

INTEGUMENTARY SYSTEM

MATERIALS NEEDED

Textbook
 Skin model
 Hand magnifier or dissecting microscope
 Forceps
 Microscope slide and coverslip
 Compound light microscope
 Prepared microscope slide of human scalp or axilla
 Prepared slide of heavily pigmented human skin
 Prepared slide of thick skin (plantar or palmar)

For Learning Extension:

Tattoo slide

The integumentary system includes the skin, hair, nails, sebaceous glands, and sweat glands. These organs provide a protective covering for deeper tissues, aid in regulating body temperature, retard water loss, house sensory receptors, synthesize various chemicals, and excrete small quantities of wastes.

The skin consists of two distinct layers. The outer layer, the epidermis, consists of stratified squamous epithelium. The inner layer, the dermis, consists of a thicker layer of dense connective tissue. Beneath the dermis is the subcutaneous layer (not considered a true layer of the skin), which is composed of adipose and loose connective tissues.

PURPOSE OF THE EXERCISE

To observe the organs and tissues of the integumentary system and to review the functions of these parts.

LEARNING OBJECTIVES

After completing this exercise, you should be able to

1. Name the organs of the integumentary system.
2. Describe the major functions of these organs.
3. Distinguish among epidermis, dermis, and the subcutaneous layer.
4. Identify the layers of the skin, a hair follicle, an arrector pili muscle, a sebaceous gland, and a sweat gland on a microscope slide, diagram, or model.

PROCEDURE

1. Review the textbook sections on *skin* and *accessory structures of the skin*.
2. As a review activity, label figures 11.1 and 11.2. Locate as many of these structures as possible on a skin model.
3. Complete Part A of Laboratory Report 11.
4. Use the hand magnifier or dissecting microscope and proceed as follows:
 - a. Observe the skin, hair, and nails on your hand.
 - b. Compare the type and distribution of hairs on the front and back of your forearm.
5. Use low-power magnification of the compound light microscope and proceed as follows:
 - a. Pull out a single hair with forceps and mount it on a microscope slide under a coverslip.
 - b. Observe the root and shaft of the hair and note the scalelike parts that make up the shaft.
6. Complete Part B of the laboratory report.
7. As vertical sections of human skin are observed, remember that the lenses of the microscope invert and reverse images. It is important to orient the position of the epidermis, dermis, and subcutaneous (hypodermis) layers using scan magnification before continuing with additional observations. Compare all of your skin observations to figure 11.3. Use low-power magnification of the compound light microscope and proceed as follows:
 - a. Observe the prepared slide of human scalp or axilla.
 - b. Locate the epidermis, dermis, and subcutaneous layer, a hair follicle, an arrector pili muscle, a sebaceous gland, and a sweat gland.
 - c. Focus on the epidermis with high power and locate the stratum corneum and stratum basale (stratum germinativum). Note how the shapes of the cells in these two layers differ.
 - d. Observe the dense connective tissue (irregular type) that makes up the bulk of the dermis.
 - e. Observe the adipose tissue that composes most of the subcutaneous layer.
8. Observe the prepared slide of heavily pigmented human skin with low-power magnification. Note that the pigment is most abundant in the epidermis.

Figure 11.1 Label this vertical section of the skin.

