

Structural Organisation in Animals — NEET MCQs with Solutions

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Q1. The apical (free) surface of absorptive epithelial cells in the small intestine is specialised by the presence of:

- (A) Microvilli forming the brush border
- (B) Tight junctions sealing the intercellular space
- (C) Hemidesmosomes anchoring to the basal lamina
- (D) Cilia that move intestinal contents

Q2. Mucus secreted by goblet cells protects the epithelial lining primarily by:

- (A) Providing lubrication and forming a chemical barrier against pathogens and digestive enzymes
- (B) Increasing the rate of diffusion across the epithelial surface
- (C) Anchoring the epithelium to the underlying connective tissue
- (D) Stimulating rapid mitosis of basal epithelial cells

Q3. Glandular epithelium is classified on multiple bases. Which of the following is a correct basis of classification of exocrine glands?

- (A) Whether the gland is derived from ectoderm or endoderm
- (B) Whether the gland is located superficially or deep in the body
- (C) Whether the cells of the gland are squamous or cuboidal
- (D) Mode of secretion — merocrine, apocrine, or holocrine

Q4. The extreme thinness of simple squamous epithelium makes it ideally suited for locations requiring:

- (A) Active secretion of proteins
- (B) Coordinated rhythmic contraction
- (C) Storage of lipid reserves
- (D) Rapid passive diffusion and filtration

Q5. Pseudostratified epithelium appears to be multilayered under a microscope, yet is classified as simple epithelium. Which observation best justifies this classification?

- (A) Nuclei are positioned at different heights, creating the illusion of layers
- (B) All cells make contact with the basement membrane, though not all reach the free surface
- (C) The tissue has two distinct cell populations with different functions
- (D) Basal cells divide to replace surface cells, creating apparent layering

Q6. Epithelium is avascular. How do epithelial cells receive nutrients?

- (A) Diffusion from the underlying connective tissue
- (B) Direct capillary supply within the epithelial layer
- (C) Active transport from lymphatic vessels
- (D) Pinocytosis from adjacent cells

Q7. Simple epithelium is highly efficient for exchange of materials because it:

- (A) Has thick cytoplasm that facilitates transport
- (B) Is multilayered, offering more surface area
- (C) Contains a fluid-filled matrix for diffusion
- (D) Consists of a single layer of cells, minimizing diffusion distance

Q8. Earthworm is described as a detritivore because it:

- (A) Feeds on living plant roots
- (B) Is an active predator
- (C) Consumes soil insects
- (D) Feeds on decaying organic matter in soil

Q9. Which layer lies immediately below the circular muscle layer in the earthworm body wall?

- (A) Cuticle
- (B) Epidermis
- (C) Longitudinal muscle layer
- (D) Peritoneum

Q10. Which of the following correctly explains the hydrostatic skeleton mechanism in earthworm?

- (A) Coelomic fluid under pressure resists muscle contraction, allowing force transmission for movement
- (B) The cuticle acts as a rigid skeleton against which muscles pull
- (C) Setae form a scaffold that supports muscle attachment
- (D) Septa contract independently to produce movement

Q11. The outermost layer of the body wall of earthworm is the cuticle. Which cell type secretes it?

- (A) Epidermal cells
- (B) Circular muscle cells
- (C) Coelomic epithelial cells
- (D) Peritoneal cells

Q12. Which of the following combinations of features is INCORRECTLY stated about external morphology of earthworm?

- (A) Prostomium is not a true segment
- (B) Peristomium is the first true segment surrounding the mouth
- (C) Clitellum is present in segments 10-12
- (D) Male genital pores are on the 18th segment

Q13. The compound eyes of cockroach are located on:

- (A) Dorsal thorax
- (B) Ventral abdomen
- (C) Lateral thorax
- (D) Dorso-lateral sides of head

Q14. The male reproductive system of cockroach consists of:

- (A) Pair of testes, vas deferens, ejaculatory duct
- (B) Ovaries and oviducts
- (C) Spermatheca only
- (D) Collateral glands only

Q15. Which of the following correctly explains why cockroach excretes uric acid rather than ammonia or urea?

- (A) Ammonia requires more energy to produce
- (B) Urea is toxic above certain concentrations
- (C) Uric acid synthesis requires more water
- (D) Uric acid is insoluble and excreted as semi-solid paste, conserving water

Q16. The type of circulatory system in cockroach is:

- (A) Closed, with blood confined to vessels
- (B) Open, with haemolymph filling the haemocoel
- (C) Double circulation, with pulmonary and systemic circuits
- (D) Absent, as cockroach relies on diffusion

Q17. Which of the following correctly explains why the midgut is the principal site of digestion in cockroach?

