

Name: _____ Lab Time: _____

Integumentary System Study Guide, Chapter 5

Part I. Clinical Applications

1. Mrs. Ibanez volunteered to help at a hospital for children with cancer. When she first entered the cancer ward, she was upset by the fact that most of the children had no hair. What is the explanation for their baldness?
2. 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 is it serious?
3. Bed ridden patients in hospitals are generally rotated every 2 hours to prevent decubitus ulcers or "bedsores". What is a bedsore and why is this effective?
4. Eric and his wife are of northern European descent. Eric is a proud new father who was in the delivery room during his daughter's birth. He tells you that when she was born, her skin was purple and covered with a cream-cheese-like substance. Shortly after birth, her skin turned pink. Can you explain his observations?
5. After studying the skin in anatomy class, Alex grabbed the large "love handles" at his waist and said, "I have too thick hypodermis, but that's okay because this layer performs some valuable functions!" What are the functions of the hypodermis?

11. Two teenagers are discussing their problems with acne. One says to the other, "Sure wish I could get rid of these whiteheads." The other replies, "At least you don't have blackheads like I do." What is the difference between a "whitehead" and a "blackhead"?

12. Even though the skin is water resistant, it is not waterproof. When the skin is immersed in water, osmotic forces may move water in or out of the epithelium. Long-term exposure to seawater endangers survivors of a shipwreck by accelerating dehydration. How and why does this occur?

13. Tretinoin (Retin-A) has been called the anti-aging cream. Since it is applied topically, how does it affect the skin?

14. Why do calluses form on the palms of the hands when doing manual labor?

15. People always say, "It's not the heat; it's the humidity," when complaining about summer weather. Why do you think people feel hotter when it's 95 degrees Fahrenheit and 95% humidity than when it's 95 degrees and 30% humidity?

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Part II

The skin protects the body by providing three types of barriers. Classify each of the protective factors listed below as an example of a chemical barrier (C), a biological barrier (B), or a mechanical (physical) barrier (M).

- _____ 1. Langerhans' cells and macrophages
- _____ 2. Intact epidermis
- _____ 3. Bactericidal secretions
- _____ 4. Keratin
- _____ 5. Melanin
- _____ 6. Acid mantle

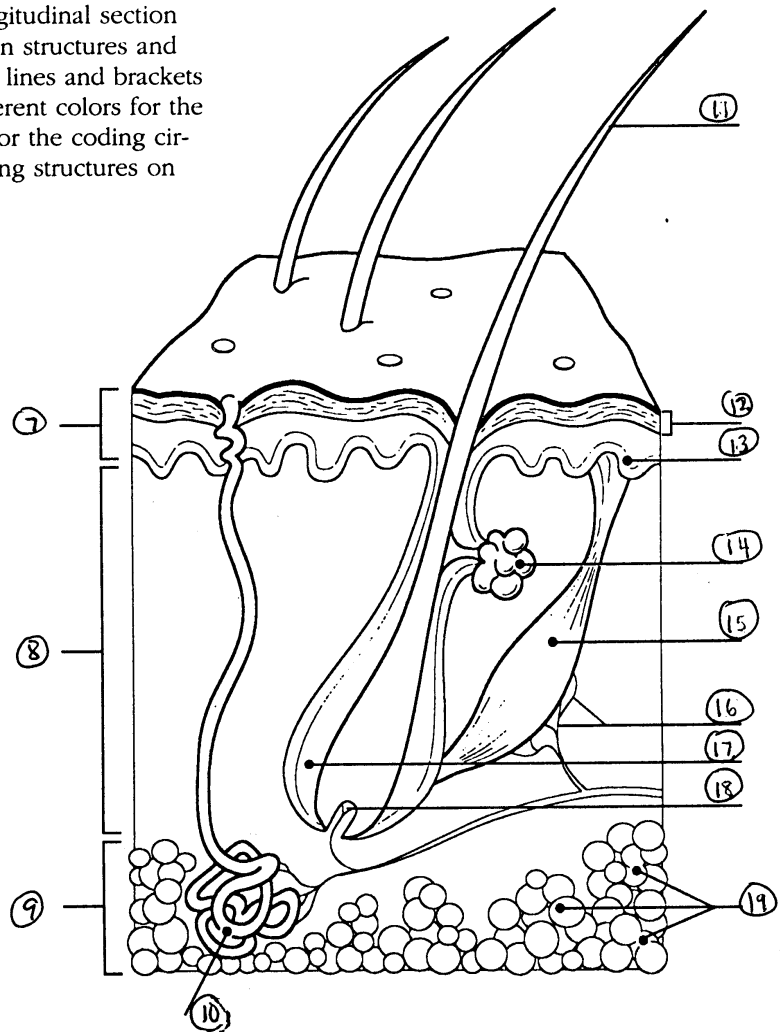
Basic Structure of the Skin

Figure 4-2 depicts a longitudinal section of the skin. Label the skin structures and areas indicated by leader lines and brackets on the figure. Select different colors for the structures below and color the coding circles and the corresponding structures on the figure.

