

# 07 Structural Organisation in Animals

**Question:** The Cockroach is :

**NEET 2023 Manipur**

- ☐ A Ammonotelic only
- ☐ B Uricotelic only
- ☐ C Ureotelic only
- ☐ D Ureotelic and Uricotelic

**Answer: B**

## **Explanation**

Cockroaches are uricotelic organisms. The process of excretion in cockroaches is performed by Malpighian tubules, which are part of the insect's excretory system. These tubules are lined by glandular and ciliated cells, which absorb nitrogenous waste products and convert them into uric acid. This uric acid is then excreted out through the hindgut.

The nature of the nitrogenous waste excreted can be species-specific and is often influenced by the organism's environment and water availability. For instance, many bony fishes, aquatic amphibians, and aquatic insects, which have abundant access to water, are ammonotelic and excrete waste in the form of ammonia. In contrast, mammals, many terrestrial amphibians, and marine

fishes, which live in environments where water conservation is critical, are ureotelic and excrete waste in the form of urea.

Given these details, the correct answer to the question "The Cockroach is:" would be Option B : Uricotelic only.

**Question:** Given below are two statements :

Statement I : In cockroach, the forewings are transparent and prothoracic in origin.

Statement II : In cockroach, the hind wings are opaque, leathery and mesothoracic in origin.

In the light of the above statements, choose the correct answer from the options given below :

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☐ A Statement I is correct but Statement II is false

☐ B Statement I is incorrect but Statement II is true

☐ C Both Statement I and Statement II are true

☐ D Both Statement I and Statement II are false

**Answer: D**

**Explanation**

The correct answer is Option D : Both Statement I and Statement II are false.

In a cockroach :

The first pair of wings (forewings or tegmina) are not transparent and prothoracic in origin, as stated in Statement I. Instead, they are opaque, dark, leathery and originate from the mesothorax.

The second pair of wings (hind wings) are not opaque, leathery and mesothoracic in origin, as stated in Statement II. Instead, they are transparent, membranous and originate from the metathorax.

**Question:** Match List-I with List-II.

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	List - I		List - II
(A)	Columnar epithelium	(I)	Ducts of glands
(B)	Ciliated epithelium	(II)	Inner lining of stomach and intestine
(C)	Squamous epithelium	(III)	Inner lining of bronchioles
(D)	Cuboidal epithelium	(IV)	Endothelium

Choose the correct answer from the options given below:

☒ A (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

☐ B (A)-(III), (B)-(II), (C)-(IV), (D)-(I)

☐ C (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

☒ D (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

**Answer: D**

### Explanation

Option D : (A)-(II), (B)-(III), (C)-(IV), (D)-(I) is correct.

Explanation :

(A) Columnar epithelium : This type of epithelium consists of tall, slender and column-like cells. It's found in the inner lining of the stomach and intestine where it aids in secretion and absorption. So, (A) matches with (II).

(B) Ciliated epithelium : These are typically columnar or cuboidal cells that have cilia (small hair-like projections) on their surface. Ciliated epithelium is usually found in the bronchioles (air passages in the lungs) and in the fallopian tubes in females. The cilia help to move mucus and other substances. So, (B) matches with (III).

(C) Squamous epithelium : Squamous cells are thin and flat, similar in shape to fish scales (the word "squamous" means scaly). This type of epithelium forms the endothelium (the lining of the heart, blood vessels, and lymphatic vessels). So, (C) matches with (IV).

(D) Cuboidal epithelium : These cells are cube-shaped and are most commonly found in the ducts of glands and kidney tubules, where they assist with secretion and absorption. So, (D) matches with (I).

**Question:** Given below are two statements:

Statement I : Ligaments are dense irregular tissue.

Statement II : Cartilage is dense regular tissue.

In the light of the above statements, choose the correct answer from the options given below:

☐ A Both Statement I and Statement II are false

☐ B Statement I is true but Statement II is false

☐ C Statement I is false but Statement II is true

☐ D Both Statement I and Statement II are true

**Answer: A**

### Explanation

The correct answer is Option A : Both Statement I and Statement II are false.

Explanation : Ligaments are a type of dense regular connective tissue, not irregular. They connect bones to other bones, providing stability and support.

On the other hand, cartilage is a type of specialized connective tissue that is not classified as dense. It's composed of cells called chondrocytes which are embedded in a matrix of collagen and elastic fibers. It's neither dense regular nor dense irregular tissue.

Therefore, both statements I and II are incorrect.

**Question:** Match List I with List II.

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	List I		List II
(A)	Mast cells	(I)	Ciliated epithelium
(B)	Inner surface of bronchiole	(II)	Areolar connective tissue
(C)	Blood	(III)	Cuboidal epithelium
(D)	Tubular parts of nephron	(IV)	Specialised connective tissue

Choose the correct answer from the options give below:

**A** A-II, B-III, C-I, D-IV

**B** A-II, B-I, C-IV, D-III

**C** A-III, B-IV, C-II, D-I

**D** A-I, B-II, C-IV, D-III

**Answer: A**

### Explanation

- Mast cells (A) : These are a type of white blood cell that is part of the immune system. They are found in many tissues, but particularly in areas close to the external environment, such as the skin and mucous membranes. They are found in connective tissues like areolar tissue.
- Inner surface of bronchiole (B) : The bronchioles are small airways in the respiratory tract that lead to the alveoli (tiny air sacs in the lungs). The inner surface of bronchioles is lined with ciliated epithelium. Cilia are small, hair-like structures that help move mucus and trapped particles out of the lungs.
- Blood (C) : This is a specialized type of connective tissue. It has cells (red and white blood cells, and platelets) suspended in a liquid matrix called plasma.
- Tubular parts of nephron (D) : Nephrons are the functional units of the kidney, responsible for filtering blood and creating urine. The tubular parts of the nephron are lined with cuboidal epithelium. This type of epithelial tissue has cells that are roughly as tall as they are wide.

