

YR 1 HISTOLOGY/EMBRYOLOGY UNIT EXAM 1 -- September 05, 1997.

QUESTIONS 1-24 ARE TO BE ANSWERED IN CONJUNCTION WITH SLIDES TO BE PROJECTED DURING THE EXAMINATION.

1. The eosinophilic material indicated here is the:
 - A. Perineurium
 - B. Dura mater
 - C. Basal(external)lamina(of the cells it encloses)
 - D. Perimysium
 - E. Perichondrium
2. Identify:
 - A. Dense regular connective tissue
 - B. Mesenchyme
 - C. Loose (areolar) connective tissue
 - D. Hyaline cartilage
 - E. Dense irregular connective tissue
3. The predominant organelles in this tissue section are:
 - A. Rough endoplasmic reticulum and polysomes
 - B. Golgi apparatus and secondary lysosomes
 - C. Smooth endoplasmic reticulum and mitochondria
 - D. Mitochondria and polysomes
 - E. Primary lysosomes and secondary lysosomes
4. Identify:
 - A. Loose (areolar) connective tissue
 - B. Hyaline cartilage
 - C. Lamellar bone
 - D. Elastic cartilage
 - E. Calcified cartilage

5. The structure indicated by the pointer could be identified as all of the following EXCEPT:
- A. Transmembrane protein
 - B. Membrane transport protein
 - C. Peripheral membrane protein
 - D. Membrane receptor protein
 - E. Integral membrane protein
6. This blood vessel was stained with the Verhoeff method. Identify the vessel.
- A. Muscular artery
 - B. Vena cava
 - C. Arteriole
 - D. Muscular venule
 - E. Continuous capillary
7. All of the following are TRUE of this region of the nucleus EXCEPT:
- A. DNA is complexed to H1 histones to form 30nm strands
 - B. 45S rRNA precursors are processed into three subunits
 - C. The material in this region is attached to the nuclear lamina
 - D. Represents the transcriptionally inactive form of chromatin
 - E. Can be visualized by light microscopy due to its strong basophilia

8. Identify the cell indicated with its product:
- A. Mast cell - histamine
 - B. Fibroblast - collagen
 - C. Chondrocyte - glycosaminoglycans
 - D. Plasma cell - antibody
 - E. Osteoprogenitor cell - osteoid
9. This cell type possesses all of the following EXCEPT:
- A. A sarcoplasmic reticulum
 - B. Alpha-actinin
 - C. Keratin intermediate filaments
 - D. Desmosomes
 - E. An external (basal) lamina
10. The epithelial type shown is:
- A. Stratified columnar
 - B. Simple cuboidal
 - C. Stratified squamous, non-keratinized
 - D. Pseudostratified ciliated columnar
 - E. Ciliated columnar
11. All are TRUE of the cell shown EXCEPT:
- A. It is a polymorphonuclear neutrophilic leukocyte
 - B. It contains numerous neutrophilic granules as well as fewer azurophil granules
 - C. It is the most numerous of the blood leukocytes counted in a normal differential leukocyte count
 - D. Granules contain major basic protein and other proteins related to control of parasitic infections and dampening of an allergic response, respectively.
 - E. It is classified as a granulocyte because it possesses specific granules and a lobated nucleus.

12. The structures indicated are components of:
- A. Cell cytoskeleton
 - B. Nuclear pore complex
 - C. Lipid droplets
 - D. Endoplasmic reticulum
 - E. Secondary lysosomes
13. The region indicated by "5" in this slide is the:
- A. Sarcoplasm reticulum
 - B. Transverse-(T-tubule)
 - C. Sarcomere
 - D. The A-band
 - E. The I-band
14. All of the following statements are TRUE of the cells shown, EXCEPT:
- A. Upon activation, they will deposit non-calcified bone matrix on the surface of a bone spicule.
 - B. They contain lysosomal (acid pH optimum) enzymes which function outside of the cell.
 - C. They may exhibit a region called the "ruffled border" by transmission EM.
 - D. They are often located in bony depressions called Howship's lacunae.
 - E. They are down-regulated by the hormone calcitonin.
15. This slide illustrates the epithelium of:
- A. A moist (mucosa) organ such as the esophagus
 - B. An elastic blood vessel such as the aorta
 - C. A region of thin skin such as the scalp
 - D. A muscular (conducting) artery
 - E. A region of thick skin such as the palm of the hand

