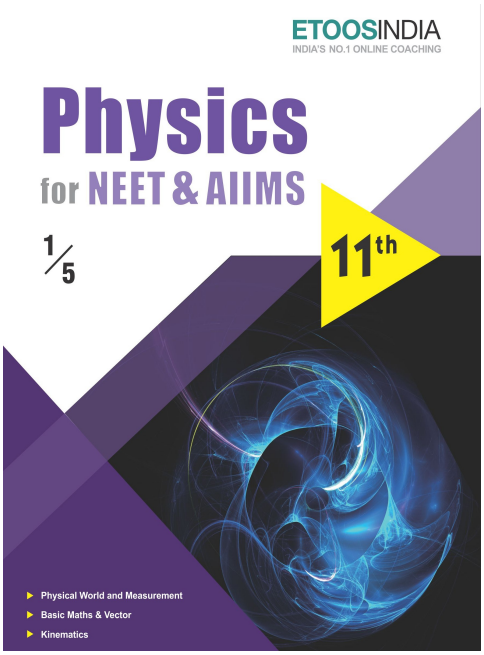
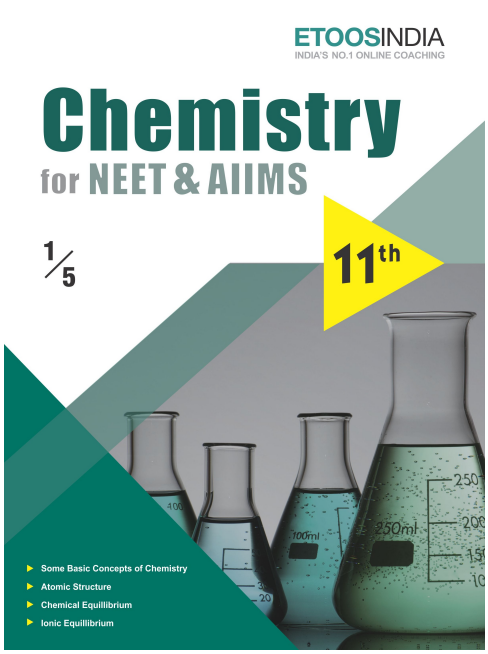
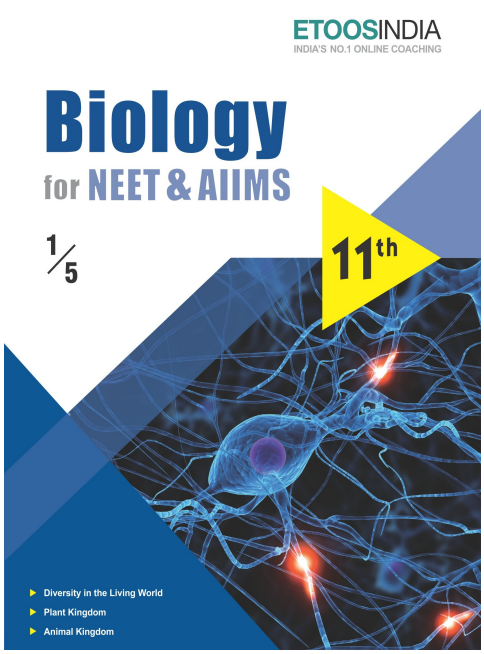
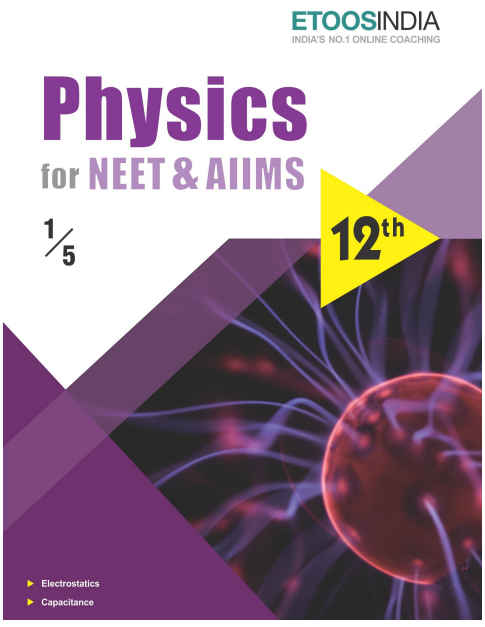
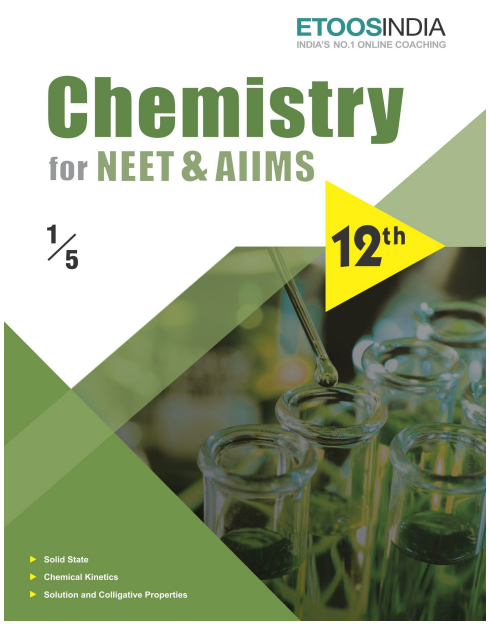
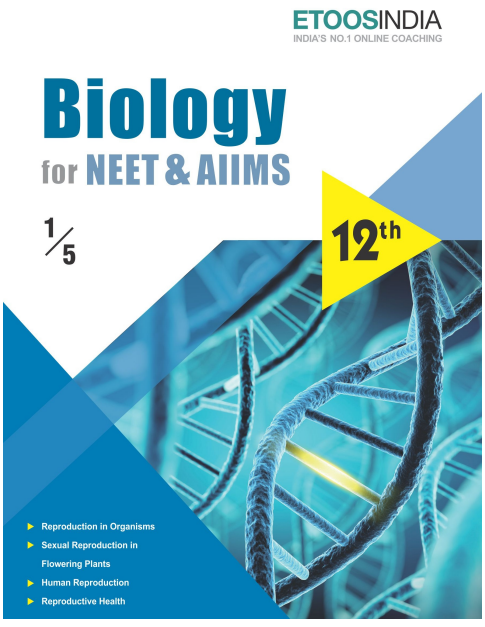












