

**#1-#32 MULTIPLE CHOICE: CHOOSE THE ONE BEST ANSWER  
& ENTER IT ON THE SCORESHEET**

**1. Which of the following is NOT one of the four basic tissues:**

- a) epithelium
- b) connective tissue
- c) skin
- d) muscle
- e) nervous tissue

**2. Which of the following is BEST stained by hematoxylin:**

- a) smooth endoplasmic reticulum
- b) rough endoplasmic reticulum
- c) integral membrane protein
- d) Golgi
- e) collagen

**3. Which of the following have the LOWEST potency:**

- a) mesenchymal stem cells
- b) hematopoietic stem cells
- c) chondrogenic progenitor cells
- d) cells of the embryoblast
- e) pericytes

**4. Regarding trophoblasts, which of the following is TRUE:**

- a) are present in the morula
- b) help give rise to the epiblast
- c) help give rise to the hypoblast
- d) help form the maternal portion of the placenta
- e) help form the embryonic portion of the placenta

**5. Regarding gastrulation, which of the following is FALSE:**

- a) generates the hypoblast
- b) generates the endoderm
- c) generates the ectoderm
- d) generates the mesoderm
- e) requires ingression

**6. Which of the following induces the formation of the floor plate in the developing neural tube:**

- a) a high concentration of bone morphogenetic protein (BMP)
- b) a high concentration of sonic hedgehog (SHH)
- c) a low concentration of sonic hedgehog (SHH)
- d) an absence of sonic hedgehog (SHH)
- e) Lim 1

**7. Which of the following are the MOST hydrophobic:**

- a) fatty acid portions of phospholipids
- b) polar head groups of phospholipids
- c) peripheral membrane proteins
- d) ribosomes
- e) nucleic acids

**8. Which of the following requires energy:**

- a) binding of a ligand to a cell surface receptor
- b) facilitated diffusion across a membrane
- c) active transport across a membrane
- d) passive transport across a membrane
- e) movement of calcium ions through a gap junction down a concentration gradient

**9. Which of the following is NOT a function of the Golgi:**

- a) protein synthesis
- b) protein glycosylation
- c) protein sorting
- d) sphingolipid synthesis
- e) phosphorylation of mannose

**10. Where does vesicle 'uncoating' occur:**

- a) at the donor membrane
- b) at the acceptor membrane
- c) in the trans-Golgi network (TGN)
- d) in the cytoplasm
- e) in nuclear pores

**11. Where does vesicle fusion occur during secretory exocytosis into the lumen of a salivary gland alveolus:**

- a) at the basal plasma membrane
- b) at the lateral plasma membrane
- c) at the apical plasma membrane
- d) at the inner nuclear membrane
- e) at the outer nuclear membrane

**12. Where is cholesterol 'hidden' when it is transported from a donor to an acceptor membrane across an ER junction.**

- a) inside a TOM complex
- b) inside a lipid transfer protein
- c) inside a binding complex
- d) on the lipid transfer protein receptor located on the donor membrane
- e) on the lipid transfer protein receptor located on the acceptor membrane

**13. Where does the  $\beta$ -oxidation-mediated breakdown of fatty acids occur:**

- a) in the outer mitochondrial membrane
- b) in the intermembrane space of the mitochondrion
- c) in the inner mitochondrial membrane
- d) in the matrix space of the mitochondrion
- e) in the peroxisome

**14. When UV-induced DNA damage cannot be corrected within a basal epidermal cell, p53 induces apoptosis via:**

- a) the intrinsic pathway
- b) the extrinsic pathway
- c) the G1 to S cell cycle checkpoint
- d) mitosis
- e) necrosis

**15. Which of the following are NOT anchoring junctions:**

- a) tight junctions
- b) zonula adherens
- c) desmosomes
- d) hemidesmosomes
- e) focal contacts

**16. In a stratified squamous epithelium, which of the following are linked to keratin filaments:**

- a) tight junctions
- b) zonula adherens
- c) desmosomes
- d) focal contacts
- e) gap junctions

**17. Which of the following is part of the ground substance of the ECM:**

- a) collagen type I
- b) collagen type II
- c) reticular fibers
- d) heparin
- e) elastin

**18. Which of the following is NOT a characteristic of proteoglycans:**

- a) mostly protein
- b) mostly carbohydrate
- c) negatively charged
- d) contain GAG's
- e) facilitate tissue hydration

**19. Which of the following BEST describes the form of an integrin molecule that is tightly bound to laminin:**

- a) monomer
- b) homodimer
- c) cis-homodimer
- d) low affinity heterodimer
- e) high affinity heterodimer

**20. Which of the following drives apical constriction in a simple columnar epithelium during morphogenic tube formation:**