16. This electron micrograph shows/contains all of the following EXCEPT:
- A. Endothelial cell
 - B. Erythrocyte
 - C. Fenestrae
 - D. Smooth muscle cells
 - E. Pinocytotic vesicles
17. The tissue illustrated here is typically characterized by:
- A. Selective communication with its neighbors via gap junctions
 - B. Voluntary contraction
 - C. Synthesis of extracellular fibrils possessing 64 - 67 nm periodicity.
 - D. Forming concentric layers around tubular organs
 - E. Membrane specializations where neighboring cells meet
18. All of the following are TRUE about the cells shown, EXCEPT:
- A. They undergo degranulation resulting in edema and rapid local swelling
 - B. Following degranulation, release of other factors such as slow reacting substance of anaphylaxis occurs and enhances the effects of histamine.
 - C. Receptors for immunoglobulin E (IgE) are numerous on the plasma membrane of these cells.
 - D. Allergens form complexes with surface immunoglobulins which result in altered membrane permeability and calcium ion influx.
 - E. The precursor of these cells are in the blood where they are called a basophilic leukocyte

19. Identify the epithelial lining:
- A. Stratified cuboidal
 - B. Simple columnar
 - C. Stratified squamous, non-keratinized
 - D. Simple, squamous, non-keratinized
 - E. Pseudostratified cuboidal with cilia
20. The cell which produced the electron-dense material indicated is a:
- A. Basophil
 - B. Eosinophil
 - C. Macrophage
 - D. Mast cell
 - E. Schwann cell
21. Identify this integumental structure:
- A. Papilla
 - B. Medulla
 - C. Epidermal peg
 - D. Arrector pili muscle
 - E. Sebaceous gland
22. All are TRUE of this cell EXCEPT:
- A. It is an agranulocyte, exhibiting many non-specific granules which contain acid hydrolytic enzymes
 - B. It is a monocyte
 - C. It is a cell whose function is wholly outside of the peripheral blood in the connective tissues
 - D. It is the precursor of the macrophage
 - E. It is a cell that is increased in number primarily in allergic reactions

23. The large basophilic cells shown here:
- A. Contain histamine and heparin in their specific granules
 - B. Are specialized cardiac muscle cells
 - C. Send axons to smooth muscle cells or glands
 - D. Are laying down nonmineralized bone matrix
 - E. Are producing antibodies such as IgG and IgE
24. All are TRUE about the structures shown, EXCEPT:
- A. Fibers are flexible, with great resistance to pulling force
 - B. Fibers are composed of microfibrils and elastin
 - C. They exhibit a periodicity of about 67 nm
 - D. In stained histological section, fibers are acidophilic
 - E. The most ubiquitous is Type 1

THE END OF SLIDE PORTION OF THE EXAMINATION

25. All of the following are TRUE regarding myelin EXCEPT:
- A. It is produced by oligodendrocytes in the central nervous system.
 - B. It is a spiral of plasma membrane produced by the myelinating cell.
 - C. It is responsible for the physical appearance of the white matter.
 - D. Its tight wrapping is produced by the homophilic binding of integral membrane proteins.
 - E. It is more likely to be found around very small (<1 μ m) than very large (>10 μ m) axons

26. All of the following are TRUE of platelets, EXCEPT:
- A. They contain both azurophil and very dense granules which release factors which contribute to clotting and reduction of local blood flow.
 - B. They release platelet derived growth factor (PDGF) which stimulates wound healing.
 - C. Normally platelets number between 200,000 - 400,000 per cubic mm of blood.
 - D. The hyalomere contains a high concentration of intermediate filaments.
 - E. The surface of each is coated with a glycocalyx accounting for their tendency to clump together in a peripheral blood smear.
27. With regard to cartilage, which is FALSE?
- A. In general, cartilage has the capacity for rapid growth while maintaining stiffness for the embryo.
 - B. Growth occurs from within (interstitial) as well as at the surface (appositional).
 - C. In the matrix of hyaline cartilage, a prominent fibrillar appearance is characteristic in the light microscope.
 - D. In elastic cartilage, the interstitial (matrix) substance exhibits frequently branching fibers in the light microscope.
 - E. In fibrocartilage, a perichondrium is often absent.
28. Which of the following is a characteristic of smooth muscle NOT shared by cardiac muscle?
- A. Centrally located nuclei
 - B. Activation of myosin by a light chain kinase
 - C. Bundles of actin filaments are anchored by alpha actinin
 - D. Many organelles are located adjacent to the nucleus
 - E. Surrounded by an external (basal) lamina

29. Which type of filament is anchored to the zonula occludens of a junctional complex?
- A. Neurofilaments
 - B. Intermediate filaments
 - C. Microtubules
 - D. Myosin filaments
 - E. None of the above
30. All of the following are TRUE regarding a junctional complex, EXCEPT:
- A. It is composed of a zonula occludens, zonula adherens and a macula adherens.
 - B. Freeze fracture techniques reveal branching rows of intramembranous particles which make up the zonula adherens.
 - C. Cadherins extend into the 20 nm extracellular space of the zonula adherens.
 - D. Actin filaments are linked to the zonula adherens.
 - E. The macula adherens is linked to intermediate filaments (10 nm) by way of a plaque protein such as desmoplakin.
31. Which of the following is TRUE regarding an erythrocyte (Rbc)?
- A. Contains an anion transport protein, spectrin, which functions in CO₂/O₂ gas exchange.
 - B. Band III, a peripheral intermediate filament-binding protein, is a major cytoskeletal element responsible for Rbc shape changes.
 - C. All of the hemoglobin molecule of the Rbc is reutilized upon Rbc degradation.
 - D. An immature Rbc is called a reticulocyte. It can be demonstrated (stained) using vital dyes which stain ribonucleoprotein.
 - E. Contains many azurophil granules which are masked by the protein hemoglobin.