- (A) Gastric caeca release digestive enzymes directly into the midgut lumen
- (B) Midgut bears chitinous lining that activates digestive enzymes
- (C) Salivary glands empty their secretions exclusively into the midgut
- (D) Midgut produces bile that emulsifies fats

Q18. Salivary glands in cockroach open into:

- (A) Crop
- (B) Buccal cavity
- (C) Gizzard
- (D) Midgut

Q19. The small intestine of a frog consists of:

- (A) Duodenum and rectum
- (B) Ileum and colon
- (C) Duodenum and ileum
- (D) Colon and caecum

Q20. The larval stage (tadpole) of a frog respire primarily through:

- (A) Lungs
- (B) Buccal cavity lining
- (C) Skin only
- (D) Gills

Q21. Which of the following best explains why cutaneous respiration is indispensable for a frog, unlike most reptiles?

- (A) Frogs have thicker skin with more mucous glands than reptiles
- (B) Frog lungs are non-functional during summer
- (C) Frogs lack a diaphragm and cannot breathe like mammals
- (D) Frog skin remains moist and vascular, enabling gas exchange, while reptile skin is keratinised and impermeable

Q22. The teeth of a frog function primarily to:

- (A) Chew and grind food into smaller pieces
- (B) Hold and grip slippery prey
- (C) Crush hard-shelled invertebrates
- (D) Break down plant cellulose

Q23. During submersion in water, entry of water through the nostrils of a frog is prevented by:

- (A) The tympanic membrane vibrating to seal the nares
- (B) The nictitating membrane covering the nostrils
- (C) Muscular valves present at the nostrils
- (D) Mucus secreted by nasal glands forming a plug

Q24. Which of the following structures is absent in an adult frog?

- (A) Tympanum
- (B) Tail
- (C) Nictitating membrane
- (D) Cloaca

Answer key and explanations

Q1. Answer: (A) Microvilli forming the brush border

Microvilli on the apical surface form the brush border, dramatically increasing absorptive surface area. Tight junctions are on the lateral surface near the apex; hemidesmosomes are on the basal surface; cilia are present in respiratory and reproductive epithelia, not the small intestine.

Q2. Answer: (A) Providing lubrication and forming a chemical barrier against pathogens and digestive enzymes

Mucus lubricates the epithelial surface (reducing physical friction) and forms a gel barrier that traps pathogens and protects against digestive enzymes and acid. It does not enhance diffusion — if anything, a thick mucus layer slightly impedes it.

Q3. Answer: (D) Mode of secretion — merocrine, apocrine, or holocrine

Exocrine glands are classified by: (1) number of cells (unicellular/multicellular), (2) structure (tubular/acinar/tubuloacinar), and (3) mode of secretion (merocrine — secretion by exocytosis; apocrine — part of cell released; holocrine — entire cell disintegrates). Germ layer origin is not a functional classification criterion.

Q4. Answer: (D) Rapid passive diffusion and filtration

Flat, thin simple squamous cells offer minimal barrier to diffusion — making them ideal for alveoli (gas exchange), glomeruli (filtration), and vessel walls. Active secretion requires metabolically active cuboidal or columnar cells.

Q5. Answer: (B) All cells make contact with the basement membrane, though not all reach the free surface

The defining criterion for "simple" epithelium is that every cell rests on the basement membrane — even if not all cells reach the lumen. The varied nuclear heights create the false appearance of stratification. This is exactly why it is called pseudo (false) stratified.

Q6. Answer: (A) Diffusion from the underlying connective tissue

Epithelium lacks blood vessels and depends entirely on diffusion from the richly vascular connective tissue beneath it. Active transport and lymphatic supply do not substitute for this.

Q7. Answer: (D) Consists of a single layer of cells, minimizing diffusion distance

A single cell layer means substances need to cross only one cell, minimizing diffusion distance. Multilayering (stratified epithelium) actually reduces exchange efficiency but increases protection.

Q8. Answer: (D) Feeds on decaying organic matter in soil

Detritivores consume decomposing organic material (detritus). Earthworm ingests soil rich in dead organic matter, making it a detritivore and an important decomposer in ecosystems.

Q9. Answer: (C) Longitudinal muscle layer

The sequence from outside inward is: cuticle → epidermis → circular muscle → longitudinal muscle → peritoneum. Peritoneum (option D) lies below longitudinal muscle, not directly below circular muscle.

Q10. Answer: (A) Coelomic fluid under pressure resists muscle contraction, allowing force transmission for movement

When circular or longitudinal muscles contract, the incompressible coelomic fluid transmits the pressure to other body regions, producing elongation or shortening. The cuticle is flexible, not rigid; setae aid grip, not structural support.

Q11. Answer: (A) Epidermal cells

The cuticle is secreted by the epidermis (single-layered columnar epithelium beneath it). This is a common NEET-style mechanism question that goes one step beyond simple identification.

