BI 189
Human Histology
Exam I, October 8, 2004

I. Multiple Choice  ____/ 50
II. Practical  ____/ 50
Total  ____/ 100
I. Multiple Choice.

Choose the best answer to each question. Fill in the appropriate circle per question number on the answer sheet. (One point each)

1. If you are looking at tissue with the compound light microscope, and you are using the 20x objective, the total magnification is:
   A. 2x.
   B. 20x.
   C. 200x.
   D. 2000x.
   E. Need more information to estimate the magnification.

2. A signal sequence of amino acids refers to
   A. A portion of the DNA.
   B. The sequence of reactions in signal transduction.
   C. A chain of amino acids that is eventually cleaved off the growing peptide, especially once firmly docked on the rER.
   D. The pathway of proteins through the ER and Golgi to secretory vesicles.
   E. Equivalent to the registration peptides in collagen synthesis.

3. In skeletal muscle, the ___________ surrounds
   A. A group of myofilaments.
   B. A group of myofibrils.
   C. A group of myofibers.
   D. A single myofiber.
   E. An entire muscle.

4. A patient returns from an excursion abroad and complains of malaise and gastrointestinal upset. Histological examination reveals unusually high quantity of cells containing Major Basic Protein. An likely explanation could be that the patient suffers from
   A. Viral infection.
   B. Parasitic worms.
   C. A pollen allergy.
   D. Anemia.
   E. Bacterial infection.

5. A mutation in the lysyl hydroxylase gene would result in clinical symptoms of connective tissue weakness due to a defect in
   A. Elastin.
   B. Keratin.
   C. Actin.
   D. Tropomyosin.
   E. Collagen.

6. An infant delivered prematurely after 30 weeks of gestation experiences respiratory distress. Each successive breath is more difficult. The reason for this is
   A. Capillary endothelial linings are not fully developed.
   B. Type II alveolar cells are not fully functional.
   C. Alveolar septa are not fully formed.
   D. Excess mucous is deposited into the alveoli.
   E. Elastin is not yet fully functional.
7. A biopsy of a section of the alveolar septum of a long-term smoker shows cells containing inhaled carbon particles. Which of the following cell types is most likely to contain these particles?

A. Clara cells.
B. Alveolar type I cells.
C. Alveolar type II cells.
D. Alveolar macrophages.
E. Goblet cells.

8. Rough ER can be described as

A. A stack of flatted saccules with cis and trans faces.
B. Site for synthesis of steroids.
C. An underdeveloped region in motor neurons' cell bodies.
D. Site for synthesis of proteins destined for secretion.
E. Intracellular membranous network made "rough" due integral proteins studding its surface.

9. Erythrocyte shape may be adversely affected by a change or defect in structure of

A. Hemoglobin.
B. Myeloperoxidase.
C. Ankyrin.
D. Major Basic Protein.
E. Rhesus factor.

10. Ectoderm, mesoderm, and endoderm

A. Are all sources of nerve tissue.
B. Are all sources of connective tissue.
C. Are all sources of epithelial tissue.
D. Are all sources of muscle tissue.
E. All of the above are true.

11. Purkinje cells

A. Are neural crest cell derivatives.
B. Are prominent features of cerebral cortex.
C. Are components of the sympathetic two-cell chain.
D. Have prominent features that distinguish them from tissue that surrounds them.
E. Are prominent structures in the anterior gray horns of the spinal cord.

12. The blood-brain barrier is maintained via contributions from

A. Arachnoid.
B. Choroid plexus.
C. Astrocytes.
D. Myelin.
E. Pia.

13. In epithelial tissue,

A. The various surfaces of each cell are functionally equivalent.
B. Cells represent an expanding, but non-renewing population.
C. Basal cells may be post-mitotic, while others at the surface are proliferative.
D. A vascular supply runs in between the individual cells.
E. Tumors may invade through the basal lamina.

14. Which of the following pairs is not correct?

A. Biconcavity: erythrocyte.
B. Adhering junctions: cardiac muscle.
C. Basal infoldings: fibroblasts.
D. Microvilli: epithelium.
E. T-tubules: skeletal muscle.
15. In patients with thrombocytopenia, blood levels of platelets are decreased and bleeding is common. The cell that must compensate by producing more platelets is found active in megakaryocyte.

