**Qs.1**

**Give the difference between simple and compound leaf.**

<table>
<thead>
<tr>
<th>Simple leaf</th>
<th>Compound leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>- If a single lamina occurs in a leaf or if lamina is incised and incisions are not reaching upto midrib than the leaf is known as simple leaf.</td>
<td>- Lamina is incised and incisions reach upto midrib or tip of petiole, dividing leaf into many leaflets than the leaf is known as compound leaf.</td>
</tr>
<tr>
<td>- Leaflets are absent</td>
<td>- Leaflets are present.</td>
</tr>
<tr>
<td>- Axillary bud is present in axil of leaf</td>
<td>- Axillary bud is absent in axil of leaflets.</td>
</tr>
</tbody>
</table>

**Qs.2**

**Explain modification of adventitious fibrous roots for storage of food.**

When a fibrous root absorb food and become fleshy, it is called tuberous root.

**Simple tuberous root** – isolated adventitious root developing from the stem, become tuberous in shape. Theses roots are irregular in shape.

* e.g., Sweet potato.

**Fasciculated tuberous root** – these tuberous roots are present in cluster.

* e.g., Asparagus, Dahlia.

**Qs.3**

**Describe the epiphytic roots.**

**Epiphytes** – Epiphytes are the plants which live on branches of trees. They obtain only habitat from host. They do not obtain water, salts, or prepare food from host. They have no contact with soil.

**Epiphytic roots** – epiphytes have some adventitious roots which remain suspended in air. These roots are spongy, thick, long and greenish. They have a specialized tissue **Velamen** on their outer surface. The cells of this tissue absorb moisture from atmosphere. These roots are also called hygroscopic roots.
Qs.4  Describe steler region of Dicot stem.

Ans.

All tissues on the innerside of the endodermis such as pericycle, vascular bundles and pith constitute the stele.

Pericycle – few layers of thick-walled parenchymatous cells, Next to endodermis. Initiation of lateral roots and vascular cambium during the secondary growth takes place in these cells.

Vascular bundles – Radial/alternate type. Exarch xylem. There are usually two to four xylem and phloem patches. Later, a cambium ring develops between the xylem and phloem.

Conjuctive tissue – The parenchymatous cells which lie between the xylem and the phloem are called conjuctive tissue.

Pith – The pith is small or inconspicuous.

OR

Qs.4  Give the differences between heart wood and sap wood.

Ans.

<table>
<thead>
<tr>
<th>Heartwood (Duramen)</th>
<th>Sapwood (alburnum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Central part of secondary xylem(wood)</td>
<td>• Peripheral part of secondary xylem(wood)</td>
</tr>
<tr>
<td>• Dark brown or backish in colour</td>
<td>• Lighter/yellow in colour</td>
</tr>
<tr>
<td>• deposition of organic compounds like tannins, resins etc</td>
<td>• No deposition of organic matter.</td>
</tr>
<tr>
<td>• Hard and durable</td>
<td>• soft</td>
</tr>
<tr>
<td>• Provide mechanical support to stem</td>
<td>• Conduction of water and minerals from roots to leaf.</td>
</tr>
</tbody>
</table>

Qs.5  Describe the tissue mainly present in the periosteum of the bones and perichondrium of Cartilage.

Ans.

Tissue mainly present in the periosteum of the bones and perichondrium of Cartilage is White fibrous tissue.

White fibrous connective tissue –

• It occurs in tendons, which are elastic cords and connect muscles to the connective tissue sheath which surrounds the bone.
• White fibres are arranged compactly and parallel in bundles.
• This kind of tissue is found in places where great strength with limited flexibility is desirable.
• They are also seen at the joint between cranium bones and make them immovable.
Qs.6 Describe sexual dimorphism in frog?

Ans

Sexual dimorphism – when both sexes male and female are morphologically different.

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Two vocal sacs are present</td>
<td>• Vocal sacs are absent</td>
</tr>
<tr>
<td>• Nuptial pad present in the index finger</td>
<td>• Nuptial pad is absent</td>
</tr>
<tr>
<td>• The skin shows dark yellow colour during breeding season.</td>
<td>• Skin colour is not changed.</td>
</tr>
<tr>
<td>• The abdominal region narrow and flat.</td>
<td>• The abdominal region is broad and bulged.</td>
</tr>
</tbody>
</table>

OR

Qs.6 Explain circulatory system in Earthworm?

