Chapter 3 (PLANT KINGDOM)

Multiple Choice Questions

Q1. Cyanobacteria are classified under

(a) Protista (b) Plantae (c) Monera (d) Algae

Ans: (c) Cyanobacteria are classified under Kingdom Monera.

• Protista— unicellular eukaryotes

• Plantae, all members of Kingdom Plantae are eukaryotic chloroplast 'chlorophyll containing organisms commonly called plants. These are autotrophic/holophytic.

Q2. Fusion of two motile gametes which are dissimilar in size is termed as

(a) Oogamy (b) Isogamy (c) Anisogamy (d) Zoogamy

Ans: (c) Fusion of two motile gametes which are dissimilar in size is termed as anisogamy.

Q3. Holdfast, stipe and frond constitute the plant body in case of

(a) Rhodophyceae (b) Chlorophyceae

(c) Phaeophyceae (d) All of the above

Ans: (c) The plant body of phaeophyceae is usually attached to the substratum by a holdfast, and has a stalk, the stipe and leaf like photosynthetic organ—the frond.

Q4. A plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. It may belong to

(a) Pteridophytes (b) Gymnosperms

(c) Monocots (d) Bryophytes

Ans: (d) A plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. It may belong to bryophytes.

Q5. A prothallus is ' '

(a) A structure in pteridophytes formed before the thallus develops

(b) A sporophytic free living structure formed in pteridophytes

(c) A gametophyte free living structure formed in pteridophytes

(d) A primitive structure formed after fertilization in pteridophytes

Ans. (c) In pteridophytes, meiosis or R/D occurs at the time of spore formation. The spores germinate to give rise to inconspicuous, small but multicellular, free-living, mostly photosynthetic thalloid gametophytes called prothallus. Prothallus tepresents the gametophytic phase in pteridophytes.

Q6. Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is

(a) Monocots (b) Dicots

(c) Pteridophytes (d) Gymnosperms

Ans: (d) Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is gymnosperms.

Q7. The embryo sac of an Angiosperm is made up of

(a) 8 cells .(b) 7 cells and 8 nuclei

(c) 8 nuclei (d) 7 cells and 7 nuclei

Ans: (b) The embryo sac of an Angiosperm is made up of 7 cells and 8 nuclei.

Q8. If the diploid number of a flowering plant is 36, what would be the chromosome number in its endosperm?

(a) 36 (b) 18 (c) 54 ' (d) 72

Ans: (c) Diploid number (2«) of a flowering plant is 36.

The chromosome number in its endosperm 3n = 54.

Q9. Protonema is

(a) Haploid and is found in mosses

(b) Diploid and is found in liverworts

(c) Diploid and is found in pteridophytes

(d) Haploid and is found in pteridophytes

Ans: (a) The predominant stage of the life cycle of a moss is the gametophyte which consists of two stages. The first stage is the protonema stage (juvenile stage) and the second stage is the leafy stage. Moss protonema resembles to multicellular green algae in structure. Moss plant develops from protonema.

Q10. The giant Redwood tree (Sequoia sempervirens) is a/ an .

(a) Angiosperm (b) Free fern

(c) Pterdophyte **(d) Gymnosperm**

Ans: (d) One of the gymnosperms, the giant redwood tree Sequoia is one of the tallest tree species.

Very Short Answer Type Questions

Q1. Food is stored as Floridean starch in Rhodophyceae. Mannitol is the reserve food material of which group of algae?

Ans: Mannitol is the reserve food material of brown algae or phaeophyceae.

Q2. Give an example of plants with

a. Haplontic life cycle

b. Diplontic life cycle

c. Haplo-diplontic **life cycle**

Ans: a. Haplontic life cycle—Volvox, Spirogyra and some species of Chlamydomonas

b. Diplontic life cycle—AH seed-bearing plants, i.e. (gymnosperms and angiosperms)

c. Haplo-diplontic life cycle—Bryophyfes and Pteridophytes

Q3. The plant body in higher plants is well differentiated and well developed. Roots are the organs used for the purpose of absorption. What is the equivalent of roots in the less developed lower plants?
Ans: In lower plants like algae, holdfast is present and in bryophytes, rhizoids are present instead of roots.

Q4. Most algal genera show haplontic life style**. Name an alga which is**
a. Haplo-diplontic
b. Diplontic
Ans: a. Haplo-diplontic—Ectocarpus, Polysiphonia and Kelps b. Diplontic—Fucus

Q5. In Bryophytes male and female sex organs are called _____ and _____
Ans: In Bryophytes male sex organ is called antheridium and female sex organ is called archegonium.

Short Answer Type Questions

Q1. Why are bryophytes called the amphibians of the plant kingdom?
Ans: Bryophytes are also called amphibians of the plant kingdom because these . plants can live in soil but are dependent on water for sexual reproduction.

Q2. The male and female reproductive organs of several pteridophytes and gymnosperms are comparable to floral structures of angiosperms. Make an attempt to compare the various reproductive parts of pteridophytes and gymnosperms with reproductive structures of angiosperms

Ans.

	Reproductive parts of pteridophytes and gymnosperms	Reproductive structures of angiosperms
(0	Strobili/cone	Flower
(ii)	Microsporophyll	Stamen
(iii)	Megasporophyll	Pistil/Carpel
(iv)	Microsporangium	Anther
(v)	Megasporangium	Ovule

Q3. Heterospory, i.e. formation of two types of spores—microspores and megaspores is a characteristic feature in the life cycle of a few members of pteridophytes and all spermatophytes. Do you think heterospory has some evolutionary significance in plant kingdom?
Ans: In majority of the pteridophytes all the spores are of similar kinds, such plants are called hom'osporous. Genera like Selaginella, Salvirtia, Marsilea and Azolla which produce two kinds of spores, macro (large) and micro (small) spores are known as heterosporous. The megaspores and microspores germinate and give rise to female and male gametophytes, respectively.
The female gametophytes in these plants are retained on the parent sporophytes for variable

periods. The development of the zygotes into young embryos take place within the female gametophytes. This event is a precursor to the seed habit considered an important step in evolution.

Q4. How far does Selaginella one of the few living members of lycopodiales **(pteridophytes) fall short of seed habit?**
Ans: Selaginella produce two kinds of spores, macro (large) and micro (small) spores. The megaspores and microspores germinate and give rise to female and male gametophytes, respectively. But Selaginella falls short of seed habit due to lack of integument around the megasporangium.

Q5. Each plant or group of plants has some phylogenetic significance in relation to evolution: Cycas, one of the few living members of gymnosperms is called as the 'relic of past'. Can you establish a phylogenetic relationship of Cycas with any other group of plants that justifies the above statement?
Ans: Cycas, one of the few living members of gymnosperms is called as the 'relic of past' because it shows many characteristics which are similar to pteridophytes, like, flagellated antherozoids, circinate ptyxis, megasporophyll is leaf like, presence of archegonia, etc.

Q6. The heterosporous pteridophytes show certain characteristics, which are precursor **to the seed habit in gymnosperms. Explain.**
Ans: In majority of the pteridophytes all the spores are of similar kinds, such plants are called homosporous. Genera like Selaginella, Salvinia, Marsilea and Azolla which produce two kinds of spores, macro (large) and micro (small) spores, are known as heterosporous. The megaspores and microspores germinate and give rise to female and male gametophytes, respectively.
The female gametophytes in these plants are retained on the parent sporophytes for variable periods. The development of the zygotes into young embryos take place within the female gametophytes. This event is a precursor to the seed habit considered an important step in evolution.

Q7. Comment on the life cycle and nature of a fern prothallus.
Ans: The diploid sporophyte is represented by a dominant, independent, photosynthetic, vascular plant body. It alternates with multicellular, saprophytic/autotrophic, independent but short-lived haploid gametophyte . called prothallus. Such a pattern is known as haplo-diplontic life cycle. All
pteridophytes exhibit this pattern.
These gametophytes require cool, damp, shady places to grow. Because of this specific restricted requirement and the need of water for fertilisation, the spread of living pteridophytes is limited and restricted to narrow geographical regions. The gametophytes (prothallus) bear male and female sex organs ' called antheridia and archegonia, respectively. Water is required for transfer of antherozoids—the male gametes released from the antheridia, to the mouth of archegonium. Fusion of male gamete … with the egg present in the archegonium result in the fonnation of zygote.
• Zygote thereafter produces a multicellular well-differentiated sporophyte which is the dominant phase of the pteridophytes.