- a) contraction of sarcomeres
- b) contraction of microvilli
- c) contraction of zonular belts
- d) contraction of intermediate filaments
- e) beating of cilia

**21. Which of the following BEST describes loose connective tissue:**

- a) few cells, little ground substance, many fibers
- b) few cells, abundant ground substance, many fibers
- c) many cells, abundant ground substance, many fibers
- d) many cells, abundant ground substance, few fibers
- e) many cells, little ground substance, few fibers

**22. Which of the following are fixed in connective tissue AND derived from hemopoietic stem cells:**

- a) fibroblasts
- b) pericytes
- c) adipocytes
- d) mast cells
- e) plasma cells

**23. Regarding exocrine glands, which of the following is FALSE:**

- a) serous alveoli bind eosin
- b) mucous alveoli secrete proteoglycans
- c) connective tissue stroma is derived from mesoderm
- d) simple glands never have branching ducts
- e) compound glands always have serous and mucous alveoli

**24. When comparing bone and cartilage, which of the following is FALSE:**

- a) both are highly vascularized
- b) both are mesodermally-derived
- c) both have fibers in their extracellular matrix
- d) both have differentiated cells located in lacunar spaces
- e) both can have progenitor cells located in an outer connective tissue covering

**25. The territorial matrix of hyaline cartilage, which binds hematoxylin, is rich in:**

- a) lamin
- b) elastin
- c) proteoglycan
- d) rough ER
- e) calcium

**26. Which of the following BEST describes an osteoblast:**

- a) only present in compact bone
- b) breaks down hydroxyapatite
- c) deposits osteoid
- d) is a bone stem cell
- e) increases blood calcium levels when active

**27. Which of the following is NOT striated:**

- a) skeletal muscle cells
- b) cardiac muscle cells
- c) smooth muscle cells
- d) collagen type I fibers in dense regular connective tissue
- e) collagen type I fibers in dense irregular connective tissue

**28. Which of the following BEST describes what happens when a skeletal myofiber contracts:**

- a) sarcomeres shorten
- b) thick filaments shorten
- c) thin filaments shorten
- d) troponin binds ATP
- e) tropomyosin binds calcium

**29. Which of the following are NOT found in cardiac muscle myofibers:**

- a) adherens junctions
- b) gap junctions
- c) t-tubules
- d) dense bodies
- e) intercalated discs

**30. Regarding the nervous system, which of the following is FALSE:**

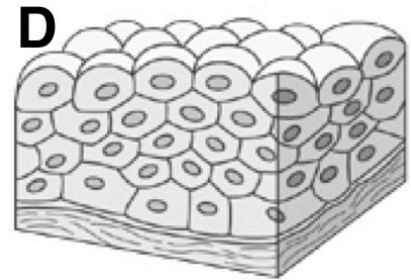
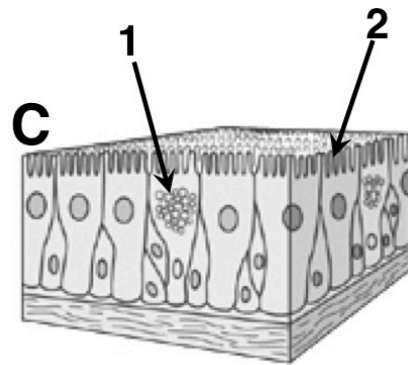
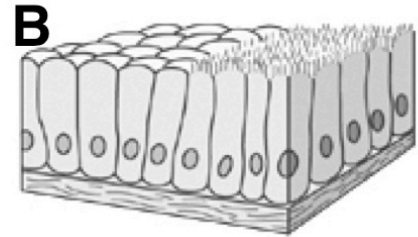
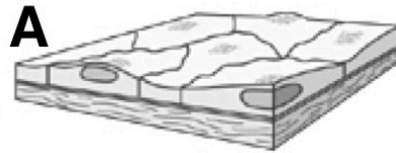
- a) preganglionic sympathetic motor neurons originate in the thoracic segments of the spinal cord
- b) somatic motor neurons originate in the ventral portion of the spinal cord
- c) autonomic motor neurons initiate voluntary contraction of skeletal muscle cells
- d) sensory nerves carry afferent information from the periphery to the central nervous system
- e) grey matter in the central nervous system contains neuronal cell bodies

**31. Regarding neurons, which of the following is CORRECT:**

- a) dendrites contain nucleoli
- b) dendrites conduct impulses away from the cell body
- c) cell bodies have no synapses
- d) axons contain microtubules
- e) axons conduct impulses towards the cell body

**32. Which of the following initiates the fusion of neurotransmitter-containing vesicles with the plasma membrane at the pre-synaptic axon terminal:**