Given this information, the correct match seems to be :

Option B :

A-II, B-I, C-IV, D-III

**Question:** In cockroach, excretion is brought about by -

**NEET 2023**

A. Phallic gland

B. Urecose gland

C. Nephrocytes

D. Fat body

E. Collateral glands

Choose the correct answer from the options given below :

**A** A, B and E only

**B** B, C and D only

**C** B and D only

**D** A and E only

**Answer: B**

**Explanation**

Option (B) is the answer because,

In cockroaches, excretion is primarily accomplished by Malpighian tubules, which are not listed in the provided options. However, among the provided options, urecose glands, nephrocytes, and the fat body do participate in excretory processes to some degree.

Urecose glands are present in male cockroach of some species. They synthesise uric acid. Nephrocytes are large, colourless, ovoid, binucleate cells attached to the dorsal diaphragm in the body cavity. Fat body accumulates, produces and stores uric acid.

Phallic gland is the structure of male reproductive system of cockroach and it secretes the outer layer of spermatophore. Collateral gland is the structure of female reproductive system of cockroach and it secretes the hard egg-case or ootheca around fertilised eggs.

**Question:** Which of the following is characteristic feature of cockroach regarding sexual dimorphism?

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**A** Presence of anal styles

**B** Presence of sclerites

**C** Presence of anal cerci

**D** Dark brown body colour and anal cerci

**Answer: A**

**Explanation**

Option (A) is the correct answer because anal styles are present in male cockroaches and absent in female cockroaches.

Option (B), (C) and (D) are not the correct answers because sclerites, anal cerci and dark brown body colour are common features of both male and female cockroaches.

2022

## MCQ (Single Correct Answer)

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**Q.1.** Which of the following types of epithelium is present in the bronchioles and Fallopian tubes?

**A** Stratified squamous epithelium

**B** Simple squamous epithelium

**C** Simple columnar epithelium

**D** Ciliated epithelium

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**Ans. (D)**

### Explanation

Option (4) is the correct answer as ciliated epithelium is mainly present in the inner lining of hollow organs like bronchioles and fallopian tubes.

Option (1) is incorrect as stratified squamous epithelium covers moist surfaces such as those of buccal cavity, pharynx and oesophagus.

Option (2) is incorrect as simple squamous epithelium is found in the walls of blood vessels and air sacs of lungs.

Option (3) is incorrect as simple columnar epithelium is found in the lining of stomach and intestine.

**Q.2.** Match List-I with List-II regarding the organs of Cockroach:

	List - I		List - II
(a)	Crop	(i)	Grinding the food particles
(b)	Proventriculus	(ii)	Secretion of digestive juice
(c)	Hepatic caecae	(iii)	Removal of nitrogenous waste
(d)	Malpighian tubules	(iv)	Storage of food

Choose the correct answer from the options given below :

**A** (a) - (i), (b) - (iv), (c) - (iii), (d) - (ii)

**B** (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

**C** (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

**D** (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

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**Ans. (B)**

**Explanation**

Option (b) is the correct answer because

(a) Crop – Responsible for storage of food

(b) Proventriculus – Grinding the food particles

(c) Hepatic caecae – Secretion of digestive juice

(d) Malpighian tubules – Removal of nitrogenous waste

**Q.3.** Choose the correct statements:

(a) Bones support and protect softer tissues and organs

(b) Weight bearing function is served by limb bones

(c) Ligament is the site of production of blood cells.

(d) Adipose tissue is specialised to store fats.

(e) Tendons attach one bone to another.

Choose the most appropriate answer from the options given below:

**A** (a), (b) and (e) only

**B** (a), (b) and (d) only

**C** (b), (c) and (e) only

**D** (a), (c) and (d) only

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**Ans. (B)**

### **Explanation**

Option (b) is the correct answer because statements (a), (b) and (d) are correct.

- Bones are the hardest tissue of our body that support and protect softer tissues and organs.
- Limb bones serve weight bearing function.
- Adipose tissue is a type of loose connective tissue specialised to store fats.
- Option (a) is incorrect because statement (e) is false as tendons attach bones to muscles.

- Option (c) is incorrect because statement (c) is false as bone marrow in some bones is the site of production of blood cells.
- Option (d) is incorrect because this option includes statement (c) which is false.

**Q.4.** Excretion in cockroach is performed by all, EXCEPT:

**A** Hepatic caeca

**B** Urecoase glands

**C** Malpighian tubules

**D** Fat body

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**Ans. (A)**

### Explanation

Option (a) is correct answer because hepatic caeca are responsible for secretion of digestive juices in cockroach and it does not participate in excretion. Urecoase glands in male cockroach, Malpighian tubules and fat bodies in both male and female cockroach are considered as excretory structures.

**Q.5.** In which of the following animals, digestive tract has additional chambers like crop and gizzard?

**A** Corvus, Columba, Chameleon

**B** Bufo, Balaenoptera, Bangarus

☐ C Catla, Columba, Crocodilus

☐ D Pavo, Psittacula, Corvus

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**Ans. (D)**

### **Explanation**

Option (d) is the correct answer because two additional chambers like crop and gizzard in alimentary canal are present in birds.