Q8. How arc the male and female gametophytes of pteridophytes and gymnosperms different from each other?
Ans: Male and female gametophytes of pteridophytes are free living while in gymnosperms male and female gametophyte do not have free-living * existence. They remain within the sporangia retained on sporophytes

Pteridophytes	Gymnosperms

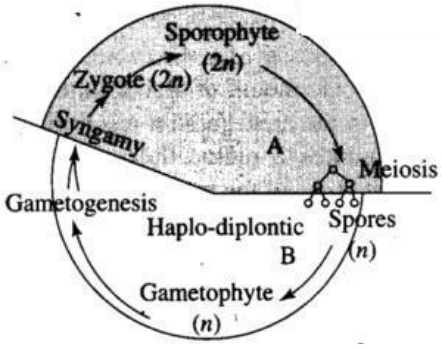
(0	Flagellated male gamete	(a)	Non-flagellated male gamete
(ii)	Water is essential for fertilisation	(b)	Water is not essential
(iii)	Pollen tubes are not formed	(c)	Pollen tubes are formed
(iv)	Archegonia with neck canal cells	(d)	Neck canal cells are absent

Q9. In which plant will you look for mycorrhiza and coralloid **roots?** Also **explain** w'hat **these terms mean.**
Ans: Roots in some genera have fungal association in the form of mycorrhiza (Finns), while in some others (Cvms) small specialised roots called coralloid roots are associated with N2-fixing cyanobacteria

Long Answer Type Questions

Q1. Gametophyte **is a dominant phase in the life cycle of a bryophyte. Explain.**
Ans: The main plant body of the biyophyte is haploid. It produces gametes, hence is called a gametophyte. The sex organs in bryophytes are multicellular.
The male sex organ is called antheridium. They produce biflagellate antherozoids or biciliated sperms. The female sex organ called archegonium is flask-shaped and produces a single egg. The antherozoids are released into water where they come in contact with archegonium. An antherozoid fuses with the egg to produce the zygote. Zygote do not undergo reduction division immediately. They produce a multicellular body called a sporophyte.

Q2. With the help of a schematic diagram, describe the haplo–diptontic **life cycle pattern of a plant group.**
Ans: In a sexually reproducing plant there is an alternation of generation between a haploid and a diploid phase of plant bodies. The haploid plant body is termed gametophyte while the diploid plant body is called sporophyte. The gametophyte produces gametes by mitosis while the haploid spores are produced by sporophyte following meiosis (reduction division). Two gamete fuse together to produce a zygote which develops into the diploid sporophyte.



In a haplodiplontic life cycle pattern, such as in bryophyta or pteridophyta both the phases of life are multicellular. However, in bryophytes, the gametophytes are small, photosynthetic, independent and represent dominant phase. The partly or totally dependent sporophyte is physically attached to the gametophyte. The (n) spores dispersed by sporophyte germinate into individual gametophytic plants. However, in pteridophytes the 2n (diploid) phase is dominant, well organized, independent while the n phase though also free-living and independent is short lived and photosynthetic. In both of these groups of plants the mobile male gametes, antherozoid produced by sex organ antheridium, travel to archegonium (bearing an egg cell) via the medium of water. Egg cell is non-motile hence the reproduction is oogamous.

Q3. Lichen is usually cited as an example of'symbiosis' in plants where an algal and a fungal species live together for their mutual benefit. Which of the following will happen if algal and fungal partners are separated from each other?

a. Both will survive and grow normally and independent from each other.

b. Both will die.

c. Algal **component will survive while the fungal component will die.**

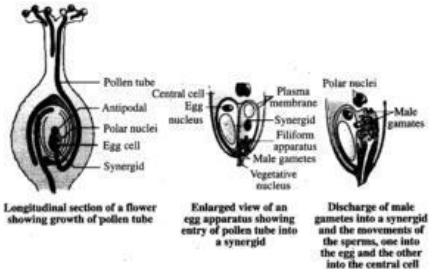
d. Fungal **component will survive while** algal **partner will die.**

Based on your answer how do you justify this association as symbiosis.

Ans: Lichen is usually cited as an example of symbiosis in biology where in a fungal and an algal species live together for mutual benefit. The algal component synthesizes the food through photosynthesis which is utilized by the fungal species for its survival. The fungal component in return provides shelter and waste products that are consumed by algal species. Experiments though have shown that algal component can grow independently when separated from fungal species. But same is not true with the fungal component which dies when separated from algal component. This association is, therefore, a typical case of master-slave relationship where fungus (master) has trapped the algal components (slave) for its own survival while giving nothing in return to it. Some authors consider this association as controlled parasitism or helotism due to the fact that sometimes the fungus sends its haustoria into the algal cells to derive nourishment.

Q4. Explain why sexual reproduction in angiosperms is said to take place through double fertilization and triple fusion. Also **draw a** labelled **diagram of embryo sac to explain the phenomena.**

Ans: After entering one of the synergids, the pollen tube release the two male gametes into the cytoplasm of the synergid.



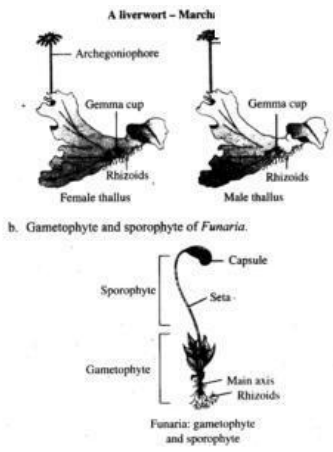
Q5. Draw labelled **diagrams of**

a. Female and male thallus **of a liverwort.**

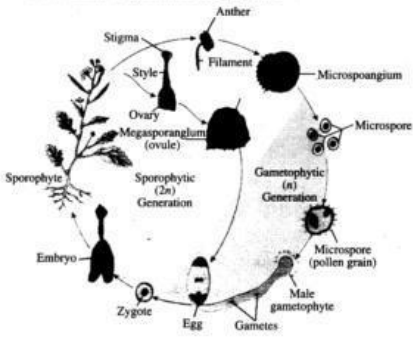
b. Gametophyte and sporophyte of Funaria.

c. Alternation of generation in Angiosperm.

Ans: a. Female and male thallus of a liverwort.



c. Alternation of generation in Angiosperm.



Biology

(Chapter – 3) (Plant Kingdom)

(Class – XI)

Exercises

Question 1:

What is the basis of classification of algae?

Answer 1:

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 2:

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.

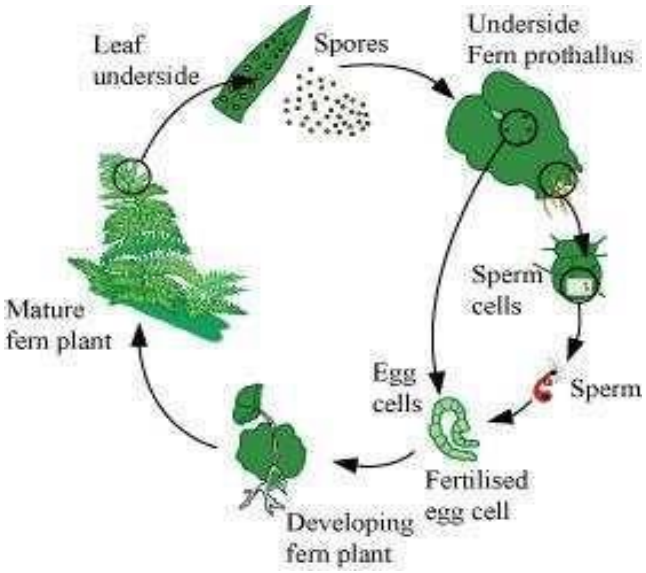
Answer 3:

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 heartshaped 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 4:

(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 5:

Economic importance of algae

Algae have diverse economic uses. They perform half of the total carbon dioxidefixation 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 icecream. 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 6:

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 7:

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 8:

(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 9:

(i) Red algae and brown algae

Red algae		Brown algae	
1.	Red algae are grouped under the class Rhodophyceae.	**1.**	Brown algae are grouped under the class Phaeophyceae.
2.	They contain floridean starch as stored food.	**2.**	They contain mannitol or laminarin as stored food.
3.	They contain the photosynthetic pigments chlorophylls a and d, and phycoerythrin.	**3.**	They contain the photosynthetic pigments chlorophylls a and c, and fucoxanthin.
4.	Their cell walls are composed of cellulose, pectin, and phycocolloids.	**4.**	Their cell walls are composed of cellulose and algin.
5.	Flagella are absent	**5.**	Two flagella are present

(ii) Liverworts and moss

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 lateral branching.
4.	Gemma cups are present	**4.**	Gemma cups are absent
5.	Sporophyte has very photosynthetic tissue little	**5.**	Sporophyte has abundant photosynthetic tissue

(iii) Homosporous and heterosporous pteridophyte

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.

(iv) Syngamy and triple fusion

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 10:

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

Question 11:

Match the followings (column **I** with column **II**)

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

Answer 11:

	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 12:

Important features of gymnosperms:

(a) 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.

(b) 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.

(c) The root system consists of tap roots. The coralloid roots present in *Cycas* are associated with nitrogen-fixing cyanobacteria.

(d) The stem can be branched (as in *Pinus* and *Cedrus*) or un-branched (as in *Cycas*).

(e) The leaves can be simple (as in *Pinus*) or compound (pinnate in *Cycas)*. The leaves are needle-like, with a thick cuticle and sunken stomata. These help in preventing water loss.

(f) Gymnosperms are heterosporous. They bear two kinds of spores – microspores and megaspores.

(g) Flowers are absent. The microsporophylls and megasporophylls are arranged to form compact male and female cones.

(h) Pollination occurs mostly through wind and pollen grains reach the pollen chamber of the ovule through the micropyle.

(i) The male and female gametophytes are dependent on the sporophyte.

(j) The seeds contain haploid endosperms and remain uncovered.

