male reproductive part of a flower. It consists of two parts, the filament and the bilobed anther. The bilobed anther is the site for meiosis and the generation of pollen grains.
(D) Gynoecium represents the female reproductive part of a flower. It consists of an ovary. The ovary is connected by a long tube (called style) to the stigma. The ovary bears numerous ovules attached to the placenta.

Question 12: How do the various leaf modifications help plants?
Answer The main function of the leaves is to carry out the process of photosynthesis. However, in a few plants, leaves are modified to perform different functions.
(a) Tendrils: The leaves of a pea plant are modified into tendrils that help the plant in climbing.
(b) Spines: The leaves in cactus are modified into sharp spines that act as an organ of defense.
(c) Phyllode: The leaves of some Australian acacia are short-lived and soon replaced by flattened, green structures called phyllodes that arise from the petiole of the leaves. The petioles in these plants synthesize food.
(d) Pitcher: The leaves of the pitcher plant are modified into pitcher-like structures, which contain digestive juices and help in trapping and digesting insects.

Question 13: Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.
Answer Inflorescence is the manner in which the flowers are arranged on the flowering axis. During the flowering season, the vegetative apex of the stem gets converted into a floral meristem. Based on whether the floral axis continues to grow or end in a flower, inflorescence is classified into racemose and cymose. In racemose inflorescence, the floral axis continues to grow and produces flowers laterally. On the other hand, in cymose inflorescence, the main axis terminates into a flower. Hence, it is limited in growth.

Question 14: Write the floral formula of an actinomorphic bisexual, hypogynous flower with five united sepals, five free petals. Five free stamens and two united carpals with superior ovary and axile placentation.
Answer The floral formula of the described flower is represented as:



Actinomorphic flowers are represented by the symbol ⊕.

A bisexual flower is indicated by ♀ .

The calx contains five united sepals which can be represented as $K_{(5)}$.

The corolla consists of five free petals and it represented as C_5.

The androecium consists of five free stamens and is represented by A_5.

The gynoecium consists of a superior ovary with two united carpels and axile placentations, which can be represented as $\underline{G}_{(2)}$.

The calyx contains five united sepals which can be represented as K(5). The corolla consists of five free petals and it represented as C5.
The androecium consists of five free stamens and is represented by A5.
The gynoecium consists of a superior ovary with two united carpels and axile placentations, which can be represented as

Question 15: Describe the arrangement of floral members in relation to their insertion on thalamus?
Answer Based on the position of the calyx, corolla, and androecium (with respect to the ovary on the thalamus), the flowers are described as hypognous, perigynous, and epigynous.
In hypogynous flowers, the ovary occupies the highest position on the thalamus while other floral parts are situated below it. In such flowers, the ovary is superior e.g., China rose, mustard etc.
In perigynous flowers, the ovary is situated at the centre and other floral parts are arranged on the rim of the thalamus. The ovary here is said to be half inferior e.g., plum, rose, peach
In epigynous flowers, the thalamus grows around the ovary fusing with its wall. The other floral parts are present above the ovary. Hence, the ovary is said to be inferior e.g., flowers of guava and cucumber.

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 6 Anatomy of Flowering Plants

Class 11 Biology Solutions Chapter 6 Anatomy of Flowering Plants

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 6 Anatomy of Flowering Plants

Question 1: State the location and function of different types of meristem.
Answer Meristems are specialised regions of plant growth. The meristems mark the regions where active cell division and rapid division of cells take place. Meristems are of three types depending on their location.

Apical meristem

It is present at the root apex and the shoot apex.The shoot apical meristem is present at the tip of the shoots and its active division results in the elongation of the stem and formation of new leaves. The root apical meristem helps in root elongation.
Intercalary meristem
It is present between the masses of mature tissues present at the bases of the leaves of grasses. It helps in the regeneration of grasses after they have been grazed by herbivores. Since the intercalary meristem and the apical meristem appear early in a plant's life, they constitute the primary meristem.
Lateral meristem
It appears in the mature tissues of roots and shoots. It is called the secondary meristem as it appears later in a plant's life. It helps in adding secondary tissues to the plant body and in increasing the girth of plants. Examples include fascicular cambium, interfascicular cambium, and cork cambium**Question 2:** Cork cambium forms tissues that form the cork. Do you agree with this statement? Explain.
Answer When secondary growth occurs in the dicot stem and root, the epidermal layer gets broken. There is a need to replace the outer epidermal cells for providing protection to the stem and root from infections. Therefore, the cork cambium develops from the cortical region. It is also known as phellogen and is composed of thin-walled rectangular cells. It cuts off cells toward both sides. The cells on the outer side get differentiated into the cork or phellem, while the cells on the inside give rise to the secondary cortex or phelloderm. The cork is impervious to water, but allows gaseous exchange through the lenticels. Phellogen, phellem, and phelloderm together constitute the periderm.

Question 3: Explain the process of secondary growth in stems of woody angiosperm with help of schematic diagrams. What is the significance?
Answer In woody dicots, the strip of cambium present between the primary xylem and phloem is called the interfascicular cambium. The interfascicular cambium is formed from the cells of the

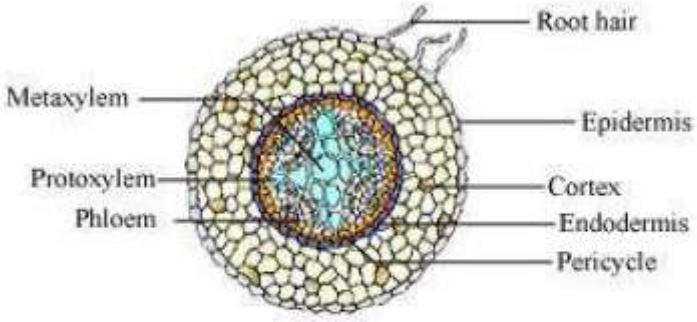
medullary rays adjoining the interfascicular cambium. This results in the formation of a continuous cambium ring. The cambium cuts off new cells toward its either sides. The cells present toward the outside differentiate into the secondary phloem, while the cells cut off toward the pith give rise to the secondary xylem. The amount of the secondary xylem produced is more than that of the secondary phloem.

The secondary growth in plants increases the girth of plants, increases the amount of water and nutrients to support the growing number of leaves, and also provides support to plants.

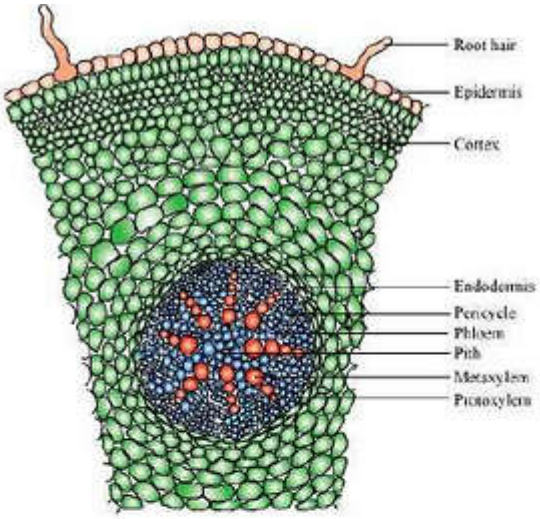
Question 4: Draw illustrations to bring out anatomical difference between
(a) Monocot root and dicot root
(b) Monocot stem and dicot stem

Answer

(a) Monocot root and dicot root

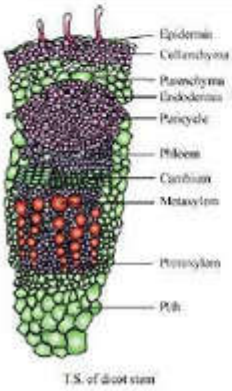


T.S. of dicot root (Primary)

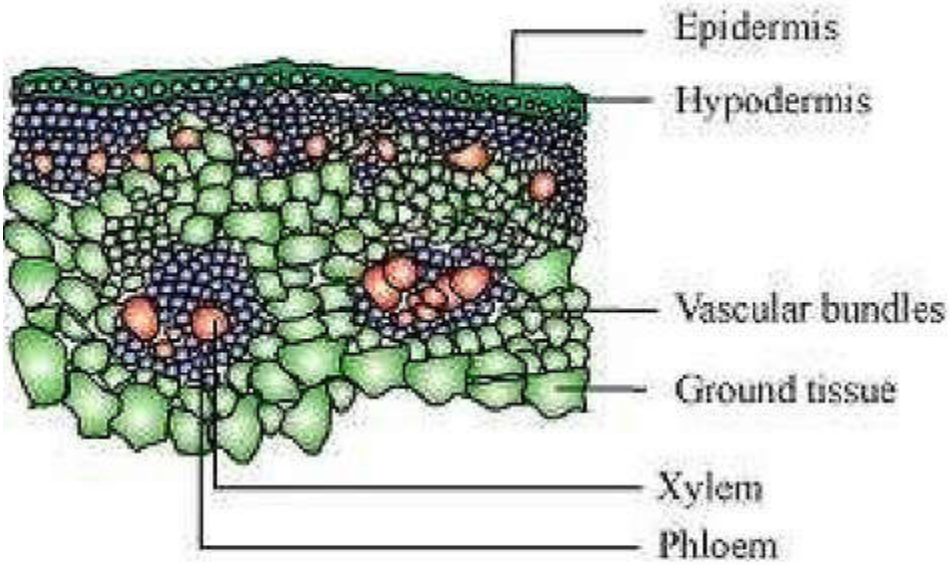


T.S. of monocot root

(b) Monocot stem and dicot stem



T.S. of dicot stem



T.S. of monocot stem

Question 5: Cut a transverse section of young stem of a plant from your school garden and observe it under the microscope. How would you ascertain whether it is a monocot stem or dicot stem? Give

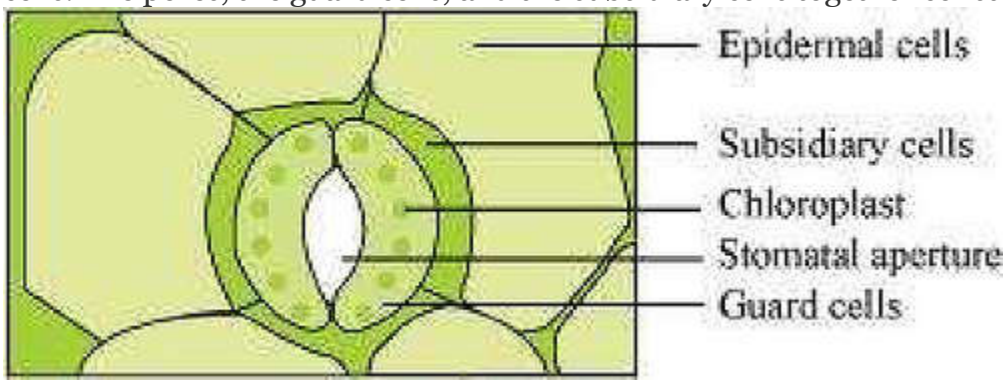
reasons.
Answer The dicot stem is characterised by the presence of conjoint, collateral, and open vascular bundles, with a strip of cambium between the xylem and phloem. The vascular bundles are arranged in the form of a ring, around the centrally-located pith. The ground tissue is differentiated into the collenchyma, parenchyma, endodermis, pericycle, and pith. Medullary rays are present between the vascular bundles.

Question 6: The transverse section of a plant material shows the following anatomical features,
(a) the vascular bundles are conjoint, scattered and surrounded by sclerenchymatous bundle sheaths
(b) phloem parenchyma is absent. What will you identify it as?
Answer The monocot stem is characterised by conjoint, collateral, and closed vascular bundles, scattered in the ground tissue containing the parenchyma. Each vascular bundle is surrounded by sclerenchymatous bundle-sheath cells. Phloem parenchyma and medullary rays are absent in monocot stems.

Question 7: Why are xylem and phloem called complex tissues?
Answer Xylem and phloem are known as complex tissues as they are made up of more than one type of cells. These cells work in a coordinated manner, as a unit, to perform the various functions of the xylem and phloem.
Xylem helps in conducting water and minerals. It also provides mechanical support to plants. It is made up of the following components:
• Tracheids (xylem vessels and xylem tracheids)
• Xylem parenchyma
• Xylem fibres
Tracheids are elongated, thick-walled dead cells with tapering ends. Vessels are long, tubular, and cylindrical structures formed from the vessel members, with each having lignified walls and large central cavities. Both tracheids and vessels lack protoplasm. Xylem fibres consist of thick walls with an almost insignificant lumen. They help in providing mechanical support to the plant. Xylem parenchyma is made up of thin-walled parenchymatous cells that help in the storage of food materials and in the radial conduction of water.
Phloem helps in conducting food materials. It is composed of:
• Sieve tube elements
• Companion cells
• Phloem parenchyma
• Phloem fibres
Sieve tube elements are tube-like elongated structures associated with companion cells. The end walls of sieve tube elements are perforated to form the sieve plate. Sieve tube elements are living cells containing cytoplasm and nucleus. Companion cells are parenchymatous in nature. They help in maintaining the pressure gradient in the sieve tube elements. Phloem parenchyma helps in the storage of food and is made up of long tapering cells, with a dense cytoplasm. Phloem fibres are made up of elongated sclerenchymatous cells with thick cell walls.

Question 8: What is stomatal apparatus? Explain the structure of stomata with a labelled diagram.
Answer Stomata are small pores present in the epidermis of leaves. They regulate the process of transpiration and gaseous exchange. The stomatal pore is enclosed between two bean-shaped guard cells. The inner walls of guard cells are thick, while the outer walls are thin. The guard cells are

surrounded by subsidiary cells. These are the specialised epidermal cells present around the guard cells. The pores, the guard cells, and the subsidiary cells together constitute the stomatal apparatus.



Question 9: Name the three basic tissue systems in the flowering plants. Give the tissue names under each system.

Answer

No.	Tissue system	Tissues present
1.	Epidermal tissue system	Epidermis, trichomes, hairs, ston
2.	Ground tissue system	Parenchyma, collenchyma, sclere
3.	Vascular tissue system	Xylem, phloem, cambium

Question 10: How is the study of plant anatomy useful to us?