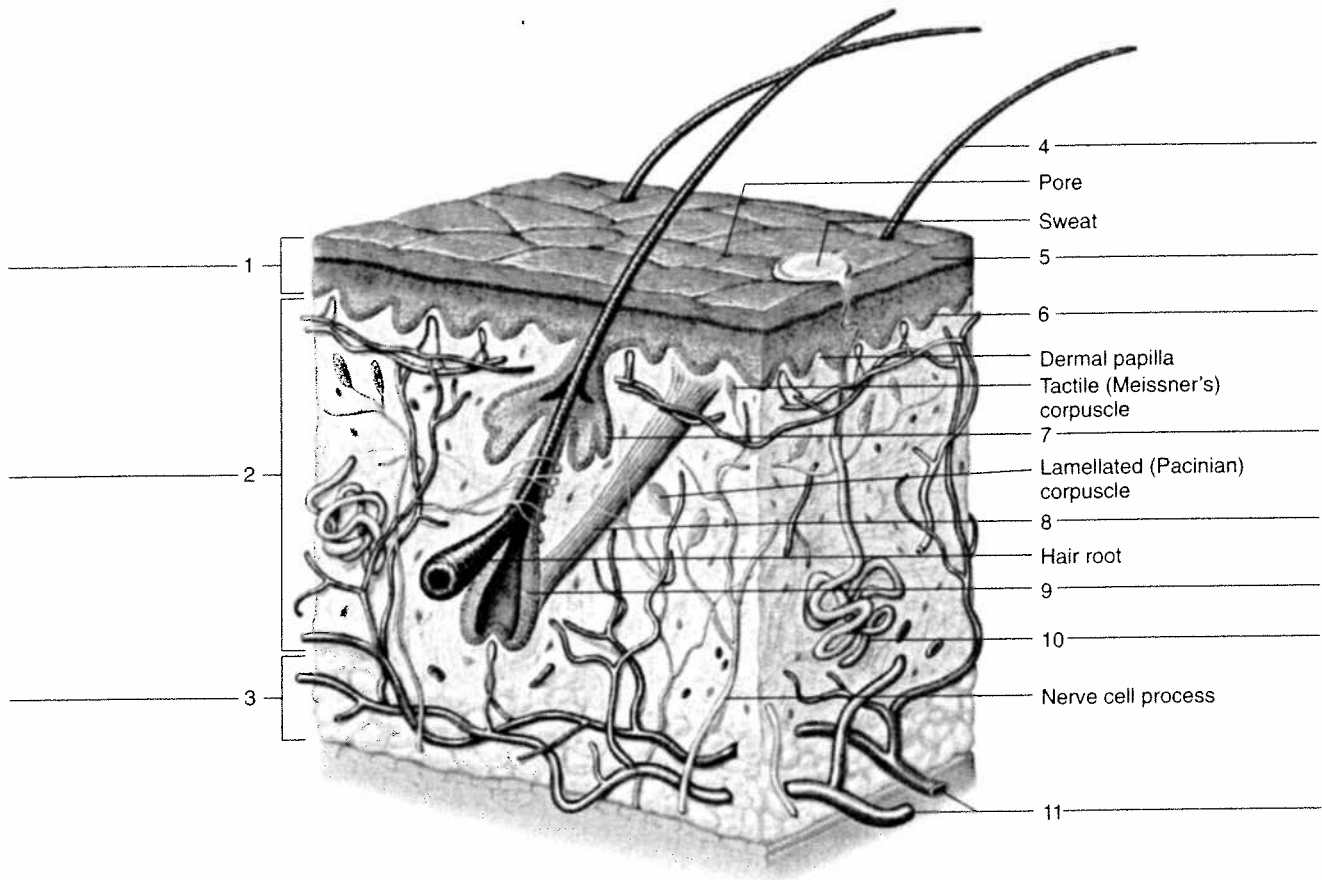


Figure 11.2 Label the epidermal layers in this section of thick skin from the palm of the hand, using the terms provided.

- Terms:**
 Basement membrane
 Stratum basale
 Stratum corneum
 Stratum granulosum
 Stratum lucidum
 Stratum spinosum

