Chapter 4: Histology: The Study of Tissues

I. Tissues and Histology

A. Tissues

1. Tissues are collections of __________ and the ____________________

2. The classification of tissue types is based on:
   a. ______________________________
   b. ______________________________
   c. ______________________________

3. Name the four primary tissue types:
   a. ______________________________
   b. ______________________________
   c. ______________________________
   d. ______________________________

4. The classification of epithelial and connective tissue is based on:
   a. ______________________________
   b. ______________________________
   c. ______________________________

5. The classification of muscle and nervous tissue is based on:
   a. ______________________________

B. Histology

1. What is histology? ______________________________________________

2. What is a biopsy? ______________________________________________

II. Embryonic Tissue

A. Endoderm

1. Considering position of the layers which layer is the endoderm? __________

2. Endoderm will form ______________________________________________

B. Mesoderm

1. Considering position of the layers which layer is the mesoderm? __________

2. Mesoderm will form ______________________________________________
C. Ectoderm
   1. Considering position of the layers which layer is the ectoderm? ___________
   2. Ectoderm will form ______________________________________________________

III. Epithelial Tissue
   A. General Characteristics of Epithelium
      1. Epithelium is composed mostly of ___________ with very little ___________
      2. Epithelium covers ______________________ and forms ______________________
         a. On what body surfaces would one expect to find epithelium?
            ________________________________________________________________
            ________________________________________________________________
      3. Define the following epithelial terms:
         a. Free or apical surface _________________________________________
         b. Lateral surface ______________________________________________
         c. Basal surface _______________________________________________
         d. How is a basement membrane formed? ___________________________
            ________________________________________________________________
         e. What does the basement membrane do? _________________________
            ________________________________________________________________
      4. What holds adjacent epithelial cells together? _______________________
      5. Epithelial tissue is "avascular" since it is not penetrated by blood vessels. So
         how do nutrients reach the epithelial cells? _______________________
         a. Where are the most metabolically active cells? ___________________
   B. List the Five Major Functions of Epithelia
      1. ______________________________________________________________
      2. ______________________________________________________________
      3. ______________________________________________________________
      4. ______________________________________________________________
      5. ______________________________________________________________
C. Classification of Epithelium

1. Classification is based on ____________________ & ___________________

2. Three major types of epithelium based on number of cell layers:
   a. Observing a simple epithelium one would expect to see: ______________
      ______________________________________________________________
   
b. Observing a stratified epithelium one would expect to see: ____________
      ______________________________________________________________
   
c. Observing pseudostratified columnar epithelium one would expect to see:
      ______________________________________________________________
      ______________________________________________________________

     1. Where might you find this type of epithelium? ____________________

3. List and describe the three shapes of epithelial cells:
   a. ___________________________________________________________
   
b. ___________________________________________________________
   
c. ___________________________________________________________

4. Types of epithelium are given two names based on:
   a. ____________________
   
b. ____________________

5. Describe how "moist stratified squamous epithelium" differs from "keratinized stratified squamous epithelium": _____________________________
   ______________________________________________________________
   ______________________________________________________________

6. Transitional Epithelium
   a. Where is it found? __________________________
   
b. What shape are the cells when they are not stretched? ______________
   
c. What shape are the cells when they are stretched? ______________

D. Functional Characteristics

1. Cell Layers and Cell Shapes
   a. Simple epithelium functions to:
      1. ______________________________
      2. ______________________________
3. ______________________________
4. ______________________________

b. Stratified epithelium functions for ______________________________
   1. As outer cells are ____________________ they are ______________

c. Flat and thin cells will allow ____________________ and ______________
d. Cuboidal or columnar cells are usually involved in __________________

2. Cell Surfaces
   a. What do smooth surfaces do? _________________________________
   b. What do microvilli do for a cell? _______________________________  
      1. Therefore they are found in cells involved in what? ____________
   c. Elongated microvilli are called ____________________
      1. They are found where what is an important function? ____________
   d. What purpose do cilia serve in the human body? _________________

3. Cell Connections
   a. List the three functions of cellular connections:
      1. ________________________________________________________
      2. ________________________________________________________
      3. ________________________________________________________
   b. Describe the structure of a desmosome: ________________________
      1. What does a hemidesmosome do? ____________________________
   c. Tight junctions ____________________ & ____________________
      1. Where is the zonula adherens and what does it do? ______________
      2. The zonula occludens forms ________________________________
         a. The tight seal prevents ________________________________
   d. What does a gap junction do? ________________________________
      1. They are most important in ________________ & ________________
      2. In ciliated epithelial cells they may __________________________

4. Glands
   a. Glands that connect to the surface by a duct are called ______________
b. Glands that do not connect by a duct are called _____________________
   1. These glands secrete into the__________________________
   2. These glands produce _____________________________
c. An exocrine gland consisting of a single cell is called ________________
   1. An example would be ______________________________
d. An exocrine gland consisting of many cells is called ________________
   1. The duct system of an exocrine gland can be:
      a. Simple which means _______________________________
      b. Compound which means ____________________________
      c. Tubular (tubule) which means ______________________
      d. Acinar (acini) which means _________________________
      e. Alveolar (alveoli) which means _____________________
e. Describe how each of the three functional types of exocrine glands work:
   1. Merocrine Glands: _______________________________
     _______________________________________________
   2. Apocrine Glands: ________________________________
     _______________________________________________
   3. Holocrine Glands: ______________________________
     _______________________________________________