Answer The study of plant anatomy helps us to understand the structural adaptations of plants with respect to diverse environmental conditions. It also helps us to distinguish between monocots, dicots, and gymnosperms. Such a study is linked to plant physiology. Hence, it helps in the improvement of food crops. The study of plant-structure allows us to predict the strength of wood. This is useful in utilising it to its potential. The study of various plant fibres such as jute, flax, etc., helps in their commercial exploitation.

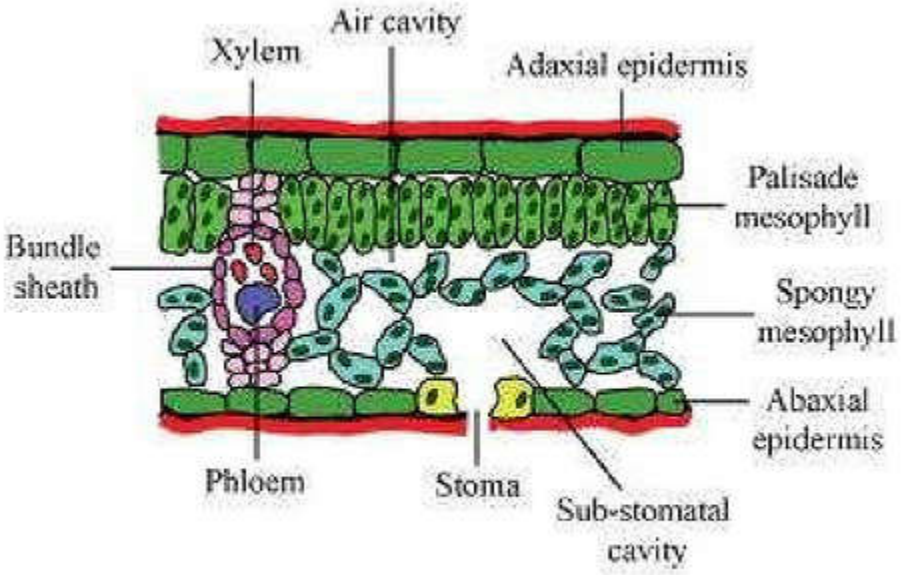
Question 11: What is periderm? How does periderm formation take place in dicot stem?

Answer Periderm is composed of the phellogen, phellem, and phelloderm.

During secondary growth, the outer epidermal layer and the cortical layer are broken because of the cambium. To replace them, the cells of the cortex turn meristematic, giving rise to cork cambium or phellogen. It is composed of thin-walled, narrow and rectangular cells.

Phellogen cuts off cells on its either side. The cells cut off toward the outside give rise to the phellem or cork. The suberin deposits in its cell wall make it impervious to water. The inner cells give rise to the secondary cortex or phelloderm. The secondary cortex is parenchymatous.

Question 12: Describe the internal structure of a dorsiventral leaf with the help of labelled diagrams.
Answer Dorsiventral leaves are found in dicots. The vertical section of a dorsiventral leaf contains three distinct parts.
[1] Epidermis:
Epidermis is present on both the upper surface (adaxial epidermis) and the lower surface (abaxial epidermis). The epidermis on the outside is covered with a thick cuticle. Abaxial epidermis bears more stomata than the adaxial epidermis.
[2] Mesophyll:
Mesophyll is a tissue of the leaf present between the adaxial and abaxial epidermises. It is differentiated into the palisade parenchyma (composed of tall, compactly-placed cells) and the spongy parenchyma (comprising oval or round, loosely-arranged cells with inter cellular spaces). Mesophyll contains the chloroplasts which perform the function of photosynthesis.
[3] Vascular system:
The vascular bundles present in leaves are conjoint and closed. They are surrounded by thick layers of bundle-sheath cells.



T. S. of dicot leaf

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 7 Structural Organisation in Animals

Class 11 Biology Solutions Chapter 7 Structural Organisation in Animals

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Question 1: Answer in one word or one line.
(i) Give the common name of Periplaneta americana.

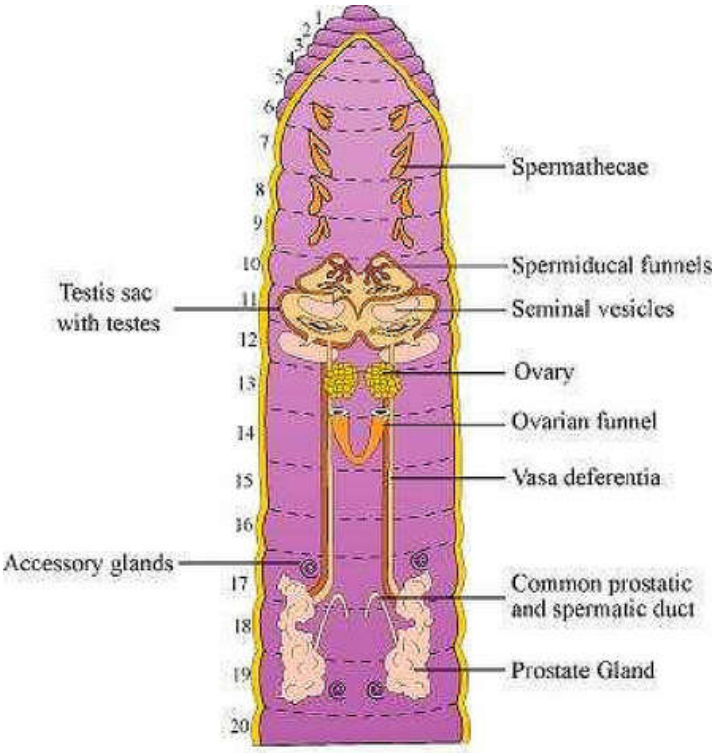
(ii) How many spermathecae are found in earthworm?

(iii) What is the position of ovaries in the cockroach?
(iv) How many segments are present in the abdomen of cockroach?
(v) Where do you find malphigian tubules?
Answer (i) The common name of Periplaneta americana is the American cockroach.
(ii) Four pairs of spermathecae are present in earthworms. They are located between sixth and the ninth segments. They help in receiving and storing the spermatozoa during copulation.
(iii) In a cockroach, the pair of ovaries is located between 12th and 13th abdominal segments.
(iv) In both sexes, the abdomen of a cockroach consists of ten segments.
(v) Malphigian tubules are main excretory organs of cockroaches. They form a part of the alimentary canal.

Question 2: Answer the following:
(i) What is the function of nephridia?
(ii) How many types of nephridia are found in earthworm based on their location?
Answer (i) Nephridia are segmentally arranged excretory organs present in earthworms.
(ii) On the basis of their location, three types of nephridia are found in earthworms. They are:
(a) Septal nephridia: These are present on both sides of the inter-segmental septa behind the 15th segment. They open into the intestines.
(b) Integumentary nephridia: These lie attached to the body wall from the third segment to the last segment, which opens on the body surface.
(c) Pharyngeal nephridia: These are present as three paired tufts in fourth, fifth, and sixth segments.

Question 3: Draw a labelled diagram of the reproductive organs of an earthworm.

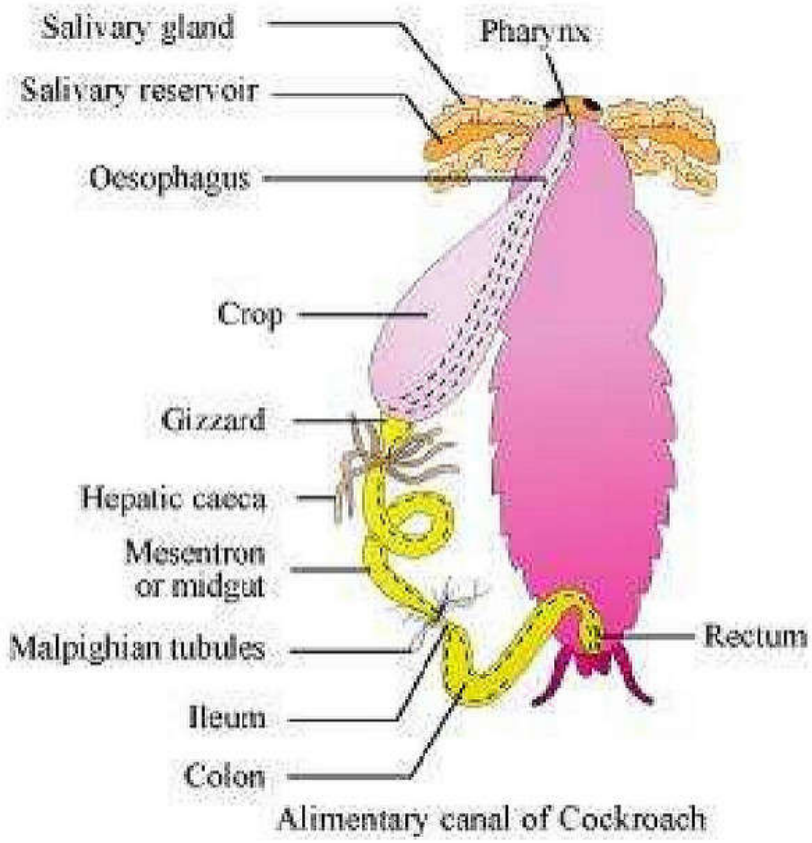
Answer



Reproductive system of Earthworm

Question 4: Draw a labelled diagram of alimentary canal of a cockroach.

Answer



Alimentary canal of Cockroach

Question 5: Distinguish between the following
(a) Prostomium and peristomium
(b) Septal nephridium and pharyngeal nephridium
Answer (a)

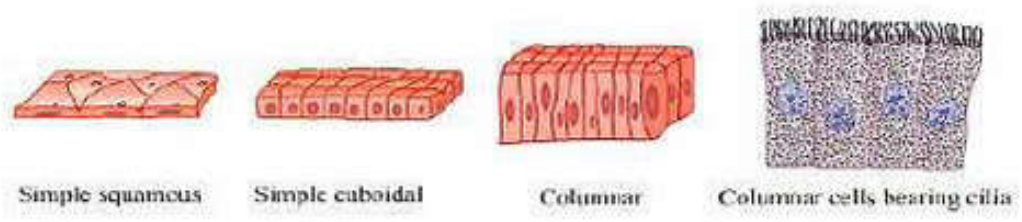
Prostomium	Peristomium
Prostomium is a small fleshy lobe, which overhangs the mouth of an earthworm. It helps the organism push into the soil and is sensory in function.	The first body segment in the earthworm is called the peristomium. It surrounds the mouth opening.

Question 6: What are the cellular components of blood?
Answer Components of blood include erythrocytes (RBCs), leucocytes (WBCs), and thrombocytes (platelets). These components form 45% of blood. They are suspended in the remaining fluid portion, called plasma.
Mammalian erythrocytes are biconcave, coloured cells devoid of a nucleus. They help in transporting respiratory gases.
Leucocytes or white blood cells are nucleated cells. They can be divided into two types, granulocytes (neutrophils, eosinophils, and basophils) and agranulocytes (lymphocytes and monocytes). They help fight against various disease-causing germs entering the body.
Thrombocytes are cell fragments produced from megarkaryocytes of the bone. They play a major role during blood coagulation.

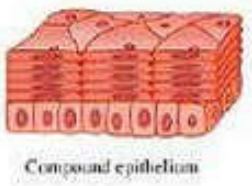
Question 7: What are the following and where do you find them in animal body
(a) Chondriocytes
(b) Axons
(c) Ciliated epithelium
Answer Chondriocytes:
They are cells of cartilages, and are present in small cavities within the matrix secreted by them.
Axons:
They are long, slender projections of neurons that help in carrying nerve impulses from the neuron body. Axons aggregate in bundles which make up the nerves. Ciliated epithelium:
It consists of simple columnar or cuboidal epithelium with cilia on their free surfaces. It is present on the inner surface of the oviducts and bronchioles. It helps in the movement of eggs or mucus in specific directions.

Question 8: Describe various types of epithelial tissues with the help of labelled diagrams.
Answer Epithelial tissue lines the surface of a body and forms a protective covering. Epithelium cells are packed tightly together with little intercellular matrix. Epithelial tissue in the body is of two types.
(a) Simple epithelium: It consists of a single layer of cells where cells are in direct contact with the basement membrane. It is further sub-divided into the following types:

(i) Simple squamous epithelium: It consists of a single layer of flat cells with irregular boundaries. It is found in the walls of the blood vessels and in the lining of alveoli.
(ii) Simple cuboidal epithelium: It consists of a single layer of cube-like cells. It is present in regions where secretion and absorption of substances takes place such as the proximal convoluted tubule region of the nephron.
(iii) Simple columnar epithelium: It consists of a single layer of tall, slender cells with their nuclei present at the base of the cells. They may bear micro-villi on the free surfaces. Columnar epithelium forms the lining of the stomach and intestines, and is involved in the function of secretion and absorption.
(iv) Ciliated epithelium: It consists of columnar or cuboidal cells with cilia on their free surfaces. They are present in bronchioles and oviducts from where they direct mucus and eggs in specific directions.
(v) Glandular epithelium:It consists of columnar or cuboidal cells involved in the secretion of substances. Glands are of two types, unicellular glands (goblet cells of the alimentary canal) and multicellular glands (salivary glands). They can be classified as exocrine (ductless glands) and endocrine glands (duct glands) by the method through which they release enzymes.



(b)



Compound epithelium: It consists of many layers of cells. It is involved mainly in the function of providing protection and has a limited role in secretion and absorption. Examples of compound epithelium include the dry surface of the skin or moist inner lining of the buccal cavity, pharynx, pancreatic ducts, and the inner lining of ducts of salivary glands.

Question 9: Distinguish between
(a) Simple epithelium and compound epithelium.
(b) Cardiac muscle and striated muscle
(c) Dense regular and dense irregular connective tissues
(d) Adipose and blood tissue
(e) Simple gland and compound gland
Answer

(a)

Simple epithelium	**Compound epithelium**
1. It is composed of only one layer of cells. **2.** It is mainly involved in the function of absorption and secretion. **3.** It is present in the lining of the stomach, intestine.	**1.** It is composed of many layers of cells. **2.** It is mainly involved in the function of protection and has a limited role in absorption and secretion. **3.** It is present in the lining of the pharynx and buccal cavity.