32. All of the following are TRUE regarding protein translation EXCEPT:
- A. Proteins synthesized at the rough endoplasmic reticulum initially contain an amino terminal signal peptide.
 - B. Ribosome assembly begins in the nucleolus but is completed in the cytoplasm.
 - C. The signal recognition particle (SRP), like ribosomes, is composed of RNA and proteins.
 - D. The outer nuclear membrane is associated with ribosomes and is a site of protein synthesis
 - E. The proteins that are translated on free polysomes are released from the cell in secretory granules.
33. All of the following statements are TRUE of bone, EXCEPT:
- A. An osteocyte is an osteoblast that has been surrounded by bone matrix.
 - B. Bone mineral is composed principally of calcium phosphate, similar to the mineral hydroxyapatite.
 - C. Osteocytes are completely isolated from each other in lamellar bone.
 - D. In mature, lamellar bone, collagen fibrils within lamellae are highly ordered.
 - E. Osteoblasts with well-developed Golgi and intense basophilia elaborate bone matrix or osteoid.
34. Choose the INCORRECT statement regarding the Golgi complex:
- A. Morphologically, the Golgi complex appears as stacks of smooth-surfaced cisternae and vesicles
 - B. The trans-Golgi network contains receptors for mannose-6-phosphate, which function to recognize lysosomal proteins
 - C. Proteins which will ultimately be secreted from the cell typically pass through the Golgi complex
 - D. The different regions of the Golgi complex are biochemically distinct
 - E. The Golgi complex contains enzymes which degrade potentially harmful hydrogen peroxide to water

35. All of the following are TRUE of the skin, EXCEPT:
- A. Its very vascularized dermis supports the avascular epidermis both physically and metabolically
 - B. Its classification into thin or thick skin is based on the combined thickness of the epidermis plus the dermis
 - C. Deep epidermal pegs anchored on the matching dermal papilla prevent the separation of the epidermis during strong angular pressure
 - D. There are more cells in the stratum spinosum than in the stratum basale
 - E. Keratohyalin granules combine with tonofilaments to form soft keratin
36. Which of the following is TRUE about elastic fibers?
- A. They are stained selectively by silver stain.
 - B. They contain significant amounts of hydroxyproline and hydroxylysine.
 - C. They are composed of a fibrillar and an amorphous component.
 - D. They are formed by the intracellular polymerization of tropocollagen molecules.
 - E. The elaboration of elastic fibers by fibroblasts utilizes different synthetic pathways than those used for collagen synthesis.
37. Glands are classified as either simple or compound depending upon which of the following?
- A. Whether or not the intralobular duct modifies the secretory product.
 - B. Whether the shape of the secretory units are tubular, pear-shaped, or form a demilune.
 - C. Whether either mucous or serous secretions are constitutively produced.
 - D. If a merocrine mode of secretion is used
 - E. If the duct system is unbranched or branched

38. Regarding blood vessels, the relationship between structure and function is TRUE in all of the following EXCEPT:
- A. Vasa vasorum in the tunica adventitia of the vena cava function to provide the vessel wall with oxygen.
 - B. Valves function to prevent the backflow of blood in medium-type arteries that carry blood against gravity.
 - C. The elastic lamellae in the tunica media of the aorta function in the maintenance of blood pressure between heart contractions.
 - D. The "loose" nature of endothelial cell junctions in postcapillary venules functions in the movement of white blood cells out of the vessel.
 - E. Myoendothelial cell junctions in arterioles function in the autoregulation of the diameter of vessel.
39. Choose the INCORRECTLY matched pair regarding the trafficking of molecules between cell cytoplasm and extracellular space:
- A. Receptor mediated endocytosis - clathrin coated pit
 - B. Exocytosis - defined as regulated or continuous
 - C. Transcytosis - movement through endothelial cells of blood vessels
 - D. Fluid-phase endocytosis - selective uptake of protein ligands
 - E. Phagocytosis - ingestion of large particles such as bacteria

