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[1]BIOLOGY – ZOOLOGY
CHAPTER 1 – THE LIVING WORLD

1. A living organism is differentiated from nonliving structure based on
   a. Reproduction b. Growth c. Metabolism **d. All the above**
2. A group of organisms having similar traits of a rank is
   a. Species **b. Taxon** c. Genus d. Family
3. Every unit of classification regardless of its rank is
   a. Taxon b. Variety c. Species d. Strain
4. Which of the following is not present in same rank?
   a. Primata b. Orthoptera c. Diptera d. Insecta
5. What taxonomic aid gives comprehensive information about a taxon?
   a. Taxonomic Key b. Herbarium c. Flora d. Monograph
6. Who coined the term biodiversity?
   a. Walter Rosen b. AG Tansley c. Aristotle d. AP de Candole
7. Cladogram considers the following characters
   a. Physiological and Biochemical **b. Evolutionary and Phylogenetic**
   c. Taxonimic and systematic d. None of the above
8. Molecular taxonomic tool consists of
   a. DNA and RNA b. Mitochondria and Endocplamic reticulum
   c. Cell wall and Membrane proteins d. All the above
9. Differentiate between probiotics and pathogenic bacteria.

Probiotics Bacteria	Pathogenic Bacteria
These are beneficial bacteria	These are disease causing bacteria
Converts milk into curd	Causes disease in plants and animals
E.g.: Lactobacillus	E.g.: Vibrio cholera

10. Why mule is sterile in nature?

Answer:

- ✓ Mules are produced by mating of Male donkey and female horse.
- ✓ Mules are sterile animals because they cannot produce gametes due to problems in pairing up of chromosomes.

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- ✓ They have odd number of chromosomes.

11. List any five salient features of the family *Felidae.*

Answer:

- ✓ They have adaptations to detect and hunt prey. They are commonly called wild cat family.
- ✓ They are carnivores (Meat – Eaters)
- ✓ Canine teeth are curved large and sharp
- ✓ Presence of wiskers
- ✓ They have acute senses – Hearing, Smell, Vision and Touch
- ✓ Nocturnal in habit
- ✓ They have well padded toes, curved and protractile claws.
- ✓ E.g. Cat, Lion, Tiger.

12. What is the role of Charles Darwin in relation to concept of species?

Answer:

Species is the basic unit of classification. In 1859 Charles Darwin in his book **Origin of species** explains the evolutionary connection of species by the process of natural selection.

13. Why elephants and other wild animals are entering into human living area?

Answer:

Human being destroys the forest due to rapid urbanization and increase in human population. When habitats are destroyed, the animals living there could not find food and shelter. They tend to wander outside of forest in search of food or shelter and enter into human living area.

14. What is the difference between a Zoo and wild life sanctuary?

Answer:

Zoo	**Sanctuary**
A zoo is a place where animals are held in capacity and public is allowed to visit and see the animals. It is artificially created habitat.	A wild-life sanctuary is a large area with natural surrounding where the animals are allowed to roam freely.
E.g. Aringar Anna Zoological Park, Vandalur	E.g. Kaziranga sanctuary, Assam

15. Can we use recent molecular tools to identify and classify organisms?

Answer:

Technological advancement has helped to evolve molecular taxonomical tools from classical tools to molecular tools. The accuracy and authenticity is more significant in the molecular tools. The following methods are being used for taxonomical classification. Molecular techniques and approaches such as

- **DNA barcoding** (short genetic marker in an organism's **DNA** to identify it as belonging to a particular species),
- **DNA hybridization** (measures the degree of genetic similarity between pools of DNA sequences),
- **DNA fingerprinting** (to identify an individual from a sample of DNA by looking at unique patterns in their DNA),
- **Restriction Fragment Length Polymorphisms (RFLP)** analysis (difference in homologous DNA sequences that can be detected by the presence of fragments of different lengths after digestion of the DNA samples)
- **Polymerase Chain Reaction (PCR)** sequencing (to amplify a specific gene, or portion of gene) are used as taxonomical tools.

16. Define biodiversity.

Answer:

The presence of a large number of species in a particular ecosystem is called 'biological diversity' or in short **'biodiversity'.** The term biodiversity was first introduced by **Walter Rosen (1985),** and defined by E.D. Wilson.

17. Write the characteristic features of living organisms.

Answer:

The key characters of living organisms are, cellular organization, nutrition, respiration, metabolism, growth, response to stimuli, movement, reproduction, excretion, adaptation and homeostasis.