Pavo (Peacock), Psittacula (Parrot), Corvus (Crow) and Columba (Pigeon) are birds.

Option (a), (b) and (c) are incorrect because Catla is a bony fish, Crocodilus, Chameleon and Bangarus are reptiles, Bufo is an amphibian and Balaenoptera is an aquatic mammal.

**Q.6.** Which of the following is not a connective tissue?

☐ A Blood

☐ B Adipose tissue

☐ C Cartilage

☐ D Neuroglia

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**Ans. (D)**

### **Explanation**

Option (d) is the correct answer as neuroglia are a part of nervous tissue.

- Neuroglia are the supportive cells of nervous tissue. They make up more than half the volume of neural tissue. Neurons, the unit of neural system are excitable cells.
- Cartilage and blood are specialised type of connective tissues.
- Adipose tissue is a type of loose connective tissue.

**Q.7.** Tegmina in cockroach, arises from

**A** Prothorax

**B** Mesothorax

**C** Metathorax

**D** Prothorax and Mesothorax

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**Ans. (B)**

**Explanation**

Option (b) is the correct answer because tegmina or forewings (the first pair of wings) in cockroach arises from mesothorax.

Options (a), (c) and (d) are incorrect because no wing arises from prothorax and hindwings arise from metathorax.

**Q.8.** Match List - I with List - II

	List - I		List - II
(a)	Bronchioles	(i)	Dense Regular Connective Tissue
(b)	Goblet Cell	(ii)	Loose Connective Tissue

	List - I		List - II
(c)	Tendons	(iii)	Glandular Tissue
(d)	Adipose Tissue	(iv)	Ciliated Epithelium

Choose the correct answer from the options given below:

**A** (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

**B** (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

**C** (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

**D** (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

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**Ans. (A)**

**Explanation**

Option (a) is the correct answer because

Ciliated epithelium is mainly present in the inner surface of hollow organs like bronchioles and fallopian tubes. The function is to move particles or mucus in a specific direction over the epithelium.

Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium. Goblet cells are unicellular glands.

Tendons are dense regular connective tissues. They attach skeletal muscles to bones.

Adipose tissue is a type of loose connective tissue located mainly beneath the skin. The cells of this tissue are specialised to store fats.

## TOPIC 1

### Epithelial Tissue

- 01** Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitation of communication with neighbouring cells via rapid transfer of ions and molecules.

[NEET 2021]

- (a) Gap junctions and adhering junctions, respectively
- (b) Tight junctions and gap junctions, respectively.
- (c) Adhering junction and tight junctions, respectively
- (d) Adhering junctions and gap junctions, respectively

**Ans. (b)**

Tight junction helps to stop the leakage of the substances across a tissue and Gap junction are channels that physically connect neighbouring cells, mediating the rapid exchange of small molecules or ions.

Adhering junction They are cell-cell junction complexes that make important contribution to embryogenesis and tissue homeostasis.

- 02** Goblet cells of alimentary canal are modified from

[NEET (Sep.) 2020]

- (a) columnar epithelial cells
- (b) chondrocytes
- (c) compound epithelial cells
- (d) squamous epithelial cells

**Ans. (a)**

Goblet cells of alimentary canal are modified from columnar epithelial cells, which secrete mucus.

These cells are found in the lining of organs like intestine and respiratory tract.

These secretes mucin (glycoprotein) and maintains the layer of mucus. As each cell secretes mucin for mucous production it is called as a unicellular mucous gland.

- 03** Cuboidal epithelium with brush border of microvilli is found in

[NEET (Sep.) 2020]

- (a) ducts of salivary glands
- (b) proximal convoluted tubule of nephron
- (c) Eustachian tube
- (d) lining of intestine

**Ans. (b)**

Cuboidal epithelium with brush border of microvilli is found in proximal convoluted tubule of nephron. The epithelium fills the lumen, and the microvilli increases the surface area by 30-40 fold.

A brush border is a name for the microvilli-covered surface of simple cuboidal epithelium and simple columnar epithelium cells found in certain locations of the body.

The proximal convoluted tubule of the vertebrate nephron lies between Bowman's capsule and the loop of Henle and functions especially in the absorption of sugar, sodium and chloride ions and water from the glomerular filtrate.

- 04** Match the following cell structures with their characteristic features.

[NEET (Odisha) 2019]

Column I		Column II	
1. Tight junctions	(i)	Cement neighbouring cells together to form sheet	
2. Adhering junctions	(ii)	Transmit information through chemical to another cells	
3. Gap junctions	(iii)	Establish a barrier to prevent leakage of fluid across epithelial cells	
4. Synaptic junctions	(iv)	Cytoplasmic channels to facilitate communication between adjacent cells	

Select the correct option from the following

- |     |       |       |      |       |
|-----|-------|-------|------|-------|
|     | 1     | 2     | 3    | 4     |
| (a) | (ii)  | (iv)  | (i)  | (iii) |
| (b) | (iv)  | (ii)  | (i)  | (iii) |
| (c) | (iii) | (i)   | (iv) | (ii)  |
| (d) | (iv)  | (iii) | (i)  | (ii)  |

**Ans. (c)**

The correct matches are

- |                       |       |  |
|-----------------------|-------|--|
| 1. Tight junctions    | (iii) | Establish a barrier to prevent leakage of fluid across epithelial cells. |
| 2. Adhering junctions | (i)   | Cement neighbouring cells together to form sheet.                        |

3. Gap junctions	(iv)	Cytoplasmic channels to facilitate communication between adjacent cells
4. Synaptic junctions	(ii)	Transmit information through chemical to another cells.