(b)

Cardiac muscles	**Striated muscles**
1. They are involuntary in function. **2.** They are multi-nucleate and branched. **3.** They are found only in the heart.	**1.** They are voluntary in function. **2.** They are multi-nucleate and unbranched. **3.** They are found only in triceps, biceps, and limbs.

(c)

Dense regular connective tissues	**Dense irregular connective tissues**

1. In dense regular connective tissues, collagen fibres are present in rows between parallel boundless fibres. **2.** They are present in tendons and ligaments.	1. In dense irregular connective tissues, fibres are arranged irregularly. **2.** They are present in the skin.

(d)

Adipose tissue	**Blood tissue**
1. It is composed of collagen fibres, elastin fibres, fibroblasts, macrophages, and adipocytes. **2.** It helps in the synthesis, storage, and metabolism of fats. **3.** It is present beneath the skin.	**1.** It is composed of RBCs, WBCs, platelets, and plasma. **2.** It helps in the transportation of food, wastes, gases, and hormones. **3.** It is present in the blood vessels.

(e)

Simple glands	**Compound glands**
1. They contain isolated glandular cells. **2.** They are unicellular. **3.** Examples include goblet cells of the alimentary canal.	**1.** They contain a cluster of secretory cells. **2.** They are multicellular. **3.** Examples include salivary glands.

Question 10: Mark the odd one in each series:
(a) Areolar tissue; blood; neuron; tendon
(b) RBC; WBC; platelets; cartilage
(c) Exocrine; endocrine; salivary gland; ligament
(d) Maxilla; mandible; labrum; athorax; coxa
Answer (a) Areolar tissue, blood, and tendons are examples of connective tissues. Neuron is an example of neural tissue.
(b) RBCs, WBCs, and platelets are the three most important components of blood. Cartilage is therefore, the odd one out.

(c) Exocrine, endocrine, and salivary glands are examples of simple glandular epithelium. Ligament is a connective tissue.
(d) Maxilla, mandible, and labrum are mouthparts of a cockroach. Antennae, on the other hand, are present in the head region of cockroaches.
(e) Protonema forms the developmental stage in the life cycle of a moss. Mesothorax, metathorax, and coxa are parts or segments present in the legs of a cockroach.

Question 11: Match the terms in column I with those in column II:

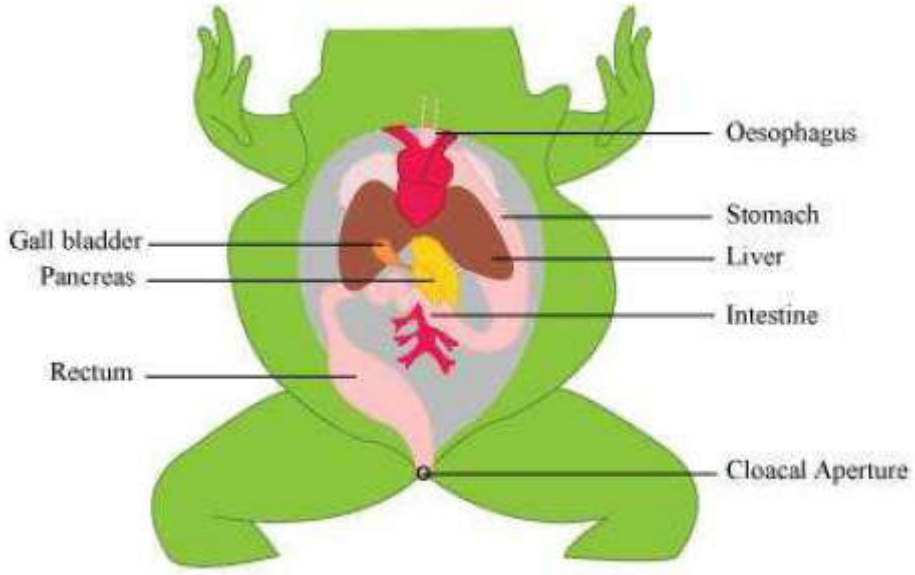
Column I	**Column II**
(a) Compound epithelium	(i) Alimentry canal
(b) Compound eye	(ii) Cockroach
(c) Septal nephridia	(iii) Skin
(d) Open circulatory system	(iv) Mosaic vision
(e) Typhlosole	(v) Earthworm
(f) Osteocytes	(vi) Phallomere
(g) Genitalia	(vii) Bone

Answer

Column I	**Column II**

(a) Compound epithelium	(iii) Skin
(b) Compound eye	(iv) Mosaic vision
(c) Septal nephridia	(v) Earthworm
(d) Open circulatory system	(ii) Cockroach
(e) Typhlosole	(i) Alimentary canal
(f) Osteocytes	(vii) Bone
(g) Genitalia	(vi) Phallomere

Question 12: Mention briefly about the circulatory system of earthworm
Answer Earthworms (Pheretima) have closed blood vascular systems, which consists of the heart, blood vessels, and capillaries. The heart pumps blood for circulating it in one direction. Blood is supplied by smaller blood cells to the gut nerve cord and the body wall. Blood glands are present in the 4th, 5th, and 6th segments, which produce blood cells and haemoglobin dissolved in blood plasma. Blood cells in earthworms are phagocytic in nature.



Digestive system of Frog

Question 14: Mention the function of the following
(a) Ureters in frog
(b) Malpighian tubules
(c) Body wall in earthworm
Answer (a) Ureters in frogs: A ureter acts as a urinogenital duct, which carries sperms along with urine in male frogs.
(b) Malphigian tubules: Malphigian tubules are excretory organs in cockroaches.
(c) Body wall in earthworms: In earthworms, the body wall consists of muscle layers. It helps in movement and burrowing.

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 8 Cell The Unit of Life

Class 11 Biology Solutions Chapter 8 Cell The Unit of Life

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Question 1: Which of the following is not correct?

(a) Robert Brown discovered the cell.

(b) Schleiden and Schwann formulated the cell theory.

(c) Virchow explained that cells are formed from pre-existing cells.
(d) A unicellular organism carries out its life activities within a single cell.
Answer (a) Robert Brown did not discover the cell. The cell was discovered by Robert Hook.

Question 2: New cells generate from
(a) bacterial fermentation (b) regeneration of old cells
(c) pre-existing cells (d) abiotic materials
Answer (c) According to the biogenic theory, new cells can only arise from pre-existing cells. Only complete cells, in favourable conditions, can give rise to new cells.

Question 3: Match the following
(a) Cristae (i) Flat membranous sacs in stroma
(b) Cisternae (ii) Infoldings in mitochondria
(c) Thylakoids (iii) Disc-shaped sacs in Golgi apparatus
Answer

Column I		Column II	
(a)	Cristae	(ii)	Infoldings in mitochondria
(b)	Cisternae	(iii)	Disc-shaped sacs in Golgi apparatus
(c)	Thylakoids	(i)	Flat membranous sacs in stroma

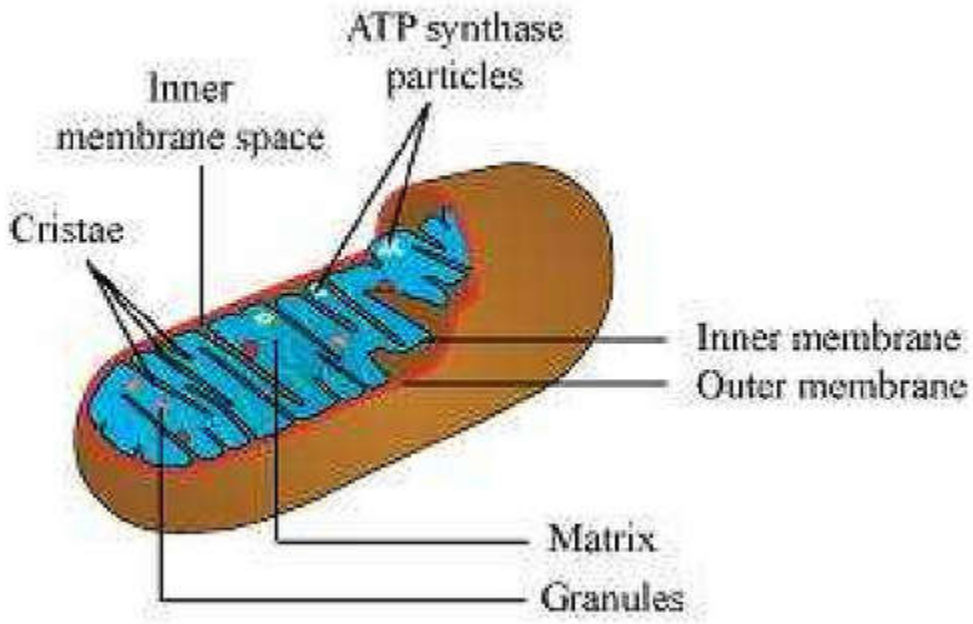
Question 4: Which of the following is correct:
(a) Cells of all living organisms have a nucleus.

(b) Both animal and plant cells have a well defined cell wall.
(c) In prokaryotes, there are no membrane bound organelles.
(d) Cells are formed de novo from abiotic materials.
Answer (c) Membrane-bound organelles are organelles surrounded by a double membrane. Nucleus, mitochondria, chloroplasts, etc., are examples of such organelles. These cell organelles are absent from prokaryotes.
(a) Only eukaryotic cells have nuclei. They are absent from prokaryotes.
(b) Cell walls are only present in plant cells. They are absent from all animal cells.
(d) All cells arise from pre-existing cells.

Question 5: What is a mesosome in a prokaryotic cell? Mention the functions that it performs.
Answer Mesosome is a convoluted membranous structure formed in a prokaryotic cell by the invagination of the plasma membrane. Its functions are as follows:
(1) These extensions help in the synthesis of the cell wall, replication of DNA. They also help in the equal distribution of chromosomes into the daughter cells.
(2) It also increases the surface area of the plasma membrane to carry out various enzymatic activities.
(3) It helps in secretion processes as well as in bacterial respiration.

Question 6: How do neutral solutes move across the plasma membrane? Can the polar molecules also move across it in the same way? If not, then how are these transported across the membrane?
Answer Plasma membrane is the outermost covering of the cell that separates it from the environment. It regulates the movement of substances into the cell and out from it. It allows the entry of only some substances and prevents the movement of other materials. Hence, the membrane is selectively-permeable.
Movement of neutral solutes across the cell membrane – Neutral molecules move across the plasma membrane by simple passive diffusion. Diffusion is the movement of molecules from a region of higher concentration to a region of lower concentration.
Movement of polar molecules across the cell membrane – The cell membrane is made up of a phospholipid bilayer and proteins. The movement of polar molecules across the non-polar lipid bilayer requires carrier-proteins. Carrier-proteins are integral protein particles having certain affinity for specific solutes. As a result, they facilitate the transport of molecules across the membrane.

Question 7: Name two cell-organelles that are double membrane bound. What are the characteristics of these two organelles? State their functions and draw labelled diagrams of both.
Answer Mitochondria and chloroplasts are the two organelles that are double-membrane-bound.



Characteristics of the mitochondria

Mitochondria are double- membrane-bound structures. The membrane of a mitochondrion is divided into the inner and outer membranes, distinctly divided into two aqueous compartments – outer and inner compartments. The outer membrane is very porous (containing the organelle), while the inner membrane is deeply-folded. These folds are known as cristae. Cristae increase the surface area inside the cell. They are the sites for ATP-generating chemical reactions. The membrane of a mitochondrion contains specific enzymes meant for specific mitochondrial functions. Hence, the mitochondria are the sites for aerobic respiration. They have their own DNA and ribosomes. Thus, they are able to make their own proteins. This is why they are considered as semi-autonomous organelles

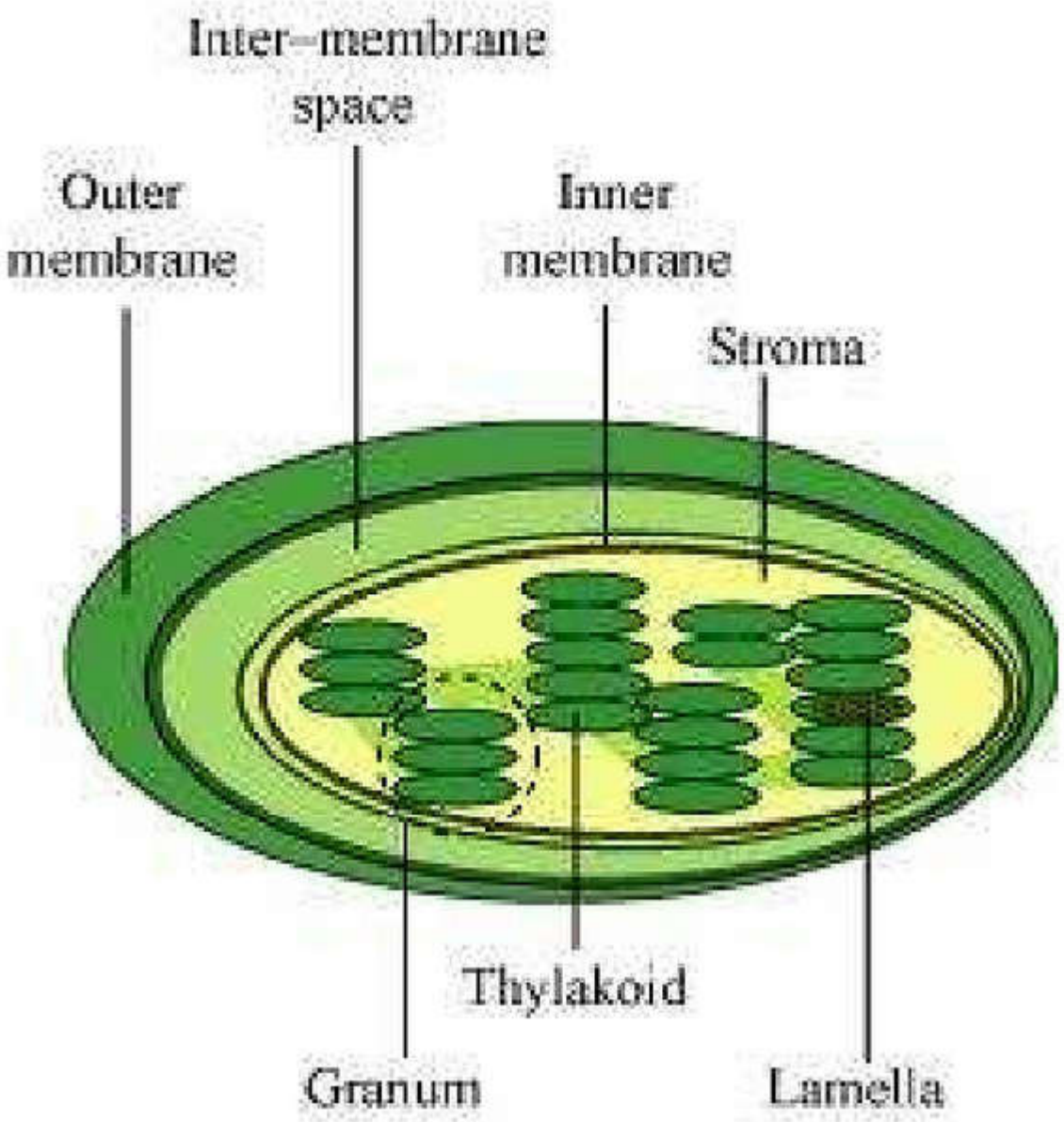
Characteristics of chloroplasts

Chloroplasts are double-membrane-bound structures.