18. Write the basic need for classification.

Answer:

- To identify and differentiate closely related species
- To know the variation among the species
- To understand the evolution of the species
- To create a phylogenetic tree among the different groups
- To conveniently study living organisms

19. Write a short note on Taxanomy.

Answer:

Taxonomy (G. *taxis*- arrangement; *nomos*-law) is the science of arrangement of living organisms along with classification, description, identification, and naming of organisms which includes all flora and fauna including microorganisms of the world. The word taxonomy was coined by **Augustin Pyramus de Candole (1813).**

20. Define Cladogram.

Answer:

The method of representing evolutionary relationships with the help of a tree diagram known as **cladogram**. Cladistic classification summarizes the genetic differences between all species in the 'phylogenetic tree'. **Ernst Haeckal** introduced the term cladogram.

21. Define extremophiles.

Answer:

The prokaryotes which have the ability to grow in extreme conditions like volcano vents, hot springs and polar ice caps, hence are also called **extremophiles.**

22. Explain genus and its types.

Answer:

A group of closely related species which have evolved from a common ancestor. In some genus there is only one species which is called as **monotypicgenus** (e.g. Red panda is the only species in the genus *Ailurus* : *Ailurus fulgens*). If there are more than one species in the genus it is known as **polytypic genus,** for example 'cats' come under the Genus *Felis,*
which has a number of closely related species, *Felis domestica* (domestic cat), *Felis margarita* (jungle cat). *Felis silvestris* (wild cat).

23. Define Binomial nomenclature.

Answer:

Biologists follow universally accepted principles to provide scientific names to known organisms. Each name has two components, a generic name and a specific epithet. This system of naming the organism is called **Binomial Nomenclature** which was popularized by Carolus Linnaeus and practised by biologists all over the world. Example, the National Bird (Indian Peafowl) – *Pavo cristatus*.

24. Write the rules of nomenclature.

Answer:

• The scientific name should be italicized in printed form and if handwritten, it should be underlined separately.
• The generic name's (*Genus*) first alphabet should be in uppercase.
• The specific name (*species*) should be in lowercase.
• The scientific names of any two organisms are not similar.
• The name or abbreviated name of the scientist who first publishes the scientific name may be written after the species name along with the year of publication. For example Lion-*Felis leo* Linn., 1758 or *Felis leo* L., 1758.
• If the species name is framed after any person's name the name of the species shall end with i, ii or ae.

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25. What is Tautonymy?

Answer:

The practice of naming the animals in which the generic name and species name are the same is called Tautonymy. Eg: Naja naja (The Indian Cobra).

26. Give examples of Cyber tools employed in taxonomic studies. (any two)

- ✓ ALIS → Automated Leafhopper Identification System.
- ✓ DAISY → Digital Automated Identification System.
- ✓ ABIS → Automatic Bee Identification System.
- ✓ SPIDA → Species Identified Automatically (spiders, wasp and bee wing characters).
- ✓ Draw wing → Honey bee wing identification.

27. What is INOTAXA?

Answer:

- ✓ e-Taxonomic resources - INOTAXA is an electronic resource for digital images and description about the species which was developed by Natural History Museum, London.
- ✓ INOTAXA means INtegrated Open TAXonomic Access

28. What are the salient features of Three domain classification

Answer:

- ✓ This classification was proposed by Carl Woese (1977) and his co-workers.
- ✓ They classified organisms based on the difference in 16S rRNA genes.
- ✓ The three domain system adds the taxon 'domain' higher than the kingdom.
- ✓ This system emphasizes the separation of Prokaryotes into two domains, Bacteria and Arachaea, and all the eukaryotes are placed into the domain Eukarya.
- ✓ Archaea appears to have more in common with the Eukarya than the Bacteria.
- ✓ Archaea differ from bacteria in cell wall composition and differs from bacteria and eukaryotes in membrane composition and rRNA types.