Ans

- In earthworm closed type of circulatory system is found.
- In circulatory system blood vessels, capillaries and heart are included.
- Due to closed circulatory system, blood is confined to the heart and blood vessels.
- Due to contraction, blood circulates into one direction and smaller blood vessels supply blood to the gut, nerve cord and the body wall.
- Blood glands are present on the 4th, 5th and 6th segments. Its function is to produce blood cells and haemoglobin which is dissolved in blood plasma.
- Blood cells are of phagocytic type.
- In earthworms there is absence of specialized breathing device. Respiratory exchange occurs through moist body surface and oxygen gets mixed into blood stream.
Qs. 7  Explain granulocyte WBC.
   Ans

   granulocytes WBC have granules in their cytoplasm.
   On the basis of staining characteristics of cytoplasm granules and shape of nucleus, granulocytes are of three types.
   (1) **Neutrophils**: The neutrophil whose granules stain weakly with both the acidic and basic stain. Neutrophils have many lobed nucleus.
   (2) **Eosinophils (Acidophil)**: Their granules which stain by acidic dyes such as eosin. Eosinophils are large in size and with bilobed nucleus.
   (3) **Basophils**: The basophil he granules of which stain by basic dyes such as methylene blue. Basophils has *S' shaped nucleus.

Qs. 8  Explain excretory organs and process of excretion in cockroach?
   Ans

   Excretory organs of cockroach are **Malpighian tubules**.
   They are present at the junction of midgut and hindgut. They are about 150 yellowish long, thin and hollow blind tubules. These blind tubules always float in the haemolymph. Each tubule is lined by glandular and ciliated cells. They absorb nitrogenous waste products and convert them into uric acid which is excreted out through the hindgut. Therefore, cockroach is a **uricotelic** animal. Excretory substances enter into the hindgut having large amount of water. This water is absorbed by the wall of hindgut.
Qs.9 Explain the types of ovary on the basis of the position of the ovary?

Ans. Three kinds of flowers occur on the basis of the position of the ovary.
1. Hypogynous flower – the thalamus becomes conical so that the ovary occupies the highest position. Such an ovary is called superior, e.g. Mustard, China rose, and Datura.
2. Perigynous flower – the thalamus becomes flat, disc-like. The ovary placed in the centre is semi-inferior. Other floral whorls are arranged on the rim of the thalamus, e.g. Rose, Caesalpinia.
3. Epigynous flower – the thalamus envelops the ovary. Here, the ovary is inferior. The other three whorls are arranged above the ovary, e.g. Sunflower, Cucumber.
Qs.9  What is composite fruit? Describe the type of composite fruits?

Ans. A composite fruit develops from all the flowers of a whole inflorescence forming one body at maturity. There are two types of multiple fruits namely sorosis and syconus.

- **Sorosis:**
  - fruit develops from spike inflorescence.
  - The rachis and the flowers along with bracts unite together into fleshy compound fruit.
  - Flowers are usually sterile and seeds are rarely formed.
  - e.g., pineapple.

- **Syconus:**
  - It is derived from a special type of inflorescence known as hypanthodium, which has a fleshy receptacle. It has large number of unisexual flowers. On ripening, the receptacle becomes fleshy and juicy and forms the edible portion.
  - e.g. Banyan fruit or Fig fruit.

Q.10  Write the floral characters of the family of *Solanum nigrum*.

**Ans.** *Solanum nigrum* is a member of Solanaceae family (Potato family).

It is classified as:

- Class: Dicotyledons
- Subclass: Gamopetalae
- Series: Bicarpellatae
- Order: Polymoniales
- Family: Solanaceae

Its floral characters are:

- **Inflorescence**: Solitary cyme or monochasial, helicold cyme, apical or axillary.
- **Flower**: Complete, actinomorphic, bisexual, hypogynous.
- **Calyx**: Sepals five, gamosepalous, tubular, valvate, persistent.
- **Corolla**: Petals five, gamopetalous, valvate, variously shaped.
- **Androecium**: Stamens five, epipetalous. introse.
- **Gynoecium**: Bicarpellary, Syncarpous, ovary superior, many ovules in each locule, Placentation axile.
- **Fruit**: Capsule or berry, seed endospermic.
- **Floral formula**: \( E_{br}, \phi, c, K_{(5)} C_{(5)} A_{5} G_{(2)} \)
Q.11 Explain female reproductive system of cockroach?

Ans.

- Cockroaches are unisexual animals and both sexes have well-developed reproductive organs.
- Female reproductive system of cockroach consists of –
  - 2 ovaries
  - Oviduct
  - Vagina
  - Spermatheca
- Ovaries – two ovaries are present laterally in the 2 to 6 abdominal segments. Each ovary is formed of a group of eight ovarian tubules or ovarioles containing a chain of developing ova.
- Oviducts – carry ova into vagina.
- Vagina – opens into genital chamber.
- Spermatheca – A pair of spermatheca is present in the 6th segment.

During copulation ovum come in the genital chamber, where they are fertilised by sperms. A dark brown coloured ootheca is formed by the group of fertilized eggs. Each ootheca has 14 to 16 eggs which give rise to nymphs.
Q.12 Explain pulmonary respiration and its steps in frog?