They are divided into outer and inner membranes, further divided into two distinct regions:

(i) Grana are stacks of flattened discs containing chlorophyll molecules. The flattened membranous sacs are called thylakoids. The thylakoids of adjacent grana are connected by membranous tubules called stroma lamellae.

(ii) Stroma is a homogenous mixture in which grana are embedded. It contains several enzymes that are used for the synthesis of carbohydrates and proteins. It also contains its own DNA and ribosomes.



Functions of the mitochondria:
(i) They are the sites for cellular respiration.
(ii) They provide energy in the form of ATP for all vital activities of living cells.
(iii) They have their own DNA and ribosomes. Hence, they are regarded as semi-autonomous organelles.
(iv) They have several enzymes, intermediately required for the synthesis of various chemicals such as fatty acids, steroids, and amino acids.
Functions of chloroplasts:
(i) They trap solar energy and utilise it for manufacturing food for plants. Hence, they are involved in the process of photosynthesis.
(ii) They contain the enzymes required for the synthesis of carbohydrates and proteins.

Question 8: What are the characteristics of prokaryotic cells?
Answer Prokaryotic cell is a unicellular organism lacking membrane-bound organelles. The characteristics of prokaryotic cells are as follows:
(i) Most of them are unicellular.
(ii) They are generally small in size. The size of a prokaryotic cell varies from 0.5 – 5 @m.
(iii) The nuclear region of a prokaryotic cell is poorly-defined because of the absence of a nuclear membrane. Hence, a prokaryotic cell lacks a true nucleus.
(iv) The genetic materials of prokaryotic cells are naked. They contain single, circular chromosomes. In addition to the genomic DNA, they have a small, circular plasmid DNA.
(v) They have specialised membranous structures called mesosomes. Mesosomes are formed by the invagination of the cell membrane. These extensions help in the synthesis of the cell wall, replication of DNA. They also help in the equal distribution of chromosomes into the daughter cells.
(vi) Membrane-bound cell organelles such as mitochondria, plastids, and endoplasmic reticulum are absent from a prokaryotic cell.
(vii) Most prokaryotic cells contain a three-layered structure – outermost glycocalyx, middle cell wall, and the innermost plasma membrane. This structure acts as a protective unit.
Examples of prokaryotic cells include blue green algae, bacteria, etc.

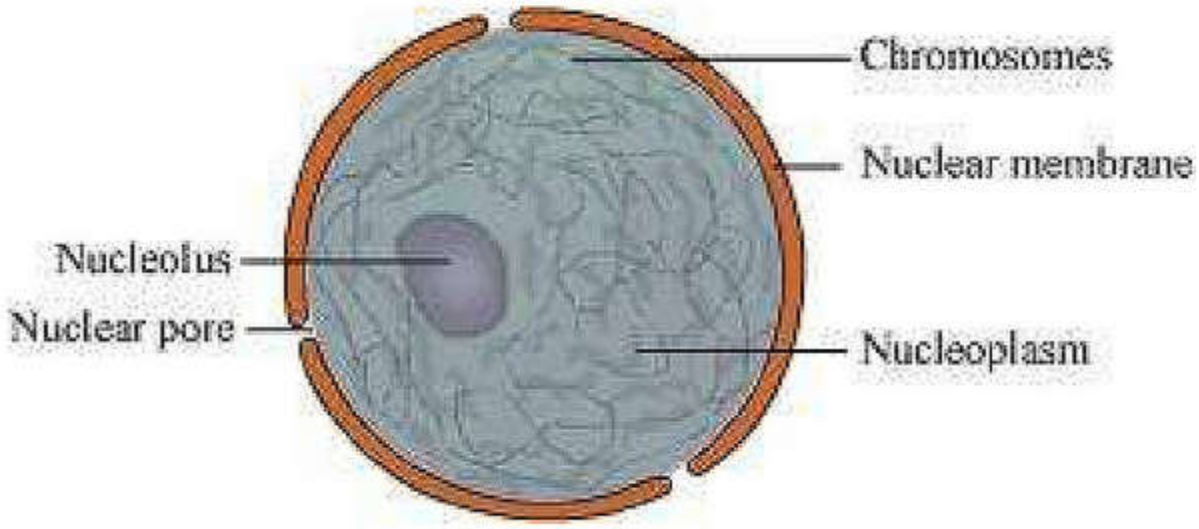
Question 9: Multicellular organisms have division of labour. Explain.
Answer Multicellular organisms are made up of millions and trillions of cells. All these cells perform specific functions. All the cells specialised for performing similar functions are grouped together as tissues in the body. Hence, a particular function is carried out by a group of cells at a definite place in the body. Similarly, different functions are carried out by different groups of cells in an organism. This is known as division of labour in multicellular organisms.

Question 10: Cell is the basic unit of life. Discuss in brief.
Answer Cells are the basic units of life capable of doing all the required biochemical processes that a normal cell has to do in order to live. The basic needs for the survival of all living organisms are the same. All living organisms need to respire, digest food for obtaining energy, and get rid of metabolic wastes.
Cells are capable of performing all the metabolic functions of the body. Hence, cells are called the functional units of life.

Question 11: What are nuclear pores? State their function.
Answer Nuclear pores are tiny holes present in the nuclear membrane of the nucleus. They are formed by the fusion of two nuclear membranes.
These holes allow specific substances to be transferred into a cell and out from it. They allow molecules such as RNA and proteins to move in both directions, between the nucleus and the cytoplasm.

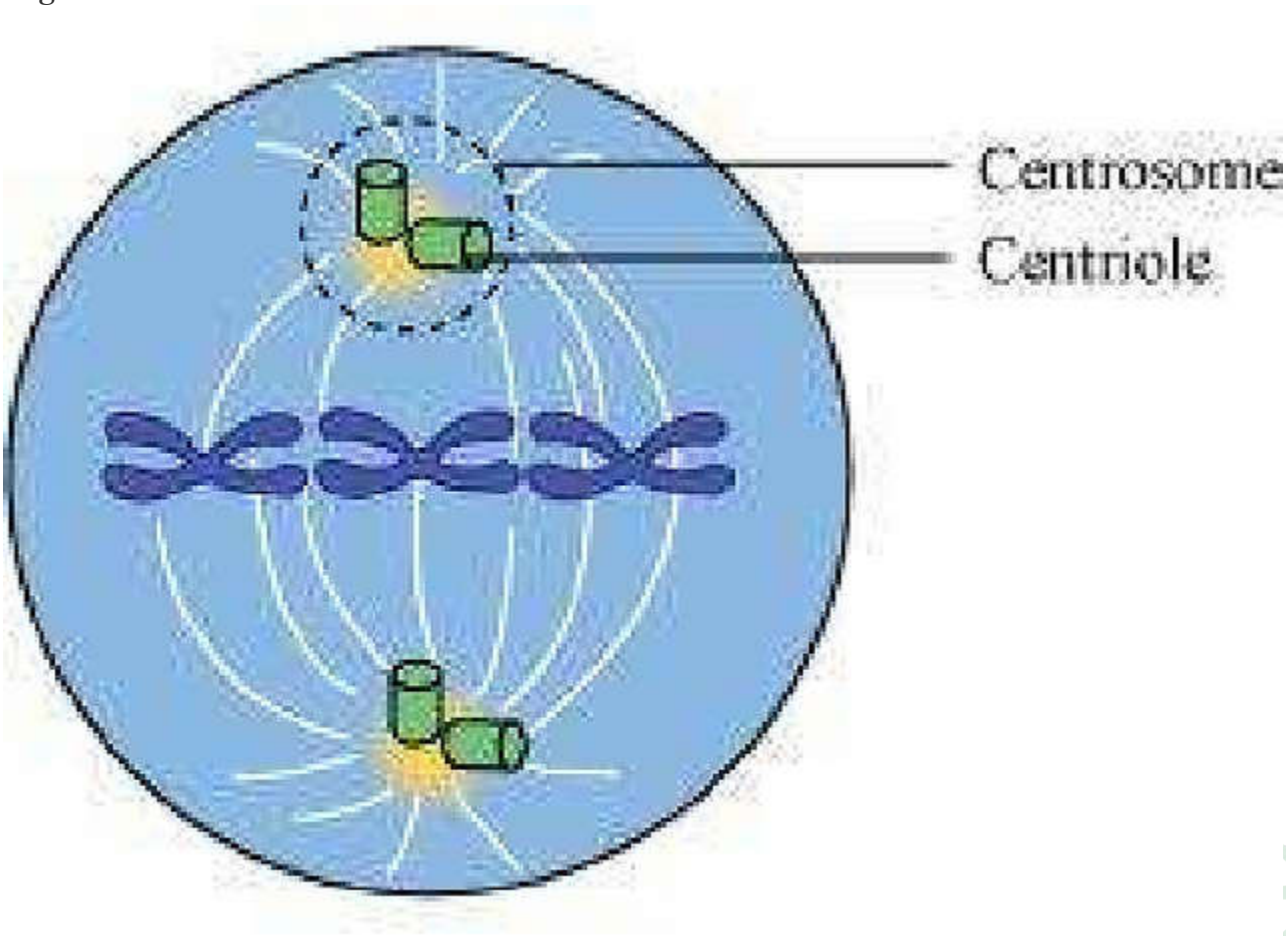
Question 12: Both lysosomes and vacuoles are endomembrane structures, yet they differ in terms of their functions. Comment.
Answer Lysosomes are membrane-bound vesicular structures holding a variety of enzymes such as lipases, proteases, and carbohydrases. The purpose of lysosomes is to digest worn out cells. They are involved in the intracellular digestion of foreign food particles and microbes. Sometimes, they also act as suicidal bags. They are involved in the self digestion of cells. They are a kind of waste disposal systems of a cell. On the other hand, vacuoles are storage sacs found in cells. They might store the waste products of cells. In unicellular organisms, the food vacuole contains the consumed food particles. It also plays a role in expelling excess water and some wastes from the cell.

Question 13: Describe the structure of the following with the help of labelled diagrams.
(i) Nucleus (ii) Centrosome
Answer (i) Nucleus
Nucleus controls all the cellular activities of the cell. It is spherical in shape. It is composed of the following structures:
Nuclear membrane: It is a double membrane separating the contents of the nucleus from the cytoplasm. The narrow space between the two membranes is called the perinuclear space. Nuclear membrane has tiny holes called nuclear pores. These holes allow specific substances to be transferred into a cell and out from it.
Nucleoplasm/Nuclear matrix: It is a homogenous granular fluid present inside the nucleus. It contains the nucleolus and chromatin. Nucleolus is a spherical structure that is not bound by any membrane. It is rich in protein and RNA molecules, and is the site for ribosome formation. Chromatin is an entangled mass of thread-like structures. It contains DNA and some basic proteins called histones.

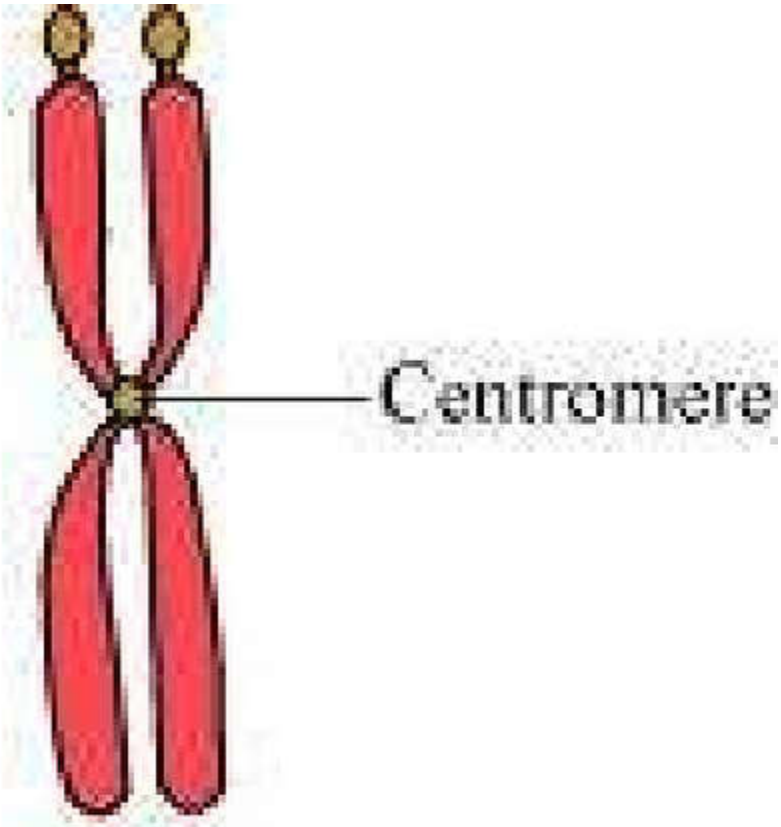


(ii) Centrosome
Centrosome consists of two cylindrical structures called centrioles. Centrioles lie perpendicular to each other. Each has a cartwheel-like organisation.
A centriole is made up of microtubule triplets that are evenly spaced in a ring. The adjacent triplets are linked together. There is a proteinaceous hub in the central part
of a centriole. The hub is connected to the triplets via radial spokes. These centrioles help in organising the spindle fibres and astral rays during cell division. They form the basal body of cilia and

flagella.



