

## Laboratory Exercise

# 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)

### For Learning Extension:

Tattoo 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 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), composed of adipose and areolar connective tissues.

### Purpose of the Exercise

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

### LEARNING OUTCOMES

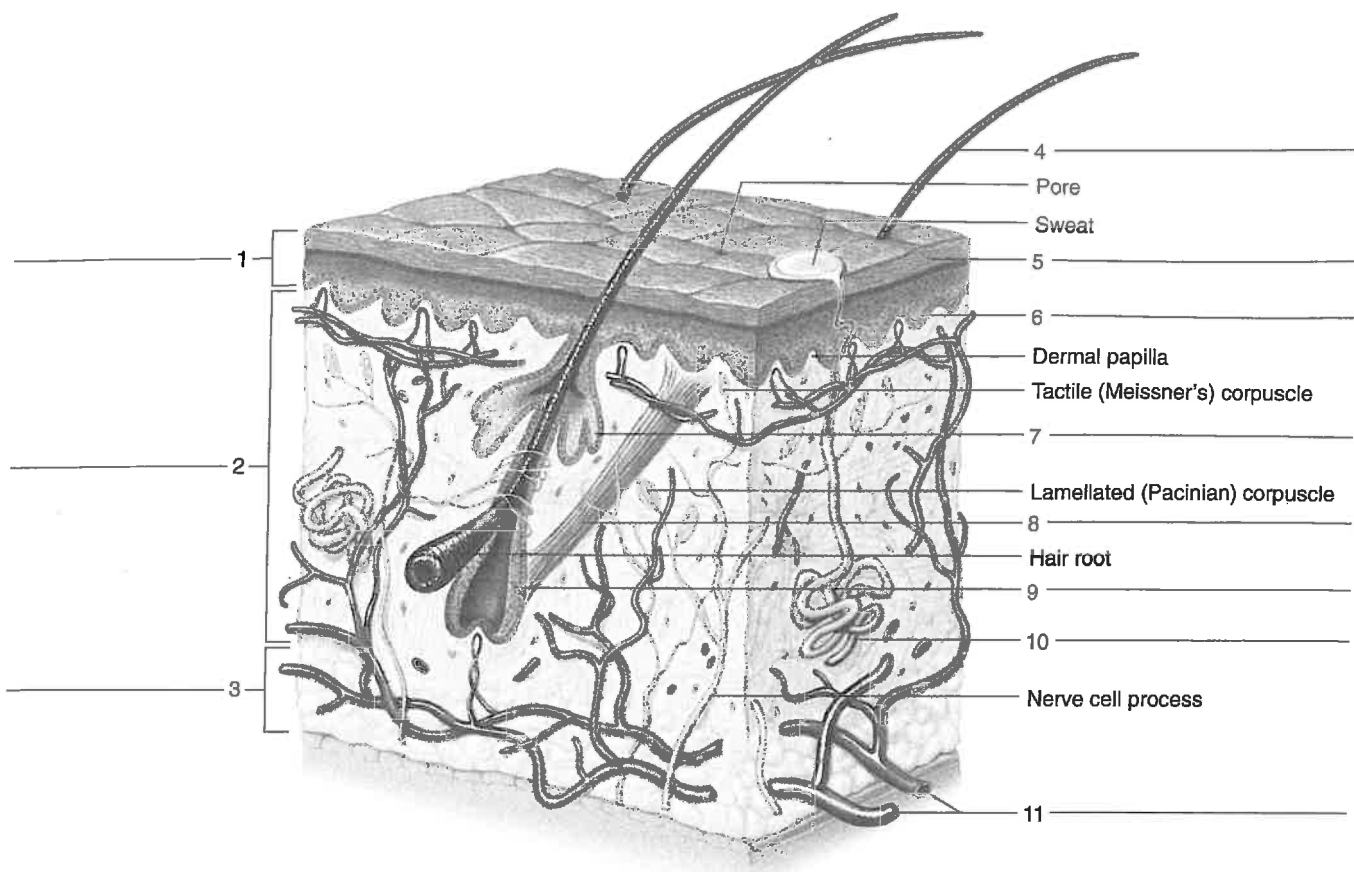
After completing this exercise, you should be able to