IV. Connective Tissue

A. General Characteristics of Connective Tissue
   1. Connective tissue _________ are separated by ________________
   2. Connective tissue structure is ________ and performs ______________

B. List the seven major categories of connective tissue function:
   1. ________________________________
   2. ________________________________
   3. ________________________________
   4. ________________________________
   5. ________________________________
   6. ________________________________
C. Cells of Connective Tissue

1. Define the function that each cell would have based on the suffix:
   a. Blasts __________________________________________________
   b. Cytes __________________________________________________
   c. Clasts __________________________________________________

2. What type of connective tissue does each of the following prefixes refer to:
   a. Fibro __________________________________________________
   b. Chondro __________________________________________________
   c. Osteo __________________________________________________

3. Adipose Cells (adipocytes)
   a. What do adipose cells do? _________________________________
   b. What do adipose cells look like? _____________________________

4. Mast Cells
   a. Where are mast cells found? _________________________________
   b. What chemicals do they contain? _____________________________
   c. What is their function? _________________________________

5. What cells continuously move into connective tissue? ______________

6. What do macrophages do? _________________________________
   a. A fixed macrophage ______________________________
   b. A wandering macrophage ______________________________

7. Embryonic connective tissue cells that persist in adult tissues are called:
   _________________________________
   a. Their potential is to _________________________________

D. Extracellular Matrix

1. List the three major components of connective tissue matrix:
   a. _________________________________
   b. _________________________________
   c. _________________________________

2. The structure of the matrix is responsible for __________________________

3. Protein Fibers of the Matrix
a. Collagen fibers are composed of ______________________________
   1. Describe the structure of a collagen molecule: ____________________________
   _________________________________________________________________
   2. What are the physical properties of collagen? ______________________
      & ______________________ but ________________________________
   3. How many types of collagen are there? ____________________________

b. Reticular fibers are actually ______________________________
   1. Describe reticular fibers: ______________________________________
   2. Functionally reticular fibers ______________________________________

c. Elastic fibers contain ________________________________
   1. This protein has the ability to _________________________________
   2. Describe an elastin molecule: _________________________________
   3. How are elastin molecules arranged in the tissue? ________________
      ______________________________________________________________

4. Other Matrix Molecules
   a. What is ground substance? ________________________________
   b. Describe the shape of hyaluronic acid molecules: __________________
   c. What quality does hyaluronic acid give to fluids? __________________
   d. What are proteoglycan monomers? ________________________________
      ______________________________________________________________
   e. What can proteoglycans do when they trap large quantities of water?
      ______________________________________________________________
   f. What do adhesive molecules do in connective tissue? ________________
      ______________________________________________________________

V. Classification of Connective Tissue
   A. Classification of connective tissue is influenced by:
      1. ______________________________
      2. ______________________________
      3. ______________________________
B. Embryonic Connective Tissue
1. It is properly called ______________________________
2. Structurally it is made up of:
   a. Irregularly ______________________________
   b. Surrounded by ______________________________
   c. In which ______________________________
3. Where is mucous connective tissue found? _________________________

C. Adult Connective Tissue
1. Loose Connective Tissue
   a. It is sometimes referred to as ______________________________
   b. Loose connective tissue consists of:
      1. Protein ____________________
      2. With numerous ____________________
   c. Functionally areolar connective tissue is:
      1. ______________________________
      2. ______________________________
   d. Structurally it contains __________, __________, & __________ fibers
      and a __________ of cells.
2. Dense Connective Tissue
   a. Protein fibers form ______________________________
   b. Dense Regular Connective Tissue
      1. What does the term "regular" in the name refer to? ______________
      2. Dense regular connective tissue has abundant ______________
         a. This makes the tissue appear what color? ______________
      3. Dense regular collagenous connective tissue forms:
         a. ____________________
         b. ____________________
   c. Dense Regular Elastic Connective Tissue
      1. Composed of bundles of ____________ & abundant _________
         a. This makes the tissue appear what color? ______________
      2. Dense regular elastic connective tissue forms ____________________
3. Functionally when stretched they __________________________

   d. Dense Irregular Connective Tissue

   1. Contains protein fibers arranged ____________________________

   2. Functionally forms sheets that have __________________________

   3. Where would you find dense irregular collag enous connective tissue?

   __________________________________

   4. Where would you find dense irregular elastic connective tissue?

   __________________________________

3. Connective Tissue with Special Properties

   a. Adipose Tissue

      1. Consists of adipocytes containing __________________________

      2. Adipose is composed of ______________ cells and a small 
         amount of _______________ that consists of ________________