40. All of the following are TRUE regarding the synthesis and assembly of mature collagen fibers, EXCEPT:
- A. Procollagen is synthesized by a routine process (i.e., signal sequence involved) typical for a protein which will be exported from the cell.
 - B. Procollagen molecules require no further processing to polymerize into collagen fibers extracellularly.
 - C. Procollagen is released by merocrine secretion.
 - D. Collagen molecules are enriched for both hydroxyproline and hydroxylysine.
 - E. Although fibroblasts are the typical cell for synthesis of collagen fibers, some other cells are similarly capable.
41. A researcher has developed a method to follow the movement of acid hydrolases in a cell from the point of their translation to their final destination. The researcher initially detects the acid hydrolases within the rough endoplasmic reticulum. Within which organelle would you next expect to see the acid hydrolases?
- A. Endocytotic vesicles
 - B. Primary lysosomes
 - C. Peroxisomes
 - D. Golgi complex
 - E. Secretory granules
42. All of the following would be found in the matrix space (inner compartment) of mitochondria EXCEPT:
- A. Elementary particles
 - B. Mitochondrial DNA
 - C. Calcium-containing granules
 - D. Mitochondrial ribosomes
 - E. Porin

43. All of the following are TRUE of the integumentary glands, EXCEPT:
- A. Both merocrine and apocrine sweat glands are under sympathetic control.
 - B. Sebaceous gland ducts coil as they pass through the epidermis.
 - C. Urea and other waste metabolic products are normal components of sweat.
 - D. The main component of sebum is secreted in a merocrine fashion.
 - E. Merocrine sweat glands are simple coiled tubular glands.
44. All of the following are TRUE concerning the extracellular matrix (ECM) EXCEPT:
- A. The ECM of loose or areolar connective tissues is synthesized principally by fibroblasts.
 - B. Hyaluronic acid, which is a non-sulfated glycosaminoglycan, is largely responsible for the consistency of the ECM and is associated with proteoglycan molecules by link proteins.
 - C. The ECM provides a mechanism allowing nutrients and waste to transit between blood and cells of the body.
 - D. The supportive properties of connective tissues are largely dependent upon the ECM.
 - E. Proteoglycans of the ECM are polycations and can be stained with anionic reagents.
45. During striated muscle contraction:
- A. The concentration of calcium ions in the myofibril is lower than in the relaxed state.
 - B. The globular heads of the actin molecules rotate to produce a "power stroke"
 - C. The Z-lines get farther apart.
 - D. Titin molecules become compressed.
 - E. The A-band gets narrower.

46. The smooth endoplasmic reticulum is necessary for all of the following cellular functions EXCEPT:
- A. Formation of the mitotic spindle
 - B. Detoxification of lipid soluble drugs
 - C. Storage of calcium ions
 - D. Synthesis of steroid hormones
 - E. Synthesis of membrane lipoproteins
47. Choose the CORRECT statement regarding the capillary:
- A. Sinusoidal capillaries have an unusually thick and continuous basal lamina.
 - B. Capillaries are extremely sensitive to vasoactive agents such as histamine and serotonin.
 - C. Fenestrated capillaries are characterized by the presence of a continuous layer of endothelial cells.
 - D. Smooth muscle cells in the tunica media of capillaries function to control blood flow through capillary beds.
 - E. Of the different types of capillaries, continuous capillaries are most common in connective tissue and muscle.
48. Which of the following is a component of the basement membrane?
- A. Cytokeratin-10 nm filaments
 - B. Type II collagen
 - C. Laminin
 - D. Spectrin II
 - E. Myosin filaments

49. All of the following regarding the process of endochondral ossification are TRUE, EXCEPT:
- A. Longitudinal bone growth is terminated by closure of the epiphyseal plate.
 - B. Osteoblasts and osteoclasts, respectively, form and remodel bone formed by this process.
 - C. Chondrocytes undergo sequential stages of proliferation and hypertrophy.
 - D. Cartilage cells die following matrix thinning and calcification.
 - E. Following termination of endochondral ossification, the articulating surfaces of the bones acquire a layer of elastic cartilage.
50. In a peripheral blood smear, you observe a cell which is about 15 μ m in diameter whose nucleus is polymorphous and whose cytoplasm contains pale, light pink granules. What cell type do you think this might be?
- A. Monocyte
 - B. Lymphocyte
 - C. Neutrophil
 - D. Mast cell
 - E. Plasma cell

51. The part of this cell specializing in conducting the action potential is best indicated by:

A.

B.

C.

D.

E.

F.

52. All of the following are TRUE regarding the central nervous system (CNS) EXCEPT:
- A. The CNS is enclosed by epineurium
 - B. The ventricular system is lined by ependymal cells
 - C. Glial cells of the CNS include oligodendrocytes and astrocytes.
 - D. Neurons in the CNS may send axons to muscle cells in the limbs.
 - E. Collections of CNS neurons of similar morphology and function are called "nuclei".
53. VSNARES are most likely to be found at the structure marked:
- A.
 - B.
 - C.
 - D.
 - E.
 - F.
 - G.
 - H.