Biology

(Chapter – 4) (Animal Kingdom)

(Class – XI)

Exercises

Question 1:

What are the difficulties that you would face in classification of animals, if common fundamental features are not taken into account?

Answer 1:

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 2:

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.

(i) Level of classification
- Cellular level
- Tissue level
- Organ level

(ii) Body cavity
- Absent
- Present

(iii) Type of body symmetry
- Radial
- Bilateral

(iv) Type of coelom development
- Acoelom
- Pseudocoelom
- True coelom

(v) Type of true coelom
- Enterocoelom
- Schizocoelom

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

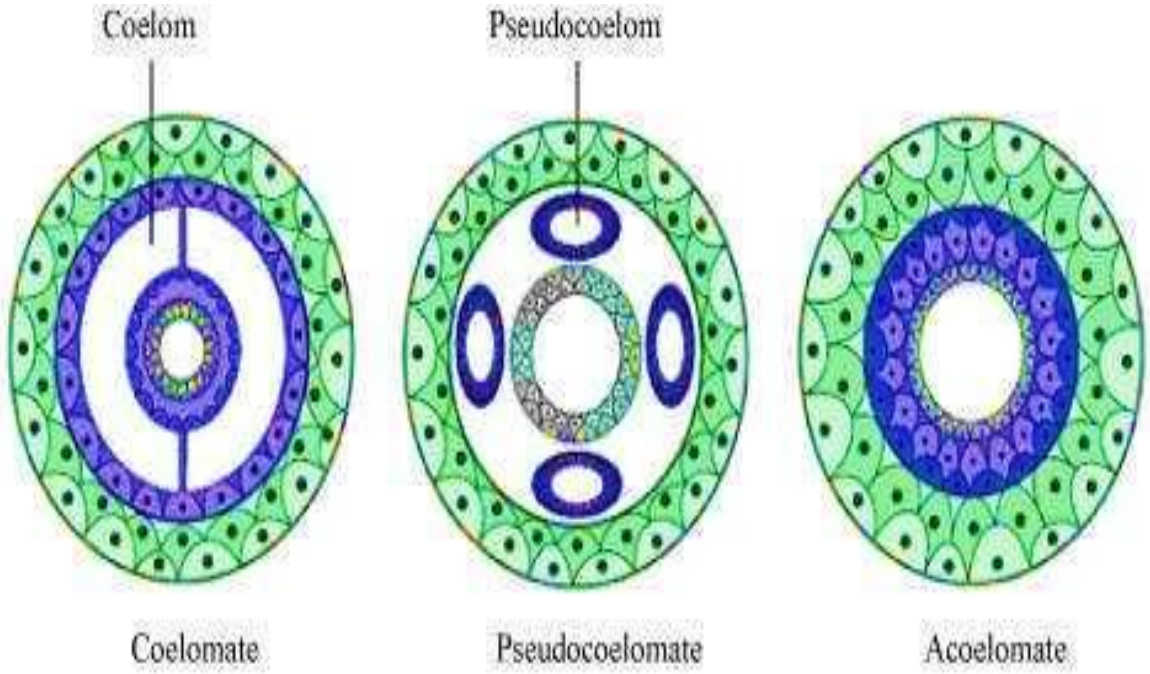
Question 3:

How useful is the study of the nature of body cavity and coelom in the classification of animals?

Answer 3:

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 4:

	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 5:

	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 6:

Taenia (Tapeworm) and *Fasciola* (liver fluke) are examples of parasitic platyhelminthes. Peculiar features in parasitic platyhelminthes are as follows.

- They have dorsiventrally flattened body and bear hooks and suckers to get attached inside the body of the host.
- Their body is covered with thick tegument, which protects them from the action of digestive juices of the host.
- 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 7:

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.

- ✓ Jointed legs that allow more mobility on land
- ✓ Hard exoskeleton made of chitin that protects the body
- ✓ 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 8:

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 9:

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 10:

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 11:

Birds have undergone many structural adaptations to suit their aerial life. Some of these adaptations are as follows.

- Streamlined body for rapid and smooth movement
- Covering of feathers for insulation
- Forelimbs modified into wings and hind limbs used for walking, perching, and swimming
- Presence of pneumatic bones to reduce weight
- 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 12:

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 13:

The body segmentation first appeared in the phylum, Annelida (*annulus* meaning little ring).

Question 14:

Match the following:

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

Answer 14:

	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 15:

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

Chapter 5 (MORPHOLOGY OF FLOWERING PLANTS)

Multiple Choice Questions

Q1. Rearrange the following zones choose the correct option as seen in the root in vertical section and choose the correct option

(A) Root hair zone
(B) Zone of meristems
(C) Root cap zone
(D) Zone of Maturation
(E) Zone of elongation

(a) C, B, E, A, D
(b) A,B,C,D,E
(c) D , E , A , C , B
(d) E , D ,C ,B ,A

Ans: (a) (C) Root cap zone, (B) Zone of meristems, (E) Zone of elongation, (A) Root hair zone, (D) Zone of maturation

Q2. In an inflorescence where flowers are borne laterally in an acropetal succession, the position of the youngest floral bud shall be

(a) Proximal (b) Distal (d) Intercalary (d) Anywhere

Ans: (b) In racemose type of inflorescences the main axis continues to grow, the flowers are borne laterally in an acropetal succession, i.e. youngest flower is present at apex and oldest flower is present at the base. In racemose, inflorescence the growth of floral axis is unlimited or indefinite.

In cymose type of inflorescence the main axis terminates in a flower, hence is limited in growth. The flowers are borne in a basipetal. order, i.e. youngest flower is present at the base and oldest flower is present at the apex. In cymose inflorescence oldest flower remains in center and youngest towards the periphery. This type of arrangement is called centrifugal.

Q3. The mature seeds of plants such as gram and peas, possess no endosperm, because

(a) These plants are not angiosperms
(b) There is no double fertilization in them
(c) Endosperm is not formed in them
(d) Endosperm gets used up by the developing embryo during seed development.

Ans: (d) The mature seeds of plants such as gram and peas, possess no endosperm, because endosperm gets used up by the developing embryo during seed development.

Q4. Roots developed from parts of the plant other than radicle are called
(a) Tap roots **(b) Fibrous roots**
(c) Adventitious roots (d) Nodular roots
Ans: (c) Roots developed from parts of the plant other than radicle are called adventitious roots.

Q5. Venation is a term used to describe the pattern of arrangement of
(a) Floral organs (b) Flowers in inflorescence
(c) Veins and veinlets in a lamina (d) All of them
Ans: (c) Venation is a term used to describe the pattern of arrangement of veins and veinlets in a lamina.
Q6. Endosperm, a product of double fertilization in angiosperms is absent in the seeds of
(a) Coconut (b) Orchids (c) Maize (d) Castor
Ans: (b) Endosperm, a product of double fertilization in angiosperms is absent in the seeds of orchids. .

Q7. Many pulses of daily use belong to one of the families below (tick the correct answer). –
(a) Solanaceae (b) Fabaceae (c) Liliaceae (d) Poaceae
Ans: (b) Many pulses of daily use belong to one of the family fabaceae. Solanaceae (potato family)
Liliaceae (lily family)
Poaceae (cereal or grass family). „

Q8. The placenta is attached to the developing seed near the
(a) Testa (b) Hilum (c) Micropyle (d) Chalaza
Ans: (b) The placenta is attached to the developing seed near the hilum.

Q9. Which of the following plants is used to extract the blue dye?
(a) Trifolium (b) Indigofera (c) Lupin (d) Cassia
Ans: (b) Blue dye is obtained from Indigofera tinctoria which belongs to family fabaceae.

Q10. Match the followings and choose the correct option.

Group A		**Group B**	
A.	Aleurone layer	(i)	Without fertilization
B.	Parthenocarpic fruit	(ii)	Nutrition
C.	Ovule	(iii)	Double fertilization

D.	Endosperm	(iv)	Seed

Options:

- A—(i), B—(ii), C—(iii), D—(iv)
- A—(ii), B—(i), C—(iv), D—(iii)
- A—(iv), B—(ii), C—(i), D—(iii)
- A—(ii), B—(iv), C—(i), D—(iii)

Ans. (b)

A.	Aleurone layer	(ii)	Nutrition
B.	Parthenocarpic fruit	(i)	Without fertilization
C.	Ovule	(iv)	Seed
D.	Endosperm	(iii)	Double fertilization

Very Short Answer Type Questions

Q1. Roots obtain oxygen from air in the soil for respiration. In the absence or deficiency of 02, root growth is restricted or completely stopped. How do the plants growing in marshlands or swamps obtain their 02 required for root respiration?
Ans: In some plants such as Rhizophora and Sonneratia (mangrove plant) growing in swampy areas near river mouths (saline marshy soil or halophytes), many roots come out of the ground and grow vertically upwards (negatively geotropic: against gravitational force). Such roots, called pneumatophores or breathing roots or respiratory roots, help to get oxygen for respiration.