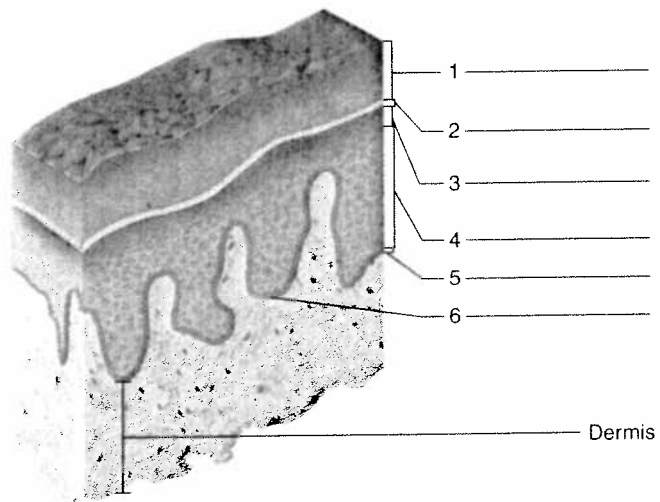
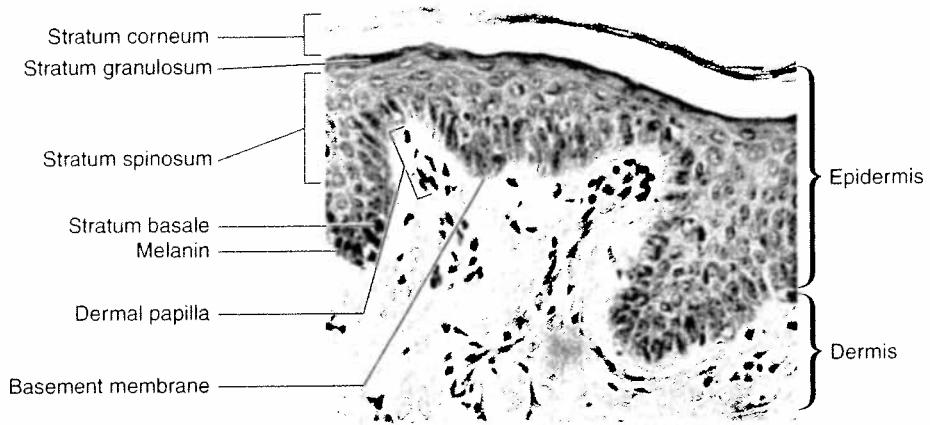
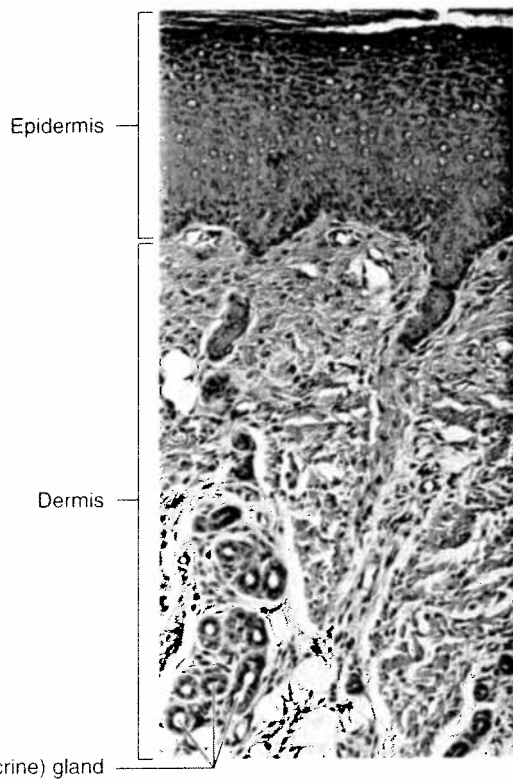


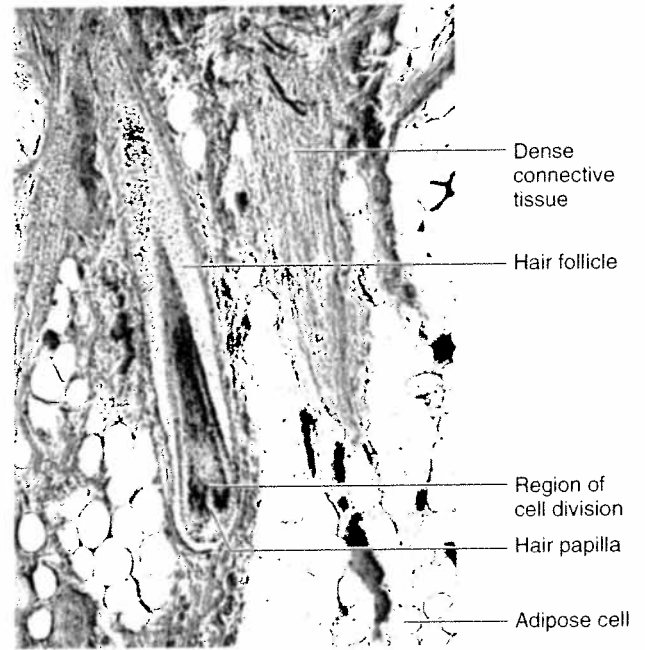
Figure 11.3 Features of human skin are indicated in these micrographs. Magnifications: (a) 290×; (b) 30× micrograph enlarged to 280×; (c) 45×; (d) 110×.



