

11

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 dark (heavily pigmented) human skin
 Prepared slide of thick skin (plantar or palmar)
 Tattoo slide

PURPOSE OF THE EXERCISE

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

LEARNING OUTCOMES **APIR**

After completing this exercise, you should be able to

- 1 Locate and name the structures of the integumentary system.
- 2 Describe the major functions of these structures.
- 3 Distinguish the locations and tissues among the epidermis, dermis, and subcutaneous layers.
- 4 Identify and sketch the layers of the skin and associated structures observed on the prepared slide.

The integumentary system includes the skin, hair, nails, sebaceous glands, and sweat glands. These structures 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 keratinized stratified squamous epithelium. The inner layer, the *dermis*, consists of a thicker layer of mainly dense connective tissue. Beneath the dermis is the *subcutaneous layer* (not considered a true layer of the skin), composed of adipose and areolar connective tissues.



PRACTICE

PROCEDURE—Integumentary System

1. Review the sections entitled “Skin and Its Tissues” and “Accessory Structures of the Skin” in chapter 6 of the textbook.
2. As a review activity, label figures 11.1 and 11.2, and study figure 11.3. 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, stratum granulosum, stratum spinosum, and stratum basale. Note how the shapes of the cells in these layers differ.
 - d. Observe the dense connective tissue (irregular type) that makes up the bulk of the dermis along with some areolar connective tissue.
 - e. Observe the adipose tissue that composes most of the subcutaneous layer along with some areolar connective tissue.

8. Observe the prepared slide of dark (heavily pigmented) human skin with low-power magnification. The pigment is most abundant in the epidermis. 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.

11. Using low-power magnification, locate a hair follicle 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.

ASSESS

CRITICAL THINKING

Explain the advantage for melanin granules 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 (fig. 11.2). Locate the stratum lucidum. Note how the stratum corneum compares to your observation of the human scalp.

10. Complete Part C of the laboratory report.

LEARN: ACTIVITY

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 because only a small, thin segment of the image is in view at any one time. Compare this to the location of melanin granules found in dark (heavily pigmented) skin. Suggest reasons why a tattoo is permanent but a suntan is not.