Q12. Answer: (C) Clitellum is present in segments 10-12

Clitellum is present in segments 14-16, NOT 10-12. All other statements are correct. This is a direct NCERT factual trap where a plausible-sounding segment number is substituted.

Q13. Answer: (D) Dorso-lateral sides of head

A pair of large compound eyes are present on the dorso-lateral sides of the head, providing a wide field of mosaic vision. They are not located on the thorax or abdomen.

Q14. Answer: (A) Pair of testes, vas deferens, ejaculatory duct

The male system has a pair of testes (4th-6th abdominal segments) connected by vas deferens to a common ejaculatory duct. Spermatheca belongs to the female system; collateral glands are female accessory glands.

Q15. Answer: (D) Uric acid is insoluble and excreted as semi-solid paste, conserving water

Cockroach is a terrestrial organism that conserves water by excreting uric acid as a semi-solid paste — this requires minimal water for elimination. Ammonia requires large amounts of water and is toxic; urea needs moderate water. Uricotely is a key terrestrial adaptation.

Q16. Answer: (B) Open, with haemolymph filling the haemocoel

Cockroach has an open circulatory system — haemolymph is not confined to vessels but flows freely in the haemocoel. Double circulation is a vertebrate feature.

Q17. Answer: (A) Gastric caeca release digestive enzymes directly into the midgut lumen

Gastric caeca, attached at the anterior midgut, secrete enzymes into the midgut, making it the main digestion site. Chitinous lining is absent in midgut (it is a distractor — foregut and hindgut have it, not midgut).

Q18. Answer: (B) Buccal cavity

Salivary ducts open at the base of the hypopharynx in the buccal cavity. They do not open into the crop or gizzard.

Q19. Answer: (C) Duodenum and ileum

Small intestine in frog comprises the duodenum (receives bile and pancreatic juice) and ileum (primary absorption site). Rectum and colon are parts of the large intestine.

Q20. Answer: (D) Gills

Tadpoles possess gills (branchial respiration) as the primary mode of respiration, analogous to fish. Lungs and skin-based respiration develop as the tadpole undergoes metamorphosis into an adult frog.

Q21. Answer: (D) Frog skin remains moist and vascular, enabling gas exchange, while reptile skin is keratinised and impermeable

Reptile skin is dry, thick and heavily keratinised — impermeable to gases. Frog skin remains permanently moist through mucous gland secretion and is densely vascularised, making it an effective respiratory surface. Frogs cannot survive if their skin dries out.

Q22. Answer: (B) Hold and grip slippery prey

Frog teeth (maxillary and vomerine) are small, conical and used only to grip prey — frogs do not chew. Food is swallowed whole. This distinguishes them from mammals with differentiated dentition.

Q23. Answer: (C) Muscular valves present at the nostrils

Frog nostrils are equipped with muscular valves that actively close during aquatic submersion, preventing water entry while allowing air intake on land. Nictitating membrane protects the eye, not the nostrils.

Q24. Answer: (B) Tail

Adult frogs lose their tail after metamorphosis from the tadpole stage. All other listed structures — tympanum, nictitating membrane, and cloaca — are present in the adult frog.

Tissues and animal facts to remember

Topic	Key fact
Squamous epithelium	Walls of blood vessels and air sacs of lungs
Cuboidal epithelium	Ducts of glands and tubular parts of nephrons
Columnar epithelium	Lining of stomach and intestine; ciliated form in bronchioles and fallopian tubes
Compound epithelium	Dry surface of skin, buccal cavity, pharynx, ducts of salivary glands and pancreas
Cell junctions	Tight junctions stop leakage; adhering junctions cement cells; gap junctions let cells communicate

Dense regular connective tissue	Tendons join muscle to bone; ligaments join bone to bone
Cartilage and bone	Cartilage: tip of nose, outer ear, between vertebrae; bone: osteocytes in lacunae, marrow makes blood cells
Muscle types	Skeletal (striated, voluntary); smooth (non-striated, involuntary, gut wall); cardiac (branched, intercalated discs)
Neural tissue	Neurons plus neuroglia; neuroglia make up more than half the volume
Earthworm (Pheretima)	Clitellum on segments 14–16; female pore on 14th, male pores on 18th; gizzard in segments 8–9; typhlosole from 26th segment
Cockroach (Periplaneta americana)	Gastric caeca at foregut-midgut junction; Malpighian tubules at midgut-hindgut junction; 13-chambered heart; ootheca
Cockroach: male vs female	Anal styles only in males; anal cerci in both sexes
Frog (Rana tigrina)	Cold-blooded; three-chambered heart (two atria, one ventricle); nictitating membrane; tympanum; cloaca
Frog respiration	Skin in water; lungs on land; tadpoles breathe through gills