CHAPTER 06

STRUCTURAL ORGANISATION IN ANIMALS

"Surgical Knwoledge depends on long practice, not from speculations".

"MARCELLO MALPIGHI (1628-1694)"

INTRODUCTION

In previous chapters you came know about various and large variety of organisms both unicellular and multicellular of the animal kingdom. In unicellular organisms, various functions are necessary to perform for life like digestion, respiration and reproduction. Even now, millions of unicellular organisms are present like Amoeba, Paramecium, Euglena etc. They are able to perform all activities not without much efficiency. The body of simple organism like Hydra is made of different type of cells and no. of cells in each type can be thousands. Therefore, in multicellular organisms or animals, a group of cells alongwith intercellular substances perform a specific function. Such organisation is called Tissue.This cell grouping has resulted in developing different structures for different functions like protective structures, reproductive cells, information conducting cells, etc.

Tissues are well organised in specific proportion and pattern to form an organ like stomach, lung, heart and kidney. So, when these organs perform a common function by their physical or by chemical interaction, they together form an organ system for e.g., digestive system, respiratory system, excretory system, etc.

ANIMAL TISSUE

Animal tissue term was given by Bichat (Father of Histology). Histology term was given by Mayer. Marcello malpighi (Father of Microscopic Anatomy) – Studied in detail.

Tissue is a group of cells which are similar in structure origin and function.

KINDS OF TISSUES : On the basis of function and location the tissues are of four types-

	Types	Origin	Function
1.	Epithelial tissue	Ectoderm, endoderm, mesoderm	Protection, secretion, absorption, excretion, reproduction.
2.	Connective tissue	Mesoderm	Attachment, support, storage
3.	Muscular tissue	Mesoderm	Movement of body part and locomotion
4.	Nervous tissue	Ectoderm	Control coordination by nerve impulse

EPITHELIAL TISSUE

Features : It has no blood supply & cells are closely packed. Intercellular space or matrix is absent. Epithelial Tissue are of two major categories. Types of epithelial tissues -

1. Covering Epithelial Tissues include simple and compound epithelium.

A. **Simple epithelium-** single layer of cell

(i) Simple squamous Epithelium : Thinnest epithelium. Simple squamous Epithelium is tiles like, so called pavement epithelium. Example - Alveoli of lungs, Bowman's capsule of Nephron, Loop of Henle (descending limb) and thin segment of ascending limb.

(ii) Simple cuboidal epithelium : Made up of cuboidal cells. Example - Vesicles of thyroid, Acini of Pancreas, Distal convoluted tubule of nephron, Germinal epithelium of seminiferous tubules of testes (They form gametes), Inner most layer of ovary, Proximal convoluted tubule of nephron. Microvilli are present on cuboidal cells of PCT.

(iii) Simple Columnar Epithelium : Cell are long and Pillar like. At the base of cells elongated nucleus is present. It is present in Bile duct.