A. Arteries and veins.
B. Spleen.
C. Bone marrow.
D. Capillaries.
E. Loose connective tissue.

16. A factory worker is exposed to a noxious gas leak and suffers lung damage. The source of cells that replenishes his damaged alveolar lining cells is

A. Alveolar macrophages.
B. Endothelial cells.
C. Ciliated cuboidal cells.
D. Alveolar type II cells.
E. Lymphocytes.

17. The calcium-binding protein of skeletal muscle is

A. Calmodulin.
B. Troponin.
C. Creatine kinase.
D. Actin.
E. Tropomyosin.

18. In a histological section through the ventral root of a spinal nerve, one sees

A. Fibers of sensory nerves only.
B. Fibers of exclusively non-autonomic motor nerves and supporting connective tissue.
C. Cytoplasmic extensions of mixed (motor and sensory) nerves.
D. Nerve cells that derive from neural crest tissue.
E. Fibers of motor nerves.

19. A patient shows up in your clinic complaining of fragile skin: blisters appear at the slightest touch. Histological examination of a skin biopsy reveals that at the sites of these blisters, the epithelium has completely lifted from the basement membrane, but is otherwise intact. If you were considering an auto-immune condition, to which kind of structures would you expect to find circulating antibodies from the patient?

A. Zonula adherens.
B. Zonula occludens.
C. Desmosomes.
D. Hemidesmosomes.
E. Intermediate filaments.

20. The area of the sarcomere that does not change in length during contraction is the

A. I band.
B. H band.
C. Distance between Z disks.
D. A band.
E. M line.
21. The special fluid that bathes central nervous system structures

- Flows in the space between the pia mater and the brain surface.
- Is secreted by cells with the morphology of simple epithelia.
- Enhances the speed of nervous tissue conduction in the CNS.
- Is a product of astrocytes that invest superficial brain capillaries.
- Comprises the physiological entity known as the blood-brain barrier.

22. In high altitude or hypoxic conditions, there would be an expected increase in the titers of

- Interleukins.
- Cerebral spinal fluid.
- Erythropoietin.
- Circulating antibodies.
- Granulocyte stimulating factor.

23. Smooth muscle cells

- Exhibit cross striations when viewed on longitudinal section.
- Are individual cells with tapered ends.
- Exhibit cross-striations when viewed on transverse section.
- Are slender syncytia that exhibit branching.
- Arise from somite cells that migrate to the walls of hollow organs.

24. Gap junctions

- Anchor epithelial cells to one another.
- Form the region of closest apposition of membranes, compared with other types of junctions.
- Feature channels that permit the passage of small molecules between cells.
- Make epithelial layers leaky, which is good in areas adapted for filtration.
- Are found only among cells with an epithelial configuration.

25. Megakaryocytes

- Reside in connective tissue proper.
- Circulate in vessels.
- Function in phagocytosis.
- Are enucleate.
- Are larger than monocytes.

26. Mast cells

- Produce and secrete antibodies in response to certain irritants.
- Store quantities of secretory products prior to cell stimulation and product release.
- Have eccentrically placed nuclei and basophilic cytoplasm.
- Migrate from connective tissue spaces to the bloodstream where they differentiate further.
- Derive from a blood cell precursor.
27. An orthochromatophilic erythroblast is more mature than a
A. Reticulocyte.
B. Platelet.
C. Howell Jolly body.
D. Hemocytoblast.
E. Erythrocyte.

28. A defect in the structure of the MAP dynein is associated with coughing and difficulty expelling mucous from the airways. This is because of
A. Accumulation of surfactant in the alveoli.
B. Reduction in smooth muscle contraction within the bronchi.
C. Impaired diaphragmatic contractions.
D. Abnormal ciliary motility.
E. Absence of cilia.