(a)

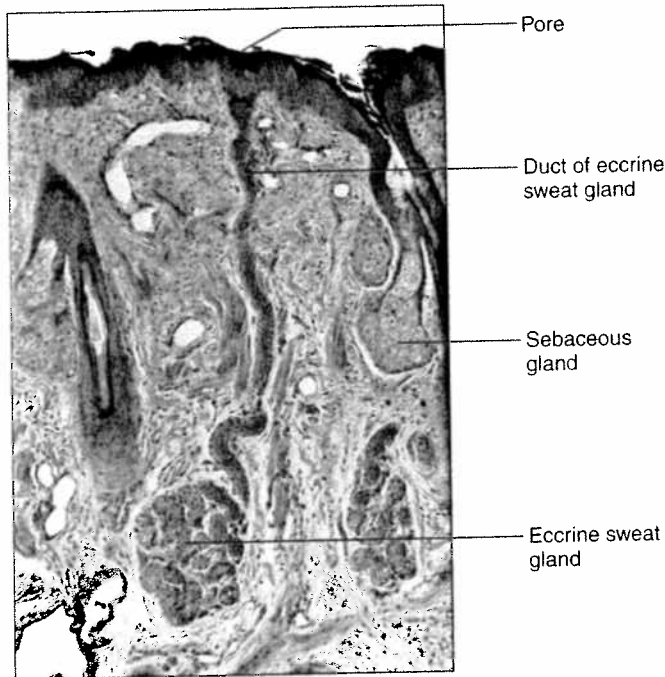


(b)



(c)

Figure 11.3 Continued.



(d)

Focus on this region with the high-power objective. The pigment-producing cells, or melanocytes, are located among the deeper layers of epidermal cells. Differences in skin color are primarily due to the amount of pigment (melanin) produced by these cells. The number of melanocytes in the skin is about the same for members of all racial groups.



Critical Thinking Application

Explain the advantage for melanin granules of being located in the deep layer of the epidermis.

9. Observe the prepared slide of thick skin from the palm of a hand or the sole of a foot. Locate the stratum lucidum. Note how the stratum corneum compares to your observation of human scalp.
10. Complete Part C of the laboratory report.
11. Using low-power magnification, locate a hair follicle that has been sectioned longitudinally through its bulblike base. Also locate a sebaceous gland close

to the follicle and find a sweat gland (fig. 11.3). Observe the detailed structure of these parts with high-power magnification.

12. Complete Parts D and E of the laboratory report.



LEARNING EXTENSION

Observe a vertical section of human skin through a tattoo, using low-power magnification. Note the location of the dispersed ink granules within the upper portion of the dermis. From a thin vertical section of a tattoo, it is not possible to determine the figure or word of the entire tattoo as seen on the surface of the skin. Compare this to the location of melanin granules found in heavily pigmented skin. Suggest reasons why a tattoo is permanent and a suntan is not.

Web Quest

Identify skin layers from micrographs and review the functions of the skin structures.

Search these at
www.mhhe.com/biosci/abio/martinlmwq.mhtml

INTEGUMENTARY SYSTEM

PART A

Match the structures in column A with the description and functions in column B. Place the letter of your choice in the space provided.