Q2. Write floral **formula for a flower which, is bisexual;** actinoiflorphic**; sepals five, twisted aestivation, petals five; valvate aestivation; stamens six; ovary** tricarpellary**, syncarpous, superior, trilocular with axile placentation.**
Ans. $\oplus \, ♂♀ \, K_5 \, C_5 \, A_6 \, \underline{G}_{(3)}$

Q3. In Opuntia **the stem is modified into a flattened green structure to perform the function of leaves (i.e., photosynthesis). Cite some other examples of modifications of plant parts for the purpose of photosynthesis.**
Ans: Some plants of arid regions modify their stems into flattened {Opuntia), or fleshy cylindrical {Euphorbia) structures. These modified stems of indefinite growth are called phylloclades. They contain chlorophyll and carry out photosynthesis.

Q4. In swampy areas like the Sunderbans in West Bengal, plants bear special kind of roots called _____ .
Ans: Pneumatophores

Q5. In aquatic plants like Pistia and Eichhomia, leaves and roots are found near
Ans: Node

Q6. Reticulate and parallel venation are characteristic of _____ and _____ respectively.

Ans: Dicotyledons and monocotyledons

Q7. Which parts in **ginger and onion are edible?**
Ans: Ginger: rhizome and onion: fleshy leaves

Q8. In epigynous flower, ovary **is situated below** the _____.
Ans: Calyx, corolla and androecium.

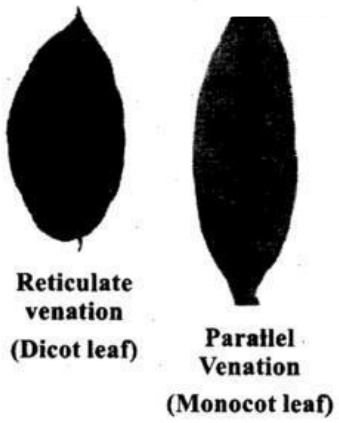
Q9. Add the missing floral organs of the given floral formula of Fabaceae.
Ans. $Br \oplus K_5$ _____ $A_{(9)+(1)}$
$Br \oplus \delta^{\uparrow} K_5 C_{1+2+(2)} A_{1+(9)} \underline{G}_1$

Short Answer Type Questions

Q1. Give two examples of roots that develop from different parts of the angiospermic **plant other than the radicle.**
Ans: The root that arise from parts of plant other than radicle are called adventitious roots. Pneumatophores—for respiration Stilt roots—for support Prop roots—for support

Q2. The essential functions of roots are anchorage and absorption of water and minerals in the terrestrial plant. What functions are associated with the roots of aquatic plants? How are roots of aquatic plants and terrestrial plants different?
Ans: The roots of aquatic plants help in balancing and anchorage. In terrestrial plants, functions of roots are anchorage and absorption of water and minerals.

Q3. Draw diagrams of a typical monocot and dicot leaves**.to show their venation pattern.**
Ans.



Q4. A typical angiosperm flower consists of four floral parts. Give the names of the floral parts and their arrangements sequentially.
Ans: A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle. These are calyx, corolla, androecium and gynoecium. The calyx is the outermost whorl of the flower and the members are called sepals. Corolla is the second outermost whorl composed of petals. Androecium is the second innermost whorl composed of stamens. Gynoecium is the innermost whorl which is female reproductive part of the flower and is made up of one or more carpels.

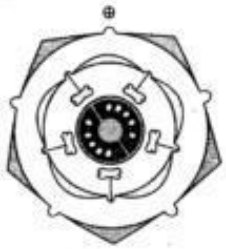
Q5. Given below are a few floral formulae of some well known **plants. Draw floral diagrams from these formulae.**

i $\oplus \, ♂ ♀ \, K_{(5)} \, C_{(5)} \, A_{(5)} \, \underline{G}_{(2)}$

ii. $\% \, ♂ ♀ \, K_{(5)} \, C_{1+2+(2)} \, A_{(9)+1} \, \underline{G}_{1}$

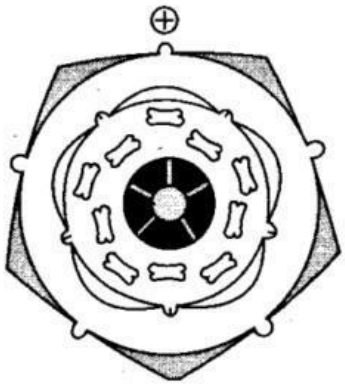
iii. $\oplus \, ♂ ♀ \, K_{5} \, C_{5} \, A_{5+5} \, \underline{G}_{(5)}$

Ans. (i)



(ii)

(iii)



Q6. Reticulate venation is found in dicot leaves while in monocot leaves venation is of parallel type. Biology being a 'Science of exceptions', find out any exception to this generalization.

Ans: Smilax and Dioscorea are monocots having reticulate venation. Calophyllum and Eryngium are dicots having parallel venation.

Q7. You have heard about several insectivorous plants that feed on insects. Nepenthes or the pitcher plant is one such example, which usually grows in shallow water or in marsh lands. What part of the plant is modified into a 'pitcher'? How does this modification help the plant for food even though it can photosynthesize like any other green plant?

Ans: In Nepenthes, picher is modified lamina. Insectivorous plants capable of growing in nitrogen or nitrate deficient soil. Pitcher help in providing the nitrogen to the plant. Leaves also photosynthesize their food.

Q8. Mango and coconut are 'drupe' type of fruits. In mango fleshy mesocarp is edible. What is the edible part of coconut? What does milk of tender coconut represent?

Ans: Edible part of coconut is endosperm or seed. Milk of tender coconut represent free nuclear liquid endosperm.

Q9. How can you differentiate between free central and axile placentation?

Ans: When the ovules are borne on central axis and septa are absent, as in Dianthus and Primrose the placentation is called free central.

When the placenta is axial and the ovules are attached to it in a multilocular ovary, the placentation is said to be axile, as in China rose, tomato and lemon.

Q10. Tendrils are found in the following plants. Identify whether they are stem tendrils or leaf tendrils,

a.Cucumber
b. Peas
c. Pumpkins
. Grapevine
e. Watermelons
Ans. a. Cucumber—stem tendrils
b. Peas Leaf Tendrils
c. Pumpkins—stem tendrils
d. Grapevine – stem tendrils
e. Watermelons—stem tendrils

Q11. Why is maize grain usually called as a fruit and not a seed?
Ans: Maize is an example of caryopsis fruit which is a simple, one seeded dry, indehiscent fruit in which pericarp and testa are fused. Pericarp is also called fruit wall which is present in maize grain, hence maize grain is actually a fruit and not a seed.

Q12. Tendrils of grapevines are homologous to the tendril of pumpkins but are analogous to that of pea. Justify the above statement.
Ans: Tendrils of grapevines are homologous to the tendril of pumpkins because both are the modification of stem (i.e., stem tendrils). Homologous structure have same origin. Analogous structure have different origin but similar function. Tendrils of grapevines are analogous to that of pea because tendrils of grapevines are modification of stem while tendrils of pea are modification of leaves. Both have different origin but performing same function, i.e., support.

Q13. Rhizome of ginger is like the roots of other plants that grows underground. Despite this fact ginger is a stem and not a root. Justify. .
Ans: Rhizome is a underground stem growing parallel to soil surface. Ginger is a stem which can be differentiated from root as it has nodes and intemodes.

Q14. Differerifiate between.
a. Bract and Bracteole
b. Pulvinus and petiole
c. Pedicel and peduncle
d. Spike and spadix
e. Stamen and staminoide
f. Pollen and pollenium
Ans: a. Reduced leaf found at the base of the pedicel is called bract while leaf like structure present between bract and flower is called bracteole.
b. In some leguminous plants the leafbase may become swollen is called pulvinus. The petiole (mesopodium) connect the leafbase with lamina and help hold the blade to light.
c. Pedicie is the stalk of flower while peduncle is the stalk of inflorescence.
d. In spike sessile flowers are attached on elongated peduncle. E.g.: Achyranthes. Spadix is a special type of spike having a fleshy peduncle and a large brightly coloured bract called spathe. E.g.: Palm, Colocasia.
e. Androecium is composed of stamens. Each stamen represents the male reproductive organ. A sterile stamen is called staminode.
f. Male gametophyte of angiosperms is called pollen or microspore. A group of pollens forms the pollinium (present in Calotropis).

Long Answer Type Questions
1. Distinguish between families Fabaceae, Solanaceae, Liliaceae on the basis of gynoecium characteristics (with figures), Also write economic importance of any one of the above family.