29. Which best describes the development of skeletal muscle?
A. A multinucleate cell forms by nuclear division, but not cytoplasmic division.
B. A multinucleate cell results from fusion of many single cells.
C. In adults, muscle mass increases by the addition of individual cells to the existing fiber.
D. Skeletal muscle develops from mesodermal precursor cells located at the site where the muscle will reside.
E. None of the above.

30. Invagination of surface ectodermal epithelial tissue accounts for
A. Formation of cilia.
B. Neural tube formation.
C. T-tubule formation.
D. Skeletal muscle development.
E. Formation of endocytotic vesicles.

31. Which is true of the choroid plexus?
A. It is a network of gross peripheral nerves.
B. It contains both nerve fibers and nerve cell bodies.
C. It contains vascularized tissue.
D. It is discontinuous with the ependyma.
E. It is a network of nerves that supply a particular peripheral area.

32. Epithelium of lung alveolar linings is well adapted for gas exchange. A reason for this is
A. It derives from ectoderm.
B. It is fortified by intercellular collagen.
C. It is stratified squamous.
D. It features gap junctions.
E. It is simple squamous.

33. The most common cells in dense regular connective tissue are
A. Macrophages.
B. Plasma cells.
C. Lymphocytes.
D. Fibroblasts.
E. Mast cells.

34. The presence of Howell Jolly bodies in the peripheral blood is indicative of defective development of
A. Neutrophils.
B. Basophils.
C. Mast cells.
D. Erythrocytes.
E. Platelets.
35. A patient presents with widespread vasodilation, lowered blood volume, and constriction of the small airways. Your diagnosis is anaphylactic shock. Which of the following cells is responsible for degranulating, and thus causing the symptoms?

A. Neutrophils.
B. Macrophages.
C. Mast cells.
D. Platelets.
E. Eosinophils.

36. Engulfing and digesting foreign material or debris is a function of

A. Oligodendrocytes.
B. Schwann cells.
C. Microglia.
D. Basophils.
E. Fat cells.

37. According to the model for cell membrane structure, integral proteins can migrate in the plane of the cell membrane. In an epithelial cell, however, their movement may be restricted to the apical area only. What structure is responsible for this limited movement?

A. Zonula adherens.
B. Macula adherens.
C. Microvilli.
D. Zonula occludens.
E. Intercalated disks.

38. The least numerous type of granulocyte in peripheral blood is the

A. Neutrophil.
B. Eosinophil.
C. Monocyte.
D. Basophil.
E. Mast cell.

39. A tumor may be classified by the identification of

A. Collagen.
B. Vimentin.
C. Myelin.
D. Laminin.
E. Hyaluronic acid.

40. Specialized cells that help coordination of contraction in ventricular myocardium are

A. Microglial cells.
B. Purkinje fibers.
C. Myoid progenitor cells in somites.
D. Astrocytes.
E. Pyramidal neurons.

41. The best evidence for the ectodermal epithelial origin of nervous system structures is seen in the arrangement of

A. Oligodendrocytes.
B. Ependyma.
C. Pia mater.
D. Astrocytes.
E. Dorsal root ganglia.

42. With respect to the cytoplasm, the nuclei of fat cells are situated in a position described as eccentric in the cell. The same can be said of

A. Cardiac muscle cells.
B. Mast cells.
C. Plasma cells.
D. Lymphocytes.
E. Simple squamous epithelial cells.
43. Cells that form a true syncytium are

A. Cardiac muscle cells.
B. Fibroblasts.
C. Plasma cells.
D. Skeletal muscle cells.
E. Adipocytes.

44. Adhering junctions

A. Comprise the Z bands of sarcomeres.
B. Comprise portions of intercalated disks in myocardial tissue.
C. Resist seepage of luminal materials into underlying connective tissue.
D. Form the basis of electrical coupling between adjacent cells.
E. Are a prominent feature of luminal cells in transitional epithelia.

45. Spreading artifact is most likely to occur at which step:

A. Fixation.
B. Embedding.
C. Sectioning.
D. Waterbath step.
E. Coverslip step.

46. Microvilli are most similar to

A. Flagella.
B. Cilia.
C. Stereocilia.
D. Villi.
E. Centrioles.

47. Regarding Z bands and intercalated disks,

A. They represent the same structure in cardiac muscle.
B. They both represent cellular sub-structure that can be resolved under the compound light microscope at 200x magnification.
C. The Z bands are points of insertion for actin filaments whereas intercalated disks bisect the A bands where myosin filaments predominate.
D. Intercalated disks are occluding junctions between myocardial cells whereas Z bands cause the dark banding pattern of striated muscle.
E. None of the above is true.