Column A

Column B

- a. Apocrine sweat gland
- b. Arrector pili muscle
- c. Dermis
- d. Eccrine sweat gland
- e. Epidermis
- f. Hair follicle
- g. Keratin
- h. Melanin
- i. Sebaceous gland
- j. Sebum
- k. Stratum basale
- l. Stratum corneum

- _____ 1. An oily secretion that helps to waterproof body surface
- _____ 2. Outermost layer of epidermis
- _____ 3. Become active at puberty
- _____ 4. Epidermal pigment
- _____ 5. Inner layer of skin
- _____ 6. Responds to elevated body temperature
- _____ 7. General name of entire superficial layer of the skin
- _____ 8. Gland that secretes an oily substance
- _____ 9. Hard protein of nails and hair
- _____ 10. Cell division and deepest layer of epidermis
- _____ 11. Tubelike part that contains the root of the hair
- _____ 12. Causes hair to stand on end and goose bumps to appear

PART B

Complete the following:

- 1. How does the skin of your palm differ from that on the back (posterior) of your hand? _____

- 2. Describe the differences you observed in the type and distribution of hair on the front (anterior) and back (posterior) of your forearm. _____

- 3. Explain how a hair is formed. _____

- 4. What cells produce the pigment in hair? _____

PART C

Complete the following:

1. Distinguish among epidermis, dermis, and subcutaneous layer. _____

2. How do the cells of stratum corneum and stratum basale differ? _____

3. State the specific location of melanin observed in heavily pigmented skin. _____

4. What special qualities does the connective tissue of the dermis have? _____

PART D

Complete the following:

1. What part of the hair extends from the hair papilla to the body surface? _____
2. In which layer of skin are sebaceous glands found? _____
3. How are sebaceous glands associated with hair follicles? _____

4. In which layer of skin are sweat glands usually located? _____

PART E

Sketch and label a vertical section of human skin, using the scanning objective.

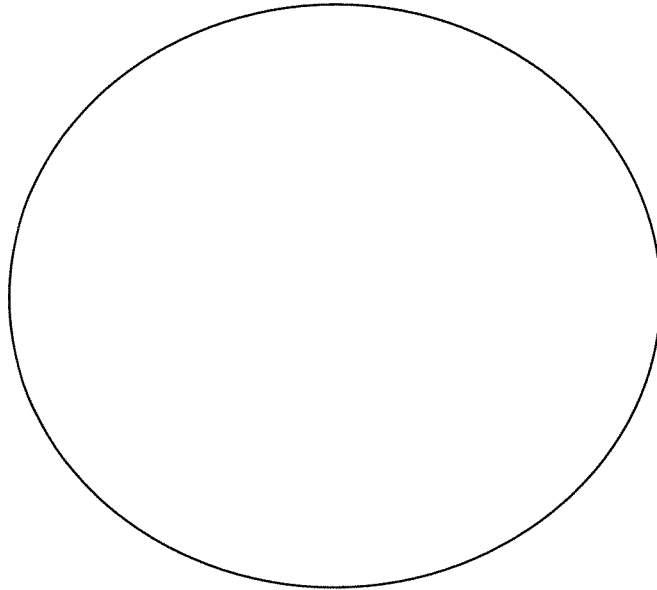
Name _____ Per. _____ Date _____

**Chapter 5- Integumentary System
Lab Drawings**

For the given procedures in the lab, follow the instructions below on what to draw, color and label.

Procedure 5- Single Hair

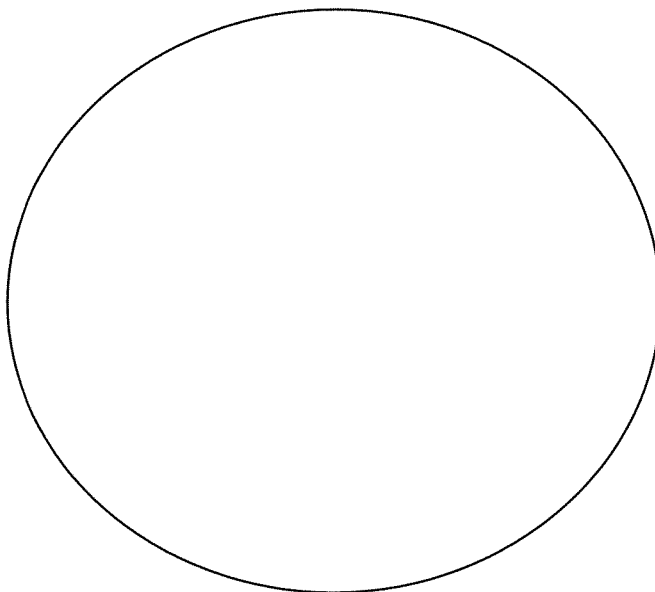
- 1 Under low power draw, color and label the single hair. Label the follicle, root, and shaft.