Ans.

- Respiration takes place through lungs in terrestrial habitat is called pulmonary respiration.
- The system consists of respiratory tracts and lungs.
- There are two respiratory tracts, each respiratory tract starts from an external nostril. It opens into the bucco-pharyngeal cavity. Bucco-pharyngeal cavity leads into a sac called laryngotracheal chamber through glottis. This laryngotracheal chamber opens into lungs.
- The entire process of pulmonary respiration is completed in three steps: (1) Aspiration, (2) Inspiration and (3) Expiration.

1. **Aspiration**: The entry of the gases into the buccopharyngeal cavity is called aspiration.
2. **Inspiration**: The gases pass through the bucco-pharyngeal cavity to lungs is called inspiration, during this process diffusion of oxygen occurred.
3. **Expiration**: The passage of impure air from the lungs to the outside of the body is called expiration.

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**OR**

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Q.12 Explain the digestive gland, which secretes bile pigments in frog?
Ans.
- Bile pigment is secreted by Liver in frog.
- Liver is the largest gland found in the frog.
- It is a dark brown coloured gland located close to the heart and lungs.
- Liver is divided into two lobes and the left is again sub divided so it appears trilobed.
- A gall bladder lies between the right and left (lateral) lobes.
- The liver secretes greenish liquid called bile which contains bile salts and bile pigments like bilirubin and biliverdin
- Bile juice is stored in gall bladder.
- The bile is transported to gall bladder by small hepatic ducts. Cystic ducts from gall bladder and hepatic ducts from liver combine to form a common bile duct. The bile duct passes through the pancreas and receives numerous pancreatic ducts. Now the bile duct is called heptopancreatic duct. It opens into the duodenum.
- Bile has no digestive enzymes, it only emulsifies fat so that liver is not truly a digestive gland.

Q.13 Explain the structure of various components of complex tissue associated with transportation of water.
Ans.
- Complex tissue associated with transportation of water and mineral ions is xylem.
- Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.
- **Tracheids and vessels** –
  - They are the main water transporting elements.
  - Tracheids and vessels have secondary wall thickening and lose their cytoplasm at maturity; hence they are dead yet functional.
  - Tracheids have pointed ends and overlap each other, whereas vessel elements have open end walls and are arranged end to end to form a larger unit called vessel.
  - Tracheids are found in pteridophytes and gymnosperms, while vessels are present in angiosperms.
- **Xylem parenchyma** –
  - They are living cells and they store starch, lipid, tannin and crystalline substances.
- **Xylem fibres** –
  - They have highly thickened walls and provide mechanical support.
Qs.14  Describe the simplest and most widely distributed connective tissue?

Ans.

Areolar tissue is the simplest and the most widely distributed connective tissue. It is also called loose connective tissue. It is made up of fibres and cells.

**Fibers** — two types of fibres: White and yellow.

- White fibres are wavy, unbranched and are arranged in bundles. They are made up of collagen protein.
- Yellow fibres are few in number, more slender and are not arranged in bundles. They are single fibres branched and joined with one another to form a delicate network. They are made of elastin.

**Cells** — cells present in ground substance are fibroblast, macrophages (histocytes) and mast cells.

- Fibroblasts are the main cells of the tissue. They synthesize two kinds of proteins - collagen and elastin.
- Phagocytic cell or histocyte are motile and ingest foreign particles, and is thus called macrophage. Thus these cells help in the defense of the body.
- Mast cells are also irregular in shape and large in size. They contain three active substances: heparin, histamine and serotonin.
Section C
(4 mark questions)

Qs.15 Explain modification of root, stem, leaf for climbing with example?

Ans:

(A) Modification of root for climbing –
Climbing or clinging roots –
Plants growing as twinnings and climbers possess weak stems so they possess modified structures for climbing.
In *Pothos*, long branched or unbranched, brown adventitious roots develop from nodes and internodes of the stem. They are called climbing or clinging roots. They secrete a sticky material which helps them to stick to the support, and helps them in climbing.

(B) Modification of stem for climbing –
Stem tendrils –
Examples are Passion flower, Cucurbita, Bittergourd, etc.
In these plants, the axillary buds modified into thin, long, threadlike structures. These are called Stem tendrils.
They twine around the support and help the plant in climbing.

(C) Modification of leaf for climbing –
Leaf tendril –
Leaf apex – *Gloriosa*.
Stipules – *Smilax*
Terminal leaflets of a compound leaf – Pea
Leaf hook –
In *Bignonia*, three terminal leaflets become hook-like or clawed.
Qs.16 Explain male reproductive system of frog with diagram?

Ans:

Frog is a unisexual animal.

**Male reproductive system**

Male reproductive organs include a pair of testes, vasa efferentia, Bidder’s canal and urinogenital ducts.