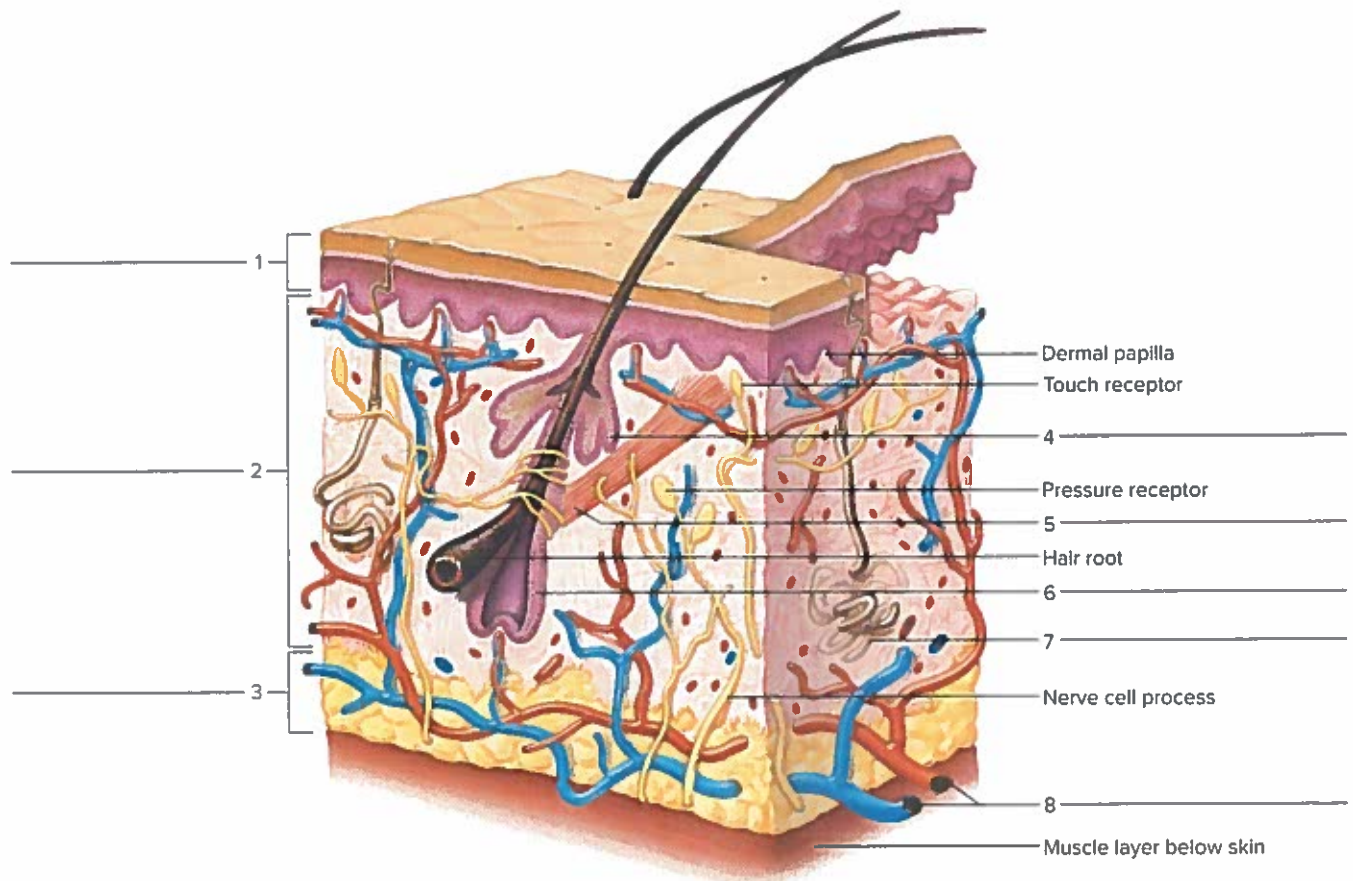


FIGURE 11.1 Label this vertical section of the skin and subcutaneous layer. APR

FIGURE 11.2 Label the features associated with this hair follicle. 

APIR

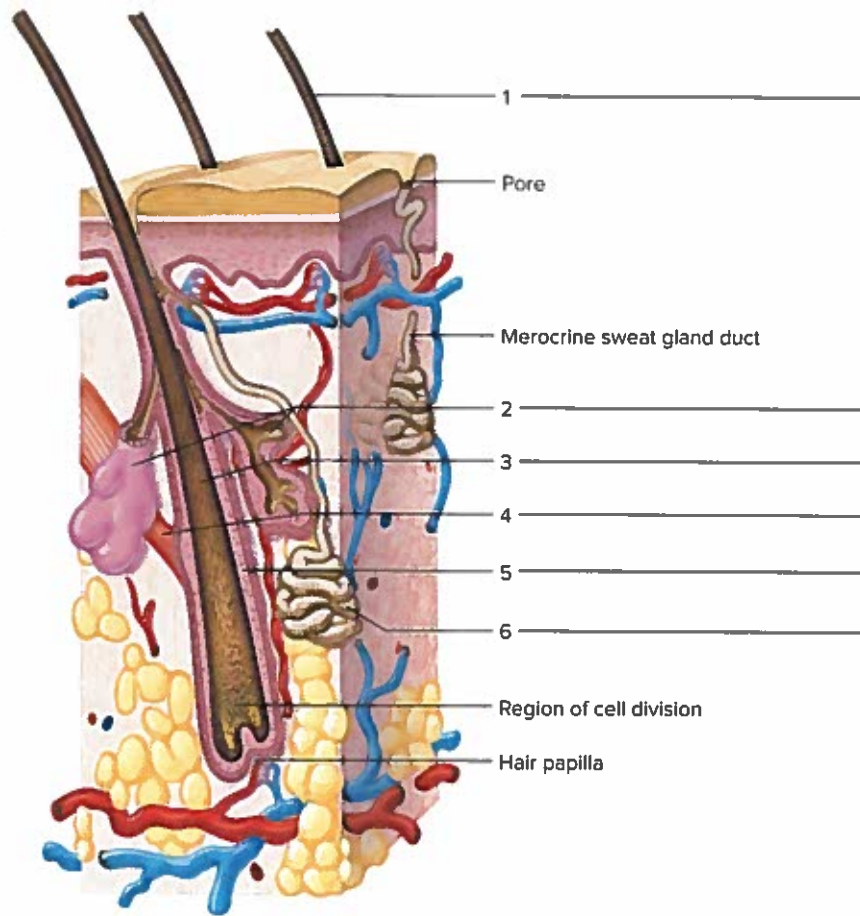
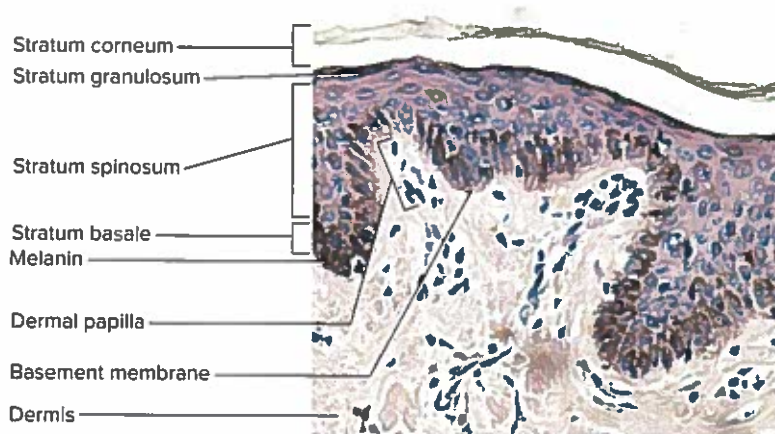
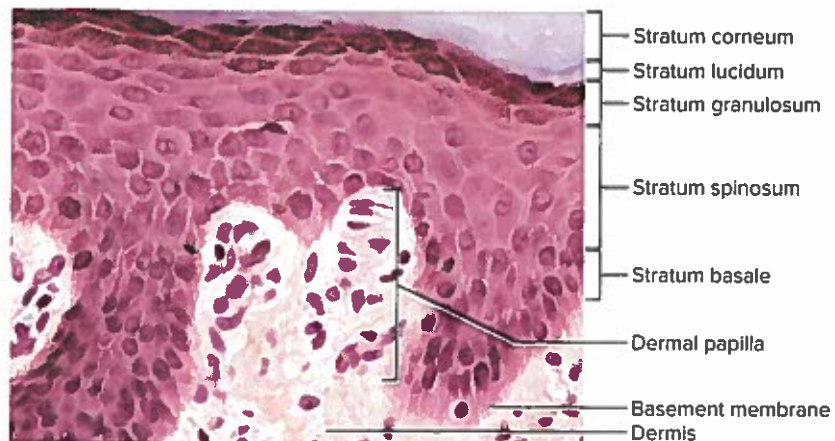