- 05** The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in [NEET (National) 2019]

- (a) Fallopian tubes and pancreatic duct  
(b) eustachian tube and salivary duct  
(c) bronchioles and Fallopian tubes  
(d) bile duct and bronchioles

**Ans. (c)**

In humans, ciliated epithelial cells are present in the bronchioles and Fallopian tube. In bronchioles, these cells help in the movement of mucus and in Fallopian tube, these are required to move the egg towards uterus.

On the other hand, salivary and pancreatic ducts are lined by simple cuboidal epithelium. Bile duct is lined by simple columnar epithelium and Eustachian tube is lined by columnar epithelium having ciliated cells.

- 06** Which type of tissue correctly matches with its location? [NEET 2016, Phase I]

Tissue	Location
(a) Areolar tissue	Tendons
(b) Transitional epithelium	Tip of nose
(c) Cuboidal epithelium	Lining of stomach
(d) Smooth muscle	Wall of intestine

**Ans. (d)**

Columnar epithelium is present in the lining of stomach.

Tendon is dense connective tissue and connects muscle to bone. Tip of nose consists of elastic cartilage.

- 07** The function of the gap junction is to [CBSE AIPMT 2015]

- (a) performing cementing to keep neighbouring cells together  
(b) facilitate communication between adjoining cells by connecting the cytoplasm for rapid transfer of

ions, small molecules and some large molecules

- (c) separate two cells from each other  
(d) stop substance from leaking across a tissue

**Ans. (b)**

A gap junction may nexus or macula communicans. These are specialised intercellular connection between a multitude of animal cell types. They directly connect the cytoplasm of two cells, which allows various molecules, ions and electrical impulses to directly pass through a regulated gate between cells.

- 08** Choose the correctly matched pair. [CBSE AIPMT 2014]

- (a) Inner lining of salivary ducts – Ciliated epithelium  
(b) Moist surface of buccal cavity – Glandular epithelium  
(c) Tubular parts of nephrons – Cuboidal epithelium  
(d) Inner surface of bronchioles – Squamous epithelium

**Ans. (c)**

Cuboidal epithelium is present in the tubular parts of nephron (PCT and DCT). It consists of short, cube-shaped cells with round nuclei located in the centre of the cell. These cells often form microvilli to increase the absorptive surface area of the cell.

Other correctly matched points are  
Inner lining of salivary ducts is lined by compound epithelium.

Moist surface of buccal cavity is lined by compound epithelium.

Inner surface of bronchioles is lined by ciliated epithelium.

- 09** In which one of the following preparations are you likely to come across cell junctions most frequently? [CBSE AIPMT 2007]

- (a) Ciliated epithelium  
(b) Thrombocytes  
(c) Tendon  
(d) Hyaline cartilage

**Ans. (a)**

Specialised cell junctions occur at many points of cell-cell and cell matrix contact in all tissues, but they are particularly important and plentiful in epithelium.

- 10** The cell junctions called tight, adhering and gap junctions are found in [CBSE AIPMT 2009]

- (a) muscular tissue  
(b) connective tissue  
(c) epithelial tissue  
(d) neural tissue

**Ans. (c)**

In epithelial tissue, the adjacent cells form ion-rich gap or cell junctions for intercellular communication and chemical exchange. These junctions probably do not provide physical support.

- 11** The ciliated columnar epithelial cells in humans are known to occur in [CBSE AIPMT 2011, 09]

- (a) bronchioles and Fallopian tubes  
(b) bile duct and oesophagus  
(c) Fallopian tubes and urethra  
(d) eustachian tube and stomach lining

**Ans. (a)**

The columnar epithelium is composed of a single layer of tall and slender cells. If the columnar cells bear cilia on their free surface, they are called ciliated columnar epithelium. They are mainly present in the inner surface of hollow organs like bronchioles and Fallopian tubes. Their function is to move particles or mucus in a specific direction over the epithelium.

- 12** The kind of epithelium which forms the inner walls of blood vessels is [CBSE AIPMT 2010]

- (a) cuboidal epithelium  
(b) columnar epithelium  
(c) ciliated columnar epithelium  
(d) squamous epithelium

**Ans. (d)**

Simple squamous epithelium consists of only one layer of flat, scale like cells usually polygonal cells, which are closely fitted together like the tiles of a mosaic. It is also known as pavement epithelium. It forms lining of blood vessels, lymph vessels, heart, peritoneum, pleura, Bowman's capsule, etc.

- 12** 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

**Ans. (b)**

Simple epithelium is a tissue in which the cells are cemented directly to one another to form a single layer. An epithelium is a sheet or tube of firmly adherent cells with minimum (practically negligible) material and space between them.

- 13** Stratum germinativum is an example of which kind of epithelium? [CBSE AIPMT 1997]  
(a) Cuboidal (b) Ciliated  
(c) Columnar (d) Squamous

**Ans. (c)**

Stratum germinativum (Stratum Malpighi/ Stratum cylindricum) consists of columnar cells resting upon a common basement membrane.