BIOLOGY – ZOOLOGY

CHAPTER 2 – ANIMAL KINGDOM

Evaluation

1. The symmetry exhibited in cnidarians is
   a. Radial b. Bilateral c. Pentamerous radial d. Asymmetrical
2. Sea anemone belongs to phylum
   a. Protozoa b. Porifera **c. Coelenterata** d. Echinodermata
3. The excretory cells that are found in platyhelminthes are
   a. Protonephridia **b. Flame cells** c. Solenocytes d. All of these
4. In which of the following organisms, self fertilization is seen.
   a. Fish b. Round worm c. Earthworm **d. Liver fluke**
5. Nephridia of Earthworms are performing the same functions as
   a. Gills of prawn **b. Flame cells of Planaria**
   c. Trachea of insects d. Nematoblasts of Hydra
6. Which of the following animals has a true coelom ?
   a. *Ascaris* **b. *Pheretima*** c. *Sycon* d. *Taenia solium*
7. Metameric segmentation is the main feature of
   a. Annelida b. Echinodermata c. Arthropoda d. Coelenterata
8. In *Pheretima* locomotion occurs with the help of
   a. circular muscles b. longitudinal muscles and setae
   c. circular, longitudinal muscles and setae d. parapodia
9. Which of the following have the highest number of species in nature?
   a. Insects b. Birds c. Angiosperms d. Fungi
10. Which of the following is a crustacean?
    a. Prawn b. Snail c. Sea anemone d. Hydra
11. The respiratory pigment in cockroach is
    a. Haemoglobin b. Haemocyanin c. Haemoerythrin **d. None of the above**
12. Exoskeleton of which phylum consists of chitinous cuticle?
    a. Annelida b. Porifera **c. Arthropoda** d. Echinodermata
13. Lateral line sense organs occur in
    a. Salamander b. Frog c. Water snake **d. Fish**
14. The limbless amphibian is

a. Icthyophis b. Hyla c. Rana d. Salamander

15. Four chambered heart is present in

a. Lizard b. Snake c. Scorpion **d. Crocodile**

16. Which of the following is not correctly paired?

a. Humans – Ureotelic

b. Birds – Uricotelic

c. Lizards – Uricotelic

d. Whale – Ammonotelic

17. Which of the following is an egg laying mammal?

a. *Delphinus* b. *Macropus* **c. *Ornithorhynchus*** d. *Equus*

18. Pneumatic bones are seen in

a. Mammalia **b. Aves** c. Reptilia d. Sponges

19. Match the following columns and select the correct option.

Column – I	Column – II
(p) Pila	(i) Devil fish
(q) Dentalium	(ii) Chiton
(r) Chaetopleura	(iii) Apple snail
(s) Octopus	(iv) Tusk shell

a. p – (ii), q – (i), r – (iii), s – (iv)

b. p – (iii), q – (iv), r – (ii), s – (i)

c. p – (ii), q – (iv), r – (i), s – (iii)

d. p – (i), q – (ii), r – (iii), s – (iv)

20. In which of the following phyla, the adult shows radial symmetry but the larva shows bilateral symmetry?

a. Mollusca **b. Echinodermata** c. Arthropoda d. Annelida

21. Which of the following is correctly matched?

a. Physalia – Portugese man of war

b. Pennatula – Sea fan

c. Adamsia – Sea pen

d. Gorgonia – Sea anemone

22. Why are spongin and spicules important to a sponge?

Answer: The sponges body is **supported** by a skeleton made up of calcareous and siliceous spicules or spongin or both.

23. What are the four characteristics common to most animals?

Answer: The basic fundamental features such as levels of organisation, diploblastic and triploblastic organisation, patterns of symmetry, coelom, segmentation and notochord.

24. List the features that all vertebrates show at some point in their development.

Answer: The chordates are characterized by the presence of notochord, solid ventral nerve cord and gill slits.

25. Compare closed and opened circulatory system

Answer:

- **Open type**: in which the blood remains filled in tissue spaces due to the absence of blood capillaries. (arthropods, molluscs, echinoderms, and urochordates)
- **Closed type:** in which the blood is circulated through blood vessels of varying diameters (arteries, veins, and capillaries) as in annelids, cephalochordates and vertebrates.

26. Compare Schizocoelom with enterocoelom

Answer: Schizocoelomates – in these animals the body cavity is formed by splitting of mesoderm. (e.g., annelids, arthropods, molluscs).

Enterocoelomate animals the body cavity is formed from the mesodermal pouches of archenteron. (e.g., Echinoderms, hemichordates and chordates)

27. Identify the structure that the archenteron becomes in a developing animal.

Answer: In the developing embryo during the process of gastrulation, the primary gut that is formed is called the **archenteron** or digestive tube. It develops into the endoderm and mesoderm of an animal.