- Arrector pili muscle
- Adipose tissue
- Hair follicle
- Nerve fibers
- Sweat (sudoriferous) gland
- Sebaceous gland

Structure of Skin Choices:

- Adipose tissue
- Arrector pilli
- Dermis
- Eccrine sweat gland
- Epidermis
- Hair follicle
- Hair papilla
- Hair shaft
- Hypodermis (subcutaneous tissue or superficial fascia)
- Nerve fibers
- Sebaceous gland
- Stratum basale
- Stratum corneum



Using the key choices, choose all responses that apply to the following descriptions. Enter the appropriate letter(s) or term(s) in the answer blanks.

⑤

Key Choices

- | | | |
|--------------------|------------------|----------------------|
| Stratum basale | Stratum lucidum | Reticular layer |
| Stratum corneum | Stratum spinosum | Epidermis as a whole |
| Stratum granulosum | Papillary layer | Dermis as a whole |

- _____ 20. Translucent cells, containing keratin *or eleidin*
- _____ 21. Strata containing all or mostly dead cells
- _____ 22. Dermis layer responsible for fingerprints
- _____ 23. Vascular region
- _____ 24. Epidermal region involved in rapid cell division; most inferior epidermal layer
- _____ 25. Scalelike cells full of keratin that constantly flake off
- _____ 26. Site of elastic and collagen fibers
- _____ 27. Site of melanin formation
- _____ 28. Major skin area from which the derivatives (hair, nails) arise
- _____ 29. Epidermal layer containing the oldest cells
- _____ 30. When tanned becomes leather

This exercise examines the relative importance of three pigments in determining skin color. Indicate which pigment is identified by the following descriptions by inserting the appropriate answer from the key choices in the answer blanks.

Key Choices

- | | | |
|----------|------------|---------|
| Carotene | Hemoglobin | Melanin |
|----------|------------|---------|

- _____ 31. Most responsible for the skin color of dark-skinned people
- _____ 32. Provides an orange cast to the skin
- _____ 33. Provides a natural sunscreen
- _____ 34. Most responsible for the skin color of Caucasians^{*Reddish*}, (Has greatest effect on Caucasians)
- _____ 35. Phagocytized by keratinocytes
- _____ 36. Found within red blood cells in the blood vessels

Part III

Complete the following statements in the blanks provided.

- _____ 1. Radiation from the skin surface and evaporation of sweat are two ways in which the skin helps to get rid of body (1).
- _____ 2. Fat in the (2) tissue layer beneath the dermis helps to insulate the body.
- _____ 3. A vitamin that is manufactured in the skin is (3).
- _____ 4. Wrinkling of the skin is caused by loss of the (4) of the skin.
- _____ 5. A decubitus ulcer results when skin cells are deprived of (5).
- _____ 6. (6) is a bluish cast of the skin resulting from inadequate oxygenation of the blood.

Using the key choices, complete the following statements. Insert the appropriate term(s) in the answer blanks.

Key Choices

- Arrector pili Hair Sebaceous glands Sweat gland (eccrine)
 Cutaneous receptors Hair follicle(s) Sweat gland (apocrine)

- _____ 7. A blackhead is an accumulation of oily material produced by _____.
- _____ 8. Tiny muscles attached to hair follicles that pull the hair upright during fright or cold are called _____.
- _____ 9. The most numerous variety of perspiration gland is the _____.
- _____ 10. A sheath formed of both epithelial and connective tissues is the _____.
- _____ 11. A less numerous variety of perspiration gland is the _____. Its secretion (often milky in appearance) contains proteins and other substances that favor bacterial growth.
- _____ 12. _____ is found everywhere on the body except the palms of the hands, soles of the feet, and lips, and it primarily consists of dead keratinized cells.
- Cutaneous receptors 13. _____ are specialized nerve endings that respond to temperature and touch, for example.
- _____ 14. _____ become more active at puberty.
- _____ 15. Part of the heat-liberating apparatus of the body is the _____.
- _____ 16. Secretin contains bacteria-killing substances.

This section reviews the severity of burns. Using the key choices, select the correct burn type for each of the following descriptions. Enter the correct answers in the answer blanks.