- 14** Basement membrane is made up of [CBSE AIPMT 1997]  
(a) only epidermal cells  
(b) only endodermal cells  
(c) Both (a) and (b)  
(d) no cell at all, but is a product of epithelial cells

**Ans. (d)**

The cells of epithelial tissues rest upon a thin layer composed of protein bound mucopoly- saccharides and glycoproteins, both secreted by epithelial cells (hence, product of epithelial cell) along with a layer of collagen fibres of the underlying connective tissue.

- 15** Epithelial tissue with thin flat cells appearing like packed tiles occurs on [CBSE AIPMT 1994]  
(a) inner lining of cheek  
(b) inner lining of stomach  
(c) inner lining of Fallopian tubes  
(d) inner lining of ovary

**Ans. (d)**

Epithelial tissue with thin flat cells appearing like packed tiles occurs on inner lining of ovary. It is called germinal epithelium.

- 16** The alveolar epithelium in the lung is [CBSE AIPMT 1990]  
(a) non-ciliated columnar  
(b) non-ciliated squamous  
(c) ciliated columnar  
(d) ciliated squamous

**Ans. (b)**

The wall of alveoli is highly vascularised. It is surrounded by flattened, non-ciliated squamous cells to increase the surface area. Simple columnar ciliated cells line the few portions of upper respiratory tract, oviduct, Fallopian tube and neurocoel of CNS, whereas non-ciliated columnar epithelium lines stomach, intestine, digestive glands and gall bladder.

## TOPIC 2 Connective Tissue

- 17** Choose the correctly matched pair. [CBSE AIPMT 2014]  
(a) Tendon – Specialised connective tissue  
(b) Adipose tissue – Dense connective tissue  
(c) Areolar tissue – Loose connective tissue  
(d) Cartilage – Loose connective tissue

**Ans. (c)**

Areolar tissue is the body's loose connective tissue, and provide flexibility and cushioning. Adipose tissue is also loose connective tissue while, the tendon is a dense connective tissue, which connect the muscles with the bone. Cartilage is composed of specialised connective tissue called chondrocytes that produce a large amount of extracellular matrix composed of collagen fibre.

- 18** The kind of tissue that forms the supportive structure in our pinna (external ears) is also found in [CBSE AIPMT 2009]  
(a) vertebrae  
(b) nails  
(c) ear ossicles  
(d) tip of the nose

**Ans. (d)**

Yellow fibrous cartilage tissue is found in pinna (external ear). It is also found at the tip of the nose.

- 19** 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

**Ans. (c)**

Loose connective tissue, also called areolar connective tissue, is the 'packing material' of the body that anchors blood vessels, nerves and body organs. It contains fibroblasts that synthesise the fibres and ground substance of connective tissue and wandering macrophages that phagocytise pathogens or damaged cells. The different fibre types include strong collagen fibres and thin elastic fibres formed of the protein elastin. Adipose (fat) tissue is considered a type of loose connective tissue.

- 20** Compared to blood our lymph has [CBSE AIPMT 2009, 1989]  
(a) no plasma  
(b) plasma without proteins  
(c) more WBCs and no RBCs  
(d) more RBCs and less WBCs

**Ans. (c)**

Lymph can be defined as blood minus RBCs, also it contains more WBCs. Lymph is a clear, colourless fluid, similar to plasma but with less protein. It is a mobile connective tissue like, blood and is formed by the filtration of blood. Microscopic examination of lymph depicts that it contains a large number of leucocytes (mostly lymphocytes), ranging from 500-75,000 per cubic mm. But platelets are not present in lymph.

- 21** 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

**Ans. (d)**

Neutrophils and monocytes are phagocytic white blood cells. Monocytes are largest of all leucocytes and generally change into macrophages after entering tissue spaces. Neutrophils are most numerous of all leucocytes, and have many lobed nucleus.

Eosinophils are granular white blood cells. Their number increases in people with allergic conditions such as asthma or hay fever. They are non-phagocytic and seem to play part in immune system. Lymphocytes are non-motile and non-phagocytic. These are found as B and T-lymphocytes. B-lymphocytes secrete antibodies to destroy microbes. T-lymphocytes either directly attack the antigens or stimulate B-lymphocytes to produce antibodies.

- 22** 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) Monocytes

**Ans. (b)**

The basophils are probably like mast cells of connective tissue. They release heparin, (a natural anticoagulant), histamine and serotonin. Their nucleus is usually three lobed and their granules take basic stain strongly.

Monocytes are largest of all types of leucocytes. Their nucleus is bean-shaped. They are motile and phagocytic in nature and engulf bacteria and cellular debris. Generally, they change into macrophages after entering tissue spaces.

Eosinophils have two-lobed nucleus. They are non-phagocytic and help in dissolving blood clot. Their number increases in people with allergic conditions such as asthma or hay fever.

Neutrophils are most numerous of all leucocytes. They eat harmful germs and are therefore, phagocytic in nature. Their nucleus is many lobed and stain weakly with both acid and basic stains.

- 23** Which one of the following mammalian cells is not capable of metabolising glucose to carbon-dioxide aerobically?

[CBSE AIPMT 2007]

- (a) White blood cells  
(b) Unstriated muscle cells  
(c) Liver cells  
(d) Red blood cells

**Ans. (d)**

Cell organelles and nucleus are absent in mature red blood cells. Therefore, aerobic respiration do not take place in red blood cells.

- 24** 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

**Ans. (b)**

Serum will not coagulate if placed separately on a slides. This is because

in blood, the serum is the component that does not contain blood cell (WBCs or RBCs) nor any clotting factor. It is the blood plasma without the fibrinogens.