28. Observe the animal below and answer the following questions

Answer:

a. Identify the animal-**Adamsia(Sea anemone)**

b. What type of symmetry does this animal exhibit?-**Bilateral Symmetry**

c. Is this animal Cephalized? -**No**

d. How many germ layers does this animal have?-**2Layers(Diploblastic)**

e. How many openings does this animal's digestive system have?-**One open only**

f. Does this animal have neurons? –**Primitive Nervous Systems**

29. Choose the term that does not belong in the following group and explain why it does not belong? Notochord, cephalisation, dorsal nerve cord and radial symmetry.

Answer: radial symmetry

Reason: Notochord, Cephalization, dorsal nerve cord are characteristic features of Phylum chordata. This Phylum comprises of animals with bilateral symmetry. Hence the term radial symmetry does not belong to the group.

30. Why flatworms are called acoelomates?

Answer:

➢ Animals which do not possess a body cavity are called acoelomates.

➢ Since there is no body cavity in these animals their body is solid without a perivisceral cavity, this restricts the free movement of internal organs. (e.g., Flatworms)

31. What are flame cells?

Answer: Specialised cells called **flame cells** are seen in Phylum platyhelminthes. These cells help in osmoregulation and excretion. They have flickering cilia or flagella for driving the absorbed excretory products.

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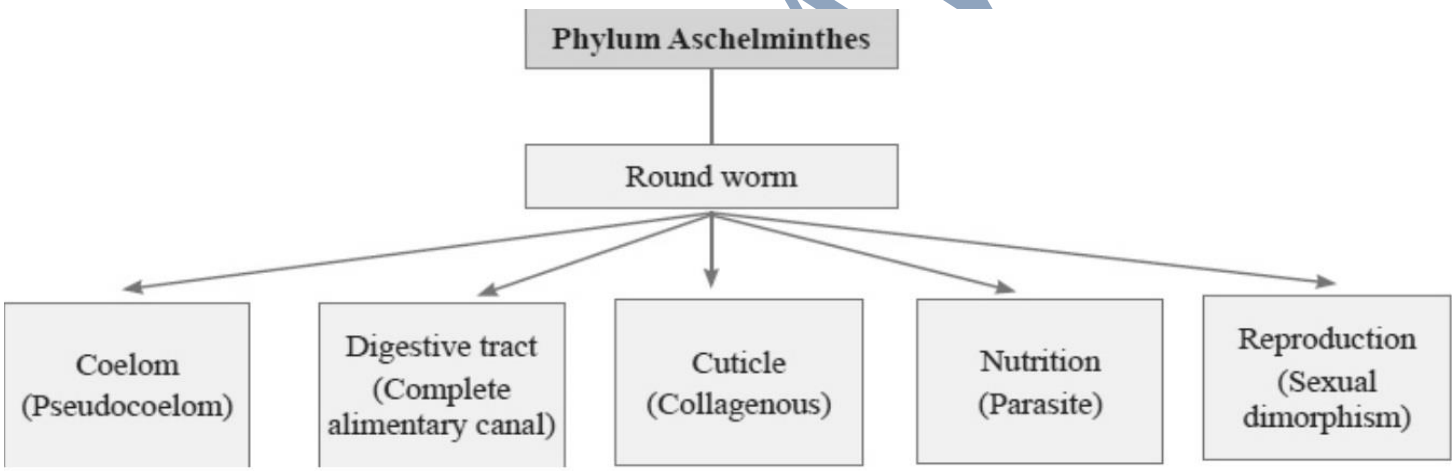
32. Concept Mapping - Use the following terms to create a concept map that shows the major characteristic features of the phylum nematoda:

Answer: Previously called Nematoda, this phylum now it is called Aschelminthes



Round worms→ pseudocoelomates→ digestive tract→ cuticle→ parasite→ sexual dimorphism

33. In which phyla is the larva trochopore found?

Answer: Phylum Annelida Development is direct or indirect and includes a trochophore larva.

34. Which of the chordate characteristics do tunicates retain as adults?

Answer: Dorsal tubular nerve cord is present only in the larval stage and a single dorsal ganglion is present in the adults.

35. List the characteristic features that distinguish cartilaginous fishes with living jawless fishes

Answer:

➢ **Jawless fish:** All members of cyclostomata are primitive, poikilothermic, jawless aquatic vertebrates and are ectoparasites on some fishes.

