Membranes & Integumentary System

Section A: Intro to Membranes
Body membranes cover surfaces, line body cavities, and form protective sheets around organs. Membranes are classified into two major groups: epithelial membranes and connective membranes. Epithelial membranes are subdivided into cutaneous, mucous and serous membranes. Connective tissue membranes only include synovial membranes.

- Cutaneous membrane (aka. skin) – covers the entire body
- Mucous membranes - lines the inside of cavities that open directly to the exterior environment such as the gastrointestinal tract, respiratory tract, reproductive tracts and the urinary tract
- Serous membranes - lines cavities of the body that do not open directly to the external environment and covers the organs within the cavities. Serous membranes are made of two layers: a layer to line a cavity, and a layer to cover an organ. Serous membranes secrete a lubricant called serous fluid that allows the organs to glide against other structures without causing friction.
- Synovial membranes - surrounds freely movable joints like the shoulder, elbow, or knee. The membrane secretes synovial fluid to lubricate the joint space, making motion much easier. The synovial fluid also nourishes the cartilage attached to the ends of bones and contains immune cells called macrophages that rid the joint space of invading microbes and debris.

1. Why are membranes important? ____________________________________________________________
2. What two types of tissue make up membranes? ______________________________________________
3. What is your skin called? __________________________________
4. Why would mucous membranes be located in cavities that open directly to the outside of the body? __________________________________________________________
5. How are the two layers of serous membrane arranged? __________________________________________
6. What can be found between the two layers of serous membrane? _____________________________
7. Why is the serous fluid important? _________________________________________________________
8. Where are synovial membranes found? ____________________________________________________
9. What are the functions of synovial fluid secreted by the membrane? ____________________________

Section B: Membranes
1. Fill in the information on the chart.

<table>
<thead>
<tr>
<th>Membrane</th>
<th>Tissue Composition – epithelial or connective</th>
<th>Locations</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutaneous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mucous</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Serous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synovial</td>
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<td></td>
</tr>
</tbody>
</table>

2. What is the function of serous fluid?
3. The serous membrane is a double-layered membrane. Label and identify the membranes in the diagrams, color if needed.

4. James has damage to his left ventricle of the heart and as a result of this damage doctors are going to have to perform surgery and cut into his heart to fix the deformity. Explain to James what layers of the serous membrane the doctors will have to cut through in order to reach his heart by starting with the most superficial layers working to the deeper areas.

Section C: Membrane Concept Check
Identify the membrane from the description below: Cutaneous Mucus Serous Synovial
1. __________________ protects the body surface
2. __________________ layer(s) of epithelial that contains goblet cells that produce and secrete mucus
3. __________________ epithelial membrane that functions to lubricate and cushion organs
4. __________________ lines body cavities open to exterior such as respiratory, urinary, and digestive
5. __________________ skin
6. __________________ main function is absorption and secretion
7. __________________ found on visceral organs and lines ventral body cavities
8. __________________ connective tissue that lines joint cavities

Serous membranes:
9. Which serous membrane lines the abdominopelvic cavity? ________________________________
10. Which serous membrane adheres to the cardiac muscle? _______________________________
11. Which serous membrane lines the pleural cavity (thoracic cavity)? _______________________
12. What organs would the visceral peritoneum adhere to? _________________________________
13. What is the purpose of the serous fluid in the serous space? ___________________________
Section D: Integumentary Functions

1. The water of the swimming pool is hypotonic to our cells. Normally cells in a hypotonic solution would swell because water rushes into the cell trying to reach equilibrium. Why don’t we swell and pop when we go for a swim?

2. You go to the beach to swim on an extremely hot, sunny afternoon. Describe two ways in which your integumentary system acts to preserve homeostasis during your outing.

3. What vitamin is produced in the skin and why is it necessary?

4. According to research, the human body contains 10 times as many bacterial cells as it does human cells and there are various types of bacteria found in different areas of the body. Then why don’t we suffer from bacterial skin infections more often?

5. Why does sunburned skin often peel in sheets?

6. The dermis houses extensive network of blood vessels that carry 8 to 10% of the total blood flow in a resting adult. How would blood flow change if the body experienced a traumatic injury to the internal organs?

7. The skin performs a wide variety of functions. What types of materials are secreted from the skin?

8. Why is melanin an essential component of your skin?

9. When your body is exposed to cold temperature, how does your skin react?

10. How does your integumentary system and nervous system function together?

11. What is the function of keratin in your skin?

Section E: Integumentary System WEBQUEST

Under the Human A&P page, click on ‘Websites’…click on the link: Integumentary System

1. List the functions of the integumentary system.

2. Click on ‘epidermis’ in the diagram. What type of tissue makes up the epidermis?

3. List the 5 layers of epidermis and characteristics of each. List from superficial to deep.
   a. 
   b. 
   c. 
   d. 
   e. 