FIGURE 11.3 Features of human skin are indicated in these micrographs (a–e).

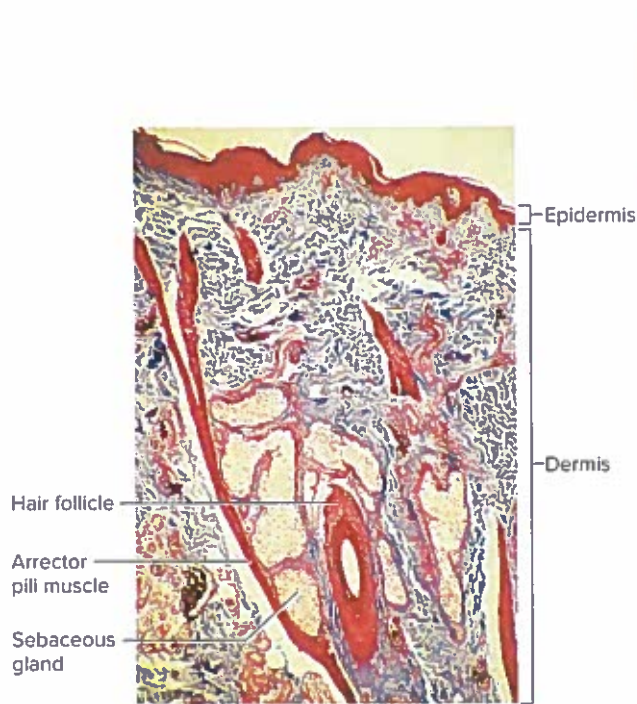
APIR (a) ©Victor B. Elchler, Ph.D.; (b, d) ©McGraw-Hill Education/Al Telsler, photographer; (c) ©Image Source/Getty Images RF; (e) ©doc-stock/Alamy Stock Photo)



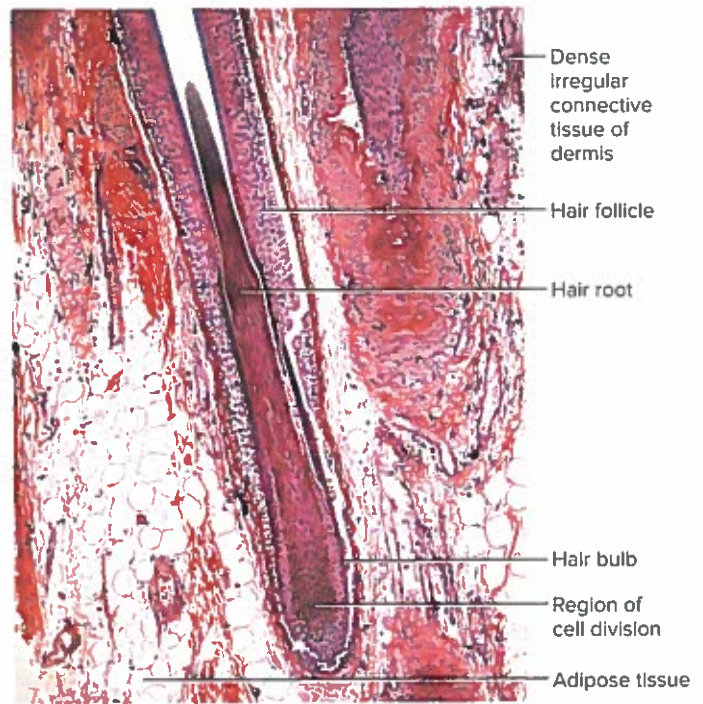
(a) Epidermis with melanin (400x)