- 25** Areolar connective tissue joins

[CBSE AIPMT 2006]

- (a) integument with muscles  
(b) bones with muscles  
(c) bones with bones  
(d) fat body with muscles

**Ans. (a)**

Loose or areolar connective tissue is the most generalised connective tissue, which is spread extensively throughout the body under the skin and epithelium, around and in between the muscles, nerves and blood vessels, between lobes and lobules of compound glands, in the sub-mucosa of respiratory and gastrointestinal tracts.

It functions mainly for binding the parts together but also helps in sliding movement of epithelia, muscles and other parts and also forms the internal histological framework or stroma of many solid organs.

- 26** 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

**Ans. (b)**

Mast cells are granulated wandering leucocyte cells. Their granules contain histamine which is vasodilator and heparin (anticoagulant). These take part in body defence and allergic reaction.

- 27** 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

**Ans. (b)**

Hyaline cartilage is present at the end of long articular bones. It provides a smooth articular surface to permit movement at joints. Elastic cartilage is found where support with flexibility is needed such as in external ears.

Fibrous cartilage is a very tough substance and is used in places of the body where shock absorbers are needed, e.g. discs between the vertebrae and in the knee joint.

- 28** 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

**Ans. (a)**

Hyaline cartilage forms nasal septum, larynx, trachea and hyoid apparatus.

- 29** The polysaccharide present in the matrix of cartilage is known as

[CBSE AIPMT 2000]

- (a) cartilagin (b) ossein  
(c) chondriotin (d) casein

**Ans. (c)**

The chief component of ground substance of cartilage is chondromucoprotein which is formed of chondriotin sulphate, keratin sulphate and hyaluronic acid.

- 30** Formation of cartilage bones involves

[CBSE AIPMT 1993]

- (a) deposition of bony matter by osteoblasts and resorption by chondroclasts  
(b) deposition of bony matter by osteoclasts and resorption by chondroblasts  
(c) only deposition of bony matter by osteolasts only  
(d) deposition of bony matter by osteoblasts only

**Ans. (d)**

Osteoblasts are bone forming cells while osteoclasts are bone-destroying cells. Ossification or osteogenesis is the process of bone formation. Chondroblasts are cartilage forming cells.

- 31** Component of blood responsible for producing antibodies is

[CBSE AIPMT 1992]

- (a) thrombocytes (b) monocytes  
(c) erythrocytes (d) lymphocytes

**Ans. (d)**

Lymphocytes (20-25%) are the second most abundant leucocytes. These protect us from pathogens and are involved in the production of antibodies. These lymphocytes are of two types, which are known as B-lymphocytes and T-lymphocytes.

**32** Histamine secreting cells are found in [CBSE AIPMT 1989]

- (a) connective tissue
- (b) lungs
- (c) muscular tissue
- (d) nervous tissue

**Ans. (a)**

Histamine is a vasodilator, involved in allergic and inflammatory reactions. It is secreted by mast cells, these are modified basophils of blood that occur in areolar tissue i.e. the loose connective tissue.

**33** Haversian canal occurs in [CBSE AIPMT 1989]

- (a) humerus (b) pubis
- (c) scapula (d) clavicle

**Ans. (a)**

Haversian canal, named after 'Clopton Havers' are fine channels parallel to the long axis of mammalian bone containing blood vessels, nerve fibres, connective tissue and occasionally lymphatic vessels. Haversian system is found in long bones of mammals (humerus among given options) and absent in spongy bones of mammals.

**34** Mineral found in red pigment of vertebrate blood is [CBSE AIPMT 1989]

- (a) magnesium (b) iron
- (c) calcium (d) copper

**Ans. (b)**

Haemoglobin constitutes about 33% of red blood cells. It is a conjugated protein, composed of a protein called globin and an  $\text{Fe}^{2+}$  porphyrin complex called heme. The mineral present in the red pigment (haemoglobin) of vertebrate blood is iron.

## TOPIC 3

### Muscular Tissue and Nervous Tissue

**35** Which of the following statements wrongly represents the nature of smooth muscle? [NEET 2021]

- (a) These muscles have no striations
- (b) They are involuntary muscles
- (c) Communication among the cells is performed by intercalated discs

(d) These muscles are present in the wall of blood vessels

**Ans. (c)**

Statement in option (c) is incorrect and can be corrected as

Intercalated discs are not found in smooth muscles these are found in cardiac muscles.

Smooth muscle cells are spindle-shaped, have a single nucleus and do not show striations. These involuntary muscles are found on the walls of internal organs such as blood vessels.

**36** Which of the following is not exclusively supplied with involuntary muscles? [CBSE AIPMT 1998]

- (a) Muscular coats of blood vessels
- (b) Muscles of the ducts of glands
- (c) Muscles of iris
- (d) Muscles of urethra

**Ans. (b)**

Muscles of the ducts of glands are not exclusively supplied with involuntary muscles. Smooth muscles are involuntary muscles and are found in the posterior part of oesophagus, stomach, urinogenital tract, blood vessels, iris of eye and dermis of skin.

**37** Characteristics of smooth muscle fibres are [CBSE AIPMT 1990]

- (a) spindle-shaped, unbranched, unstriated, uninucleate and involuntary
- (b) spindle-shaped, unbranched, unstriated, multinucleate and involuntary
- (c) cylindrical, unbranched, unstriated, multinucleate and involuntary
- (d) cylindrical, unbranched, unstriated, multinucleate and voluntary

**Ans. (a)**

Smooth muscle fibres are spindle-shaped, thick in the middle and thin at either ends, uninucleated, no sarcolemma, contraction is slow, involuntary under the control of autonomous nervous system. These muscles are also known as visceral muscles, non-striated, non-skeletal or involuntary muscles.