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

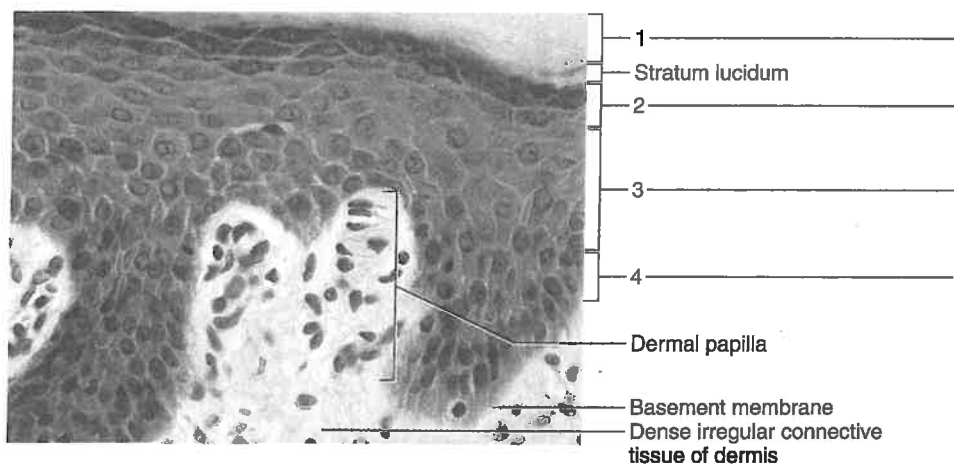
### EXPLORE

### Procedure—Integumentary System

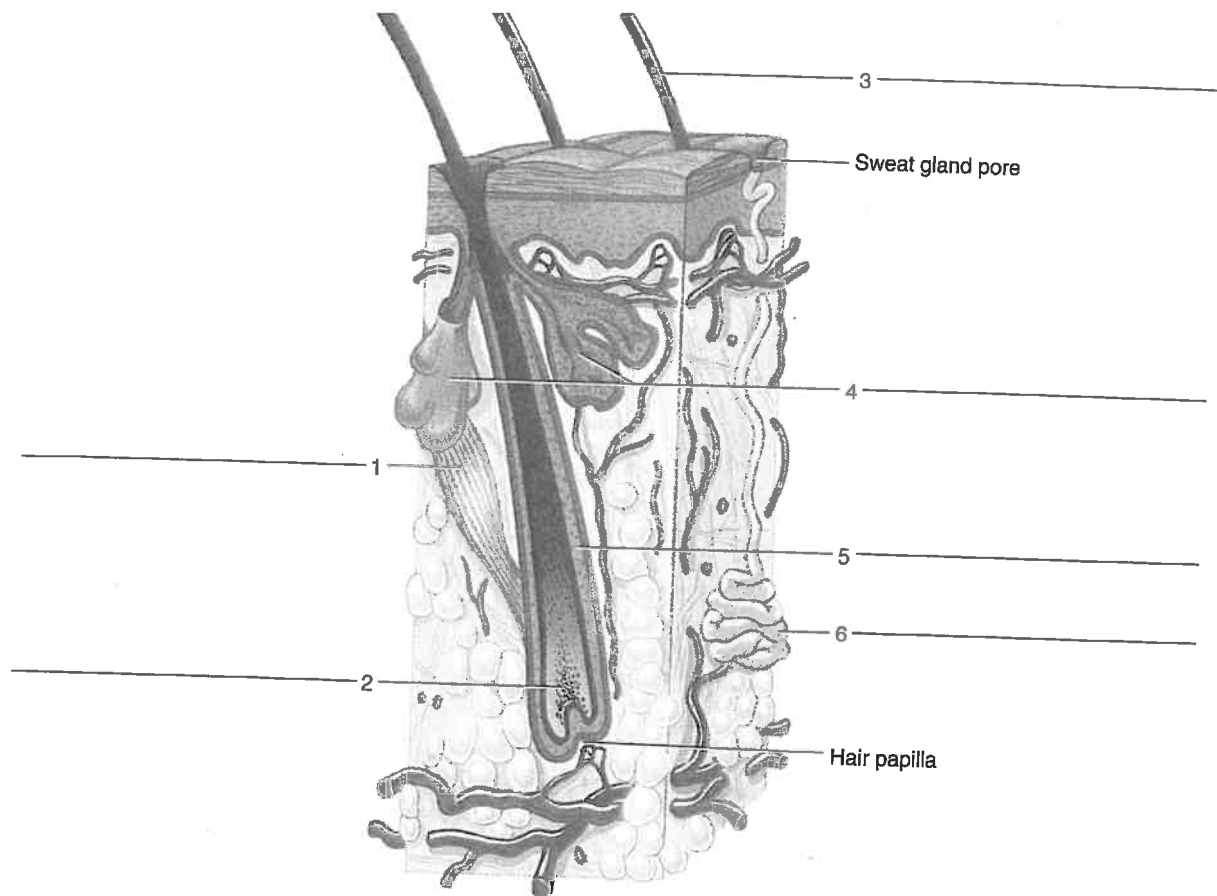
1. Review the sections entitled “Skin and Its Tissues” and “Accessory Structures of the Skin” in chapter 6 of the textbook.
2. As a review activity, label figures 11.1, 11.2, and 11.3. Locate as many of these structures as possible on a skin model.
3. Complete Part A of Laboratory Report 11.
4. Use the 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 11.4. 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.
  - e. Observe the adipose tissue that composes most of the subcutaneous layer.