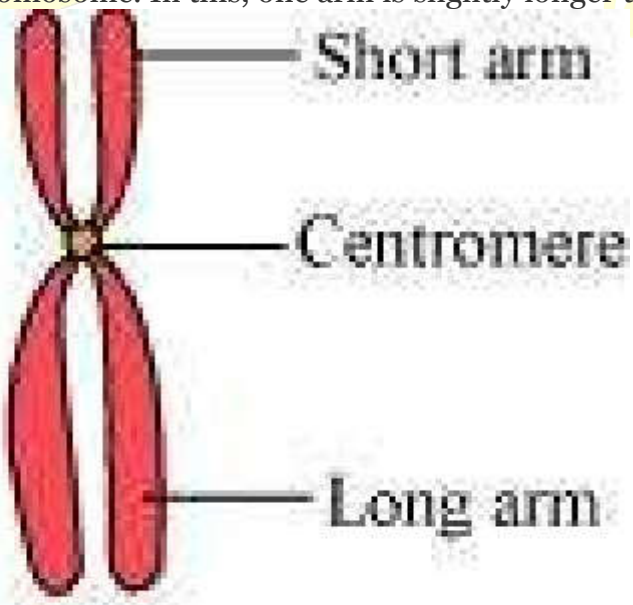
Question 14: What is a centromere? How does the position of centromere form the basis of classification of chromosomes. Support your answer with a diagram showing the position of centromere on different types of chromosomes.
Answer Centromere is a constriction present on the chromosomes where the chromatids are held together.
Chromosomes are divided into four types based on the position of the centromere.
(i) Metacentric chromosome
The chromosomes in which the centromere is present in the middle and divides the chromosome into two equal arms is known as a metacentric chromosome.



Metacentric chromosome

(ii) Sub-metacentric chromosome

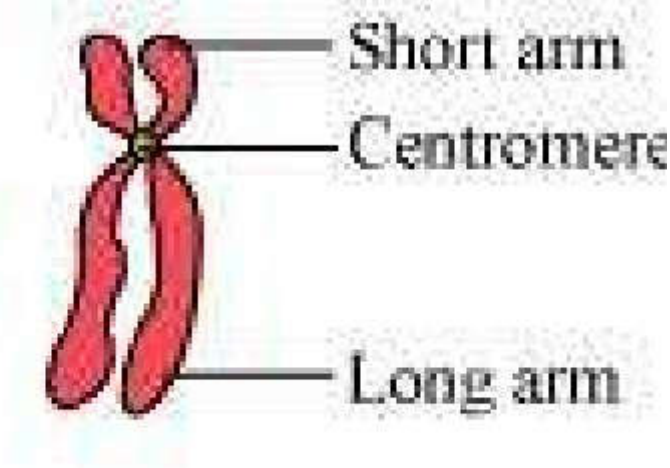
The chromosome in which the centromere is slightly away from the middle region is known as a sub-metacentric chromosome. In this, one arm is slightly longer than the other.



Sub-metacentric chromosome

(iii) Acrocentric chromosome

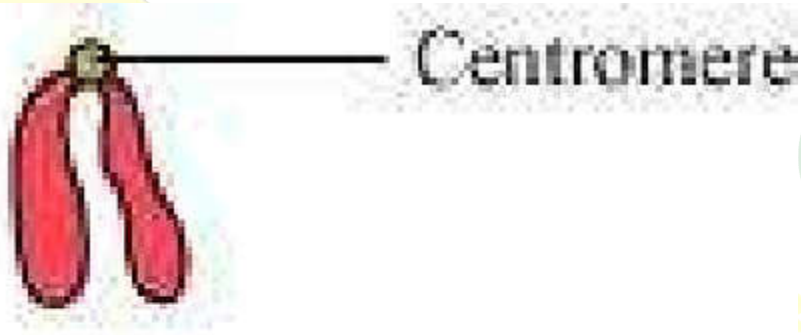
The chromosome in which the centromere is located close to one of the terminal ends is known as an acrocentric chromosome. In this, one arm is extremely long and the other is extremely short.



Acrocentric chromosome

(iv) Telocentric chromosome

The chromosome in which the centromere is located at one of the terminal ends is known as a telocentric chromosome.



Telocentric chromosome

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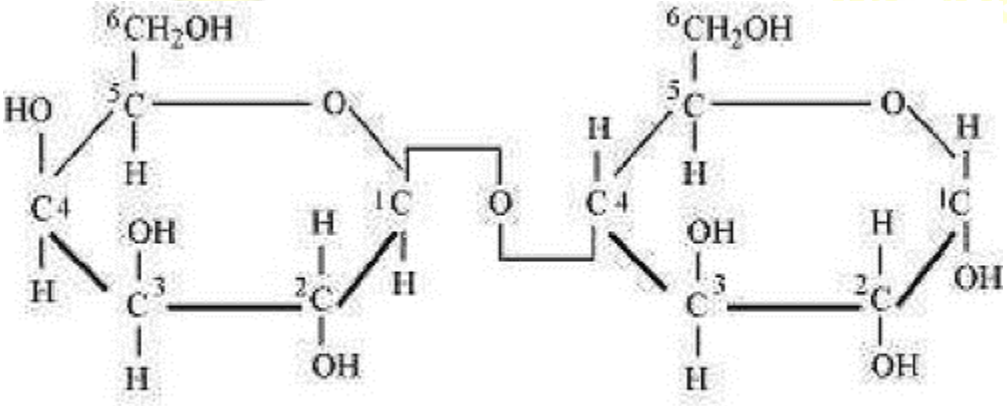
Question 1: What are macromolecules? Give examples.

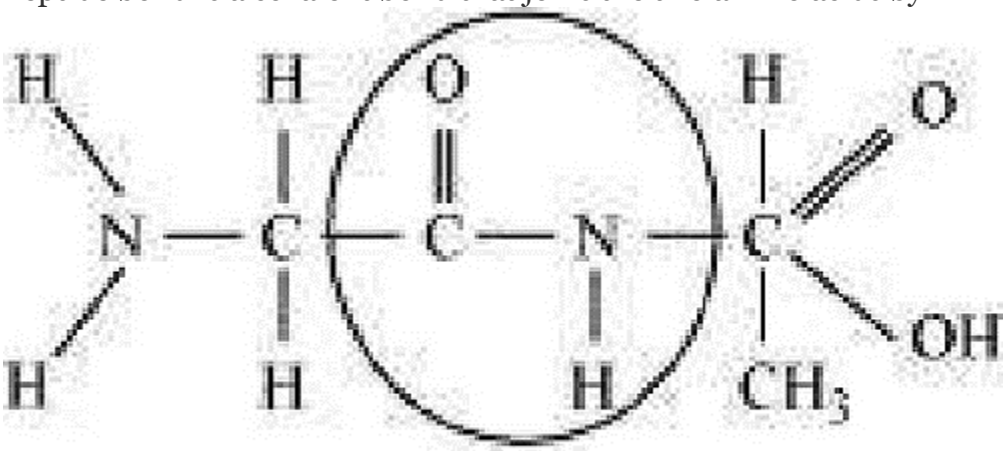
Answer Macromolecules are large complex molecules that occur in colloidal state in intercellular fluid. They are formed by the polymerization of low molecular weight micromolecules. Polysaccharides, proteins, and nucleic acids are common examples of macromolecules.

Question 2: Illustrate a glycosidic, peptide and a phospho-diester bond.
Answer
(a)
Glycosidic bond is formed normally between carbon atoms, 1 and 4, of neighbouring monosaccharide units.



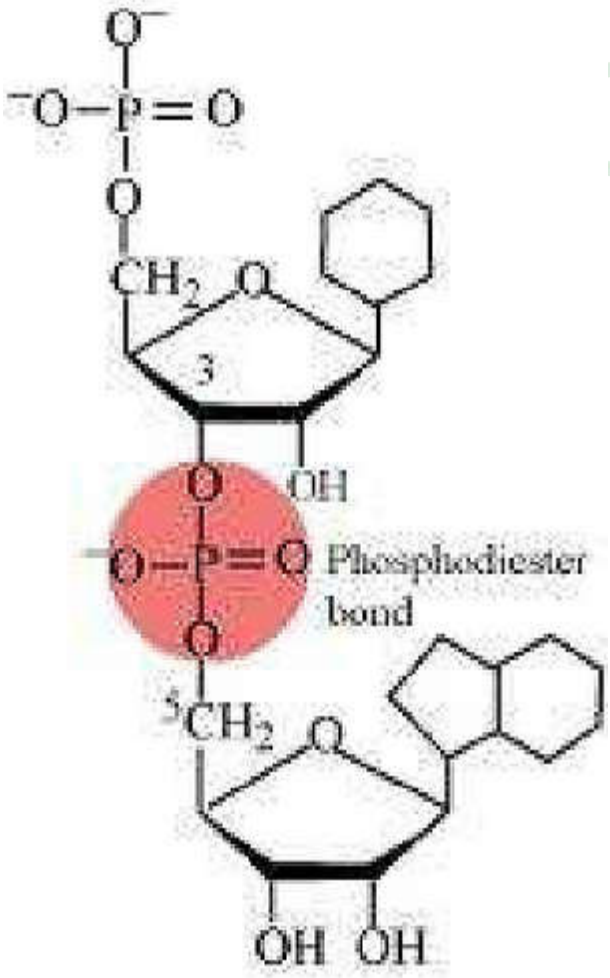
Glycosidic bond

(b)
Peptide bond is a covalent bond that joins the two amino acids by – NH – CO linkage.



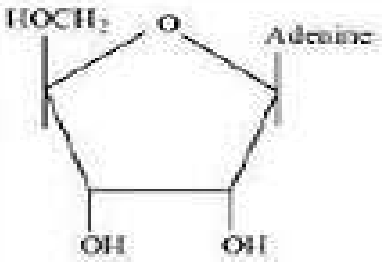
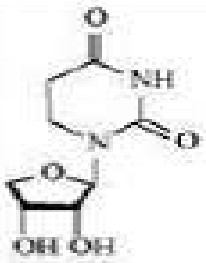
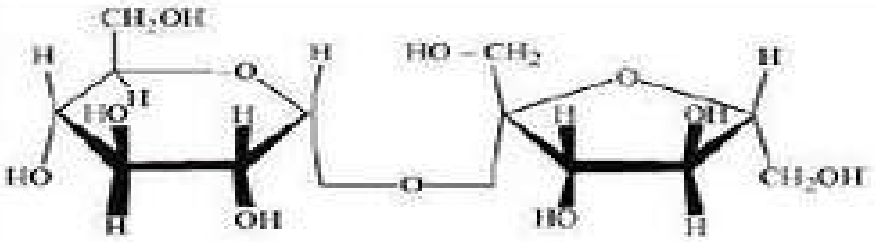
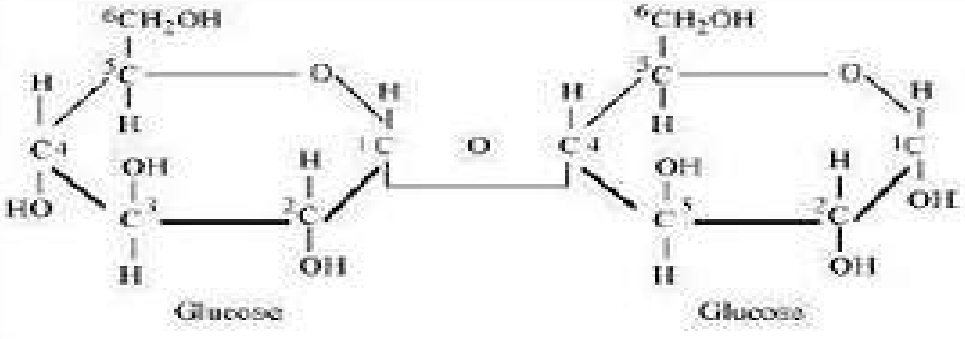
Peptide bond

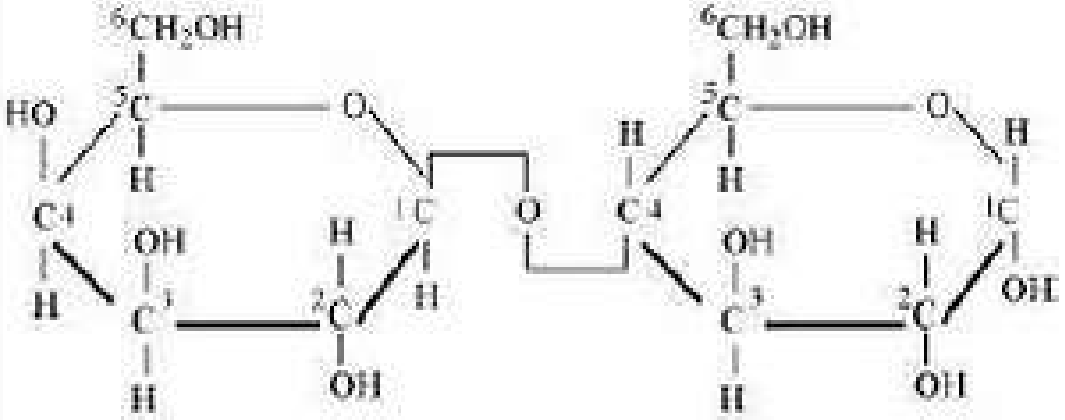
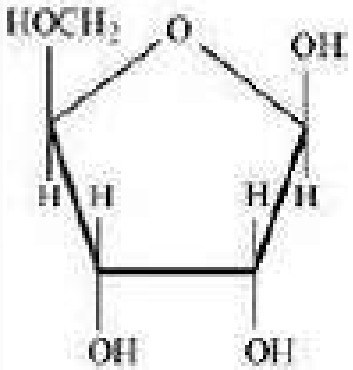
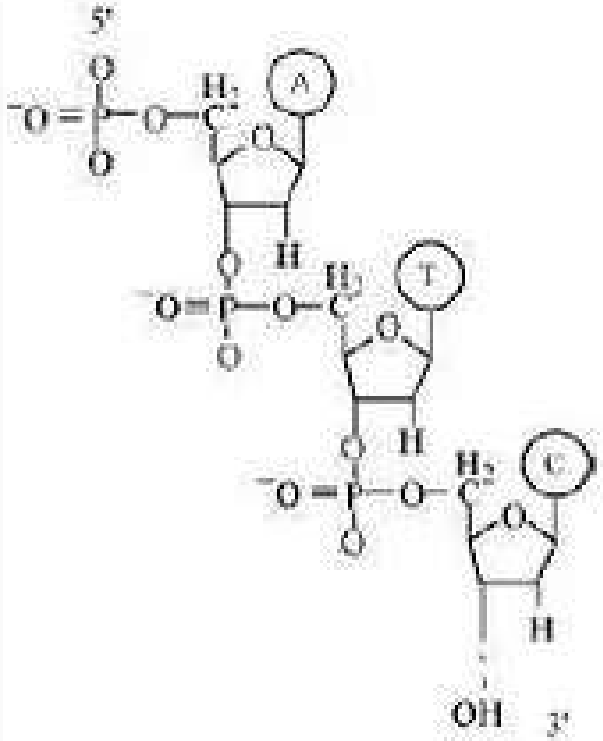
(c)
Phosphodiester bond is a strong covalent bond between phosphate and two sugar groups. Such bonds form the sugar phosphate backbone of nucleic acids.