48. Which is true of mitochondria?

A. They can be seen with the compound light microscope at 200x magnification.
B. They function in the packaging and secretion of cellular products.
C. They are numerous in epithelia adapted to pose a minimal barrier for filtration and diffusion.
D. They are numerous in regions of cells engaged in active transport.
E. They can be described as a single-membrane-bound sac of enzymes.

49. Which is true of oligodendrocytes?

A. A single one can form myelinated sheaths around several PNS axons.
B. They are of blood cell origin.
C. They are of neural crest origin.
D. They are found in the CNS and PNS.
E. None of the above are true.

50. After exposure to a known antigen a patient experiences difficulty breathing. The airways subject to constriction due to smooth muscle contraction are

A. Primary bronchi.
B. Secondary bronchi.
C. Trachea.
D. Bronchioles.
E. Alveoli.
II. Practical.

(#51-90) Choose the best answer to each question associated with a plate. True/False questions are indicated (T/F); answer appropriately. (#91-100) Answer the questions associated with each station. (One point per answer)

PLATE 1

51. The tissue shown (between the arrowheads) is

A. Stratified epithelium.
B. Dense irregular connective tissue.
C. Smooth muscle.
D. Nerve ganglion.
E. Peripheral nerve.

52. (T/F) This tissue is best adapted for filtration.

A. True.
B. False.

53. (T/F) Cells at or near the blue arrowhead in this tissue are more likely to be mitotically active.

A. True.
B. False.

54. (T/F) The oldest cells would be found at the blue arrow.

A. True.
B. False.

55. (T/F) Cells at the red arrow will be sloughed off.

A. True.
B. False.

56. (T/F) Hemidesmosomes are found near the blue arrowhead.

A. True.
B. False.

PLATE 2

57. The area defined by the red arrowheads contain

A. Mostly nerve fibers.
B. Cerebral gray matter.
C. Cerebral white matter.
D. Schwann cells.
E. Ganglion nerve bodies.

58. The blue arrow indicates cells diagnostic of

A. Cerebrum.
B. Cerebellum.
C. Sympathetic ganglion.
D. Sensory nervous system function.
E. Dorsal root ganglion.
PLATE 3

59. The red arrows span

- An area of loose connective tissue.
- The basal lamina.
- Smooth muscle.
- An area derived from endoderm.
- An actively mitotic epithelium layer.

60. (T/F) The black arrow indicates a structural specialization that is a feature of the bladder lining.

- A. True.
- B. False.

61. (T/F) The black arrow indicates a structure that contains tubulin dimers organized in a predictable array.

- A. True.
- B. False.

62. (T/F) The black arrow indicates a specialization that requires ATP for function.

- A. True.
- B. False.

63. (T/F) Every cell in this lining tissue rests upon the basal lamina.

- A. True.
- B. False.

64. (T/F) The red arrows reside in an area derived from ectoderm.

- A. True.
- B. False.

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PLATE 4

65. The arrows are in the lumen of a

- A. Goblet cell.
- B. Terminal bronchiole.
- C. Fat cell.
- D. Gland.
- E. Respiratory bronchiole.

66. The area shown in the field exhibits this feature:

- A. Resistance to abrasion.
- B. Increased surface area.
- C. Secretion of cerebral spinal fluid.
- D. Glandular organization.
- E. High tensile strength.