Ans: a. Gynoecium

i. Fabaceae— Monocarpellary, ovary unilocular, marginal placentation

L.S. Carpel

ii. Solgnaceae—Bicarpellary,* syncarpous, carpels placed obliquely, bilocular, axile placentation

iii. Liliaceae—Tricarpellary, syncarpous, ovary superior, axile placentation

b. Economic importance of fabacae:

i. Source of pulses (gram, arhar)

ii. Edible oil (soyabean, groundnut)

iii. Dye (Indigofera)

iv. Fibres (sunhemp)

v. Fodder (Sesbania, Trifolium)

vi. Ornamental {Lupin)

vii. Medicine (mulaithi)

Q2. Describe various stem modifications associated with food storage, climbing **and protection.**

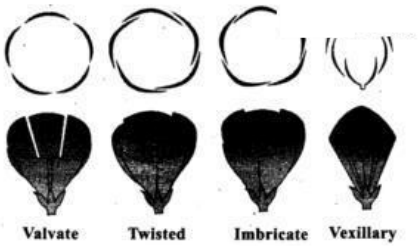
Ans: The stem may not always be typically like what they are expected to be. They are modified to perform different functions. Underground stems of potato, ginger, turmeric, zaminkand, Colocasia are modified to store food in them. They also act as organs of perennation to tide over conditions unfavourable for growth. Stem tendrils which develop from axillary buds, are slender and spirally coiled and help plants to climb such as in gourds (cucumber, pumpkins, watermelon) and grapevines. Axillary buds of stems may also get modified into woody, straight and pointed thorns. Thoms are found in many plants such as Citrus, Bougainvillea. They protect plants from browsing animals. Some plants of arid regions modify their stems into flattened {Opuntia), or fleshy cylindrical {Euphorbia) structures. They contain chlorophyll and carry out photosynthesis.

Q3. Stolon, offset and rhizome are different forms of stem modifications. How can these modified forms of stem be distinguished from each other?

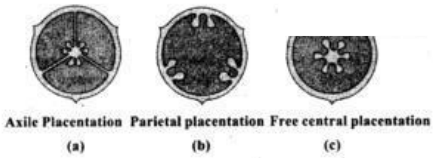
Ans: Underground stems called stolon of some plants spread to new niches and when older parts die new plants are formed.

OfFest: A lateral branch with short intemodes and each node bearing a rosette of leaves and a tuft of roots is found in aquatic plants like Pistia and Eichhornia.
Rhizome is underground stem growing parallel to soil surface. In ginger, turmeric, Gloriosa and lotus stem is called rhizome which is differentiated from roots in having scale leaves and axillary buds and helps in vegetative propagation.

Q4. The mode of arrangements of sepals or petals in a floral bud is known as aestivation. Draw the various types of aestivation possible for a typical pentamerous flower.
Ans: The mode of arrangement of sepals or petals in floral bud with respect to the other members of the same whorl is known as aestivation. The main types of aestivation are valvate, twisted, imbricate and vexillary. When sepals or petals in a whorl just touch one another at the margin, without overlapping, as in Calotropis, it is said to be valvate. If one margin of the appendage overlaps that of the next one and so on as in china rose, lady's finger and cotton, it is called twisted. If the margins of sepals or petals overlap one another but not in any particular direction as in Cassia and gulmohur, the aestivation is called imbricate. –
In pea, bean and Crotolaria flowers, there are five petals, the largest (standard) overlaps the two lateral petals (wings) which in turn overlap the two smallest anterior petals (keel); this type of aestivation is known as vexillary or papilionaceous (or descending imbricate).



Q5. The arrangements of ovules within the ovary is known as placentation. What does the term placenta refer to? Name and draw various types of placentations in the flower as seen in T.S. or V.S.
Ans: The ovules are female reproductive structures and borne in the ovary of the flower. The number, structure, their position in the ovary varies in different plants. They also differ in mode of attachment with the ovary wall. At the point of attachment there is a cellular ridge or cushion of cells called placenta. The mode of attachment of ovule to the placenta is known as placentation which is of the following types: (a) Parietal (b) Marginal (c) Axile (d) Free central (e) Basal.



Q6. Sunflower is not a flower. Explain.
Ans: Sunflower is actually an inflorescence (capitulum), it is not a flower.
Capitulum (Head): Here the peduncle is flattened which is called receptacle. Inflorescence is surrounded by whorl of bracts collectively called involucre. On receptacle two kinds of florets are present: .
1. Ray florets: Zygomorphic, unisexual female, corolla ligulate or strap shaped.
ii. Disc florets: Actinomorphc, bisexual, corolla tubular, present in centre. Ray florets present towards periphery and disc florets present in the centre, e.g.: Compositae (Asteraceae) family —Sunflower (Helianthus), Tagetus (Marigold) and Dahlia.

Q7. How do you distinguish between hypogeal germination and epigeal germination? What is the role of cotyledon (s) and the endosperm in the germination of seeds?

Ans: 1. Hypogeal Germination: When the epicotyl grows first, only the plumule is pushed out of the soil. While cotyledons and all other parts remain under the soil, the germination is called hypogeal. E.g.: Most of the monocots (Maize^' Rice and Coconut) and some of the dicots (Pea, Gram, Broad bean = Vicia faba, Mango).

2. Epigeal Germination: When hypocotyl grows first, it pushes the cotyledons and other parts of the seed out of the soil. This germination is called epigeal. E.g.: Helianthus (sunflower), mustard, cucurbits, castor, Onion, Tamarindus, French bean, Alisma.

Q8. Seeds of some plants germinate immediately after shedding from the plants while in other plants they require a period of rest before germination. The later phenomena is **called as dormancy. Give the reasons for seed dormancy and some methods to break it.**

Ans: There are certain seeds which fall to germinate even when external conditions are favourable. Such seeds are understood to be undergoing a period of dormancy which is controlled not by external environment but are under endogenous control or conditions within the seeds itself.

Reasons for seed dormancy:

• Impermeable and hard seed coat; presence of chemical inhibitors such as abscisic acid (ABA), phenolic acid; para-ascrobic acid; and immature embryos are some of the reasons which causes seed dormancy.

Methods of breaking seed dormancy:

• Seed dormancy allows the plants to overcome unfavourable climatic conditions. This dormancy however can be overcome through natural means and various other man-made measures. For example, the seed coat barrier in some seeds cane be broken by mechanical abrasions are caused by microbial action, and passage through digestive tract of animals. Weakening of hard seed coat with sharp edge or knives is called scarification. Prechilling treatment to break seed dormancy is called stratification. Effect of inhibitory substances can be removed by subjecting the seeds to chilling conditions or by application of certain chemical like gibberellic acid and nitrates. Seed domancy is also breaked by auxin and cytokinin. Changing the environment conditions, such as light and temperature and other methods to overcome seed dormancy.

Biology

(Chapter – 5) (Morphology of Flowering Plants)

(Class – XI)

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 1:

Primarily, there are two types of root systems found in plants, namely the tap root system and fibrous root system. The 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 2:

(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 3:

Pinnately Compound Leaf	Palmately Compound Leaf
The leaflets are attached to the common axis, called rachis.	The leaflets are attached at a common point on the leaf stalk.
Examples include *neem* and *Cassia fistula*(also called golden shower plant)	Examples include silk cotton (*Bombax*) and *Cannabis.*

Question 4:

Explain with suitable examples the different types of phyllotaxy?

Answer 4:

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) *Z*ygomorphic

(e) Superior ovary

(f) Perigynous flower

(g) Epipetalous Stamen

Answer 5:

(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

Answer 6:

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

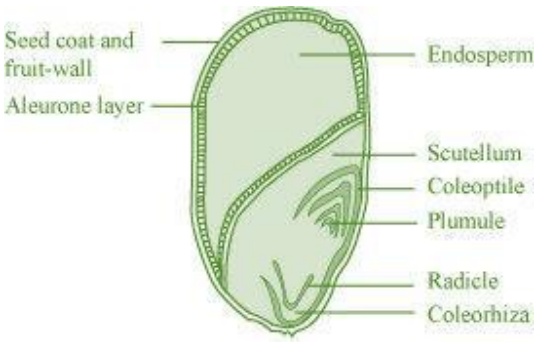
(ii) V.S. of maize seed

Answer 7:

(i)

Structure of Gram seed

(ii)



V.S. of maize seed

Question 8:

Describe modifications of stem with suitable examples

Answer 8:

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 semitechnical description. Also draw their floral diagrams after studying them.

Answer 9:

(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

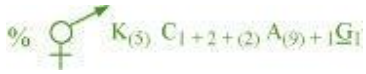
Calyx: It contains five sepals which are gamosepalous while aestivation is imbricate.

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: Used for medicinal purposes.

Floral diagram of family Solanaceae

Question 10:

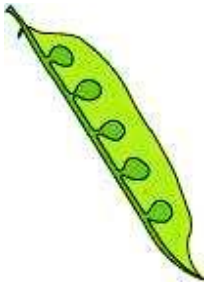
Describe the various types of placentations found in flowering plants.

Answer 10:

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 11:

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 12:

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 defence.

(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 13:

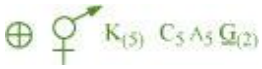
Inflorescence is the manner in which the flowers are arranged on the flowering axis. During the flowering season, the vegetative apex of the stem gets converted into a floral meristem. Based on whether the floral axis continues to grow or end in a flower, inflorescence is classified into racemose and 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 14:

The floral formula of the described flower is represented as:



Actinomorphic flowers are represented by the symbol ⊕ .

A bisexual flower is indicated by ♀ .

The calyx 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 $\underline{G}_{(2)}$.

Question 15:

Describe the arrangement of floral members in relation to their insertion on thalamus?

Answer 15:

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.

Biology

(Chapter – 7) (Structural Organisation in Animals)

(Class – XI)

Exercises

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 1:

(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 12^{th} and 13^{th} 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 2:

(i) Nephridia are segmentally arranged excretory organs present in earthworms.