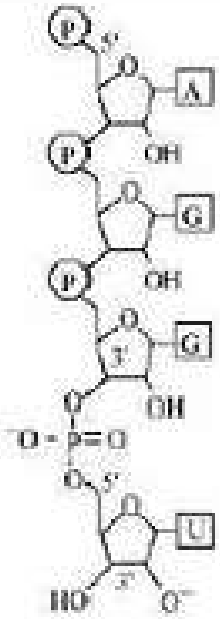
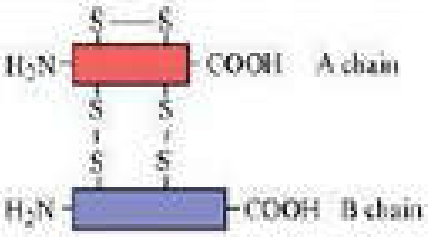


Question 3: What is meant by tertiary structure of proteins?
Answer The helical polypeptide chain undergoes coiling and folding to form a complex three-dimensional shape referred to as tertiary structure of proteins. These coils and folds are arranged to hide the non-polar amino acid chains and to expose the polar side chains. The tertiary structure is held together by the weak bonds formed between various parts of the polypeptide chain.

Question 4: Find and write down structures of 10 interesting small molecular weight biomolecules. Find if there is any industry which manufactures the compounds by isolation. Find out who are the buyers.
Answer
(a)

	Molecule	Structure
1.	Adenosine	
2.	Thymidine	
3.	Sucrose	
4.	Maltose	

5.	Lactose	
6.	Ribose	
7.	DNA	

8.	RNA	
9.	Glycerol	
10.	Insulin	

(b)

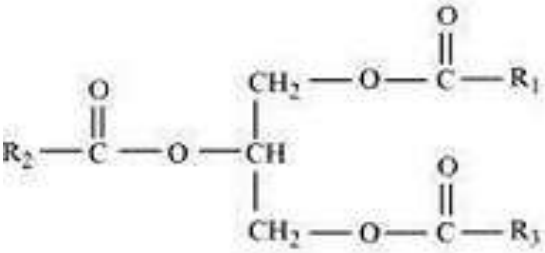
	Compound	Manufacturer	Buyer
1.	Starch products	Kosha Impex (P) Ltd.	Research laboratories, educational institutes, and other industries, which use biomolecules as a precursor for making other products.
2.	Liquid glucose	Marudhar apparels	

3.	Various enzymes such as amylase, protease, cellulase	Map (India) Ltd	

Question 5: Proteins have primary structure. If you are given a method to know which amino acid is at either of the two termini (ends) of a protein, can you connect this information to purity or homogeneity of a protein?
Answer Yes, if we are given a method to know the sequence of proteins, we can connect this information to the purity of a protein. It is known that an accurate sequence of a certain amino acid is very important for the functioning of a protein. If there is any change in the sequence, it would alter its structure, thereby altering the function. If
we are provided with a method to know the sequence of an unknown protein, then using this information, we can determine its structure and compare it with any of the known correct protein sequence. Any change in the sequence can be linked to the purity or homogeneity of a protein.
For example, any one change in the sequence of haemoglobin can alter the normal haemoglobin structure to an abnormal structure that can cause sickle cell anaemia.

Question 6: Find out and make a list of proteins used as therapeutic agents. Find other applications of proteins (e.g., cosmetics, etc.)
Answer Proteins used as therapeutic agents are as follows:
1. Thrombin and fibrinogen – They help in blood clotting.
2. Antigen (antibody) – It helps in blood transfusion.
3. Insulin – It helps in maintaining blood glucose level in the body.
4. Renin – It helps in osmoregulation.
Proteins are also commonly used in the manufacture of cosmetics, toxins, and as biological buffers.

Question 7: Explain the composition of triglyceride.
Answer Triglyceride is a glyceride, which is formed from a single molecule of glycerol, esterified with three fatty acids. It is mainly present in vegetable oils and animal fat.

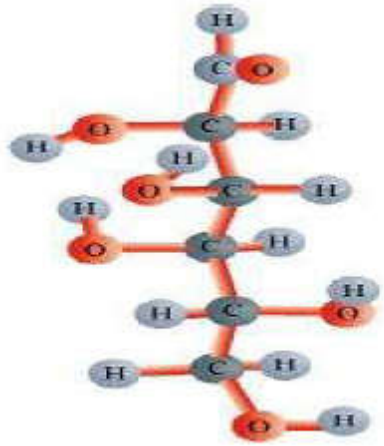


Structure of triglyceride

The general chemical formula of triglyceride is $R_2COO-CH_2CH(-OOCR_1)CH_2-OOCR_3$, where R_1, R_2, and R_3 are fatty acids. These three fatty acids can be same or different.

Question 8: Can you describe what happens when milk is converted into curd or yoghurt from your understanding of proteins.
Answer Proteins are macromolecules formed by the polymerization of amino acids. Structurally, proteins are divided into four levels.
(a) Primary structure – It is the linear sequence of amino acids in a polypeptide chain.
(b) Secondary structure – The polypeptide chain is coiled to form a threedimensional structure.
(c) Tertiary structure – The helical polypeptide chain is further coiled and folded to form a complex structure.
(d) Quaternary structure – More than one polypeptide chains assemble to form the quaternary structure.
Milk has many globular proteins. When milk is converted into curd or yoghurt, these complex proteins get denatured, thus converting globular proteins into fibrous proteins. Therefore, by the process of denaturation, the secondary and tertiary structures of proteins are destroyed.

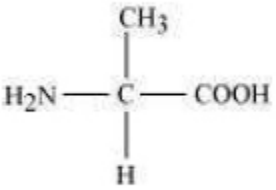
Question 9: Can you attempt building models of biomolecules using commercially available atomic models (Ball and Stick models).
Answer Ball and stick models are 3-D molecular models that can be used to describe the structure of biomolecules. In ball and stick model, the atoms are represented as balls whereas the bonds that hold the atoms are represented by the sticks. Double and triple bonds are represented by springs that form curved connections between the balls. The size and colour of various atoms are different and are depicted by the relative size of the balls. It is the most fundamental and common model of representing biomolecular structures.



In the above ball and stick model of D-glucose, the oxygen atoms are represented by red balls, hydrogen atoms by blue balls, while carbon atoms are represented by grey balls.

Question 10: Attempt titrating an amino acid against a weak base and discover the number of dissociating (ionizable) functional groups in the amino acid.
Answer Titrating a neutral or basic amino acid against a weak base will dissociate only one functional group, whereas titration between acidic amino acid and a weak acid will dissociate two or more functional groups.

Question 11: Draw the structure of the amino acid, alanine.
Answer Structure of alanine



Question 12: What are gums made of? Is Fevicol different?
Answer Gums are hetero-polysaccharides. They are made from two or more different types of monosaccharides. On the other hand, fevicol is polyvinyl alcohol (PVA) glue. It is not a polysaccharide.

Question 13: Find out a qualitative test for proteins, fats and oils, amino acids and test any fruit juice, saliva, sweat and urine for them.
Answer (a) Test for protein
Biuret's test – If Biuret's reagent is added to protein, then the colour of the reagent changes from light blue to purple.
(b) Test for fats and oils Grease or solubility test
(c) Test for amino acid
Ninhydrin test – If Ninhydrin reagent is added to the solution, then the colourless solution changes to pink, blue, or purple, depending on the amino acid.

Item		Name of the test	Procedure	Result	Inference
1.	Fruit juice	Biuret's test	Fruit juice + Biuret's reagent	Colour changes from light blue to purple	Protein is present.
		Grease test	To a brown paper, add a few drops of fruit juice.	No translucent spot	Fats and oils are absent or are in negligible amounts.
		Ninhydrin test	Fruit juice + Ninhydrin reagent + boil for 5 minutes	Colourless solution changes to pink, blue, or purple colour	Amino acids are present.
2.	Saliva	Biuret's	Saliva + Biuret's	Colour changes from	Proteins are

		test	reagent	light blue to purple	present.
		Grease test	On a brown paper, add a drop of saliva.	No translucent spot	Fats/oils are absent.
		Ninhydrin test	Saliva + Ninhydrin reagent + boil for 5 minutes	Colourless solution changes to pink, blue, or purple colour	Amino acids are present.
3.	Sweat	Biuret's test	Sweat + Biuret's reagent	No colour change	Proteins are absent.
		Solubility test	Sweat + Water	Oily appearance	Fats/oil may be present.
		Ninhydrin test	Sweat + Ninhydrin reagent + boil for 5 minutes	No colour change, solution remains colourless	Amino acids are absent.
4.	Urine	Biuret's test	Few drops of urine + Biuret's reagent	Colour changes from light blue to purple	Proteins are present.
		Solubility test	Few drops of urine + Water	Little bit of oily appearance	Fats may or may not be present.
		Ninhydrin test	Few drops of urine +	Colourless solution changes to pink,	Amino acids are present.

			Ninhydrin reagent + boil for 5 minutes	blue, or purple colour depending on the type of amino acid	

Question 14: Find out how much cellulose is made by all the plants in the biosphere and compare it with how much of paper is manufactured by man and hence what is the consumption of plant material by man annually. What a loss of vegetation!
Answer Approximately, 100 billion tonnes of cellulose are made per year by all the plants in the biosphere and it takes 17 full grown trees to make one ton of paper. Trees are also used to fulfil the other requirements of man such as for timber, food, medicines, etc. Hence, it is difficult to calculate the annual consumption of plant material by
man.

Question 15: Describe the important properties of enzymes.
Answer Properties of enzymes
(1) Enzymes are complex macromolecules with high molecular weight.
(2) They catalyze biochemical reactions in a cell. They help in the breakdown of large molecules into smaller molecules or bring together two smaller molecules to form a larger molecule.
(3) Enzymes do not start a reaction. However, they help in accelerating it.
(4) Enzymes affect the rate of biochemical reaction and not the direction.
(5) Most of the enzymes have high turnover number. Turnover number of an enzyme is the number of molecules of a substance that is acted upon by an enzyme per minute. High turnover number of enzymes increases the efficiency of reaction.
(6) Enzymes are specific in action.
(7) Enzymatic activity decreases with increase in temperature.
(8) They show maximum activity at an optimum pH of 6 – 8.
(9) The velocity of enzyme increases with increase in substrate concentration and then, ultimately reaches maximum velocity.

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Class 11 Biology Solutions Chapter 10 Cell Cycle and Cell Division

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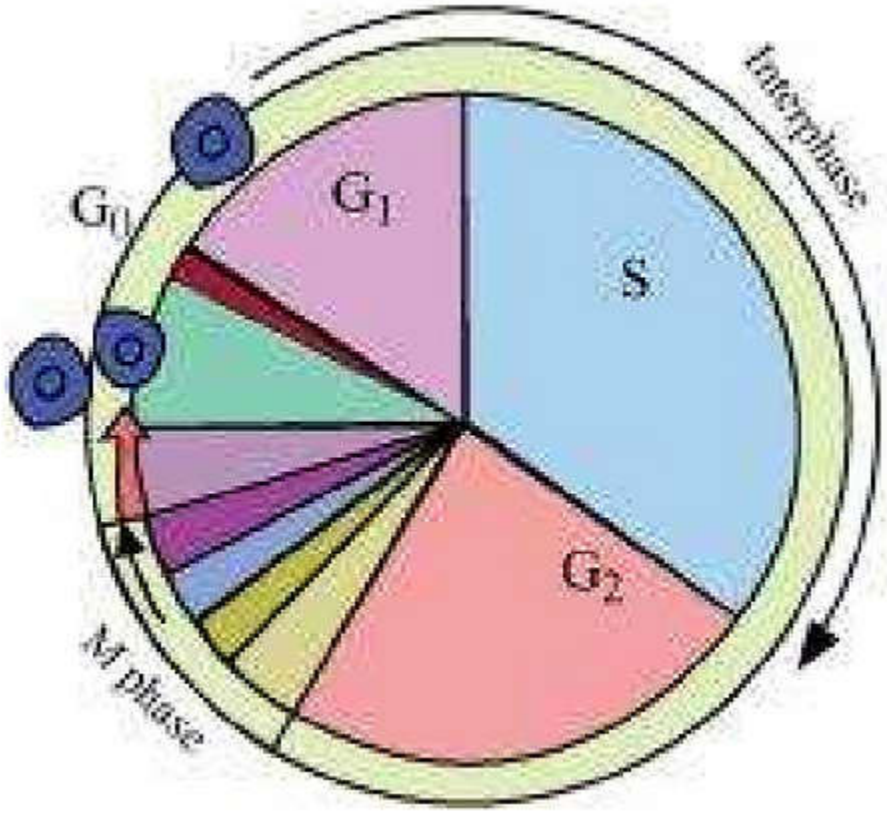
Question 1: What is the average cell cycle span for a mammalian cell?
Answer The average cell cycle span for a mammalian cell is approximately 24 hours.