➢ Mouth is circular without jaws and suctorial

➢ Examples: *Petromyzon* (Lamprey) and *Myxine* (Hag fish)

➢ **Cartilaginous fish:** They are marine fishes with cartilaginous endoskeleton. Notochord is persistent throughout life.

➢ Skin is tough covered by dermal **placoid scales'**

➢ Their jaws are very powerful.

➢ Examples: *Scoliodon* (Shark), *Trygon* (Sting ray), *Pristis* (Saw fish)

36. List three features that characterise bony fishes.

Answer: Bony fishes includes both marine and freshwater living with bony endoskeleton and spindle shaped body.

➢ Skin is covered by ganoid, cycloid or ctenoid scales.

➢ Respiration is by four pairs of filamentous gills and is covered by an operculum on either side.

➢ Sexes are separate, external fertilization is seen and most forms are oviparous Examples: *Exocoetus* (Flying fish),

37. List the functions of air bladder in fishes.

Answer:

➢ **Hydrostatic organ:** keeps equal weight of fish and volume of water.

➢ **Respiration:** Helps in exchange of Gases.

➢ **Sound production:** Helps to produce sound

➢ **Auditory function:** Helps to ear sounds

➢ **Sensory function:** Helps to obserbs pressure changes in water.

38. Write the characteristics that contribute to the success of reptiles on land.

Answer:

➢ Reptiles are mostly terrestrial animals and their body is covered by dry, and cornified skin with epidermal scales or scutes.

➢ Reptiles have three chambered heart but four chambered in crocodiles.

➢ Most reptiles lay **cleidoic eggs** with extraembryonic membranes like amnion, allantois, chorion and yolk sac.

➢ Excretion by metanephric kidneys and are uricotelic. They are monoecious. Internal fertilization takes place and all are oviparous.

➢ Examples : *Chelone* (Turtle), *Testudo* (tortoise), *Hemidactylus* (House lizard),

39. List the unique features of bird's endoskeleton.

Answer:

➢ The endoskeleton of bird is fully ossified (bony) and the long bones are hollow with air cavities (pneumatic bones).

➢ It helps to fly in air with low weight.

40. Could the number of eggs or young ones produced by an oviparous and viviparous female be equal? Why?

Answer:

➢ The numbers of eggs produced by an oviparous mother will be more than the young ones produced by a viviparous mother because in oviparous animals, the development of youngones 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 youngones.

➢ On the otherhand in viviparous organisms,the development of youngones takes place in safe conditions inside the body of the mother.

➢ They are less exposed to environmental conditions and predators. Therefore, there are more chance of their survival and hence,less number of youngones is produced compared to the number of eggs.

CHAPTER 3 - TISSUE LEVEL OF ORGANISATION

Evaluation:-

1. The main function of the cuboidal epithelium is

a. Protection b. Secretion c. Absorption **d. Both (b) and (c)**

2. The ciliated epithelium lines the

a. Skin b. Digestive tract c. Gall bladder **d. Trachea**

3. What type of fibres are found in connective tissue matrix?

a. Collagen b. Areolar c. Cartilage d. Tubular

4. Prevention of substances from leaking across the tissue is provided by

a. Tight junction b. Adhering junction c. Gap junction d. Elastic junction

5. Non-shivering thermogenesis in neonates produces heat through

a. White fat **b. Brown fat** c. Yellow fat d. Colourless fat

6. Some epithelia are pseudostratified. What does this mean?

Answer: Pseudo-stratified epithelial cells are columnar, but unequal in size. Although the epithelium is single layered yet it appears to be multi-layered because the nuclei lie at different levels in different cells. Hence, it is also called pseudostratified epithelium and its function is secretion and absorption.

7. Differentiate white adipose tissue from brown adipose tissue.

Answer:

- ✓ Adipose tissues are also found in subcutaneous tissue, surrounding the kidneys, eyeball, heart, etc.
- ✓ Adipose tissue is called '**white fat**' or **white adipose tissue.**
- ✓ The adipose tissue which contains abundant mitochondria is called '**Brown fat**' or **Brown adipose tissue.**

- ✓ White fat stores nutrients whereas brown fat is used to heat the blood stream to warm the body. -Brown fat produces heat by **non-shivering thermogenesis** in neonates.

8. Why blood is considered as a typical connective tissue?

Answer:

- ✓ **Blood** is the fluid connective tissue containing plasma, red blood cells (RBC), white blood cells (WBC) and platelets.
- ✓ It functions as the transport medium for the cardiovascular system, carrying nutrients, wastes, respiratory gases throughout the body.