7

Key Choices

First-degree burn

Second-degree burn

Third-degree burn

- _____ 17. Full-thickness burn; epidermal and dermal layers destroyed; skin is blanched
- _____ 18. Blisters form
- _____ 19. Epidermal damage, redness, and some pain (usually brief)
- _____ 20. Epidermal and some dermal damage; pain; regeneration is possible
- _____ 21. Regeneration impossible; requires grafting
- _____ 22. Pain is absent because nerve endings in the area are destroyed

23. What is the importance of the vernix caseosa

Fill in the type of skin cancer that matches each of the following descriptions:

- _____ 24. Epithelial cells, not in contact with the basement membrane, develop lesions; metastasize
- _____ 25. Cells of the lowest level of the epidermis invade the dermis and hypodermis; exposed areas develop ulcer; slow to metastasize
- _____ 26. Rare but often deadly cancer of pigment-producing cells

27. What does ABCD mean in reference to examination of pigmented areas? _____

select the best answers

28. Which is *not* part of the skin?
- A. Epidermis C. Dermis
- B. Hypodermis D. Superficial fascia
29. Which of the following is *not* a tissue type found in the skin?
- A. Stratified squamous epithelium
- B. Loose connective tissue
- C. Dense irregular connective tissue
- D. Ciliated columnar epithelium
- E. Vascular tissue
30. Epidermal cells that aid in the immune response include:
- A. Merkel cells C. melanocytes
- B. Langerhans' cells D. spinosum cells
31. Which epidermal layer has the highest concentration of Langerhans' cells and has numerous desmosomes and thick bundles of keratin filaments?
- A. Stratum corneum
- B. Stratum lucidum
- C. Stratum granulosum
- D. Stratum spinosum

32. Some infants are born with a fuzzy skin; this is due to:

- A. vellus hairs
- B. terminal hairs
- C. lanugo
- D. hirsutism

33. The reticular layer of the dermis is most important in providing:

- A. strength and elasticity to the skin
- B. toughness to the skin
- C. insulation to prevent heat loss
- D. the dermal papilla, which produce fingerprints

34. A burn patient reports that the burns on her hands and face are not painful, but she has blisters on her neck and forearms and the skin on her arms is very red. This burn would be classified as:

- A. first-degree only
- B. second-degree only
- C. third-degree only
- D. critical

35. Fingerprints are caused by:

- A. the genetically determined arrangement of dermal papillae
- B. the conspicuous epidermal ridges
- C. the sweat pores
- D. all of these

Match names of epidermal strata with correct descriptions. Choose from answers in the box.

Basale	Corneum	Granulosum	Lucidum	Spinosum
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36. Clear stratum present only in thick skin.

in the condition known as dandruff: this layer thickens during callus formation.

37. Stratum consisting of one single layer of cuboidal or columnar cells; new cells form here.

39. Cells in this stratum secrete a lipid waterproofing sealant.

38. Most superficial layer of skin; consists of many layers of flat, dead cells; excessive shedding of cells in this layer of the scalp

40. Cells in this region exhibit spiny projections.

Describe the dermis in this exercise.

41. The dermis is located (*deep? superficial?*) to the epidermis and consists of (*epithelial? connective?*) tissue. The upper portion of the dermis projects into epidermal regions by fingerlike extensions known as dermal _____ . Meissner's corpuscles here are sensitive to (*pressure? touch?*). Free nerve endings within papillae are sensitive to _____ .

42. Deeper regions of the dermis are composed of (*loose? dense?*) connective tissue strengthened by _____ and _____ fibers. Extreme stretching of these fibers (as in pregnancy or obesity) leads to formation of stretch marks or _____ .

43. Explain what accounts for different skin colors — Name the three pigments:
 1. _____ 2. _____ 3. _____

44. Dark skin is due primarily to the presence of the pigment _____ , which is in greatest abundance in the (*dermis? epidermis?*). In the inherited condition called _____ , this pigment is absent in hair, skin, and eyes.

45. Carotene contributes a _____ color to skin.

46. List two possible causes of the condition known as pallor.

47. Jaundiced skin has a more (*blue? red? yellow?*) hue, often due to _____ problems. Cyanotic skin appears more (*blue? red? yellow?*) due to lack of oxygen and excessive carbon dioxide in the blood vessels of the skin.

- Check your understanding of skin glands by stating whether the following descriptions refer to *sebaceous*, *sudoriferous*, or *ceruminous* glands.