B. **Compound epithelium -** Multiple cell layer. It is divided into transitional and stratified epithelium. It is of two type-

(i) Transitional Epithelium (Plastic epithelium) : Stretchable and Water proof epithelium. Only epithelium in which basement membrane absent. Ex. Renal pelvis, Urinary Bladder, Ureter, Proximal Part of Urethra etc.

(ii) Stratified Epithelium : Non Elastic. Basement membrane present. On the basis of shape of outer most layer, it is divided into three.

(a) Stratified Squamous Epithelium - Outer layer of cells are flat and innermost cuboidal.

(i) Keratinized Eg. Epidermis of skin.

(ii) Non Keratinised Eg. Buccopharyngeal cavity, Oesophagus, Vagina, Cornea of eye.

(b) Stratified cuboidal epithelium - Inner most layer cuboidal and Outer most layer cuboidal e.g. Conjuctiva, Duct of sweat gland, Female urethra.

(c) **Stratified columnar epithelium** – Two types -

(i) **Ciliated** stratified columnar epithelium - Outer most layer columnar and cilia is present. Eg. Epithelium of larynx, Upper part of soft palate, Ciliated epithelium is present in buccal cavity of frog.

(ii) **Non ciliated** stratified columnar epithelium e.g. Male urethra & epiglottis.

2. Glandular Epithelial Tissues - include glands.

GLANDULAR TISSUE (EXOCRINE GLANDS)

Gland – Group of Cells which secrete specific chemical is called as gland.

GLANDS

On the basis of presence or absence of duct

Endocrine gland	**Exocrine gland**	**Mixed gland**
(Without duct)	(With duct)	(Partly Endocrine and Partly exocrine)
Ex. Pituitary gland	Ex. Mammary gland	Ex. Pancreas gland

GLANDS

On the basis of number of cells

(A) Unicellular	(B) Multicellular
Eg. – Goblet cells	

1. Simple glands - (Duct not branched)

(On the basis of structure)

(a) Simple tubular - Eg. : Intestinal gland

(b) Simple coiled - Eg. : Sweat Gland

(c) Simple alveolar - Absent in mammals
Eg. Cutaneous Glands in frog

2. Compound gland - (Duct branched)

(On the basis of structure)

(a) Compound tubular-Ex. Brunner's gland of duodenum , Gastric Glands

(b) Compound alveolar - Ex. Sebaceous gland, Sublingual gland, Sub Mandibular gland

(c) Compound tubulo alveolar .
Ex. Active mammary glands, Parotid gland, Cowper's Gland, Bartholin gland

On the basis of mechanism of secretion glands are of three types

Holocrine	Apocrine	Merocrine or Ecrine
Cell destroy at the time of secretion (Thickest secretion)	Upper part of cell is destroy at the time of secretion	Substance releases through diffusion
Eg. : Sebaceous gland	Eg. : Mammary Glands, Modified Apocrine sweat gland	Eg. : Sweat Glands Salivary Glands

Etoos Tips & Formulas

A tissue is defined as group of cells along with intercelluar substance having similar a origin and performing similar function.

EPITHELIUM TISSUE

(i) Epithelium tissue has a free surface, which faces either a body fluid or the out side environment.

(ii) Epithelium is of two type : simple and compound epithelium .

(iii) Simple epithelium is made up 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.

(iv) Simple squamous epithelium is made of a single layer of flattened cell with irregular boundaries. Found in blood vessel and inner lining Â·on lungs and are involved in forming a diffusion boudary.

(v) The cuboidal epithelium is commonly found in ducts of glands and tubular part of nephrons and its main function is secretion and absorption.

(vi) The columnar epithelium is made up of pillar shaped cells in which nucleus is located at the base. When free surface has microvilli, found in the lining of stomach and intestine.

(vii) When their free surface has cilia they are called as ciliated epithelium, found in the lining of bronchioles and fallopian tubes.

(viii) Compound epithelium has a limited role in secretion and absorption. Their main function is to provide protection against chemical and mechanical stresses. They cover the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary gland and of pancreatic ducts.

(ix) Some of columnar or cuboidal cells get specialised for secretion and are called as glandular epithelium. They are mainly of two types, unicellular {goblet cells) and multicellular (salivary glands)

(x) On the basis of mode of pouring their secretion glands are exocrine and endocrine.

Three types of cell junctions are found in epithelium :

(1) Tight junction (help to stop substances from leaking across a tissue)

(2) Adhering junctions (perform cementing - to keep neighbouring cells together)

(3) Gap junction (for rapid transfer of ions, small molecules and some times big molecules)

CONNECTIVE TISSUE

(i) Connective tissue are most abundant and widely distributed in the body .