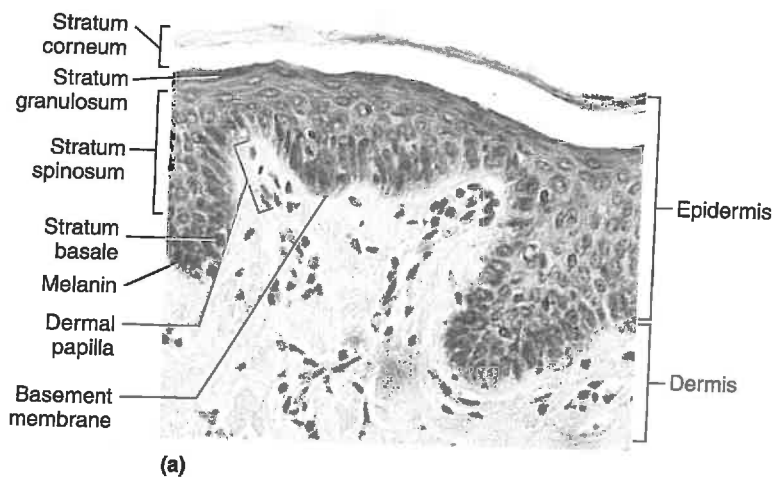
**Figure 11.1** Label this vertical section of the skin and subcutaneous layer. **1**



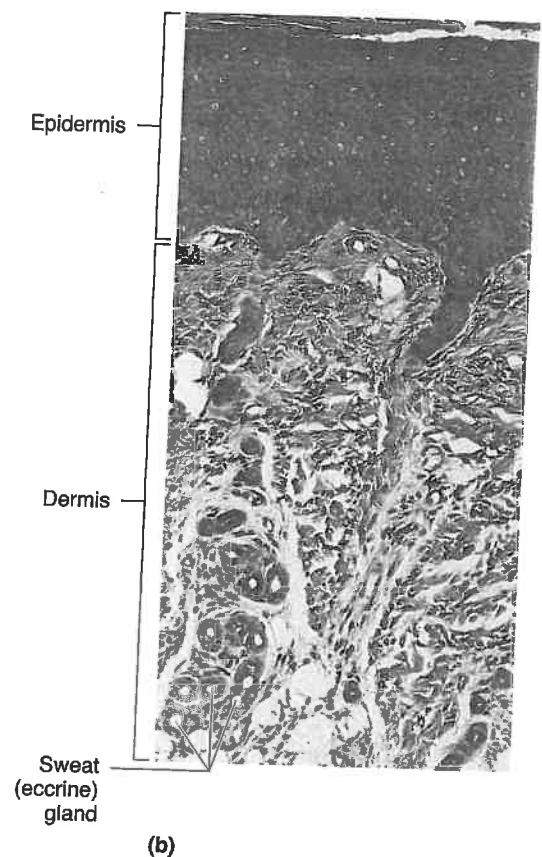
**Figure 11.2** Label the epidermal layers in this section of thick skin from a fingertip (50X). **3**