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PLATE 5

67. Soon after its secretion, the substance provided by this structure will be found in the

- A. Bloodstream.
- B. Trachea.
- C. Stomach lumen.
- D. Subarachnoid space.
- E. Spleen.
PLATE 6

68. The fiber indicated (several red arrows) is rich in desmosine, and provides the tissue it resides in with:

A. Tensile strength.
B. Resistance to wear.
C. Elasticity.
D. Adhesion.
E. Waterproofing.

69. Cells that produce this fiber belong to the category:

A. Epithelium.
B. Nerve.
C. Muscle.
D. Neural crest cells.
E. Connective tissue.

PLATE 7

70. Identify which of the following cells is indicated by the red arrow.

A. Neuron.
B. Astrocyte.
C. Oligodendrocyte.
D. Microglia.
E. Schwann cell.

71. Identify which of the following cells is indicated by the blue arrow.

A. Neuron.
B. Astrocyte.
C. Oligodendrocyte.
D. Microglia.
E. Schwann cell.

72. Identify which of the following cells is indicated by the black arrow.

A. Neuron.
B. Astrocyte.
C. Oligodendrocyte.
D. Microglia.
E. Schwann cell.

73. Identify which of the following cells is indicated by the green arrow.

A. Neuron.
B. Astrocyte.
C. Oligodendrocyte.
D. Microglia.
E. Schwann cell.

PLATE 8

74. The tissue indicated (between the arrowheads) includes some connective tissue that surrounds:

A. Epithelium.
B. Muscle.
C. Nerve.
D. Loose connective tissue.
E. Dense connective tissue.

75. The field shown can be found in the

A. Gut.
B. Respiratory tract.
C. Skin.
D. Limb.
E. Heart.
PLATE 9

76. Identify which of the following cells is indicated by the black arrow.
   A. Plasma cell.
   B. Fibroblast.
   C. Goblet cell.
   D. Macrophage.
   E. Epithelial cell.

77. Identify which of the following cells is indicated by the red arrow.
   A. Plasma cell.
   B. Fibroblast.
   C. Goblet cell.
   D. Macrophage.
   E. Epithelial cell.

78. Identify which of the following cells is indicated by the green arrow.
   A. Plasma cell.
   B. Fibroblast.
   C. Goblet cell.
   D. Macrophage.
   E. Epithelial cell.

80. (T/F) The field shown contains derivatives of all three germ layers.
   A. True.
   B. False.

81. Identify which of the following descriptions is indicated by the red arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.

82. Identify which of the following descriptions is indicated by the blue arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.

83. Identify which of the following descriptions is indicated by the black arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.

PLATE 10

83. Identify which of the following descriptions is indicated by the black arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.

84. Identify which of the following descriptions is indicated by the red arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.

85. Identify which of the following descriptions is indicated by the blue arrow.
   A. Seals off areas.
   B. Generates ATP.
   C. Adapted for increased surface area.
   D. 9+2 structure.
   E. “Spot weld”.
PLATE 11

84. The arrowheads indicate

A. Cross striations.
B. Artifacts of fixation processing.
C. Areas that provide for intercellular communication and adhesion.
D. A and I bands of the sarcomere.
E. Fused basal laminae.

PLATE 12

85. Which description is best associated with the region indicated by the red arrow?

A. An area with laminin and collagen IV.
B. A site of frequent histamine release.
C. An area abundant with cadherins in the membrane.
D. A site of hematopoiesis.
E. Site where occluding junctions are expected.

86. Which description is best associated with the region indicated by the black arrow?

A. An area with laminin and collagen IV.
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E. Site where occluding junctions are expected.

PLATE 13

87. The black arrows span

A. A structure present in stem cells.
B. A structure present in mature erythrocytes.
C. An area containing ribosomes.
D. A structure containing cristae. mitochondria
E. A structure abundant in lysozyme.

88. The encircled area represents

A. A structure containing digestive enzymes.
B. A microtubule organizing center.
C. A secretory granule.
D. A region rich in Golgi membrane.
E. None of these.

PLATE 14

89. This field is from a dorsal root ganglion. The nerve cells' origin is

A. Endoderm.
B. Skin ectoderm.
C. Neural crest.
D. Mesoderm.
E. Notochord.

90. The splotchy pink material seen in the cytoplasm of the neurons represents

A. Golgi apparatus.
B. Microtubules.
C. Mitochondria.
D. Lysosomes.
E. Rough ER.
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## INDIVIDUAL SCORES REPORT

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**SUMMARY:**

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