(ii) Their special function are linking and supporting other tissues/organs of the body .

(iii) In all connective tissues except blood the cells secret fibres like collagen, elastic and reticular .

(iv) These cells also secrete modified polysaccharides which accumulate between cells and fibres which acts as matrix (ground substance).

Connective tissues are classified into three types

(1) Loose connective tissue.

(2) Dense connective tissue.

(3) Specialised conr1ective tissue.

(a) Loose connective tissue consists of Areolar and Adipose tissue, present beneath the skin.

(b) In Dense connective tissue fibres and fibroblasts are-compactly packed.

(c) Dence connective can be regular namely Tendon and Ligament where as irregular are oriented differently in the skin.

(v) In cartilage intercellular material is solid and pliable e.g.- tip of nose, ear pinna etc.

(vi) Bone have a hard and non-pliable ground substance rich in calcium salt. Bone cells (osteocytes) are present in the Lacunae. The bone marrow in some bone is the site of production of blood cells.

(vii) Blood is fluid connective tissue containing plasma, RBC, WBC and platelets. It is main circulating fluid that helps in the transport of various substances.

SOLVED EXAMPLE

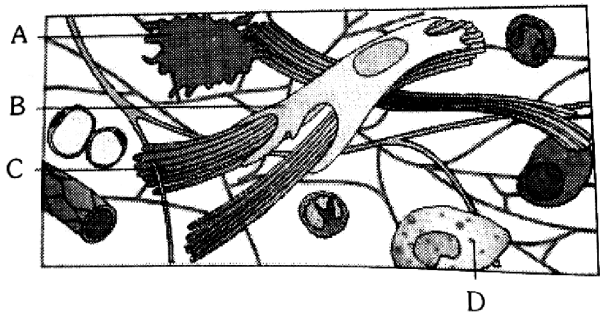
Ex.1 Name the type of tissue that form gland
(A) Epithelial **(B)** Muscular
(C) Squamous **(D)** Cuboidal
Sol. **(A)**

Ex.2 The cell junctions called tight, adhering and gap junctions are found in
(A) Muscular tissue **(B)** Connective tissue
(C) Epithelial tisssue **(D)** Neural tissue
Sol. **(C)**

Ex.3 The cells lining the blood vessels belongs to the category of
(A) Columnar epithelium
(B) Connective tissue
(C) Smooth muscle tissue
(D) Squamous epithelium
Sol. **(D)**

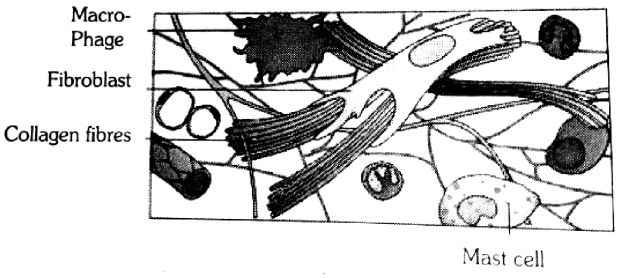
Ex.4 The ciliated columnar epithelium cells in humans are known to occur in
(A) Fallopian tubes and urethra
(B) Eustachain tube and stomach lining
(C) Bronchioles and Fallopian tubes
(D) Bile duct and oesophagus
Sol. **(C)** : Ciliated columnar epithelium lines bronchioles and fallopian tubes.

Ex.5 Given below is the diagrammatic sketch of a certain type of connective tissue. Identify the parts labelled A, B, C and D and select the right option about them



Part - A **Part - B** **Part - C** **Part - D**
(A) Macro-phage, Fibroblast, Collagen fibres, Mast cells
(B) Mast cell , Macro-phage, Fibroblast, Collagen, fibres
(C) Macro-phage, Collagen fibres, Fibroblast , Mast cell
(D) Mast cell, Collagen fibres, Fibroblast, Macro-phage

Sol. **(A)** Correct labeling as follws :



Ex.6 Haversian system is a diagnostic feature of
(A) Avian bones
(B) All animals
(C) Mammalian bones only
(D) Reptilian bones
Sol. **(C)** : Mammalian bone is characterized by the presence of haversian system or osteon. Osteon is a basic structural unit of mammalian bone consisting of the haversian canal, lamellae and lacunae.

Ex.7 The supportive skeletal structures in the human external ears and in the nose tip are examples of
(A) Ligament **(B)** Areolar tissue
(C) Bone **(D)** Cartilage
Sol. **(D)** : Cartilage is a type of connective tissue which is present in human external ears and in the nose tip.