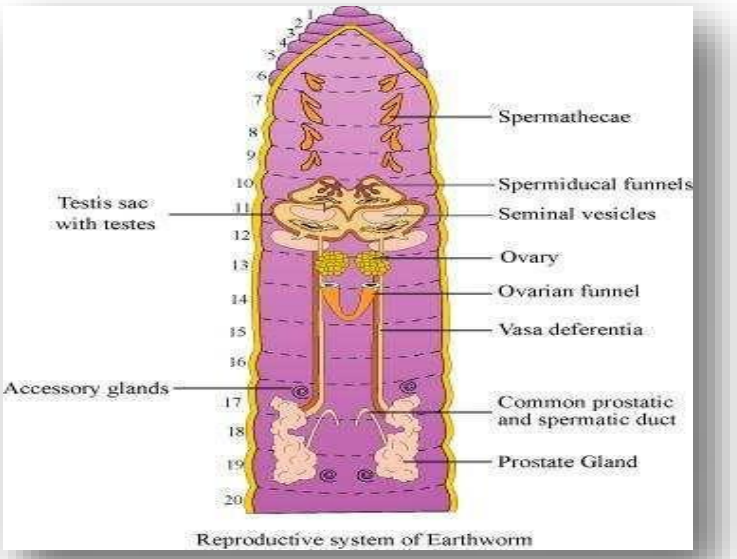
(ii) On the basis of their location, three types of nephridia are found in earthworms. They are:

- Septal nephridia: These are present on both sides of the inter-segmental septa behind the 15^{th} segment. They open into the intestines.
- Integumentary nephridia: These lie attached to the body wall from the third segment to the last segment, which opens on the body surface.
- 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.

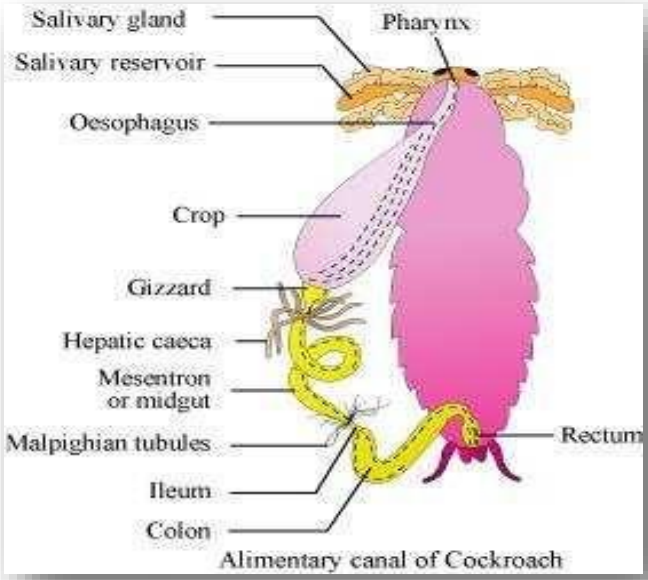
Answer 3:



Question 4:

Draw a labelled diagram of alimentary canal of a cockroach.

Answer 5:



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.

(b)

Septal nephridium	Pharyngeal nephridium
They are **present** on both sides of intersegmental septa behind the 15^{th} segment. They open into the intestines.	They are present as three paired tufts in the fourth, fifth, and sixth segments.

Question 6:

What are the cellular components of blood?

Answer 6:

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 7:

(a) Chondriocytes

They are cells of cartilages, and are present in small cavities within the matrix secreted by them.

(b) 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.

(c) 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 8:

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:

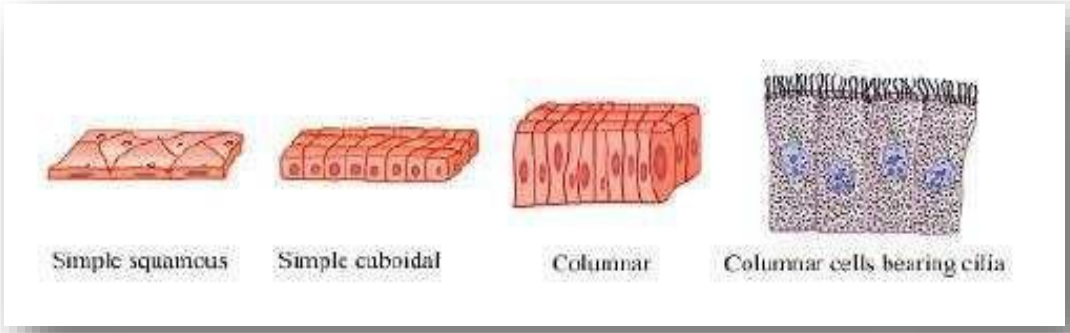
(i) Simple squamous epithelium: It consists of a single layer of flat cells with irregular boundaries. It is found in the walls of the blood vessels and in the lining of alveoli.

(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.

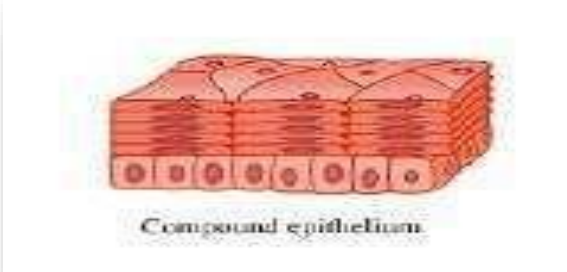
(iii) Simple columnar epithelium: It consists of a single layer of tall, slender cells with their nuclei present at the base of the cells. They may bear micro-villi on the free surfaces. Columnar epithelium forms the lining of the stomach and intestines, and is involved in the function of secretion and 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 9:

(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 adipociytes. 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; antennae

(e) Protonema; mesothorax; metathorax; coxa

Answer 10:

(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 11:

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

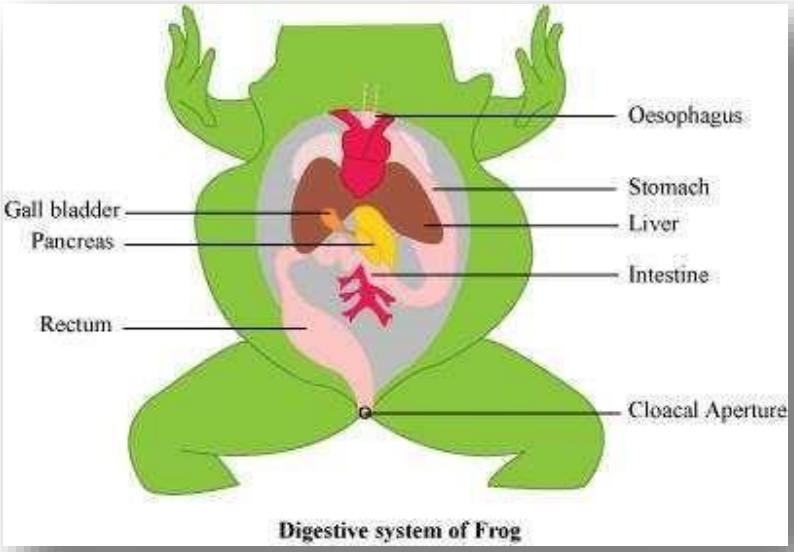
Answer 12:

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 4^{th}, 5^{th}, and 6^{th} segments, which produce blood cells and haemoglobin dissolved in blood plasma. Blood cells in earthworms are phagocytic in nature.

Question 13:

Draw a neat diagram of digestive system of frog.

Answer 13:



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 14:

(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.

Chapter 7 (STRUCTURAL ORGANISATION IN ANIMALS)

Multiple Choice Questions

Q1. Which one of the following types of cell is involved in making of the inner walls of large blood vessels?
(a) Cuboidal epithelium
(b) Columnar epithelium
(c) Squamous epithelium
(d) Stratified epithelium
Ans: (c) The squamous epithelium (pavement epithelium) is made up of a single thin layer of flattened cells with irregular boundaries. They are found in the walls of blood vessels and air sacs of lungs and are involved in a function like forming a diffusion boundary.

Q2. To which one of the following categories does adipose tissue belong?
(a) Epithelial
(b) Connective
(c) Muscular
(d) Neural
Ans: (b) Loose connective tissue has cells and fibres loosely arranged in a semi¬fluid ground substance, for example, areolar tissue present beneath the skin. Adipose tissue is a type of loose connective tissue located mainly beneath the skin.

Q3. Which of the following is not a connective tissue?
(a) Bone
(b) Cartilage
(c) Blood
(d) Muscles
Ans: (d) Cartilage, bones and blood are various types of specialised connective tissues.

Q4. The clitellum is a distinct part in **the body of earthworm, it is found in**
(a) Segments 13-14—15
(b) Segments 14-15-16
(c) Segments 12-13-14
(d) Segments 15-16-17
Ans: (b) The ditellum, a prominent circular band of glandular nature is found from 14th-16th segments. It secretes mucus and albumin, which helps in the formation of cocoon.

Q5. Setae help in locomotion in earthworm but are not uniformly present in all the segments. They are present in
(a) 1st segment
(b) Last segment
(c) Clitellar segment
(d) 20th-22nd segment
Ans: (d) Setae help in locomotion in earthworm, it is present in all the segments except 1st segment, last segment and clitellar segment.