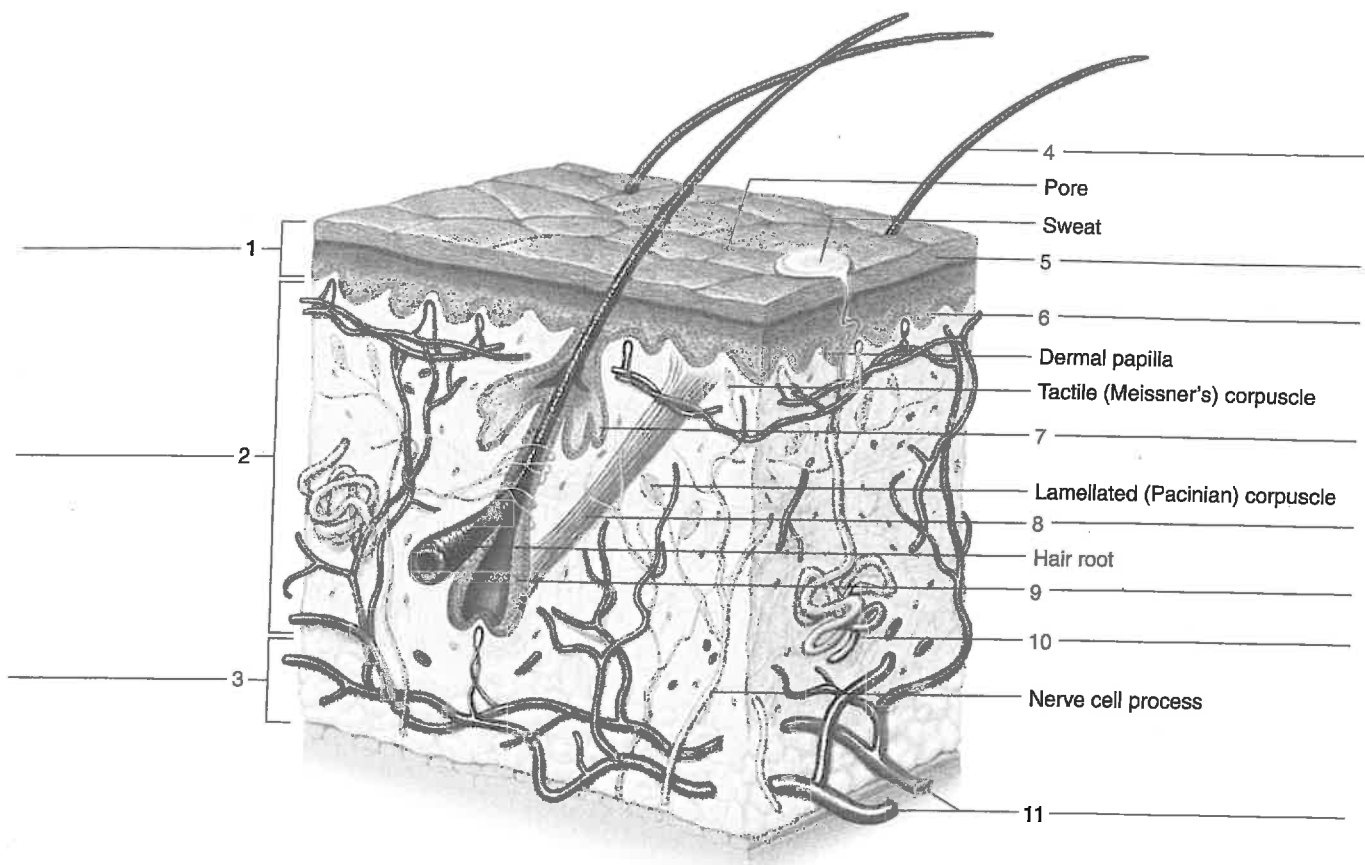


**Figure 11.3** Label the features associated with this hair follicle.

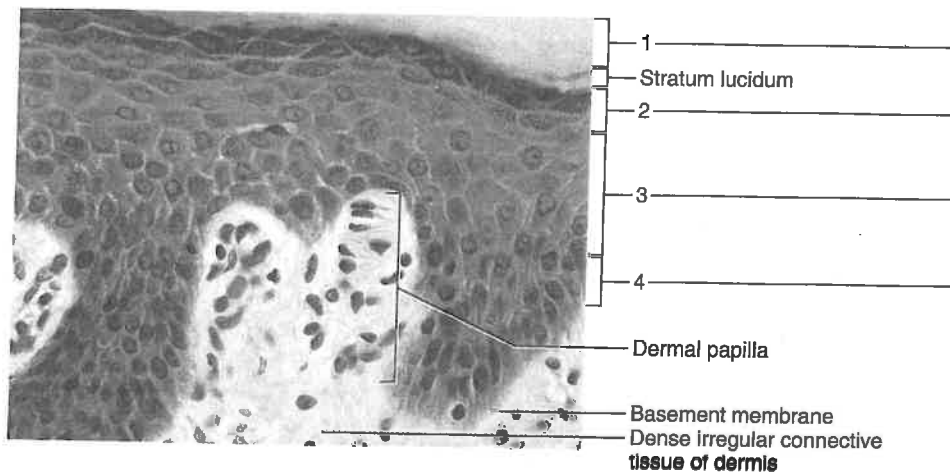


**Figure 11.4** Features of human skin are indicated in these micrographs. Magnifications: (a) 290 $\times$ ; (b) 30 $\times$  micrograph enlarged to 280 $\times$ ; (c) 45 $\times$ ; (d) 110 $\times$ .