- a) rough endoplasmic reticulum
- b) smooth endoplasmic reticulum
- c) microtubular motor proteins
- d) SNARE proteins
- e) botox

#33-#40 SHORT ANSWERS: WRITE THE CORRECT ANSWER DIRECTLY ON THE EXAM**Fig 01: Epithelia**

**33. In Fig 1, which lettered epithelium is pseudostratified:**

(write the letter)  C

**34. In Fig 1, which lettered epithelium contains cells that do NOT have hemidesmosomes:**

(write the letter)  D

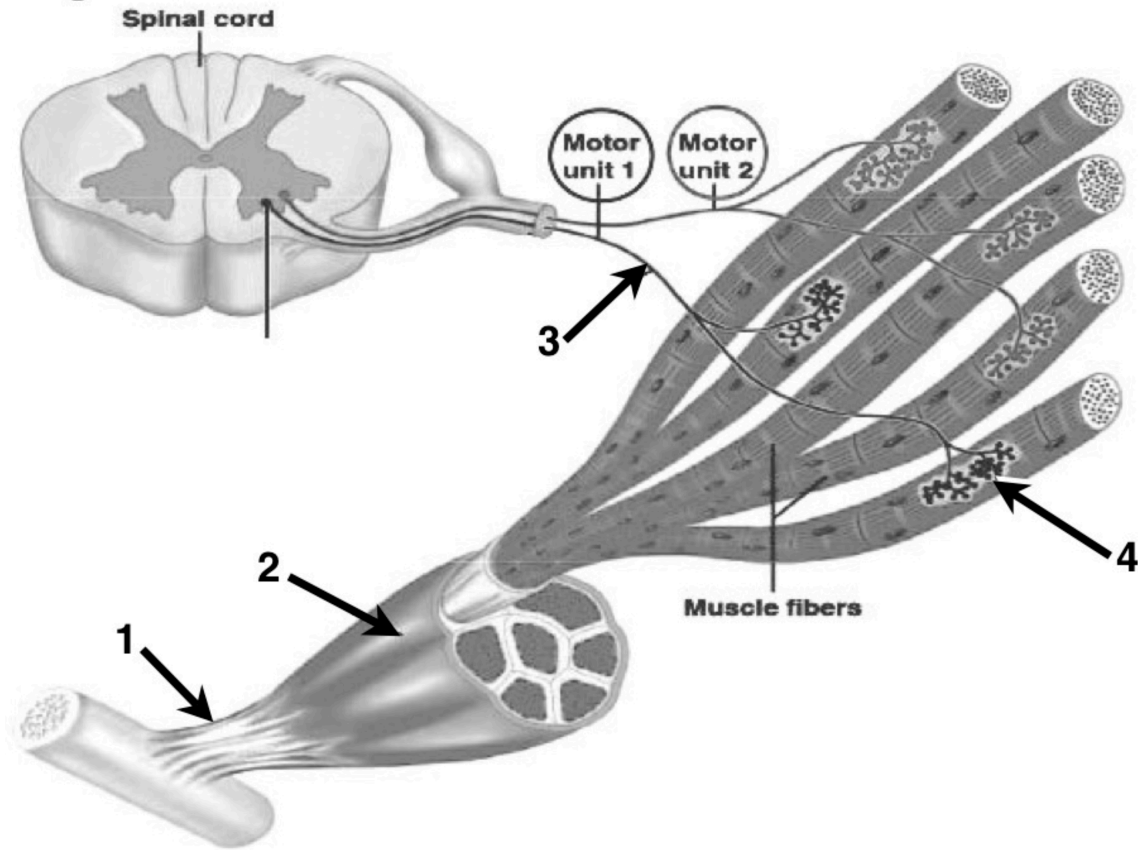
**35. From a polarity point of view, what is the directionality of the secretory machinery in the cell labelled #1 in Fig. 1:**

(write polarized direction of secretion)  Apical

**36. In Fig 1, what is the name of the cellular specializations labelled #2 if they contain bundles of actin filaments in their cores:**

(write the name of the specializations)  Cilia

*End of questions from Fig 1; Proceed to Fig 2*

**Fig 2: Skeletal Muscle Motor Unit**

37. In Fig 2, what is the name of the major ECM fiber found in structure #1, which consists of a type of connective tissue that connects skeletal muscle to bone:

(name the ECM fiber type) Collagen Type 1

38. In Fig 2, what is the name of the connective tissue covering that is structure #2 (note: it surrounds the entire muscle):

(name the specific muscle covering) Epimysium

39. In Fig 2, what portion of the motor neuron is represented by structure #3:

(name the portion of the neuron) Axon

40. What does Botox inhibit when an action potential arrives at structure #4 in Fig 2:

(what is inhibited) Ach vesicle release