4. Click on the ‘melanocyte’. What is the function of the melanocyte?

5. Click on the ‘dermis’. What can be found in the dermis?

6. Click on ‘sweat glands’. What are the two types of sweat glands and their functions?
   a. 
   b. 

7. Click on ‘sebaceous glands’. What is the function?

8. Click on ‘arrector pili muscle’. What is its function?
9. Click on ‘hair follicle’. What two substances can be found in hair? _______________________________

10. Click on ‘hypodermis’. What tissue makes up this layer? ________________________________

11. The hypodermis is commonly known as ________________.

12. Click on ‘sensory receptors’. What type of receptors are located in the skin? ______________________________

Section F: Skin Diagram
Use the textbook or your notes to label the parts of the skin.

Section G: Epidermis
1. Label the sample of skin from your arm.
   a. _________________________
   b. _________________________
   c. _________________________
   d. _________________________

2. Which layer is not shown in the diagram?
   ________________ Why not? _______________________________
3. The epidermis is avascular, so how do the cells receive nutrients and oxygen to survive? 

4. What do melanocytes produce? 

5. An ant crawls onto your leg while sitting around a campfire at night. What sensory receptor in the epidermis is stimulated? 

6. Which protein provides the epidermis with the necessary protective properties to toughen cells of the epidermis and help seal minor abrasions? 

7. Excess shedding of cells from the outer layer of skin in the scalp causes dandruff. What is the name of this layer of skin? 

8. As you pick up a piece of lumber, a splinter pierces the palm of your hand and lodges in the third layer of the epidermis. What is the name of this layer of skin? 

9. Skin cells are constantly undergoing division to produce millions of cells on a daily basis. What is the name of the layer where this process occurs? 

10. Which layer has bundles of protein filaments that help with tension and binding of the epidermis? 

11. Which layer is full of active keratinocytes and the last layer to receive nourishment? 

12. What cells migrate to the epidermis to ingest materials and signal the immune system if damage to the epidermis occurs? 

Section H: Dermis & Hypodermis 

1. Nicole visited a health spa recently and was given a deep pressure massage. What sensory receptors were stimulated during the massage? 

2. Which fibers in the dermis help seal cuts, keep skin hydrated and strengthen the tissue? 

3. Which fibers provide the stretch ability of our skin? 

4. What happens to the dermis when it is excessively stretched as in pregnancy or obesity? 

5. Erik can’t feel pain. What in his skin may be damaged? 

6. Both newborn infants and aged individuals have very little subcutaneous tissue. How does this affect their sensitivity to cold temperatures? 

7. If another ant crawls onto your arm while sitting around a campfire at night. What sensory receptor in the dermis is stimulated? 

8. What structures can be found in the dermal papillae? 

9. What is the advantage of having dermal papillae indent into the epidermis? 

10. What structures form the genetically determined pattern of your fingerprints? 

11. What is the function of the cutaneous plexus? 

12. Which layer contains areolar connective tissue filled with collagen and elastin fibers? 

13. Which layer is largely adipose tissue that anchors the skin to underlying tissue? 

14. What are blisters? 

15. What happens to your skin as you age? 

16. Which layers of the dermis is the most superficial? 

17. What sensory receptors are found in the dermis? 

18. What type of tissue makes of the dermis? 

19. Why are flexure lines important? 

20. Why is it important to cut parallel to flexure lines?
Section I: At the Clinic – Case studies that represent actual medical cases.
1. Zoe went to the pool or the beach all summer and developed a dark tan. Unfortunately, around mid October she noticed her skin was much lighter. What happened to her dark skin?

2. Jamie goes to the doctor complaining about being dehydrated on a regular basis throughout the day. During her examination, the doctor also noticed that Jamie’s hair and nails were very brittle causing them to break easy. To test a theory, the doctor placed Jamie’s hand in water to see what happened to her skin after prolonged exposure to the water. Based on this analysis which cells are not functioning properly? Explain how you determined this conclusion.

3. Mrs. Dexter, a 45 year old woman, has had a medical exam that reveals several impairments of homeostasis related to her Integumentary system. The medical staff has made the following notes in her chart:
   - Epidermal abrasions of the right arm and shoulder. Severe lacerations of the right cheek and temple.
   The medical staff in the emergency room cleaned, sutured ‘stitched’, and bandaged her up before admitting her to the hospital for further testing. Assuming that bacteria are penetrating in these areas, what skin defense mechanisms might act to prevent further bacterial invasion?

4. A model is concerned about a new scar on her abdomen. She tells her surgeon that there is practically no scar from the appendix operation down when she was 16, but this new gallbladder scar is ‘gross’. Her appendectomy scar is small and obliquely located on the inferior abdominal surface. By contrast, the gallbladder scar is large, lumpy and runs at right angles to the central axis of the body trunk. Can you explain why the scars are so different?

5. Reese was getting ready for work one morning and noticed how her skin has aged since she was a teenager. She now had wrinkles and her skin feels thinner. As her dermatologist, you need to explain what has happened to her skin? Why has her skin experienced these changes?