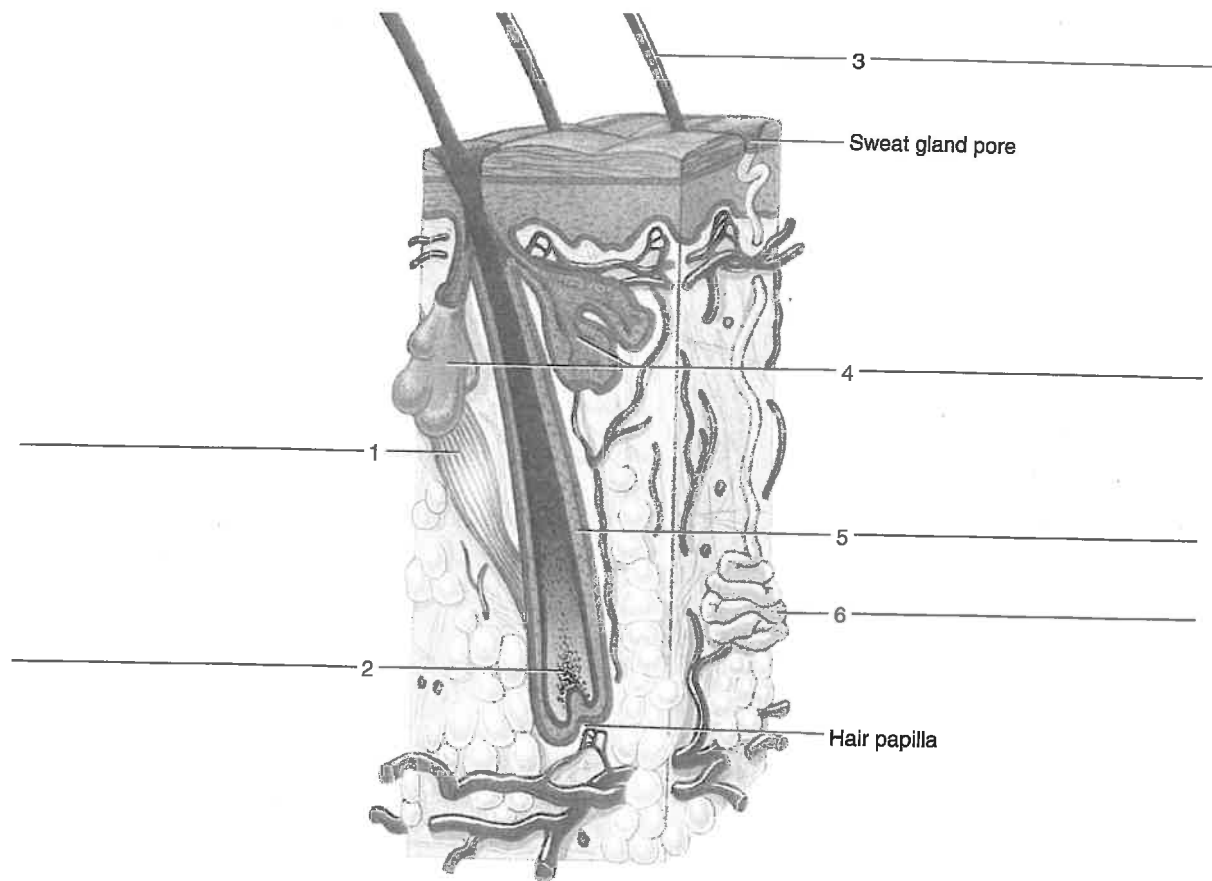




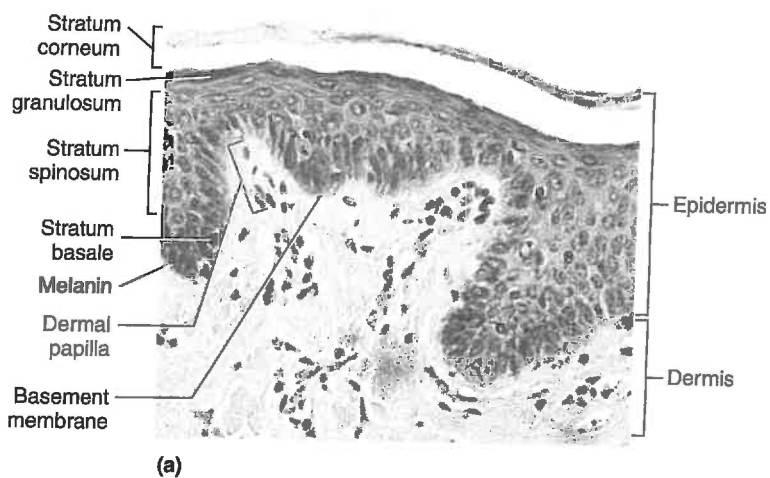
**Figure 11.1** Label this vertical section of the skin and subcutaneous