Q6. Which one of the following statements is true for cockroach?
(a) The number of ovarioles in each ovary are ten.
(b) The larval stage is called caterpillar.
(c) Anal styles are absent in females.
(d) They are ureotelic.
Ans: (c) In cockroach, anal styles are absent in females.

Q7. Match the following and choose the correct option.

A.	Adipose tissue –	(i)	Nose
B.	Stratified epithelium	(ii)	Blood
C.	Hyaline cartilage	(iii)	Skin
D.	Fluid connective tissue	(iv)	Fat storage

(a) A—(i), B—(ii), C—(iii), D—(iv)
(b) A—(iv), B—(iii), C—(i), D—(ii)
(c) A—(iii), B—(i), C—(iv), D—(ii)
(d) ' A—(ii), B—(i), C—(iv), D—(iii)

Ans. (b)

A.	Adipose tissue	(iv)	Fat storage
B.	Stratified epithelium	(Hi)	Skin
C.	Hyaline cartilage	(i)	Nose
D.	Fluid connective tissue	(ii)	Blood

Q8. Match the following and choose the correct answer.

A.	Hermaphrodite	(0	Produces blood cells and haemoglobin

B.	Direct development	(ii)	Testis and ovary in the same animal
G.	Chemoreceptor	(iii)	Larval form absent
D.	Blood gland in earthworm	(iv)	Sense of chemical substances

(a) A—(ii), B—(iii), C—(iv), D—(i)
(b) A—(iii), B—(ii), C—(iv), D—(i)
(c) A—(i), B—(iii), C—(ii), D—(iv)
(d) A—(ii), B—(iv), C—(iii), D—(i)
Ans: (a)

A.	Hermaphrodite	(ii)	Testis and ovary in the same animal
B.	Direct development	(iii)	Larval form absent
C.	Chemoreceptor	(iv)	Sense of chemical substances
D.	Blood gland in earthworm	(0	Produces blood cells and haemoglobin

Q9. Match the following with reference to cockroach and choose the correct option.

A.	Phallomere	(i)	Chain of developing ova
B.	Gonopore	(ii)	Bundles of sperm
C.	Spermatophore	(iii)	Opening of the ejaculatory duct
D.	Ovarioles	(iv)	The external genitalia

(a) A—(iii), B—(iv), C—(ii), D—(i)
(b) A—(iv), B—(iii), C—(ii), D—(i)
(c) A—(iv), B—(ii), C—(iii), D—(i)
(d) A—(ii), B—(iv), C—(iii), D—(i)

10. Match the followings and choose the correct answer.

A.	Touch	(i)	Nasal epithelium
B.	Smell	(ii)	Foramen magnum
C.	Cranial nerves	(iii)	Sensory papillae
D.	Medulla oblongata	(iv)	Peripheral nervous system

(a) A—(iii), B—(i), C—(ii), D—(iv)

(b) A—(ii), B—(i), C—(iv), D—(iii)
(c) A—(ii), B—(iv), C—(ii), D—(i)
(d) A—(iii), B—(i), C—(iv), D—(ii)

Ans: (d)

A.	Touch	(iii)	Sensory papillae
B.	Smell	(i)	Nasal epithelium
C.	Cranial nerves	(iv)	Peripheral nervous system
D.	Medulla oblongata	(ii)	Foramen magnum

Very Short Answer Type Questions

Q1. State the number of segments in earthworm which are covered by a prominent dark band or clitellum.
Ans: 14th—16th segments.

Q2. Where are sclerites present in Cockroach?
Ans: In each segment of the body of cockroach, exoskeleton has hardened plates called sclerites.

Q3. How many times do nymphs moult to reach the adult form of cockroach**?**
Ans: The nymph grows by moulting about 13 times to reach the adult form.

Q4. Identify the sex of a frog in which sound producing vocal sacs are present.
Ans: Male frog

Q5. Name the process by which a tadpole develops into an adult frog.
Ans: By metamorphosis a tadpole develops into an adult frog.

Q6. What is the scientific term given to earthworm's body segments?
Ans: Metamers

Q7. A muscle fibre tapers at both ends and does not show striations. Name the muscle fibre.
Ans: Smooth muscle fibre

Q8. Name the different cell junctions found in tissues.
Ans: a. Tight Junctions
b. Adhering Junctions
c. Gap Junctions

Q9. Give two identifying features of an adult male frog.
Ans: a. Vocal Sacs
b. Thumb pads/copulatory pads in thumb

Q10. Which mouth part of cockroach is comparable to our tongue?
Ans: Hypopharynx

Q11. The digestive system of a frog is made of the following parts. Arrange them in an order beginning from mouth**.**

Mouth, oesophagus, buccal cavity, stomach, intestine, cloaca, rectum, cloacal aperture
Ans: Mouth, buccal cavity, oesophagus, stomach, intestine, rectum, cloaca and cloacal aperture.

Q12. What is the difference between cutaneous and pulmonary respiration?
Ans: Frogs respire on land and in the water by two different methods. In water, skin acts as aquatic respiratory organ (cutaneous respiration). Dissolved oxygen in the water is exchanged through the skin by diffusion. On land, the buccal cavity, skin and lungs act as the respiratory organs. The respiration by lungs is called pulmonary respiration.

Q13. Special **venous connection between liver and intestine, and between kidney and intestine is found in** frog**, what are they called?**
Ans: Hepatic portal system and renal portal system respectively.

Short Answer Type Questions

Q1. Give the location of hepatic caeca in a Cockroach. What is their function?
Ans: A ring of 6-8 blind tubules called hepatic caeca are present at the junction of foregut and midgut. Hepatic caeca secretes digestive juice.

Q2. Frogs are beneficial for mankind, justify the statement.
Ans: Frogs are beneficial for mankind as they can eat some crop pests and protect crop. Frogs maintain ecological balance as they are an important component of food chain and food web in the ecosystem. They are edible in some countries.

Q3. The body of sponges does not possess tissue level of organisation though it is made of thousands of cells. Comment.
Ans: Though all members of Animalia are multicellular, all of them do not exhibit the same pattern of organisation of cells. For example, in sponges, the cells are arranged as loose cell aggregates, i.e. they exhibit cellular level of organisation. Some division of labour (activities) occur among the cells. Hence, the body of sponges does not possess tissue level of organisation.

Q4. Structural organisation in animals attains different levels as cell—organ— organ system. What is missing in this chain? Mention the significance of such an organisation.
Ans: Tissue is missing in this chain. In multicellular animals, a group of similar cells along with intercellular substances perform a specific function. Such an organisation is called tissue. Tissues are organised in specific proportion and pattern to form an organ like stomach, lung, heart and kidney. When two or more organs perform a common function by their physical and/or chemical interaction, they together form organ system, e.g., digestive system, respiratory system, etc. Cells, tissues, organs and organ systems split up the work in a way that exhibits division of labour and contribute to the survival of the body as a whole.

Q5. Stratified epithelial cells have limited role in secretion. Justify their role in our skin.
Ans: Stratified epithelium is made of more than one layer of cells and thus has a limited role in secretion and absorption. Their main function is to provide protection against chemical and mechanical stresses. They cover the dry surface of the skin.

Q6. How does a gap junction facilitate intercellular communication?
Ans: Gap junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells, for rapid transfer of ions, small molecules and sometimes big molecules.

Q7. Why are blood, bone and cartilage called connective tissue?

Ans: Blood, bone and cartilage are called connective tissue because of their special function of linking and supporting other tissues/organs of the body.

Q8. Why are neurons **called excitable cells? Mention special features of the membrane of the** neuron**?**
Ans: Neurons are called excitable cells because when a neuron is suitably stimulated, an electrical disturbance is generated which swiftly travels along its plasma membrane. Arrival of the disturbance at the neuron's endings, or output zone, triggers events that may cause stimulation or inhibition of adjacent neurons and other cells.

Q9. Why earthworm is **called the friend of** farmer**?**
Ans: Earthworms are known as 'friends of farmers' because they make burrows in the soil and make it porous which helps in respiration and penetration of the developing plant roots. The process of increasing fertility of soil by the earthworms is called vermicomposting.

Q10. How do you distinguish between dorsal **and ventral surface of the body of** earthworm**?**
Ans: The dorsal surface of the body of earthworm is marked by a dark median mid dorsal line (dorsal blood vessel) along the longitudinal axis of the body. The ventral surface is distinguished by the presence of genital openings (pores).

Q11. Correct the wrong statements among the following.
a. In earthworm, a single male genital pore is present.
b. Setae help in locomotion of earthworm.
c. Muscular layer in the body wall of earthworm **is made up of only circular muscles.**
d. Typhlosole is the part of intestine **of** earthworm**.**
Ans: a. In earthworm, a pair of male genital pores is present.
b. Correct statement
c. Muscular layer in the body wall of earthworm is made up of circular muscles and longitudinal muscles.
d. Correct statement

Q12. Why nephridia in earthworm that are basically similar in structure classified into three types? Mention the names of each.
Ans: The excretory organs occur as segmentally arranged coiled tubules called nephridia (sing.: nephridium). They are of three types: (i) septal nephridia, present on both the sides of intersegmental septa of segment 15 to the last that open into intestine, (ii) integumentary nephridia, attached to lining of the body wall of segment 3 to the last that open on the body surface and (iii) pharyngeal nephridia, present as three paired tufts in the 4th, 5th and 6th segments. These different types of nephridia are basically similar in structure.
Nephridia regulate the volume and composition of the body fluids. A nephridium starts out as a funnel that collects excess fluid from coelomic chamber. The funnel connects with a tubular part of the nephridium which delivers the wastes through a pore to the surface in the body wall into the digestive tube.

