

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

1. Which of the following is a component of tissues:

- a) cells
- b) extracellular ground substance
- c) extracellular fibers
- d) all of the above
- e) none of the above

2. Which of the following are stained by hematoxylin:

- a) ribosomes
- b) ribosomal proteins
- c) signal peptidases in the membranes of the endoplasmic reticulum
- d) all of the above
- e) none of the above

3. Normally, which of the following are totipotent:

- a) mesenchymal stem cells
- b) hematopoietic stem cells
- c) embryoblast stem cells
- d) all of the above
- e) none of the above

4. Which of the following is a maternal component of the placenta:

- a) extraembryonic mesoderm
- b) cytotrophoblast
- c) syncytiotrophoblast
- d) all of the above
- e) none of the above

5. Which of the following induces neural tube formation:

- a) the notochord
- b) the neural crest
- c) the somites
- d) all of the above
- e) none of the above

6. Which of the following is an integral membrane protein:

- a) G-alpha protein
- b) G-protein coupled receptor
- c) neurotransmitter that binds to a G-protein coupled receptor
- d) hormone that binds a G-protein coupled receptor
- e) cAMP

7. Which of the following is NOT initiated by the unfolded protein response:

- a) removal of misfolded protein from the ER
- b) destruction of misfolded protein by lysosomes
- c) increased expression of chaperone proteins
- d) transit through cell cycle checkpoints
- e) apoptosis

8. Which of the following is most responsible for sorting proteins that will be inserted into the plasmamembrane:

- a) endoplasmic reticulum/Golgi intermediate compartment (ERGIC)
- b) trans Golgi network (TGN)
- c) trans face of the Golgi
- d) medial face of the Golgi
- e) cis face of the Golgi

9. When blood calcium levels are high, which of the following initiates the secretion of the protein hormone calcitonin by facilitating the fusion of calcitonin-containing vesicles with the plasmamembrane of thyroid epithelial cells:

- a) SNARE proteins
- b) coat proteins
- c) mannose-6-phosphate
- d) hydrolysis of GTP
- e) botox

10. In the late endosome, which of the following causes the release of the mannose-6-phosphate receptor from lysosomal enzyme:

- a) clathrin coating
- b) clathrin uncoating
- c) high pH
- d) low pH
- e) dephosphorylation of the lysosomal enzyme

11. Which of the following is a characteristic of lipid transfer proteins:

- a) initiate vesicle budding
- b) insert themselves into acceptor membranes
- c) extract lipid from donor membranes
- d) require ATP for function
- e) are insoluble in the cytoplasm

12. Regarding the cytoskeleton, which of the following is CORRECT:

- a) microtubules have the smallest diameter of the three major cytoskeletal elements
- b) actin filaments consist of overlapping protein rods
- c) intermediate filaments are formed from globular monomers
- d) microtubules are a major cytoskeletal component of microvilli
- e) intermediate filaments are found in the cytoplasm and the nucleus

13. Regarding the transition from the G1 to the S phase of the cell cycle, which of the following is CORRECT:

- a) stimulated by DNA damage
- b) inhibited by p53 activation
- c) induces apoptosis
- d) prevents DNA replication
- e) part of mitosis

14. Regarding cell junctions, which of the following is FALSE:

- a) adherens junctions control diffusion of solutes between cells
- b) desmosomes are anchoring junctions
- c) tight junctions contain occludins and claudins
- d) gap junctions are communicating junctions
- e) hemidesmosomes are cell-ECM junctions

15. Which of the following are NOT found in the lateral membrane domains of cells that make up a simple columnar epithelium:

- a) adherens junctions
- b) desmosomes
- c) tight junctions
- d) gap junctions
- e) hemidesmosomes

16. Which of the following facilitates cis-homodimer formation by cadherins:

- a) integrins
- b) catenins
- c) calcium
- d) actin
- e) trans-binding

17. Which of the following is NOT part of the ground substance of connective tissue ECM:

- a) hyaluronic acid
- b) glycosaminoglycans
- c) proteoglycans
- d) glycoproteins
- e) collagens

18. Where are the extracellular domains of integrins located in the basal lamina:

- a) lamina lucida
- b) lamina densa
- c) lamina reticularis
- d) lamina propria
- e) cilia