Ex.8 Bone-forming cells are known as :
(A) Chondroclasts **(B)** Osteoblasts
(C) Chondroblasts **(D)** Osteoclasts
Sol. **(B)**

Ex.9 A matured mammalian (RBC) is unusual because
(A) It exhibits diapedsis
(B) It is colourless
(C) It has no nucleus
(D) It can change its shape
Sol. **(C)**

Ex.10 Which of the following is not phagocytic in nature
(A) Monocyte
(B) Lymphocyte
(C) Mast cell
(D) Neutrophil

Exercise # 1 SINGLE OBJECTIVE NEET LEVEL

1. Human RBCs in 1.5% salt solution will :
(A) burst (B) shrink
(C) seal up (D) remains unaffeced

2. Volkmann's canals are found in-
(A) bones of birds (B) bones of mammals
(C) bones of amphibians (D) cartilage of mammals

3. Ends of long bone are covered with :
(A) muscles (B) ligaments
(C) cartilage (D) blood cells

4. Sarcomere is a segment of striated muscle fibre between :
(A) M-lines (B) Z-lines
(C) H-zones (D) I-bands

5. This one is the characteristic of epithelial tissue-
(A) Tissue are highly vascularized
(B) These cells never produce glands
(C) The cells will have a rapid rate of cell division
(D) Large intercellular spaces are seen between cells

6. The joint between axon of a neuron and the dendrite of the next is called-
(A) Synapse (B) Bridge
(C) Junction (D) Joint

7. Bones joints are made up of-
(A) Cardiac muscles (B) Elastin fibres
(C) Skeletal muscle fibres (D) Collagen fibres

8. In *Pheretima* blood glands are found in which of the following segments ?
(A) 1, 2, 3 (B) 7, 8, 9
(C) 4, 5, 6 (D) 10, 11, 12

9. How many lateral hearts are in *Pheretima*?
(A) 12 (B) 16
(C) 8 (D) 4

10. In *Pheretima* mouth develops form which of the following ?
(A) Ectoderm (B) Mesoderm
(C) Blastopore (D) Endoderm

11. The animal which respires without respiratory organs is-
(A) Frog (B) Fish
(C) Earthworm (D) Cockroach

12. Neurons of Pheretima are-
(A) Only motor (B) Only adjustor
(C) Only Sensory (D) All

13. In *Pheretima*, locomotion occurs with the help of :
(A) circular muscles
(B) longitudinal muscles and setae
(C) circular, longitudinal muscles and setae
(D) parapodia

14. Earthworm takes food by which method-
(A) Ciliary feeding (B) Detritus feeding
(C) Liquid feeding (D) None of these

15. Mandibles are present in the mouth parts of -
(A) locust (B) cockroach
(C) bedbug (D) housefly

16. The palpiger of cockroach bears -
(A) lingula (B) submentum
(C) labrum (D) labial palp

17. Which one of the following mouth parts are found in Cockroach ?
(A) Cutting and chewing (B) Piercing
(C) Sucking (D) Drilling

18. Basic unit of compound eyes of Cockroach is:
(A) ocselli (B) ommatidia
(C) ratinule (D) crystalline cone

Exercise # 2 SINGLE OBJECTIVE AIIMS LEVEL

1. Which one of the following anticoagulant is added in blood during storage-
(A) Sodium carbonate (B) Sodium oxalate
(C) Sodium chloride (D) Sodium hydroxide

2. Haversian canals are interconnected by-
(A) Hyloid canal (B) Volkmann's canale
(C) Clockwatt's canal (D) Schliman's canal

3. White adipose tissue contains-
(A) Multilocular fat cells (B) Bilocular fat cells
(C) Unilocular fat cells (D) Alocular fat cells

4. Haversian canal is found in the bone of-
(A) Mammals (B) Reptiles
(C) Aves (D) Pices

5. Most radiosensitive tissue of body is-
(A) Bone marrow (B) Platelet
(C) Nervous tissue (D) Lymphocyte

6. Which one of the following contain the largest quantity of extra cellular material -
(A) Striated muscle
(B) Areolar Tissue
(C) Stratified layer
(D) Myelinated nerve fibre

7. Ventricles of brain are lined by the cells called-
(A) Ependymal (B) Neuron cells
(C) Neuroglea (D) Schwann's cells

8. In earthworm gizzard is found in which segment-
(A) 7 (B) 8
(C) 9 (D) 10

9. Cocoon is formed in earthworns in-
(A) Chitinous setae (B) Cutitcle
(C) Clitellum (D) Epidermal muscles

10. Chloragogen cells are found in :-
(A) Blood of cockroach
(B) Blood of earthworm
(C) Coelomic fluid of earthworm
(D) body wall of Leucosolenia