Q13. Common **name of some animals are given in Column A, write their scientific name in Column B.**

Column A		Column B
a.	Tiger	
b.	Peacock	
c.	Housefly	

Ans:

a.	Tiger	Panthera tigris
b.	Peacock	Pavo cristatus
c.	Housefly	Musca domestica

Q14. Complete the following statement:
a. In Cockroach grinding of food **particle is performed** by
b**. Malpighian tubules help in removal** of
c**.** Hind **gut of Cockroach js differentiated** into
d**. In Cockroach blood vessels open into spaces called**
Ans: a. . In Cockroach grinding of food particle is performed by gizzard.
b. Malpighian tubules help in removal of nitrogenous waste products.
c. Hindgut of Cockroach is differentiated into ileum, colon and rectum.
d. In Cockroach blood vessels open into spaces called sinuses.

Q15. Mention special features of eye **in Cockroach.**
Ans: The compound eyes are situated at the dorsal surface of the head. Each eye consists of about 2000 hexagonal ommatidia (sing.: ommatidium). With the help of several ommatidia, a cockroach can receive several images of an object. This kind of vision is known as mosaic vision with more sensitivity but less resolution, being common during night (hence called nocturnal vision).

Q16. Frog **is a poikilotherm, exhibits camouflage and undergoes aestivation and hibernation, how are all these beneficial to it?**
Ans: Frog have the ability to change colour which hides them from their enemies (camouflage). This protective coloration is called mimicry.
Frogs are not seen during peak summer and winter. During this period they take shelter in deep burrows to protect them from extreme heat and cold. This is called as summer sleep (aestivation) and winter sleep (hibernation).

Q17. Write the functions in brief in column B, appropriate to the structures given in column A.

Column A		Column B	
a.	Nictitating membrane	i.	
b.	Tympanum	ii.	
c.	Copulatory pad	iii.	

Ans:

a.	Nictitating membrane	i.	Protects them while in water.
b.	Tympanum	ii.	Receives sound signals
c.	Copulatory pad	iii.	Hold the female during copulation

Q18. Write the appropriate type of tissues in column B according to the functions mentioned in column A.

Column A		Column B	
a.	Secretion and absorption	i.	
b.	Protective covering	ii.	
c.	Linking and supporting framework	iii.	

Ans:

Column A		Column B	
a.	Secretion and absorption	i.	Cuboidal epithelium
b.	Protective covering	ii.	Compound epithelium
c.	Linking and supporting framework	iii.	Connective tissue

Q19. Using appropriate examples, differentiate between false and true body segmentation.
Ans: (i) Metamerism: In some animals, the body is externally and internally divided into segments with a serial repetition of at least some organs. For example, in earthworm, the body shows this pattern called metameric segmentation and the phenomenon is known as metamerism or true segmentation.
Metamerism is found in 3 animal phylums—Annelida, Arthropoda and chordata.
(ii) Pseudometamerism or false segmentation: In tapeworm, the body is externally divisible into parts called proglottis. They develop from the neck but are not embryonic in origin, this segmentation is called pseudometamerism.

Q20. What is special about tissue present in the heart?
Ans: Cardiac muscle tissue is a contractile tissue present only in the heart. Cell junctions fuse the plasma membranes of cardiac muscle cells and make them stick together. Communication junctions (intercalated discs) at some fusion points allow the cells to contract as a unit, i.e. when one cell receives a signal to contract, its neighbours are also stimulated to contract.

Long Answer Type Questions

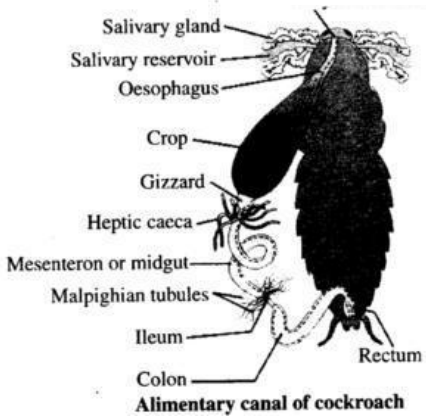
Q1. Classify and describe epithelial tissue on the basis of structural modifications of cells.
Ans: There are two types of epithelial tissues namely simple epithelium and compound epithelium. Simple epithelium is composed of a single layer of cells and functions as a lining for body cavities, ducts, and tubes. The compound epithelium consists of two or more cell layers and has protective function as it does in our skin. On the basis of structural modification of the cells, simple epithelium is further divided into three types. These are (i) Squamous, (ii) Cuboidal and (iii) Columnar
• The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries. They are found in the walls of blood vessels and air sacs of lungs and are involved in functions like forming a diffusion boundary. The cuboidal epithelium is composed of a single layer of cube-like cells. This is commonly found in ducts of glands and tubular parts of nephrons in kidneys and its main functions are secretion and absorption. The epithelium of proximal convoluted tubule (PCT) of nephron in the kidney has microvilli. The

columnar epithelium is composed of a single layer of tall and slender cells. Their nuclei are located at the base. Free surface may have microvilli. They are found in the lining of stomach and intestine and help in secretion and absorption.
• Compound epithelium is made of more than one layer (multi-layered) of cells and thus has a limited role in secretion and absorption. Their main function is to provide protection against chemical and mechanical stresses. They cover the dry surface of the skin, the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and of pancreatic ducts.

Q2. Write down the common features of the connective tissue. On the basis of structure and function, differentiate between bones and cartilages. .
Ans: Connective tissues are most abundant and widely distributed in the body of complex animals. They are named connective tissues because of their special function of linking and supporting other tissues/organs of the body. They range from soft connective tissues to specialised types, which include cartilage, bone, adipose, and blood. In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin. The fibres provide strength, elasticity and flexibility to the tissue. These cells also secrete modified polysaccharides, which accumulate between cells and fibres and act as matrix (ground substance).
• The intercellular material of cartilage is solid and pliable and resists compression. Cells of this tissue (chondrocytes) are enclosed in small cavities within the matrix secreted by them. Most of the cartilages in vertebrate embryos are replaced by bones in adults. Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults.
• Bones have a hard and non-pliable ground substance rich in calcium salts and collagen fibres which give bone its strength. It is the main tissue that provides structural frame to the body. Bones support and protect softer tissues and organs. The bone cells (osteocytes) are present in the spaces called lacunae. Limb bones, such as the long bones of the legs, serve weight-bearing functions. They also interact with skeletal muscles attached to them to bring about movements. The bone marrow in some bones is the site of production of blood cells.

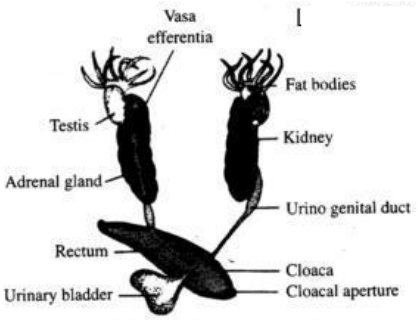
Q3. Comment upon the gametic exchange in earthworm during mating.
Ans: A mutual exchange of sperm occurs between two worms during mating. One worm has to find another worm and they mate juxtaposing opposite gonadal openings exchanging packets of sperms called spermatophores. Mature sperm and egg cells, and nutritive fluid are deposited in cocoons produced by the gland cells of clitellum. Fertilisation and development occur within the cocoons which are deposited in soil. The ova (eggs) are fertilised by the sperm cells within the cocoon which then slips off the worm and is deposited in or on the soil. The cocoon holds the worm embryos. After about 3 weeks, each cocoon produces two to twenty baby worms with an average of four. Development of earthworms is direct, i.e. there is no larva formed.

Q4. Explain the digestive system of Cockroach with the help of a labelled sketch.
Ans: The digestive system consists of alimentary canal and digestive glands. The alimentary canal of cockroach is divided into foregut, midgut and hindgut. The mouth opens into a short tubular pharynx, leading to a narrow tubular passage, the oesophagus, which opens into a sac like crop used for storing food. The crop is followed by a gizzard or proventriculus. Gizzard consists of six chitinous plates called teeth which helps in grinding food. The entire foregut is lined by cuticle. A ring of six to eight blind tubular structures called hepatic or gastric caecae is present at the junction of foregut and midgut which secrete digestive juice. At the junction of midgut and hindgut is present another ring of yellow colored thin filamentous malpighian tubules which help in removal of excretory products from haemolymph. The hindgut is broader than midgut and is differentiated into ileum, colon and rectum. The rectum opens out through anus.



Alimentary canal of cockroach

Q5. Draw a neat and well labelled **diagram of** male **reproductive system of a frog.**



Male reproductive system of frog