Section J: Skin Pigments
1. What 3 pigments contribute to the color of your skin? ____________________________________________
2. How do melanocytes produce melanin? Why is this important for our skin? _________________________
3. Aside from skin cancer, what affect can UV exposure have on your skin? __________________________
4. You are a doctor and a nurse comes in to tell you that your patient is cyanotic. What is cyanosis? What does its presence indicate? ____________________________________________
5. Martha brings her 9 month old child to the clinic because his skin has turned orange. After blood test, the doctor can not find any medical reason for the child’s orange coloration. Excluding liver or kidney disease, what could have caused the coloration in the infant’s skin?

6. Eric and his wife are of northern European descent. Eric is a proud new father who was in the delivery room for his daughter’s birth. He tells you that when she was born, her skin was purple. After the baby had been breathing for a few minutes, her skin turned a normal, pink color. Can you explain these things? ________

7. How do bruises form? ____________________________________________________________________________
Section K: Skin Appendages
1. Explain the function of the epidermal and connective tissue sheaths that form hair.
   a. Epidermal tissue sheaths __________________________________________________________
   b. Connective tissue sheaths _______________________________________________________
2. What are the tiny muscles attached to the hair follicle that pull the hair upright during fright or cold?
   ____________________________________________________________
3. When hair is cut it doesn’t hurt, but when hair is pulled from the root you feel pain. Why is this so?
   ______________________________________________________________
4. What is the function of sebaceous glands? ______________________________________________
5. A new mother brings her infant to the clinic, worried about a yellowish, scummy deposit that has built up on the baby's scalp. What is this condition called and what caused the condition? ______________________
6. What’s the difference between acne and pimples? ________________________________________
7. What glands are involved in thermoregulation? _____________________________________________
8. What glands become active at puberty under the influence of sex hormones? ___________________
9. What material can be found in both hair and nails? _________________________________________
10. Katelyn noticed that during her English class, she excessively sweats in her axillary region and she has bad body odor. Her mom takes her to the doctor, and the doctor diagnoses her with hyperhidrosis. What glands are overly stimulated and what is causing her bad body odor? ____________________________
   __________________________________________________________________________________
11. How are the compositions of eccrine and apocrine sweat different? __________________________
   __________________________________________________________________________________

Section L: Skin Cancer Investigation
Effects of the sun on skin –
1. What are some of the benefits of the sun’s UV rays on our skin? ____________________________
2. How are these rays harmful? __________________________________________________________
   __________________________________________________________________________________

Causes –
1. How do UV rays affect normal cell division? _____________________________________________
   __________________________________________________________________________________

Tumors –
1. What are the main differences between benign and malignant tumors? ______________________
   __________________________________________________________________________________

Common risk factors –
1. What are the five most common modifiable risk factors of skin cancer? Explain each.
   a. _________________________________________________________________________________
   b. _________________________________________________________________________________
   c. _________________________________________________________________________________
   d. _________________________________________________________________________________
   e. _________________________________________________________________________________

Skin cancer: types –
1. What are the main warning signs of skin cancer? _________________________________________
   ➢ Click on the tabs for the three types of cancer and answer the questions.
**Basal Cell Carcinoma**
1. What are the characteristics of basal cell carcinoma? 
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

2. Click on and review the six samples of basal cells. How might you know you have basal cell carcinoma?
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

**Squamous Cell Carcinoma**
1. In which layer of skin do squamous cell carcinomas originate? ______________________________

2. Describe where squamous cell carcinoma most likely found on the body. ______________________________

3. Why should people be more aware of squamous cell carcinoma? ______________________________

4. What should individuals look for when checking for squamous cell carcinoma on their skin?
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

5. Click on and review the five samples of squamous cell carcinoma. What characteristics might alert you to this kind of skin cancer? ______________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

**Melanoma and the danger signs**
1. Why is melanoma the most dangerous form of skin cancer? ______________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

2. In which layer does melanoma originate? ______________________________

3. What are the ABCD symptoms? ______________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

**Section M: Cancer & Burns**
1. A 40-year old “beach boy” is complaining that his suntan made him popular when he was young – but now he has several darkly pigmented moles that are growing rapidly and are as big as large coins. He shows you the moles and immediately you think “ABCD”. What does that mean, and why should you try and convince him to be concerned for his future health?
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

2. Which cancer occurs in melanocytes and is most dangerous? ______________________________

3. Which cancer is slow growing, does not metastasize and is curable? ______________________________

4. Victims of third-degree burns demonstrate the loss of vital functions performed by the skin. What are the two most important problems encountered clinically with such patients? ______________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

5. Mrs. Kennedy received second degree burns on her abdomen when she dropped a kettle of boiling water. She asked her doctor if she would need to have a skin graft. What do you think he told her? ______________________________

6. John has just been brought into the emergency room following a fiery explosion at a chemical plant. He is diagnosed with third degree burns over the anterior surfaces of his arms and trunk. Assess the burn damage using the “Rule of 9” and determine if the burns are critical or not. Also, explain what specific structural damage has occurred to his skin? ______________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

**Human A & P Resources** – tab on right side of website:
- Click on textbook links…find integumentary system chapter – complete quizzes, self-test and activities.
- On “AP lecture videos”, watch video on Integumentary system.
- On “Flashcards” and “Matching Games”, find skin cards/game and practice.