19. Regarding epithelia, which of the following is FALSE:

- a) have a high cell/ECM ratio
- b) can be one or more cell layers thick
- c) are highly vascularized
- d) form surface linings in the body
- e) form the parenchyma of exocrine glands

20. Which of the following BEST describes the cells that make up a simple squamous epithelium:

- a) cube-like cells
- b) tall and column-like cells
- c) thin and flat cells
- d) multinucleate cells
- e) cells without polarity

21. Which of the following is CORRECT:

- a) antibody-producing cells are fixed in the connective tissue
- b) loose connective tissue has little ground substance
- c) dense connective tissue has few fibers
- d) reticular connective tissue contains collagen
- e) the cytoplasm of adipocytes stains intensely with eosin

22. When comparing cartilage and bone, which of the following is CORRECT:

- a) only cartilage has a prominent ECM
- b) only bone contains collagen
- c) only cartilage is mineralized
- d) only bone is vascularized
- e) only cartilage contains resorptive cells

23. Which of the following is found in hyaline cartilage, but is NOT found in fibrocartilage:

- a) perichondrium
- b) collagen
- c) lacunae
- d) proteoglycans
- e) glycosaminoglycans

24. Which of the following is NOT found in spongy bone:

- a) osteoprogenitor cells
- b) osteoblasts
- c) osteoclasts
- d) osteocytes
- e) osteons

25. Regarding muscle cells, which of the following is CORRECT:

- a) all types are contractile
- b) all types contract voluntarily
- c) all types contain sarcomeres
- d) all types are derived from ectoderm
- e) all types are mononucleate

26. Regarding skeletal muscle, which of the following is CORRECT:

- a) epimysium binds to dystroglycan complexes
- b) perimysium contains no collagen
- c) endomysium is dense connective tissue
- d) basal lamina surrounds individual myofibers
- e) myofibrils are multinucleate

27. In a skeletal muscle myofiber, which of the following is a major site of ER junctions:

- a) myotendinous junction
- b) neuromuscular junction
- c) dystroglycan complex
- d) triad
- e) nucleolus

28. Which of the following BEST describes what happens when a cardiomyocyte contracts:

- a) thin filaments shorten
- b) thick filaments shorten
- c) sarcomeres shorten
- d) intercalated discs shorten
- e) tropomyosin proteins shorten

29. Which of the following are NOT found in smooth muscle cells:

- a) actin
- b) myosin
- c) t-tubules
- d) dense bodies
- e) gap junctions

30. Which of the following is part of the peripheral nervous system:

- a) autonomic ganglia
- b) cortical gyri
- c) cortical sulci
- d) spinal white matter
- e) spinal grey matter

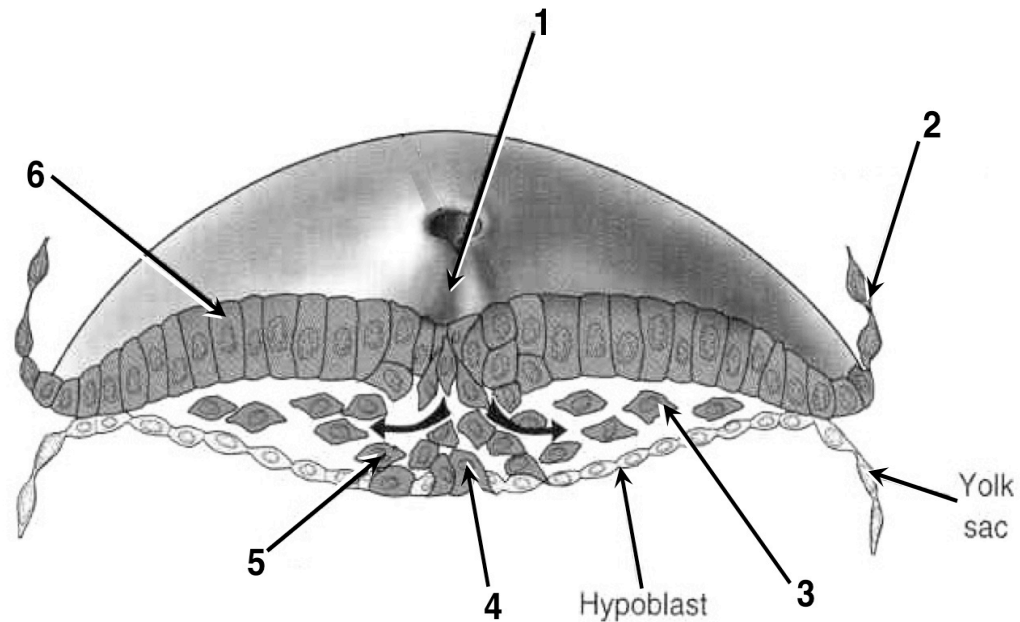
31. Which of the following are NOT located in the soma (i.e. the cell bodies) of neurons:

- a) nuclei
- b) dendrites
- c) Golgi
- d) smooth endoplasmic reticulum
- e) Nissl substance

32. Which of the following is most prominent in the pre-synaptic terminal of an axodendritic synapse:

- a) myelin
- b) neurotransmitter receptors
- c) neurotransmitter-containing vesicles
- d) neuronal cell bodies
- e) dendrites

End of Multiple Choice Questions; Proceed to Short Answer Questions

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

33. In Fig 1, which numbered structure is part of the amnion:

(write the number of the structure) _____

34. In Fig 1, what is the name of the structure labelled #1:

(write the name of the structure) _____

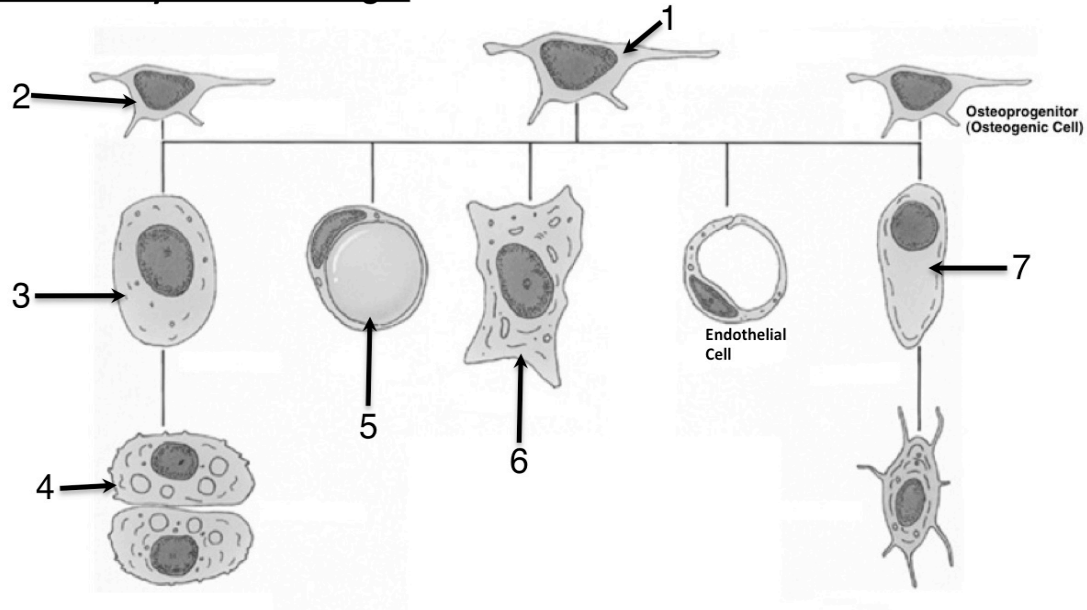
35. In Fig 1, the cell labelled #3 expresses the transcription factor 'slug'. What is a function of 'slug' in this cell.

(write the function) _____

36. In Fig 1, when gastrulation is complete which primary germ layer will the cell labelled #4 contribute to:

(write the name of the primary germ layer) _____

End of questions from Fig 1; Proceed to Fig 2

Fig 02: Mesenchymal Cell Lineages

37. In Fig 2, which numbered cell is a lineage-restricted stem cell:

(write the number) _____

38. In Fig 2, which numbered cell is most like a pericyte:

(write the number) _____

39. In Fig 2, which numbered cell is located in a lacuna:

(write the number) _____

40. In Fig 2, cell #6 is the major producer of the fibers that predominate in dense irregular connective tissue. What is the name of this cell:

(write the name of the cell) _____

End of Exam