9. Differentiate between elastic fibres and elastic connective tissue.

Answer:

- ✓ **Elastic fibre** is found in the skin as the leathery dermis and forms fibrous capsules of organs such as kidneys, bones, cartilages, muscles, nerves and joints.
- ✓ **Elastic connective tissue** contains high proportion of elastic fibres. It allows recoil of tissues following stretching. It maintains the pulsatile flow of blood through the arteries and the passive recoil of lungs following inspiration. It is found in the walls of large arteries; ligaments associated with **vertebral column** and within the walls of the **bronchial tubes.**

10. Name any four important functions of epithelial tissue and provide at least one example of a tissue that exemplifies each function.

Answer:

The functions of epithelium include **protection, absorption, filtration, excretion, secretion** and **sensory reception.**

1. Absorption -Simple epithelium
2. Secretion- Columnar epithelium, pseudo-stratifiedepithelium
3. Protection- Pseudo-stratified epithelium

11. Write the classification of connective tissue and their functions

Answer:

All connective tissues consist of three main components namely fibres, ground substance and cells. The **'Fibres'** of connective tissue provide support. Three types of fibres are found in the connective tissue matrix. They are **collagen**, **elastic** and **reticular** fibres. Connective tissues are of three types namely, **Loose connective tissues** (Areolar, Adipose and Reticular) and **Dense connective tissues** (dense regular, dense irregular and elastic) and **Specialized connective tissues** (cartilage, bone and blood).

Loose connective tissues

In this tissue the cells and fibres are loosely arranged in semi fluid ground substances. For example the **Areolar connective tissue** beneath the skin acts as a support framework for epithelium and acts as a reservoir of water and salts for the surrounding body tissues, hence aptly called tissue fluid. It contains fibroblasts, macrophages, and mast cells. **Adipose tissue** is similar to areolar tissue in structure and function and located beneath the skin. Adipocytes commonly called adipose or fat cells predominate and account for 90% of this tissue mass. The cells of this tissue store fats and the excess nutrients which are not utilised immediately are converted to fats and are stored in tissues. Adipose tissue is richly vascularised indicating its high metabolic activity. While fasting, these cells maintain life by producing and supplying energy as fuel. Adipose tissues are also found in subcutaneous tissue, surrounding the kidneys, eyeball, heart, etc. Adipose tissue is called '**white fat'** or **white adipose tissue.** The adipose tissue which contains abundant mitochondria is called '**Brown fat**' or **Brown adipose tissue.** White fat stores nutrients whereas brown fat is used to heat the blood stream to warm the body. Brown fat produces heat by nonshivering thermogenesis in neonates.

Reticular connective tissue resembles areolar connective tissue, but, the matrix is filled with fibroblasts called reticular cells. It forms an internal framework (**stroma**) that supports the blood cells (largely lymphocytes) in the lymph nodes, spleen and bone marrow.

Dense connective tissues (connective tissue proper)

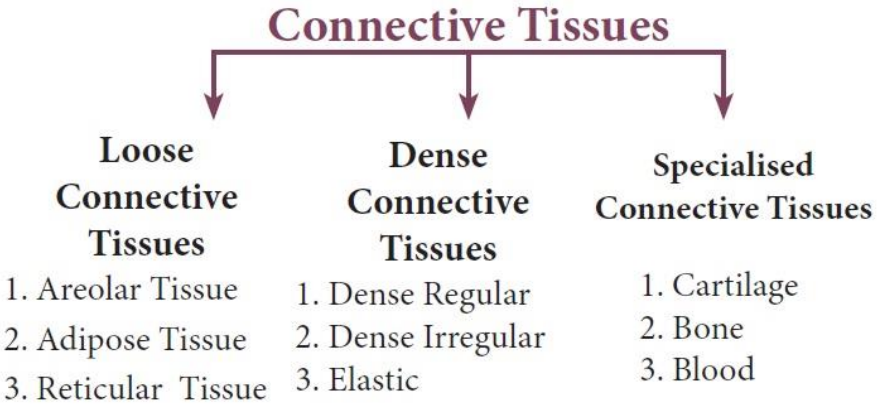
Fibres and fibroblasts are compactly packed in the dense connective tissues. Orientations of fibres show a regular or irregular pattern and are called dense regular and dense irregular tissues. **Dense regular connective tissues** primarily contain collagen fibres in rows between many parallel bundles of tissues and a few elastic fibres. The major cell type is **fibroblast.** It attaches muscles and bones and withstands great tensile stress when pulling force is applied in one direction. This connective tissue is present in **tendons,** that attach skeletal muscles to bones and ligaments attach one bone to another. **Dense irregular connective tissues** have bundles of thick collagen fibres and fibroblasts which are arranged irregularly. The major cell type is the **fibroblast**. It is able to withstand tension exerted in many directions and provides structural strength. Some elastic fibres are also present. It is found in the skin as the leathery dermis and forms fibrous capsules of organs such as kidneys, bones, cartilages, muscles, nerves and joints. **Elastic connective tissue** contains high proportion of elastic fibres. It allows recoil of tissues following stretching. It maintains the pulsatile flow of blood through the arteries and the passive recoil of lungs following inspiration. It is found in the walls of large arteries; ligaments associated with vertebral column and within the walls of the bronchial tubes.