11. Main function of porphyrin pigment present in earthworm:-
(A) Help in respiration
(B) Helps in reproduction
(C) Makes the worm beautiful
(D) Protection from adverse effects of sun

12. Type of body cavity (Coelom) in earthworm is :-
(A) Acoelomic (B) Schizocoel
(C) Haemocoelic (D) Enterocoelic

13. The enormous amount in saliva of cockroach-
(A) Amylase (B) Protease
(C) Lipase (D) None

14. In cockroach number of segments in muscle abdomen are-
(A) 10 (B) 12
(C) 14 (D) 16

15. Most swollen segment in leg cockroach is :
(A) Tarsus (B) Coxa
(C) Femur (D) Trochanter

16. Main character for the distinction between male and female cockroach :
(A) Antennae (B) Mandibles
(C) Anal cerci (D) Anal style

17. Anal styles are found in :
(A) Housefly
(B) Female cockroach
(C) Male cockroach
(D) Both male & female cockroach

18. Head of frog is .... and its anterior conical part is called :-
(A) circular, snout (B) triangular, snout
(C) rectangular, snout (D) pentagonal, snout

19. Select the true statement regarding frog (Rana tigrina):-
(A) Frog is a homeothermal animal
(B) Frog drinks about 5 litres H_2O per day
(C) poisonous glands are not found on the body of frog.
(D) A very long tail is present in posterior part of frog's body.

Exercise # 3 PART - 1 MATRIX MATCH COLUMN

1. Which one of the following is correct pairing of a body part and the kind of muscle tissue that moves it?
   (A) Biceps of upper arm – Smooth muscle fibres
   (B) Abdominal wall – Voluntary smooth muscle
   (C) Iris – Involuntary smooth muscle
   (D) Heart wall – Involuntary unstriated muscle

2. Match Colum I with Column - I and select the correct option from the codes given below.

Column I	Column II
A. Simple columnar	i. Wall of heart epithelium
B. Cardiac muscle	ii. Bone joints
C. Adipose tissue	iii. Inner lining of stomach and intestine
D. Hyaline cartilage	iv. Below the skin in the abdomen, buttockes, thighs and breasts
	v. Diaphragm

   (A) A-**iii**, B-**i**, C-**ii**, D-**iv** (B) A-**iii**, B-**v**, C-**ii**, D-**iv**
   (C) A-**i**, B-**iii**, C-**iv**, D-**v.** (D) A-**iii**, B-**i**, C-**iv**, D-**ii**

3. Which of the following is a wrongly matched pair?
   (A) Unicellular glandular cells – Goblet cell
   (B) Saliva – Exocrine secretion
   (C) Fusiform fibres – Smooth muscle
   (D) Cartilage – Areolar tissue

4. Match Column-I with Column -II and select the correct option from the codes given below.

Column-I	Column-II
A. Hyaline cartilage	i. Pectoral girdle of frog
B. Fibrous cartilage	ii. Long bones, sternum, ribs
C. Elastic cartilage	iii. Pubic symphysis
D. Calcified cartilage	iv. Eustachian tube, epiglottis

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

5. Which one of the following structures in *Pheretima* is correctly matched with its function?
   (A) Clitellum – Secretes cocoon
   (B) Gizzard – Absorbs digested food
   (C) Setae – Provides defence against predators
   (D) Typhlosole – Storage of extra nutrients

6. Which of the following structure is correctly matched with its description?
   (A) Septal nephridia and – Both are exonephric pharyngeal nephridia
   (B) Typhlosole – Helps in grinding the soil particles and decaying leaves.
   (C) Hepatic caeca – Blind tubules present at the junction of foregut and mid-gut in the alimentary canal of the cockroach.
   (D) Gizzard – Internal median fold present in the dorsal wall of the intestine of earthworm.

Exercise # 4

PART - 1 PREVIOUS YEAR (NEET/AIPMT)

1. The polysaccharide present in the matrix of cartilage is known as [CBSE AIPMT-2000]
(A) cartilagin (B) ossein
(C) chondriotin (D) casein

2. Simple epithelium is a tissue in which the cells are [CBSE AIPMT-2000]
(A) hardened and provide support to the organ
(B) cemented directly to one another to form a single layer
(C) continuously dividing to provide form to an organ
(D) loosely connected to one another to form an irregular organ

3. If a piece of bone such as femur of frog is kept in dilute HCl for about a week. It will [CBSE AIPMT-2000]
(A) assume black colour (B) shrink in size
(C) turn flexible (D) crack into pieces