- **Testis**
  - Each testis is located at the antero-lateral part of the kidney. It is oval-shaped, small and yellowish in colour. It remains connected to the kidney by mesorchium. It produce sperms.

- **Vasa efferentia**
  - The sperms produce in testes are transported to Vasa efferentia.

- **Bidder’s canal**
  - It connects vasa efferentia to urinogenital duct.

- **Urinogenital ducts**
  - They carry sperms to cloaca.

![Male urinogenital system diagram](https://biologyaipmt.wordpress.com/)

OR
Qs.16   Explain voluntary nervous system and draw the diagram of dorsal view of brain of frog?
Ans:

**Nervous system of frog**
- Nervous system of frog is located on the dorsal side of the body.

- It is divided into two sections. (1) Voluntary nervous system and (2) Involuntary nervous system.

- The regulation of voluntary nervous system is under the willingness of animals.
- Voluntary nervous system divides into central and peripheral nervous system.

- **Central nervous system** –
  - It consists of brain and a spinal cord.
  - Brain is situated in the head and protected within the cranium.
  - Brain is divided into three regions: fore brain, mid brain, and hind brain.
- Fore brain includes a pair of olfactory lobes, a pair of cerebral hemispheres and diencephalons. On the ventral side of diencephalons one hollow, bilobed and pouch like part is located, which is known as infundibulum. Pituitary gland is attached to the broad posterior end of it. It is master endocrine gland controlling various physiological activities, animal growth and development.

- The mid brain includes of two large oval and obliquely arranged optic lobes.

- Hind brain is composed of cerebellum and medulla oblongata. The medulla oblongata continues as the spinal cord in the vertebral column.
  - Spinal cord presents in the trunk region and terminates in the hollow cavity of urostyle of a vertebral column as a filum terminale.

- **Peripheral nervous system**
  - The peripheral nervous system is formed by cranial nerves and spinal nerves arising from brain and spinal cord respectively.
  - In frog **10 pairs** of cranial nerves from brain and **9 pairs** of spinal nerves from spinal cord arise.
Qs. 17  Describe the structure of adult bone?

Ans.

- Bone is a specialized connective tissue.
- Some of the features of this tissue are as follows:
  - It is highly vascular, mineralized, hard and rigid.
  - It is resilient
  - It has a regenerating capacity
  - It has a canalicular system.
- The mature bone is composed of two kinds of tissues: (a) the compact bone and (b) spongy.
- The ground substance or the matrix is composed of protein called ossein and various inorganic salts of lime, like calcium phosphate, calcium carbonate, magnesium phosphate and calcium fluorides.
- In adult bone flat irregular spaces called lacuna occurs in the solid matrix and each lacuna contains a flat bone cell or osteocyte.
- An osteocyte has an irregular shape and long cytoplasmic process. These processes extended into minute canals radiating from each lacuna.
- The lacunae are in communication with one another by fine canalicules.
- In a long dried bone of frog, large number of lamellae are present in a ground substance.
- In the center there is a narrow cavity of the bone. It contains a tissue known as the bone marrow which is yellow in colour. It is composed of adipose tissue, blood vessels, etc.
- The bone increases in thickness by the addition of successive layers to the outside as well as to the insides.
- In mammalian bones many column like structures are seen called Haversian system. In each Haversian system, several concentric layers (lamellae) of bony matrix encircle a longitudinal central canal (Haversian canal). This canal carries blood vessels and nerves.
- Spongy bones are found in vertebrae, ribs, skull, etc. It contains red bone marrow, which is the seat for formation of erythrocytes and granulocytes.
Qs. 18 Explain the structure of monocot seed with the help of diagram?
Ans:
Maize is a typical example of monocotyledon seed (endospermic seed).

- Maize grain is flat, yellow, narrow at one end and broad at the other end.
- If the seed is cut longitudinally into two parts and the cut face stained with iodine, the endosperm part will appear deep blue because of starch and the embryo part will appear yellowish.

- **Structure of monocot seed**

1. **Hull** – it is the outermost, tough covering formed through fusion of pericarp and seed coat.
2. **Aleurone layer** – It is present under the hull. It is made up of big square or rectangular cells. Grains of proteins are stored in these cells.
3. **Cotyledon** – it is single, thin and shield-shaped and present in the embryonic region. It is also called scutellum.
   The outer layer of scutellum which remains in contact with endosperm is called epithelial layer.
4. **Endosperm** – it is large part which stores food mainly in the form of starch.
5. **Embryo** – it is present and attached at the narrow end of scutellum.
   Its one end form plumule, which gives rise to shoot system and its protective covering is called coleoptile.
   At the other end of embryoradicle is present, which gives rise to root system and its protective covering is called coleorhiza.