Question 2: Distinguish cytokinesis from karyokinesis.
Answer

Cytokinesis		Karyokinesis	
(i)	Cytokinesis is the biological process involving the division of a cell's cytoplasm during mitosis or meiosis.	(i)	Karyokinesis is the biological process involving the division of a cell's nucleus during mitosis or meiosis.
(ii)	It is divided into four stages – prophase, metaphase, anaphase, and telophase.	(ii)	Stages such as prophase, metaphase, anaphase, and telophase are not present in karyokinesis.

Question 3: Describe the events taking place during interphase.
Answer Interphase involves a series of changes that prepare a cell for division. It is the period during which the cell experiences growth and DNA replication in an orderly manner. Interphase is divided into three phases.
(i) G1 phase
(ii) S phase
(iii) G2 phase
G1 phase – It is the stage during which the cell grows and prepares its DNA for replication. In this phase, the cell is metabolically active.
S phase – It is the stage during which DNA synthesis occurs. In this phase, the amount of DNA (per cell) doubles, but the chromosome number remains the same. G2 phase – In this phase, the cell continues to grow

and prepares itself for division. The proteins and RNA required for mitosis are synthesised during this stage.

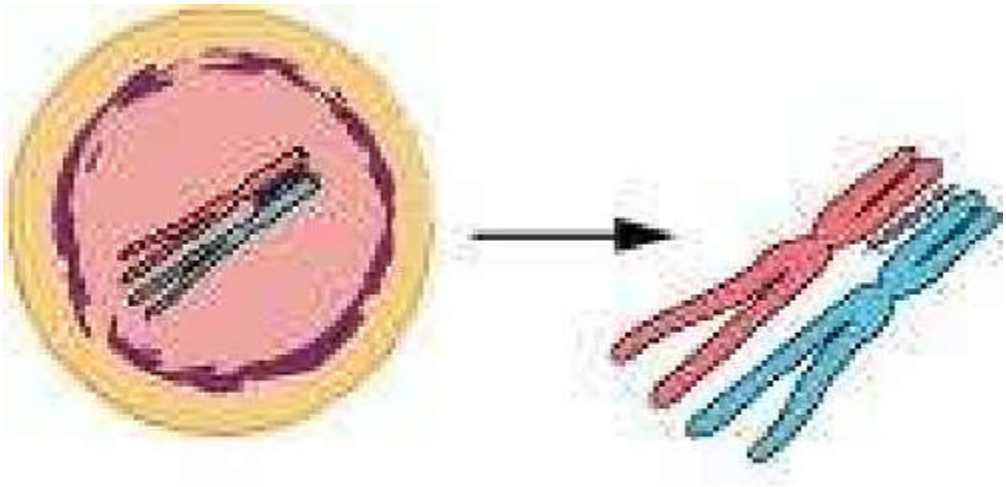


Question 4: What is G0 (quiescent phase) of cell cycle?
Answer G0 or quiescent phase is the stage wherein cells remain metabolically active, but do not proliferate unless called to do so. Such cells are used for replacing the cells lost during injury.

Question 5: Why is mitosis called equational division?
Answer Mitosis is the process of cell division wherein the chromosomes replicate and get equally distributed into two daughter cells. The chromosome number in each daughter cell is equal to that in the parent cell, i.e., diploid. Hence, mitosis is known as equational division.

Question 6: Name the stage of cell cycle at which one of the following events occur:
(i) Chromosomes are moved to spindle equator
(ii) Centromere splits and chromatids separate
(iii) Pairing between homologous chromosomes takes place
(iv) Crossing over between homologous chromosomes takes place
Answer (i) Metaphase
(ii) Anaphase
(iii) Zygotene of meiosis I
(iv) Pachytene of meiosis I

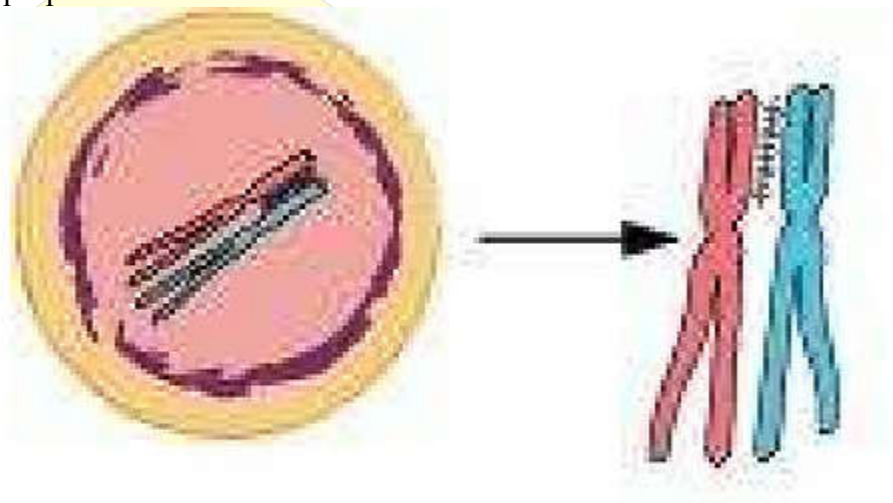
Question 7: Describe the following:
(a) synapsis (b) bivalent (c) chiasmata Draw a diagram to illustrate your answer.
Answer (a) Synapsis
The pairing of homologous chromosomes is called synapsis. This occurs during the second stage of prophase I or zygotene.



Synapsis: pairing of homologous chromosomes

(b) Bivalent

Bivalent or tetrad is a pair of synapsed homologous chromosomes. They are formed during the zygotene stage of prophase I of meiosis.

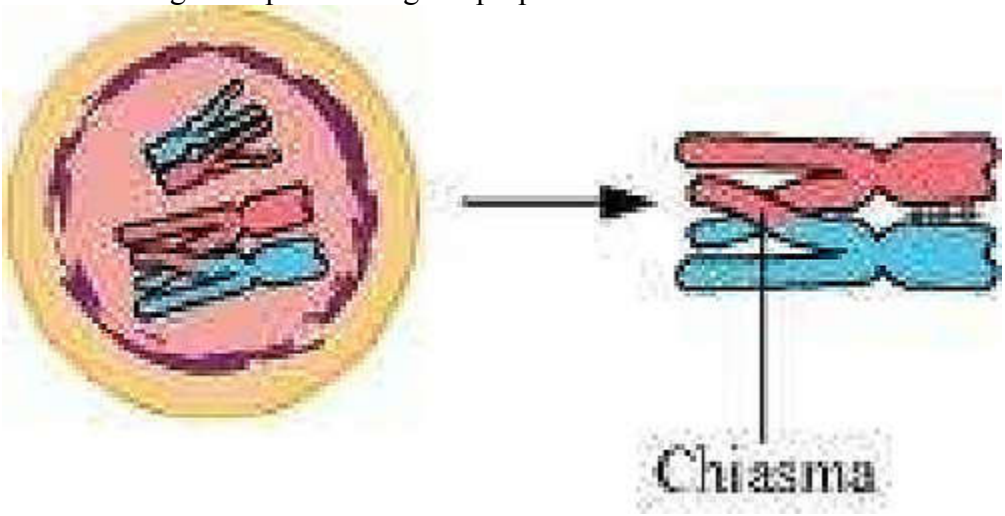


4 Homologous chromatids or 2 Homologous chromosomes

(c) Chiasmata

Chiasmata is the site where two sister chromatids have crossed over. It represents the site of cross-over. It is

formed during the diplotene stage of prophase I of meiosis.

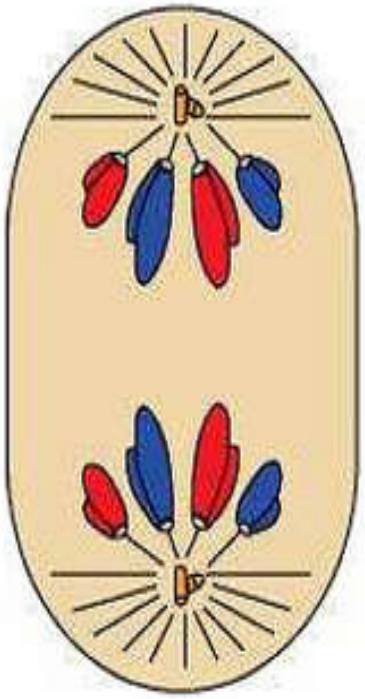
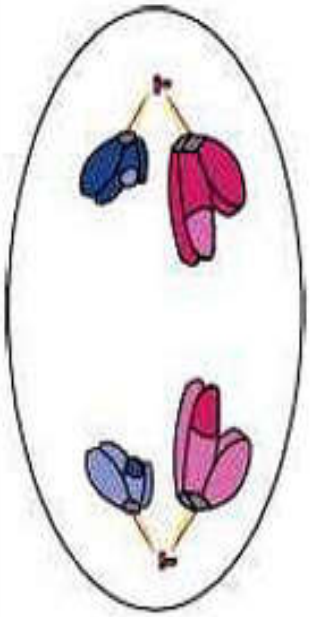


Question 8: How does cytokinesis in plant cells differ from that in animal cells?
Answer

Cytokinesis in plant cells		Cytokinesis is animal cells	
(i)	The division of the cytoplasm takes place by cell plate formation.	(i)	The division of the cytoplasm takes place by cleavage.
(ii)	Cell plate formation starts at the centre of the cell and grows outward, toward the lateral walls.	(ii)	Cleavage starts at the periphery and then moves inward, dividing the cell into two parts.

Question 9: Find examples where the four daughter cells from meiosis are equal in size and where they are found unequal in size.
Answer (a) Spermatogenesis or the formation of sperms in human beings occurs by the process of meiosis. It results in the formation of four equal-sized daughter cells.
(b) Oogenesis or the formation of ovum in human beings occurs by the process of meiosis. It results in the formation of four daughter cells which are unequal in size.

Question 10: Distinguish anaphase of mitosis from anaphase I of meiosis.
Answer

Anaphase of mitosis	Anaphase I of meiosis
Anaphase is the stage during which the centromere splits and the chromatids separate. The chromosomes move apart, toward the opposite poles. These chromosomes are genetically identical.	During anaphase **I**, the homologous chromosomes separate, while the chromatids remain attached at their centromeres. Hence, in anaphase **I**, the chromosomes of each bivalent pair separate, while the sister chromatids remain together.
 Anaphase	 Anaphase

Question 11: List the main differences between mitosis and meiosis.
Answer

Mitosis		Meiosis	
1.	In mitotic division, a single division results in two daughter cells.	**1.**	Meiotic division involves two successive divisions – meiosis **I** and meiosis **II**. These divisions result in four daughter cells.
2.	Mitosis is known as equational division. This is because the daughter cells have the same diploid number of chromosomes as the parent.	**2.**	Meiosis **I** is known as reductional division. This is because the chromosome number is reduced to half. Meiosis **II** is known as equational division. This is because the sister chromatids separate and the chromosome number remains the

			same.
3.	Prophase is short and does not comprise any phase.	**3.**	Prophase **I** is very long and comprises 5 phases –leptotene, zygotene, pachytene, diplotene, and diakinesis.
4.	There is no pairing of chromosomes, crossing-over, or chiasmata-formation during prophase.	**4.**	In the zygotene stage of prophase, the pairing of chromosomes occurs. During pachytene, the crossing-over occurs. The chiasmata are formed in the diplotene stage.
5.	Synaptonemal complex is not formed.	**5.**	Synaptonemal complex is formed during the zygotene stage of prophase **I.**
6.	Anaphase involves the separation of the chromatids of each chromosome.	**6.**	During anaphase **I**, the homologous chromosomes separate, while the chromatids remain attached at their centromeres. During anaphase **II**, the chromatids separate as a result of the splitting of the centromere.
7.	Mitosis plays a significant role in the healing, repair, and growth of a cell.	**7.**	Meiosis brings about variation and maintains the chromosome number from generation to generation.

Question 12: What is the significance of meiosis?
Answer Meiosis is the process involving the reduction in the amount of genetic material. It comprises two successive nuclear and cell divisions, with a single cycle of DNA replication. As a result, at the end of meiosis II, four haploid cells are formed.
Significance of meiosis
1. Meiosis maintains the chromosome number from generation to generation. It reduces the chromosome

number to half so that the process of fertilisation restores the original number in the zygote.
2. Variations are caused by the cross-over and the random distribution of homologous chromosomes between daughter cells. Variations play an important role in evolution.
3. Chromosomal mutations are brought about by the introduction of certain abnormalities. These chromosomal mutations may be advantageous for an individual.

Question 13: Discuss with your teacher about
(i) haploid insects and lower plants where cell-division occurs, and
(ii) some haploid cells in higher plants where cell-division does not occur.
Answer (i) In some insects and lower plants, fertilization is immediately followed by zygotic meiosis, which leads to the production of haploid organisms. This type of life cycle is known as haplontic life cycle.
(ii) The phenomenon of polyploidy can be observed in some haploid cells in higher plants in which cell division does not occur. Polyploidy is a state in which cells contain multiple pairs of chromosomes than the basic set. Polyploidy can be artificially induced in plants by applying colichine to cell culture.

Question 14: Can there be mitosis without DNA replication in S phase?
Answer Mitotic cell division cannot take place without DNA replication in S phase. Two important events take place during S phase – one is the synthesis or duplication of DNA and the other is the duplication of the centriole. DNA duplication is important as it maintains the chromosome number in the daughter cells. Mitosis is an equational
division. Therefore, the duplication of DNA is an important step.

Question 15: Can there be DNA replication without cell division?
Answer There can be DNA replication without cell division. During cell division, the parent cell gets divided into two daughter cells. However, if there is a repeated replication of DNA without any cell division, then this DNA will keep accumulating inside the cell. This would increase the volume of the cell nucleus, thereby causing cell expansion.
An example of DNA duplication without cell division is commonly observed in the salivary glands of Drosophila. The chromosome undergoing repeated DNA duplication is known as polytene chromosome.