4. Which cells do not form layer and remain structurally separate ? [CBSE AIPMT-2001]
(A) Epithelial cells (B) Muscle cells
(C) nerve cells (D) Gland cells

5. During an injury nasal septum gets damaged and for its recovery which cartilage is preferred? [CBSE AIPMT-2001]
(A) Hyaline cartilage (B) Elastic cartilage
(C) Calcified cartilage (D) Fibrous cartilage

6. Which cartilage is present at the end of long bones? [CBSE AIPMT-2002]
(A) Calcified cartilage (B) Hyaline cartilage
(C) Elastic cartilage (D) Fibrous cartilage

7. Which one of the following contains the largest quantity of extracellular material? [CBSE AIPMT-2003]
(A) Myelinated nerve fibres
(B) Striated muscle
(C) Areolar tissue
(D) Stratified epithelium

8. Mast cells of connective tissue contain [CBSE AIPMT-2004]
(A) vasopressin and relaxin
(B) heparin and histamine
(C) heparin and calcitonin
(D) serotonin and melanin

9. Areolar connective tissue joins [CBSE AIPMT-2006]
(A) integument with muscles
(B) bones with muscles
(C) bones with bones
(D) fat body with muscles

10. A drop of each of the following, is placed separately on four slides. Which of them will not coagulate? [CBSE AIPMT-2007]
(A) Blood plasma
(B) Blood serum
(C) Sample from the thoracic duct of lymphatic system
(D) Whole blood from pulmonary vein

11. In which one of the following preparations are you likely to come across cell junctions [CBSE AIPMT-2007]
(A) Ciliated epithelium (B) Thrombocytes
(C) Tendon (D) Hyaline cartilage

12. Which one of the following mammalian cells is not capable of metabolising glucose to carbon-dioxide aerobically [CBSE AIPMT-2007]
(A) Red blood cells (B) White blood cells
(C) Unstriated muscle cells (D) liver cells

13. Which type of white blood cells are concerned with the release of histamine and the natural anticoagulant heparin [CBSE AIPMT-2008]
(A) Neutrophils (B) Basophils
(C) Eosinophils (D) Red blood cells

14. The most active phagocytic white blood cells are [CBSE AIPMT-2008]
(A) neutrophils and eosinophils
(B) lymphocytes and macrophages
(C) eosinophils and lymphocytes
(D) neutrophils and monocytes

MOCK TEST

1. Pseudostratified epithelium is found in
(A) seminiferous tubule (B) Fallopian tube (C) trachea (D) kidney tubules

2. **Assertion :** Gap junctions perform cementing function to keep the neighbouring cells together.
Reason : Tight junctions facilitate the cell to communicate with each other by connecting the cytoplasm of adjoining cells, for rapid transfer of ions, small and big molecules, etc.
(A) Both assertion and reason are true and reason is the correct explanation of assertion.
(B) Both assertion and reason are true but reason is not the correct explanation of assertion.
(C) Assertion is true but reason is false.
(D) Both assertion and reason are false.

3. Choose the wrong statement.
(A) Tight junctions help to stop substances from leaking across a tissue.
(B) Adhering junctions perform cementing to keep neighbouring cells together.
(C) Gap junction facilitate the cells to communicate with each other by connecting the nuclei of adjoining cells.
(D) Compound epithelium has a limited role in secretion and absorption.

4. Match the following.

Column - I	Column - II
A. Squamous epithelium	i. Bone
B. Dense regular connective tissue	ii. Skin
C. Glandular epithelium	iii. Air sacs of lungs
D. Specialised connective tissue	iv. Tendon
E. Dense irregular connective tissue	v. Goblet cells

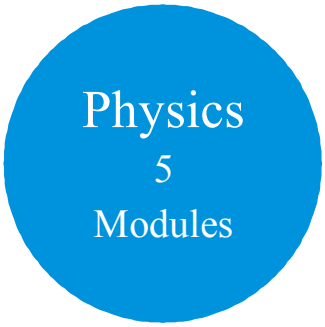
(A) A-ii, B-v, C-iii, D-iv, E-i (B) A-iii, B-v, C-i, D-ii, E-iv
(C) A-iii, B-iv, C-v, D-i, E-ii (D) A-v, B-i, C-ii, D-iv, E-iii
(E) A-iv, B-iii, C-v, D-ii, E-i

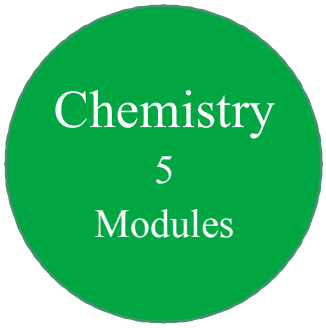
5. Choose the incorrect statement from the following.
(A) Adipose tissue is a type of dense connective tissue.
(B) Tendons attach muscle to bone.
(C) Cartilage is made up of chondrocytes.
(D) Ciliated epithelium is the modified columnar epithelium.