Specialized connective tissues are classified as cartilage, bones and blood. 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, and ear pinna, 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 gives strength to the bones. 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.

Blood is the fluid connective tissue containing plasma, red blood cells (RBC), white blood cells (WBC) and platelets. It functions as the transport medium for the cardiovascular system, carrying nutrients, wastes, respiratory gases throughout the body.



12. What is an epithelium? Enumerate the characteristic features of different epithelia.

Answer: Epithelial tissue is a sheet of cells that covers the body surface or lines the body cavity. It occurs in the body as a covering, as a lining epithelium and as glandular, epithelium. The functions of epithelium include protection, absorption, filtration, excretion, secretion and sensory reception. Based on the structural modification of the cells, the epithelial tissues are classified into **simple epithelium and compound epithelium or stratified epithelium**.

Simple epithelium is composed of a single layer of cells. They are found in the organs of absorption, secretion and filtration. It is further classified into squamous epithelium, cuboidal epithelium, columnar epithelium, ciliated epithelium and pseudostratified epithelium.

- The **squamous epithelium** is made of a single thin layer of flattened cells with irregular boundaries. They are found in the kidney glomeruli, air sacs of lungs, lining of heart, blood vessels and lymphatic vessels and are involved in functions like forming a diffusion boundary and filtration in sites where protection is not important.

- The **cuboidal epithelium** is made of a single layer of cube like cells. This tissue is commonly found in the kidney tubules, ducts and secretory portions of small glands and surface of the ovary. Its main functions are secretion and absorption.
- The **columnar epithelium** is composed of single layer of tall cells with round to oval nuclei at the base. It lines the digestive tract from the stomach to the rectum. The two modifications of this lining are the presence of microvilli on the apical surface of the absorptive cells and Goblet cell which secretes the protective lubricating mucus. The functions of this epithelium include absorption, secretion of mucus, enzymes and other substances.
- If the columnar cells bear cilia on their free surfaces they are called **ciliated epithelium**. This ciliated type propels mucus by ciliary actions and it lines the small bronchioles, fallopian tubes and uterus. Nonciliated type lines most of the digestive tract, gall bladder and secretory ducts of glands.
- **Pseudo-stratified epithelial** cells are columnar, but unequal in size. Although the epithelium is single layered yet it appears to be multi-layered because the nuclei lie at different levels in different cells. Hence, it is also called pseudostratified epithelium and its functions are protection, secretion and absorption. Ciliated forms line the trachea and the upper respiratory tract. The non ciliated forms, line the epididymis, large ducts of a glands and tracts of male urethra.

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	Monthly Q&A	Mid Term Q&A	Revision Q&A	PTA Book Q&A	Centum Questions	Creative Questions
	Quarterly Exam	Half Yearly Exam	Public Exam	NTSE	SLAS	

9th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Quarterly Exam	Half Yearly Exam	Annual Exam	RTE		

8th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Public Model Q&A	NMMS	Periodical Test

7th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

6th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

1st to 5th Standard	Syllabus	Books	Study Materials	Periodical Test	SLAS	
	Term 1	Term 2	Term 3	Public Model Q&A		

Exams	TET	TNPSC	PGTRB	Polytechnic	Police	Computer Instructor
	DEO	BEO	LAB Asst	NMMS	RTE	NTSE

Portal	Matrimony	Mutual Transfer	Job Portal

Volunteers	Centum Team	Creative Team	Key Answer Team

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	Proceedings	GO's	Regulation Orders	Pay Orders	Panel	

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