## TOPIC 4

### Structural Organisation in Some Animals

**38** Which of the following characteristic is incorrect with respect to cockroach? [NEET 2021]

- (a) A ring of gastric caeca is present at the junction of midgut and hindgut
- (b) Hypopharynx lies within the cavity enclosed by the mouth parts
- (c) In females, 7<sup>th</sup> - 9<sup>th</sup> sterna together form a genital pouch
- (d) 10<sup>th</sup> abdominal segment in both sexes, bears a pair of anal cerci

**Ans. (a)**

In cockroach, a ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut which secrete digestive juice to facilitate digestion.

Rest statements are correct.

**39** Following are the statements about prostomium of earthworm. [NEET 2021]

- I. It serves as a covering for mouth.
- II. It helps to open cracks in the soil into which it can crawl.
- III. It is one of the sensory structures.
- IV. It is the first body segment.

Choose the correct answer from the options given below

- (a) I, II and III are correct
- (b) I, II and IV are correct
- (c) I, II, III and IV are correct
- (d) II and III are correct

**Ans. (a)**

Statements I, II and III are correct.

Earthworms have cylindrical body. Anterior end consists of the mouth and the prostomium, a lobe which serves as a covering for the mouth and as a wedge to force open cracks in the soil. The prostomium is sensory in function. Statement IV is incorrect and can be corrected as :  
The first body segment is called the peristomium.

**40** In cockroach, identify the parts of the foregut in correct sequence.

[NEET (Oct.) 2020]

- (a) Mouth → Oesophagus → Pharynx → Crop → Gizzard  
 (b) Mouth → Crop → Pharynx → Oesophagus → Gizzard  
 (c) Mouth → Gizzard → Crop → Pharynx → Oesophagus  
 (d) Mouth → Pharynx → Oesophagus → Crop → Gizzard

**Ans. (d)**

In cockroach, the parts of the foregut in correct sequence are

Mouth → Pharynx → Oesophagus → Crop → Gizzard

The alimentary canal in cockroach has three regions, i.e. foregut, midgut and hindgut. The foregut comprises of the mouth, which opens into a short tubular pharynx, leading to a narrow tubular passage called oesophagus. This in turn opens into a sac-like structure called crop used for storing food. The crop is followed by gizzard or proventriculus which helps in grinding the food particles.

**41** Match the following columns with reference to cockroach and select the correct option from the codes given belows. [NEET (Oct.) 2020]

Column I	Column II
A. Grinding of the food particles	1. Hepatic caecal
B. Secrete gastric juice	2. 10th segment
C. 10 pairs	3. Proventriculus
D. Anal cerci	4. Spiracles
	5. Alary muscles

**Codes**

- A B C D  
 (a) 3 1 4 2  
 (b) 4 3 5 2  
 (c) 1 4 3 2  
 (d) 2 3 1 4

**Ans. (a)**

The option (a) is the correct match with reference to cockroach which is as follows

Grinding of the food particles is done by proventriculus or gizzard.

Hepatic caeca is a ring of 6-8 blind tubules present at the junction of foregut and midgut. It secretes digestive juice.

There are 10 pairs of small holes called spiracles present on the lateral side of the body which are part of respiratory system.

Anal cerci is a pair of jointed filamentous structure in both sexes in their 10th segment.

**42** If the head of cockroach is removed, it may live for few days because [NEET (Sep.) 2020]

- (a) the cockroach does not have nervous system  
 (b) the head holds a small proportion of a nervous system, while the rest is situated along the ventral part of its body  
 (c) the head holds a 1/3rd of a nervous system, while the rest is situated along the dorsal part of its body.  
 (d) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen

**Ans. (b)**

Option (b) is correct because the nervous system of cockroach consists of a series of fused segmentally arranged ganglia joined by paired longitudinal connectives on the ventral side. Three ganglia, i.e. in the thorax and six in the abdomen. In this way cockroach nervous system is spread throughout the body. The head holds a bit of a nervous system, while the rest is situated along the ventral (belly side) part of its body. Therefore if the head region of a cockroach is removed it may live for few days.

**43** Which of the following statements is incorrect? [NEET (Odisha) 2019]

- (a) Cockroaches exhibit mosaic vision with less sensitivity and more resolution  
 (b) A mushroom-shaped gland is present in the 6-7th abdominal segments of male cockroach  
 (c) A pair of spermatheca is present in the 6th segment of female cockroach  
 (d) Female cockroach possesses sixteen ovarioles in the ovaries

**Ans. (a)**

Statement (a) is incorrect because cockroach vision is very sensitive but provides less resolution. Such vision is called mosaic vision. It has compound eye and each eye contains about 2000 ommatidia.

**44** Select the correct sequence of organs in the alimentary canal of cockroach starting from mouth

[NEET (National) 2019]

- (a) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum  
 (b) Pharynx → Oesophagus → Gizzard → Ileum → Crop → Colon → Rectum  
 (c) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum  
 (d) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum

**Ans. (d)**

The correct sequence of organs in the alimentary canal of cockroach starting from mouth is

Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum.

Both crop and gizzard are the structures of foregut. The former serves as the food reservoir while the latter helps to masticate the food due to the presence of six chitinous teeth in it.

