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>
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<td></td>
<td></td>
</tr>
<tr>
<td>Synovial</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
2. The serous membrane is a double-layered membrane. Label and identify the membranes in the diagrams, color if needed.

3. 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. ___________________ found on visceral organs and lines ventral body cavities
7. ___________________ connective tissue that lines joint cavities

Serous membranes:
8. Which serous membrane lines the abdominopelvic cavity? ______________________________
9. Which serous membrane adheres to the cardiac muscle? ______________________________
10. Which serous membrane lines the pleural cavity (thoracic cavity)? ______________________
11. What organs would the visceral peritoneum adhere to? ________________________________
12. 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. 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’. 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 ‘hypodermis’. What tissue makes up this layer?

10. The hypodermis is commonly known as ______________.

11. Click on ‘sensory receptors’. What 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 epidermis 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. An ant crawls onto your leg while sitting around a campfire at night. What sensory receptor in the epidermis is stimulated? ____________________________________________________________________

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

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

7. 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 this layer? ____________________________

8. Skin cells are constantly undergoing division to produce millions of cells on a daily basis. What is this layer? ____________________________

9. 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 helps seal cuts, keeps skin hydrated and strengthens 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. If another ant crawls onto your arm while sitting around a campfire at night. What sensory receptor in the dermis is stimulated? _________________________________
6. What structures can be found in the dermal papillae? _________________________________
7. What is the advantage of having dermal papillae indent into the epidermis? _________________________________
8. Which dermal layer is most superficial: papillary or reticular? _________________________________
9. Which layer is largely adipose tissue that anchors the skin to underlying tissue? _________________________________
10. What happens to your skin as you age? _________________________________

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? _________________________________
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? _________________________________

Section J: Skin Pigments
1. What 3 pigments contribute to the color of your skin? _________________________________
2. Why is melanin 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’t 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? _________________________________
Section K: Skin Appendages
1. What are the tiny muscles attached to the hair follicle that pull the hair upright during fright or cold?
   ________________________________________________________________
2. When hair is cut it doesn’t hurt, but when hair is pulled from the root you feel pain. Why is this so?
   _______________________________________________________________________________________
3. What is the function of sebaceous glands? ________________________________________________
   _______________________________________________________________________________________
4. 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? _______________________
   _______________________________________________________________________________________
5. What glands are involved in thermoregulation? ___________________________________________
6. What glands become active at puberty under the influence of sex hormones? ________________
7. What material can be found in both hair and nails? _______________________________________
8. 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 hyperhydrosis. What glands are overly stimulated and what is causing her bad body odor? _______________________
   _______________________________________________________________________________________

Section L: 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? ___________________________________________
   _______________________________________________________________________________________