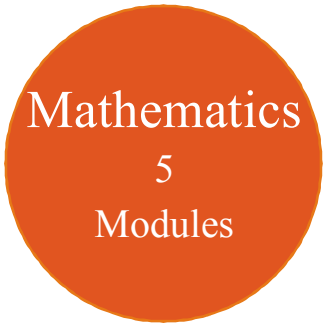
6. The function of the gap junction is to
(A) separate two cells from each other
(B) stop substance from leaking across a tissue
(C) performing cementing to keep neighbouring cells together
(D) facilitate communication between adjoining cells by connecting the cytoplam for rapid transfer of ions, small molecules and some large molecules.

7. Most of the cartilages in vertebrate embryo are replaced in adult by
(A) blood (B) bones (C) tendons (D) ligaments
(E) muscle

11th Class Modules Chapter Details

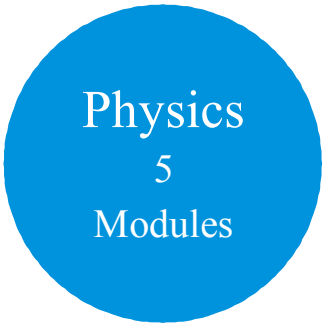


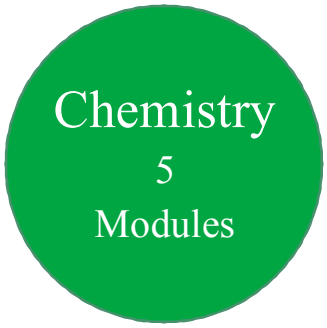


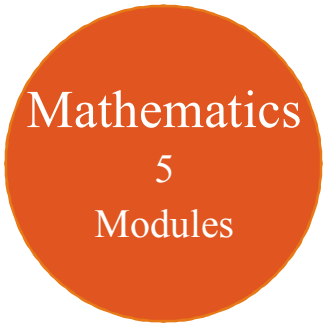


PHYSICS	CHEMISTRY	BIOLOGY
Module-1 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics **Module-2** 1. Law of Motion & Friction 2. Work, Energy & Power **Module-3** 1. Motion of system of particles & Rigid Body 2. Gravitation **Module-4** 1. Mechanical Properties of Matter 2. Thermal Properties of Matter **Module-5** 1. Oscillations 2. Waves	**Module-1(PC)** 1. Some Basic Conceps of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium **Module-2(PC)** 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) **Module-3(IC)** 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block **Module-4(OC)** 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry **Module-5(OC)** 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds	**Module-1** 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom **Module-2** 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals **Module-3** 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition **Module-4** 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases **Module-5** 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

12th Class Modules Chapter Details







PHYSICS

Module-1

1. Electrostatics
2. Capacitance

Module-2

1. Current Electricity
2. Magnetic Effect of Current and Magnetism

Module-3

1. Electromagnetic Induction
2. Alternating Current

Module-4

1. Geometrical Optics
2. Wave Optics

Module-5

1. Modern Physics
2. Nuclear Physics
3. Solids & Semiconductor Devices
4. Electromagnetic Waves

CHEMISTRY

Module-1(PC)

1. Solid State
2. Chemical Kinetics
3. Solutions and Colligative Properties

Module-2(PC)

1. Electrochemistry
2. Surface Chemistry

Module-3(IC)

1. P-Block Elements
2. Transition Elements (d & f block)
3. Co-ordination Compound
4. Metallurgy

Module-4(OC)

1. HaloAlkanes & HaloArenes
2. Alcohol, Phenol & Ether
3. Aldehyde, Ketone & Carboxylic Acid

Module-5(OC)

1. Nitrogen & Its Derivatives
2. Biomolecules & Polymers
3. Chemistry in Everyday Life

BIOLOGY

Module-1

1. Reproduction in Organisms
2. Sexual Reproduction in Flowering Plants
3. Human Reproduction
4. Reproductive Health

Module-2

1. Principles of Inheritance and Variation
2. Molecular Basis of Inheritance
3. Evolution

Module-3

1. Human Health and Disease
2. Strategies for Enhancement in Food Production
3. Microbes in Human Welfare

Module-4

1. Biotechnology: Principles and Processes
2. Biotechnology and Its Applications
3. Organisms and Populations

Module-5

1. Ecosystem
2. Biodiversity and Conservation
3. Environmental Issues