**45** Select the correct route for the passage of sperms in male frogs. [NEET 2017]

- (a) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca  
 (b) Testes → Vasa efferentia → Kidney → Seminal vesicle → Urinogenital duct → Cloaca  
 (c) Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca  
 (d) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca

**Ans. (d)**

In male frogs, germinal epithelium of seminiferous tubules produce sperms, which are transferred to kidney via vasa efferentia, from the kidney, these enter into Bidder's canal from where, the sperms are carried to the transverse collecting tubules, longitudinal collecting tubule and then to urinogenital duct. The later carries the sperms to seminal vesical. where, they are stored temporarily. From here, sperms are carried to cloaca and then these shed into water.

- 46** Frog's heart when taken out of the body continues to beat for sometime.

Select the best option from the following statements. [NEET 2017]

- I. Frog is a poikilotherm.
  - II. Frog does not have any coronary circulation.
  - III. Heart is myogenic in nature.
  - IV. Heart is autoexcitable.
- (a) Only III
  - (b) Only IV
  - (c) I and II
  - (d) III and IV

**Ans. (d)**

Frog heart is myogenic and autoexcitable. In this conditions, contraction of the heart originates within the muscles itself. When muscles are contracting. They are releasing heat, which keeps the electrochemical reactions in muscles going so the muscles of heart keep contracting after the removal of heart from the body.

- 47** Which of the following features is not present in *Periplaneta americana*? [NEET 2016, Phase I]

- (a) Indeterminate and radial cleavage during embryonic development
- (b) Exoskeleton composed of N-acetylglucosamine
- (c) Metamerically segmented body
- (d) Schizocoelom as body cavity

**Ans. (a)**

Cockroach has determinate cleavage during embryonic development and it develops into nymph, which is a fully developed cockroach except its size as it is much smaller than the adult one.

- 48** In male cockroaches, sperms are stored in which part of the reproductive system?

[NEET 2016, Phase II]

- (a) Seminal vesicles
- (b) Mushroom glands
- (c) Testes
- (d) Vas deferens

**Ans. (a)**

In male cockroaches, sperms are stored in the seminal vesicles of the reproductive system. The seminal vesicles are small sacs present on the ventral surface of the anterior of the ejaculatory duct.

- 49** The body cells in cockroach discharge their nitrogenous waste in the haemolymph mainly in the form of [CBSE AIPMT 2015]

- (a) ammonia
- (b) potassium urate
- (c) urea
- (d) calcium carbonate

**Ans. (b)**

Insects including cockroach excrete nitrogenous waste in the form of soluble potassium urate which is liberated into the haemolymph and taken up by the cells lining the Malpighian tubules. The tubules facilitate the absorption of urate by stirring up the blood. In the cells of the tubule the potassium urate reacts with water and carbon dioxide (from respiration) to form potassium hydrogen carbonate and uric acid. The former is absorbed back into the blood, but the later is excreted.

- 50** What external changes are visible after the last moult of a cockroach nymph? [NEET 2013]

- (a) Mandibles become harder
- (b) Anal cerci develop
- (c) Both fore wings and hind wings develop
- (d) Labium develops

**Ans. (c)**

In cockroach, development is pauro metabolous. The nymph grows by moulting about 13 times to reach the adult form. The next to last nymphal stage has wing pads but only adult cockroaches have wings.

Anal cerci are a pair of jointed filamentous structures in 10<sup>th</sup> segment of both sexes labium is a lower lip and a pair of mandibles are present in mouthparts of cockroach.

- 51** Select the correct statement from the ones given below with respect to *Periplaneta americana*. [CBSE AIPMT 2012]

- (a) Nervous system located dorsally, consists of segmentally arranged ganglia joined by a pair of longitudinal connectives
- (b) Males bear a pair of short thread-like anal styles
- (c) There are 16 very long Malpighian tubules present at the junctions of midgut and hindgut
- (d) Grinding of food is carried out only by the mouth parts

**Ans. (b)**

In cockroach, the male and females can be identified easily with the presence or absence of one pair of anal styles in the posterior region. The anal styles are unjointed, thread-like structures present on the 9<sup>th</sup> sternite of male.

- 52** Which one of the following correctly describes the location of some body parts in the earthworm *Pheretima*? [CBSE AIPMT 2009]

- (a) Two pairs of accessory glands in 16-18 segments
- (b) Four pairs of spermathecae in 4-7 segments
- (c) One pair of ovaries attached at intersegmental septum of 14th and 15th segments
- (d) Two pairs of testes in 10th and 11th segments

**Ans. (d)**

In earthworm, two pairs of testes are found in 10th and 11th segments, accessory glands in 17th and 19th segments, four pairs of spermatheca from 6th-9th segment and one pair of ovaries in 13th segment.

- 53** 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

**Ans. (c)**

When a bone is kept in dilute acid for a few days, the salts get dissolved, leaving only soft and flexible organic matrix (decalcification). If kept in KOH, it remains unaffected, only the surrounding muscles and connective tissue get dissolved so that the bone now appears clean. If burned, the organic matter burns off producing smoke and the ash (mineral matter) is left behind.

- 54** In frog, the surface of attachment of tongue is [CBSE AIPMT 1997]

- (a) sphenoid
- (b) palatine
- (c) pterygoid
- (d) hyoid apparatus

**Ans. (d)**

Main part of hyoid apparatus is a broad, flat and squarish plate, also called basilingual plate, because it provides attachment and support to the tongue.