Total Magnification _____

Procedure 7- Prepared Slide of Human Scalp

- 1 Under medium power draw, color, and label the following structures: Epidermis, Dermis, Subcutaneous Layer, Arrector pili muscle, Sebaceous gland, Sweat gland and Dense Irregular Connective Tissue.

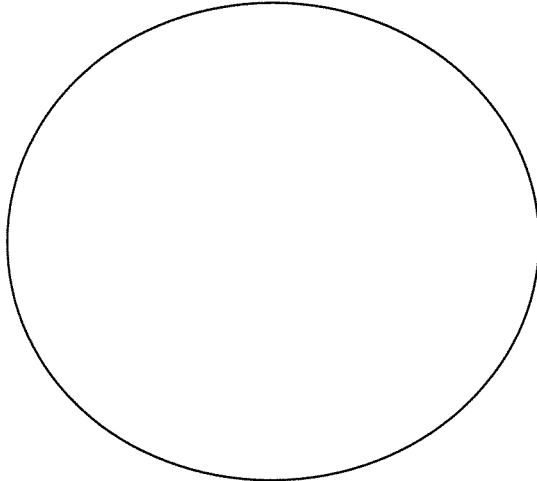


Total Magnification _____

Procedure 8- Prepared Slide of Pigmented Skin vs. Non-Pigmented Skin

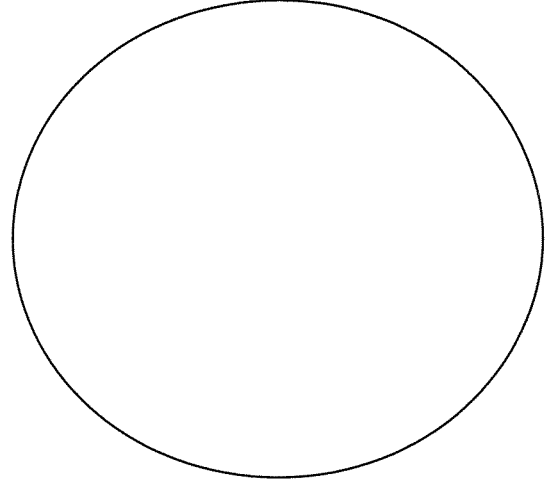
- 1 Under high power, draw and color pigmented and non-pigmented skin. On your pigmented skin drawing, label the area of the epidermis where melanocytes will be located.

Pigmented



Total Magnification _____

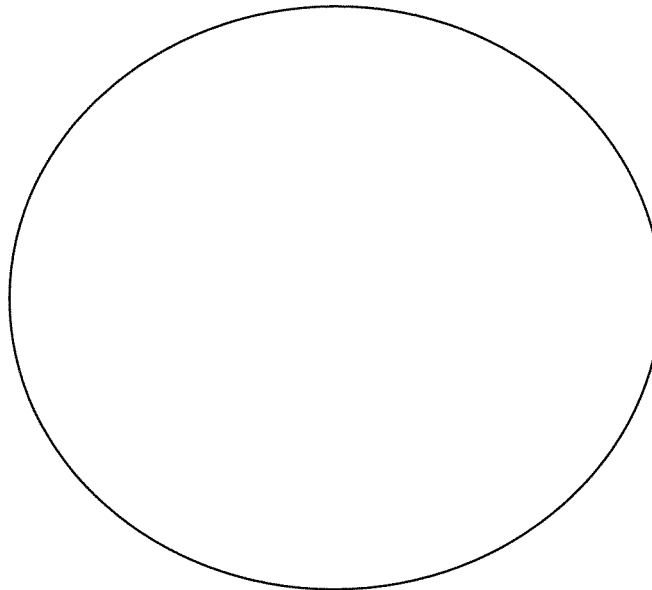
Non-Pigmented



Total Magnification _____

Procedure 9- Prepared Slide of Sole of Foot

- 1 Under high power, draw and color the sole of the foot. Label the stratum corneum, stratum basale, and dense irregular connective tissue.



Total Magnification _____