Question 16: Analyse the events during every stage of cell cycle and notice how the following two parameters change
(i) Number of chromosomes (N) per cell
(ii) Amount of DNA content (C) per cell
Answer During meiosis, the number of chromosomes and the amount of DNA in a cell change.
(i) Number of chromosomes (N) per cell During anaphase I of the meiotic cycle, the homologous chromosomes separate and
start moving toward their respective poles. As a result, the bivalents get divided into two sister chromatids and receive half the chromosomes present in the parent cell. Therefore, the number of chromosomes reduces in anaphase I.
(ii) Amount of DNA content (C) per cell During anaphase II of the meiotic cycle, the chromatids separate as a result of the splitting of the centromere. It is the centromere that holds together the sister chromatids of each chromosome. As a result, the chromatids move toward their respective poles. Therefore, at each pole, a haploid number of chromosomes and a haploid amount of DNA are present.
During mitosis, the number of chromosomes remains the same. The DNA duplicated in the S phase gets separated in the two daughter cells during anaphase. As a result, the DNA content (C) of the two newly-formed daughter cells remains the same.

Answers NCERT Solutions For Class 11 Biology http://freehomedelivery.net/ Solutions Chapter 11 Transport in Plants

Class 11 Biology Solutions Chapter 11 Transport in Plants

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Question 1: What are the factors affecting the rate of diffusion?
Answer Diffusion is the passive movement of substances from a region of higher concentration to a region of lower concentration. Diffusion of substances plays an important role in cellular transport in plants. Rate of diffusion is affected by concentration gradient, membrane permeability, temperature, and pressure. Diffusion takes place as long as there is a difference between the concentrations of a substance across a barrier. However, diffusion stops, when the concentrations of the substance on either side of the barrier become equal. The permeability of a membrane affects the rate of diffusion. Diffusion rate increases as membrane permeability increases. Changes in temperature and pressure values also affect the diffusion of substances. Pressure plays an important role in the diffusion of gases as gases diffuse from a region of higher partial pressure to a region of lower partial pressure.

Question 2: What are porins? What role do they play in diffusion?
Answer Porins are types of proteins which form pores of large sizes in the outer membranes of plastids such as chloroplast, mitochondria and the membranes in bacteria. They help in facilitating the passive transport of small-sized protein molecules.

Question 3: Describe the role played by protein pumps during active transport in plants.
Answer In plant cells, active transport occurs against the concentration gradient, i.e., from a region of lower concentration to a region of higher concentration. The process of active transport involves specific protein pumps. The protein pumps are made up of specific proteins called trans-membrane proteins. These pumps first make a complex with the substance to be transported across the membrane, using the energy derived from ATP. The substance finally gets liberated into the cytoplasm as a result of the dissociation of the protein–substance complex.

Question 4: Explain why pure water has the maximum water potential.
Answer Water potential quantifies the tendency of water to move from one part to the other during various cellular processes. It is denoted by the Greek letter Psi or Ψ. The water potential of pure water is always taken as zero at standard temperature and pressure. It can be explained in terms of the kinetic energy possessed by water molecules. When water is in liquid form, the movement of its molecules is rapid and constant. Pure water has the highest concentration of water molecules. Therefore, it has the highest water potential. When some solute is dissolved in water, the water potential of pure water decreases.

Question 5: Differentiate between the following:
(a) Diffusion and Osmosis
(b) Transpiration and Evaporation
(c) Osmotic Pressure and Osmotic Potential
(d) Imbibition and Diffusion
(e) Apoplast and Symplast pathways of movement of water in plants.
(f) Guttation and Transpiration.

Answer

(a) Diffusion and osmosis

	Diffusion		Osmosis
1.	Diffusion is the passive movement of particles, ions, and molecules along the concentration gradient.	1.	Osmosis is the process in which the diffusion of a solvent (water) occurs across a semi-permeable membrane.
2.	It can occur in solids, liquids, and gases.	2.	It occurs in the liquid medium.
3.	It does not require a semi-permeable membrane.	3.	It requires a semi-permeable membrane.

(b) Transpiration and evaporation

	Transpiration		Evaporation
1.	It occurs in plants.	1.	It occurs from any free surface and involves living and non-living surfaces.
2.	It is a physiological process.	2.	It is a physical process.
3.	It occurs mainly through the stomatal pores on plant leaves.	3.	It is occurs through any free surface.
4.	It is controlled by environmental factors as well as physiological factors of plants such as root-shoot ratio and number of stomata.	4.	It is entirely driven by environmental factors.

(c) Osmotic pressure and osmotic potential

	Osmotic pressure		Osmotic potential
1.	It is expressed in bars with a positive sign.	1.	It is expressed in bars with a negative sign.

2.	It is a positive pressure.	**2.**	It is a negative pressure.
3.	Its value increases with an increase in the concentration of solute particles.	**3.**	Its value decreases with an increase in the concentration of solute particles.

(d) Imbibition and diffusion

Imbibition		**Diffusion**	
1.	Imbibition is a special type of diffusion. In this process, water is absorbed by solids and colloids, causing an enormous increase in volume.	**1.**	Diffusion is the passive movement of particles, ions, and molecules along the concentration gradient.
2.	It usually involves water.	**2.**	It involves solids, liquids, and gases.

(e) Apoplast and symplast pathways of movement of water in plants

Apoplast pathway		**Symplast pathway**	
1.	The apoplast pathway involves the movement of water through the adjacent cell walls of the epidermis and cortex. The movement of water is restricted at the casparian strips of the root endodermis.	**1.**	The symplast pathway involves the movement of water through the interconnected protoplasts of the epidermis, cortex, endodermis, and root pericycle.
2.	It is a faster process of water movement and water moves through mass flow.	**2.**	It is a slower process of water movement.

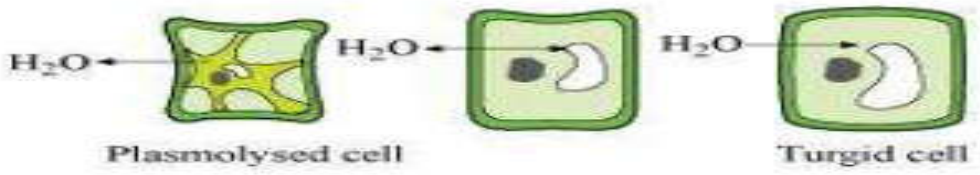
(f) Guttation and transpiration

Guttation		Transpiration	
1.	It occurs usually at night.	1.	It occurs usually during the day.
2.	Water is lost from the leaves in the form of liquid droplets.	2.	Water is lost from the leaves in the form of water vapour.
3.	It occurs through the vein endings of leaves.	3.	It occurs through the stomata.
4.	It is an uncontrolled process.	4.	It is a controlled process.

Question 6: Briefly describe water potential. What are the factors affecting it?
Answer Water potential quantifies the tendency of water to move from one part to the other during various cellular processes such as diffusion, osmosis, etc. It is denoted by the Greek letter Psi or Ψ and is expressed in Pascals (Pa). The water potential of pure water is always taken as zero at standard temperature and pressure. Water potential (Ψw) is expressed as the sum of solute potential (Ψs) and pressure potential (Ψp).
$\Psi w = \Psi s + \Psi p$
When some solute is dissolved in water, the water potential of pure water decreases. This is termed as solute potential (Ψs), which is always negative. For a solution at atmospheric pressure, $\Psi w = \Psi s$. The water potential of pure water or a solution increases on the application of pressure values more than atmospheric pressure. It is termed as pressure potential. It is denoted by Ψp and has a positive value, although a negative pressure potential is present in the xylem. This pressure potential plays a major role in the ascent of water through the stem.

Question 7: What happens when a pressure greater than the atmospheric pressure is applied to pure water or a solution?
Answer The water potential of pure water or a solution increases on the application of pressure values more than atmospheric pressure. For example: when water diffuses into a plant cell, it causes pressure to build up against the cell wall. This makes the cell wall turgid. This pressure is termed as pressure potential and has a positive value.

Question 8: (a) With the help of well-labelled diagrams, describe the process of plasmolysis in plants, giving appropriate examples.
(b) Explain what will happen to a plant cell if it is kept in a solution having higher water potential.
Answer (a) Plasmolysis can be defined as the shrinkage of the cytoplasm of a plant cell, away from its cell wall and toward the centre. It occurs because of the movement of water from the intracellular space to the outer-cellular space. This happens when the plant cell is placed in a hypertonic solution (i.e., a solution having more solute concentration than the cell cytoplasm). This causes the water to move out of the cell and toward the solution. The cytoplasm of the cell shrinks and the cell is said to be plasmolysed. This process can be observed in an onion peel kept in a highly concentrated salt solution.



Process of plasmolysis

(b) When a plant cell is placed in a hypertonic solution or a solution having higher water potential, the

water diffuses into the cell (i.e., movement is observed from higher to lower water pressure region). The entry of water in the plant cell exerts pressure on the rigid cell wall. This is called turgor pressure. As a result of its rigid
cell wall, the plant cell does not burst.

Question 9: How is the mycorrhizal association helpful in absorption of water and minerals in plants?
Answer Mycorrhiza is a symbiotic association of fungi with the root systems of some plants. The fungal hyphae either form a dense network around the young roots or they penetrate the cells of the roots. The large surface area of the fungal hyphae is helpful in increasing the absorption of water and minerals from the soil. In return, they get sugar and nitrogenous compounds from the host plants. The mycorrhizal association is obligate in some plants. For example, Pinus seeds do not germinate and establish in the absence of mycorrhizal.

Question 10: What role does root pressure play in water movement in plants?
Answer Root pressure is the positive pressure that develops in the roots of plants by the active absorption of nutrients from the soil. When the nutrients are actively absorbed by root hairs, water (along with minerals) increases the pressure in the xylem. This pressure pushes the water up to small heights. Root pressure can be observed experimentally by cutting the stem of a well-watered plant on a humid day. When the stem is cut, the solution oozes from the cut end. Root pressure is also linked to the phenomenon of guttation, i.e., the loss of water in the form of liquid droplets from the vein endings of certain herbaceous plants. Root pressure is only able to transport water up to small heights. However, it helps in re-establishing the continuous chains of water molecules in the xylem. Transpirational pull maintains the flow of water molecules from the roots to the shoots.

Question 11: Describe transpiration pull model of water transport in plants. What are the factors influencing transpiration? How is it useful to plants?
Answer In tall trees, water rises with the help of the transpirational pull generated by transpiration or loss of water from the stomatal pores of leaves. This is called the cohesion-tension model of water transport. During daytime, the water lost through transpiration (by the leaves to the surroundings) causes the guard cells and other
epidermal cells to become flaccid. They in turn take water from the xylem. This creates a negative pressure or tension in the xylem vessels, from the surfaces of the leaves to the tips of the roots, through the stem. As a result, the water present in the xylem is pulled as a single column from the stem. The cohesion and adhesion forces of the water molecules and the cell walls of the xylem vessels prevent the water column from splitting. In plants, transpiration is driven by several environmental and physiological factors. The external factors affecting transpiration are wind, speed, light, humidity, and temperature. The plant factors affecting transpiration are canopy structure, number
and distribution of stomata, water status of plants, and number of open stomata. Although transpiration causes water loss, the transpirational pull helps water rise in the stems of plants. This helps in the absorption and transport of minerals from the soil to the various plant parts. Transpiration has a cooling effect on plants. It helps maintain plant shape and structure by keeping the cells turgid. Transpiration also provides water for photosynthesis.

Question 12: Discuss the factors responsible for ascent of xylem sap in plants.
Answer Transpirational pull is responsible for the ascent of water in the xylem. This ascent of water is dependent on the following physical factors:
· Cohesion – Mutual attraction between water molecules
· Surface tension – Responsible for the greater attraction between water molecules in liquid phase than in gaseous phase

· Adhesion – Attraction of water molecules to polar surfaces
· Capillarity –Ability of water to rise in thin tubes
These physical properties of water allow it to move against gravity in the xylem.

Question 13: What essential role does the root endodermis play during mineral absorption in plants?
Answer In plants, nutrients are absorbed through the active and passive transports. The endodermal cells of the roots containing suberin allow only selected minerals to pass through them. The transport proteins present in the membranes of these cells act as check points for the various solutes reaching the xylem.

Question 14: Explain why xylem transport is unidirectional and phloem transport bi-directional.
Answer During the growth of a plant, its leaves act as the source of food as they carry out photosynthesis. The phloem conducts the food from the source to the sink (the part of the plant requiring or storing food). During spring, this process is reversed as the food stored in the sink is mobilised toward the growing buds of the plant, through the phloem. Thus, the movement of food in the phloem is bidirectional (i.e., upward and downward). The transport of water in the xylem takes place only from the roots to the leaves. Therefore, the movement of water and nutrients in the xylem is unidirectional.

Question 15: Explain pressure flow hypothesis of translocation of sugars in plants.
Answer According to the pressure flow hypothesis, food is prepared in the plant leaves in the form of glucose. Before moving into the source cells present in the phloem, the prepared food is converted into sucrose. Water moves from the xylem vessels into the adjacent phloem, thereby increasing the hydrostatic pressure in the phloem. Consequently, the sucrose moves through the sieve cells of the phloem. The sucrose already present in the sink region is converted into starch or cellulose, thereby reducing the hydrostatic pressure in the sink cells. Hence, the pressure difference created between the source and the sink cells allows sugars to be translocated from the former to the latter. This starch or cellulose is finally removed from the sink cells through active transport.

Question 16: What causes the opening and closing of guard cells of stomata during transpiration?
Answer The tiny pores present on the surfaces of leaves, called stomata, help in the exchange of gases. Each stoma consists of bean-shaped or dumbbell-shaped guard cells. The epidermal cells surrounding the guard cells are modified to form subsidiary cells. The opening and closing of the guard cells is caused by a change in their turgidity. The inner walls of the guard cells are thick and elastic, while the outer walls are thin. The numerous microfibrils present in the guard cells facilitate the opening and closing of the guard cells.
At the time of the opening of the stomata, the turgidity of the guard cells increases. As a result, the outer walls bulge and the inner walls become crescent-shaped. The stomatal opening is facilitated by the radial arrangement of the microfibrils At the time of the closing of the stomata, the guard cells lose their turgidity, the outer and inner walls retain their original shapes, and the microfibrils get arranged longitudinally.