   3. Functionally adipose is:

      a. ______________________________

      b. ______________________________

      c. ______________________________

   b. Reticular Tissue

      1. Forms the ______________ of lymphatic tissue.

      2. Characterized by a network of ______________ & ______________

4. Cartilage

   a. Cartilage is composed of cells called ____________________ that are in 
      spaces called _______________ inside an ________________

   b. The matrix of cartilage contains ______________, ______________, & ______________

   c. The proteoglycans can trap ______________________________

      1. This allows cartilage to __________________________________

   d. The collagen fibers give cartilage ______________________________

   e. What is the perichondrium? _________________________________

   f. Why does cartilage heal slowly? ______________________________

   g. Hyaline Cartilage

      1. It has large amounts of ______________ & ______________
2. Where would you find hyaline cartilage?
   a. ______________________________
   b. ______________________________
   c. It also covers ______________________________

h. Fibrocartilage
   1. It has more __________________ than __________________
   2. Functionally it is slightly ______________ & __________________
   3. Where would you find fibrocartilage? __________________________

i. Elastic Cartilage
   1. It has _______ fibers in addition to _________ & _________
   2. Where would you find elastic cartilage? _______________________

5. Bone
   a. Bone consists of ___________________ & __________________
   b. The organic portion consists of ________ fibers, primarily _________
   c. The inorganic portion consists of ______________________________

   1. What minerals to they contain? ______________ & ______________
   d. Bone cells are called _______________ & are located in ____________
   e. Cancellous or Spongy Bone

   1. Composed of plates called ______________ surrounding __________
   f. Compact Bone

   1. What is a lamellae? _______________________________________
   g. Why does bone repair so easily? ______________________________

6. Hemopoietic Tissue and Blood
   a. Why is blood unusual among connective tissues? _________________
   b. What does hemopoietic tissue do? ______________________________
   c. What is yellow bone marrow composed of? ______________________
   d. What is red bone marrow composed of? _________________________

VI. Muscle Tissue
   A. The main characteristic of muscle tissue is _______________________
   B. Muscle Tissue Structure
1. What does striated mean? ______________________________
2. Therefore nonstriated would mean? ______________________________

C. Muscle Tissue Function
1. What does voluntary mean? ______________________________
2. What does involuntary mean? ______________________________

D. Based on structural and functional classification (B & C above):
1. Skeletal muscle is ______________________________
2. Cardiac muscle is ______________________________
3. Smooth muscle is ______________________________

VII. Nervous Tissue
A. Nervous tissue has the ability to ______________________________
B. Describe each of the major parts of a neuron:
   1. Cell body: ______________________________
   2. Nerve cell processes consist of ______________________________
   2. Dendrite: ______________________________
      a. A dendrite _________ the action potential and __________________
   3. Axon: ______________________________
      b. An axon usually conducts ______________________________
C. Describe the structure of the three types of neurons:
   1. Multipolar neurons have ______________________________
   2. Bipolar neurons have ______________________________
   3. Unipolar neurons have ______________________________
D. Neuroglia are ______________________________
   1. Functionally neuroglia:
      a. __________________
      b. __________________
      c. __________________

VIII. Membranes
A. Mucous Membrane
1. It consists of ____________________, ____________________, a thick ____________________, & sometimes, ____________________

2. Mucous membranes line ____________________________________________

3. Functions include ____________________, ____________________, & _____________

B. Serous Membrane

1. It consists of ____________________ called ____________________, its ____________________ & ______________________________

3. Serous membranes line ____________________________________________

4. The membrane is moistened by _________ which ____________________

5. Functionally serous membranes:
   a. Protect ________________________________
   b. Help _________________________________
   c. Act as ________________________________

C. Synovial Membrane

1. It is composed of ____________________________________________

2. Synovial membranes line ____________________________________________

3. They produce a fluid rich in ______________________________ which makes ____________________ thereby ___________________________

IX. Inflammation

A. The inflammatory response:

1. Mobilizes ______________________________

2. Isolates ______________________________

3. Removes ______________________________

B. List the five major manifestations (symptoms) of an inflammatory response:

1. ____________________

2. ____________________

3. ____________________

4. ____________________

5. ____________________
C. Mediators of inflammation include:
   1. ____________________
   2. ____________________
   3. ____________________
   4. ____________________ & others

D. Why is dilation of blood vessels beneficial? ______________________________
   _____________________________________________________________________

E. What does increased permeability of blood vessels do? ____________________
   _____________________________________________________________________

F. What is edema and why does it occur? _________________________________
   _____________________________________________________________________

G. The site of injury is "walled off" from surrounding tissues by ________________

X. Tissue Repair
A. Tissue repair is the substitution of ________________ for ________________
B. Which type of repair results in normal function? ____________________
C. Which type of repair will produce scar tissue? ____________________

D. Classification of Cells
   1. What group of cells continues to divide throughout life? ________________
   2. What group of cells divides only in response to injury? ________________
   3. What group of cells has a very limited ability to divide? ________________

E. ____________________ heals wounds when the edges are close together.
F. ____________________ heals wounds when the edges are far apart.

XI. Tissues and Aging
A. In older people cells ______________________________
B. In older people collagen fibers ______________________________
   1. Collagen connective tissue becomes less ________ & more ________
C. Elastic fibers _________, bind to __________, & become ________________