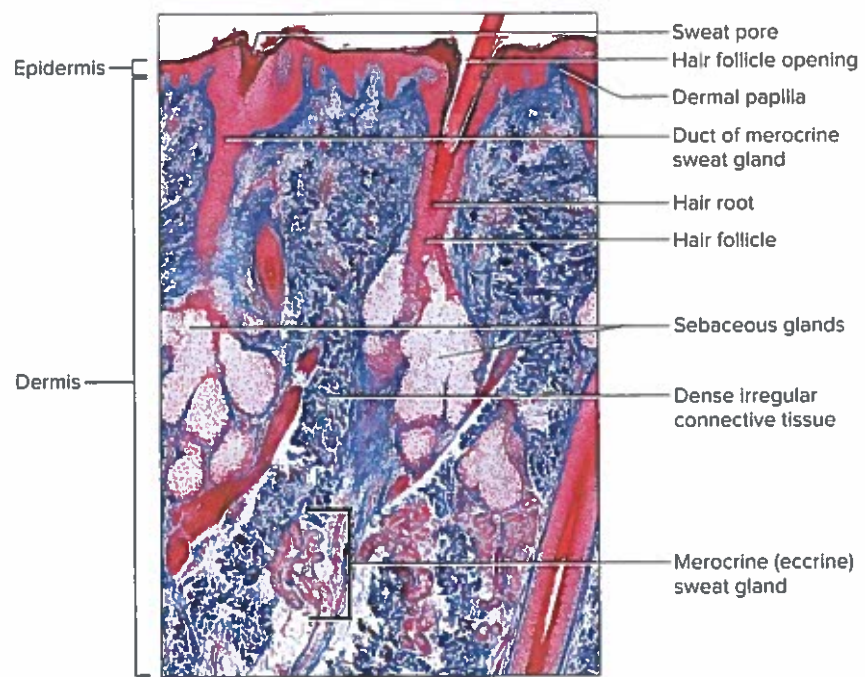
(b) Strata of thick skin (500x)



(c) Skin layers (30x)



(d) Hair follicle (175x)



(e) Skin layers with glands (30x)

FIGURE 11.3 Continued. **APR**

Name _____

Date _____

Section _____

The **A** corresponds to the indicated Learning Outcome(s) found at the beginning of the laboratory exercise.

Integumentary System



PART A ASSESSMENTS

Match the structures in column A with the descriptions and functions in column B. Place the letter of your choice in the space provided. **1** **2**

Column A

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

Column B

- _____ 1. Oily secretion that helps to waterproof body surface
- _____ 2. Outermost layer of epidermis
- _____ 3. Become active at puberty in axillary and groin regions
- _____ 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 mixture
- _____ 9. Tough 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 ASSESSMENTS

Complete the following:

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

2. Describe the differences you observed in the type and distribution of hair on the front (anterior) and back (posterior) of your forearm. **1** _____

3. Explain how a hair is formed. **2** _____

4. What cells produce the pigment in hair? **2** _____



PART C ASSESSMENTS

Complete the following:

1. Distinguish the locations and tissues among the epidermis, dermis, and subcutaneous layer. **3** _____

2. How do the cells of stratum corneum and stratum basale differ? **3** _____

3. State the specific location of melanin observed in dark (heavily pigmented) skin. **3** _____

4. What special qualities, due to the presence of fibers, does the connective tissue of the dermis have? **3** _____



PART D ASSESSMENTS

Complete the following:

1. What part of the hair extends from between the bulb and the shaft? **1** _____
2. In which layer of skin are sebaceous glands found? **1** _____
3. How are sebaceous glands associated with hair follicles and what do they secrete? **1** _____

4. The ducts of apocrine sweat glands open into _____ **1**



PART E ASSESSMENTS

Using the scanning objective, sketch a vertical section of human skin. Label the skin layers and a hair follicle, a sebaceous gland, and a sweat gland. **4**