#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

Looking for 'C', but slight amiguity as it could be argued that embryoblast is not completely totipoent. Therefore added 'E' also.

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

Looking for 'A', but slight ambiguity as it could be argued that notochord induces neural plate formation. Therefore, added 'E' also.

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

Looking for 'C'; however some ambiguity because the question did not state 'functional cis-homodimer'. Therefore, accepted all answers (ie. a free mark)

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

Looking for 'D', but slight ambiguity because 'A' does not say 'all' antibody-producing cells. Therefore, accepted 'A' and 'D'.

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

Note: For students who wrote exam at Access & Diversity we allowed all of A to E given the typo that was not corrected as it was in IRC-2 and IRC-4.

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

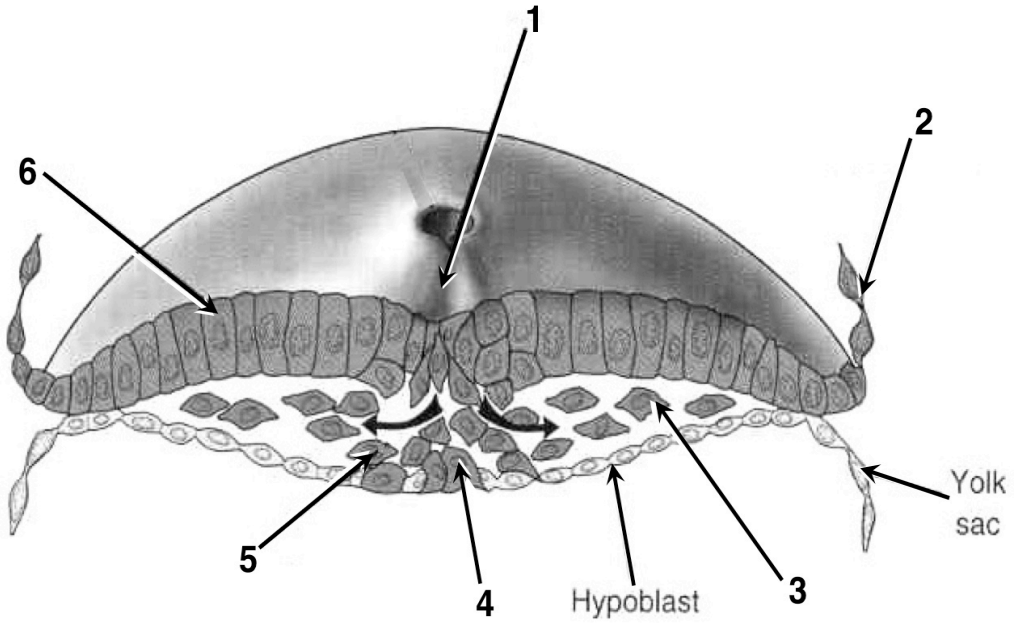
31. Which of the following are NOT located in the soma (i.e. the cell bodies) of neurons:
a) nuclei
b) dendrites
c) Golgi
d) smooth endoplasmic reticulum
e) Nissl substance

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) **2**

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

(write the name of the structure) **Primitive Streak, Groove, or Node**

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

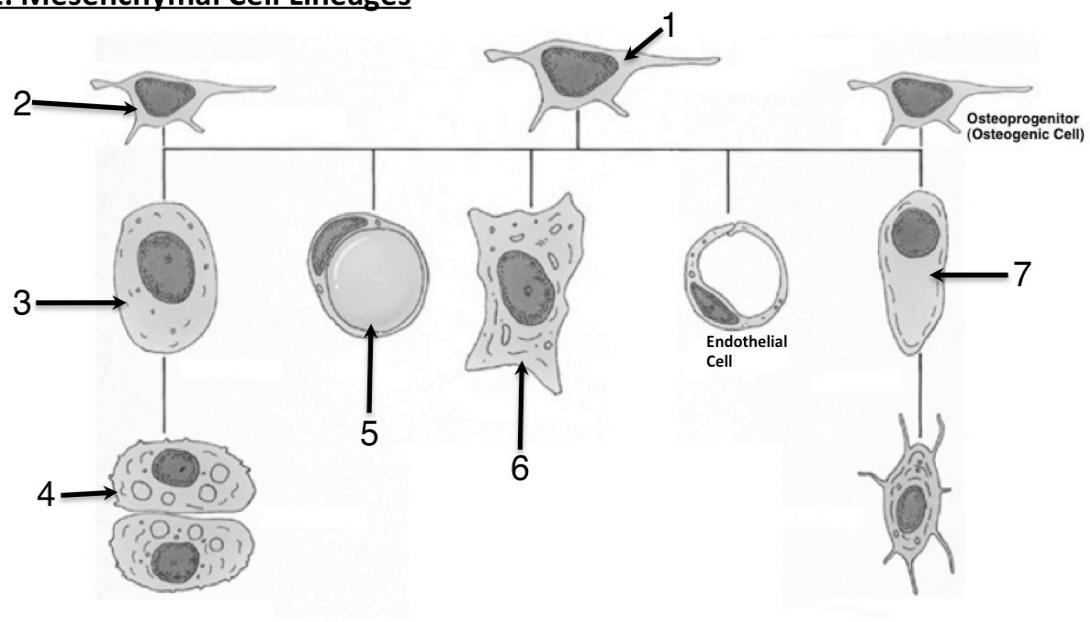
(write the function) **Decrease E-cadherin or adherens junctions, or cell-cell junctions, or adhesion between cells, or induce epithelial to mesenchymal transformation (EMT)**

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) **Endoderm**

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) **2**

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

(write the number) **1**

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

(write the number) **4**

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) **Fibroblast or Fibrocyte**

End of Exam