layer. **1**



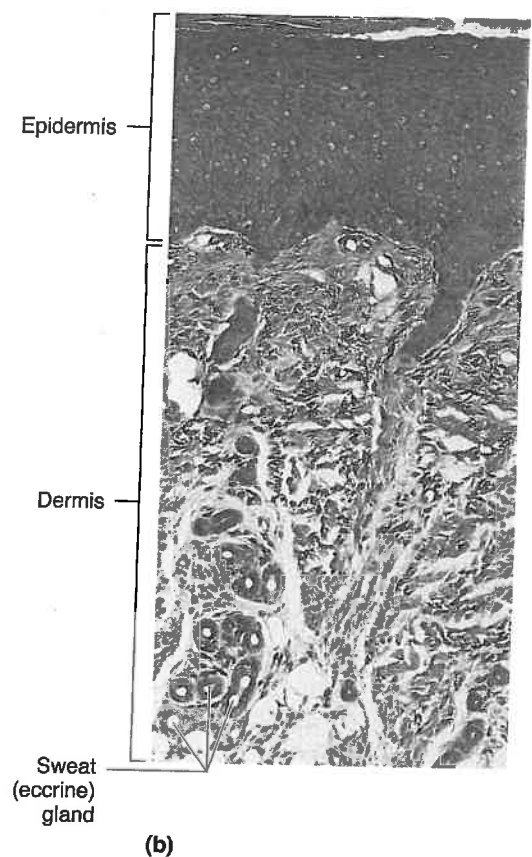
**Figure 11.2** Label the epidermal layers in this section of thick skin from a fingertip (50 $\times$ ). **3**

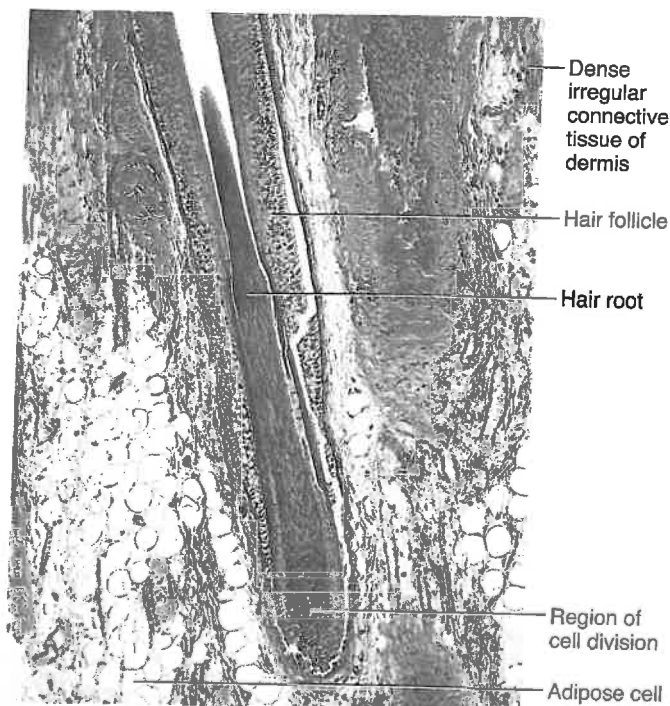


**Figure 11.3** Label the features associated with this hair follicle. **1**



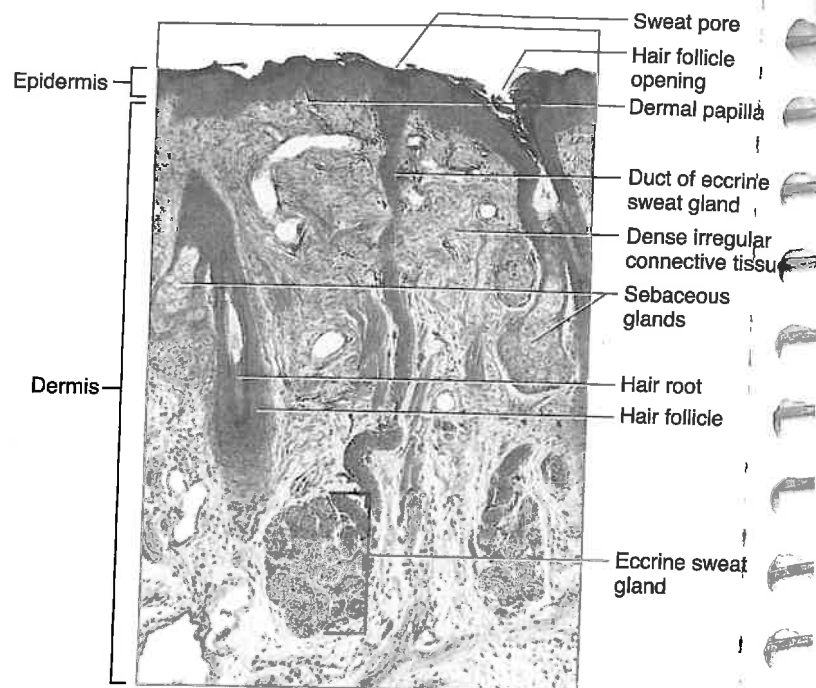
**Figure 11.4** Features of human skin are indicated in these micrographs. Magnifications: (a) 290 $\times$ ; (b) 30 $\times$  micrograph enlarged to 280 $\times$ ; (c) 45 $\times$ ; (d) 110 $\times$ .





(c)

Figure 11.4 Continued.



(d)

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.



### Critical Thinking Application

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

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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.
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. 11.4). 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 dark (heavily pigmented) skin. Suggest reasons why a tattoo is permanent and a suntan is not.

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