(9)

48. Sweat glands: _____

49. Glands leading directly to hair follicle; secrete sebum, which keeps hair and skin from drying out:

50. Line the outer ear canal; secrete earwax: _____

51. When enlarged, they form blackheads, pimples, or boils: _____

52. Their principal functions are to regulate body temperature and to eliminate wastes: _____

53. Eccrine versions of these glands are most prominent on forehead, palms, and soles, whereas apocrine types are found in armpits, groin, breasts, and in bearded areas of males. _____

54. Look at one of your own nails.
free edge, nail body, lunula, and cuticle.

Identify these parts of your nail:

- Answer these questions about nails and hair.

55. Are nails formed of cells (*Yes? No?*) Do nails contain keratin? (*Yes? No?*) What type of tissue forms nails? (*Dermis? Epidermis?*)

56. How is the function of the *nail matrix* similar to that of the *matrix of a hair*?

57. Why does the nail body appear pink, yet the lunula and free edge appear white?

58. "Goose bumps" occur as a result of:
A. Contraction of arrector pili muscles
B. Secretion of sebum
C. Contraction of elastic fibers in the bulb of the hair follicle
D. Contraction of papillae

59. Select the one *false* statement about the stratum basale.
A. It is the one layer of cells that can undergo cell division.
B. It consists of a single layer of squamous epithelial cells.
C. It does normally contain keratinocytes.
D. It is the deepest layer of the epidermis.

62. Select the one *false* statement.
A. Epidermis is composed of epithelium.
B. Dermis is composed of connective tissue.
C. White hair can be due to presence of air bubbles in the hair.
D. Carotene is a pigment that gives red color to skin.

63. The medical specialty that deals with diagnosis and treatment of skin disorders is:
A. Oncology C. Cytology
B. Myology D. Dermatology

64. Select the cell that functions in immunity:
A. Merkel cell C. Melanocyte
B. Langerhans cell D. Keratinocyte

Arrange the answers in correct sequence.

- _____ 60 From most superficial to deepest:
A. Dermis
B. Epidermis
C. Subcutaneous tissue

- _____ 61 From most superficial to deepest:
A. Stratum lucidum
B. Stratum corneum
C. Stratum basale

65 _____ accounts for over 75% of all skin cancers.

- A. solar keratosis D. malignant melanoma
B. basal cell carcinoma
C. squamous cell carcinoma E. none of the above are correct

(10)

- 66 Which of the following is properly matched?
- A. sudoriferous—oil
 - B. sebaceous—sweat
 - C. sudoriferous—keratin
 - D. sebaceous—oil
 - E. none are properly matched

- 67 If you were dissecting the palm of a hand, the third layer of the epidermis you would cut is the stratum
- A. spinosum
 - B. granulosum
 - C. corneum
 - D. lucidum
 - E. basale

- 68 The stratum corneum consists of
- A. mitotically active cells
 - B. cells that produce melanin
 - C. dead cells
 - D. cells containing adipose tissue
 - E. fiber-producing cells

- 69 Acne is an inflammation of the
- A. oil glands
 - B. sweat glands
 - C. epithelium
 - D. ceruminous glands
 - E. sudoriferous glands

- 70 Merkel (tactile) discs are located in the stratum
- A. basale
 - B. corneum
 - C. granulosum
 - D. germinativum
 - E. lucidum

- 71 Which portion of a nail is buried in a fold of skin?
- A. nail body
 - B. nail root
 - C. lunula
 - D. eponychium
 - E. cuticle

Match the following epidermal layers to their description.

stratum basale	stratum lucidum
stratum corneum	stratum spinosum
stratum granulosum	

72. This layer of the epidermis contains 8–10 rows of polyhedral keratinocytes that fit closely together.
73. This layer consists of 25–30 rows of flat, dead keratinocytes completely filled with keratin.
74. Found only in the thick skin of the palms and soles and is absent in thin skin.
75. Consists of 3–5 rows of flattened keratinocytes that contain darkly staining granules of a substance called keratohyalin.
76. This single layer of cuboidal to columnar keratinocytes contains stem cells, which are capable of continued cell division. Melanocytes, Langerhans cells, and Merkel cells are scattered here.

Complete the following questions pertaining to the anatomy of the hair.

77. Surrounding the root is the _____, which is made up of an external root sheath and internal root sheath of epithelium.
78. The _____ of the hair is the outermost layer, consisting of a single layer of thin, flat, scalelike cells.
79. The _____ is the superficial portion, which projects from the surface of the skin.
80. Composed of two or three rows of polyhedral cells containing pigment granules and air spaces, this portion is the _____.
81. The _____ forms the major part of the shaft and consists of elongated cells, which contain pigment granules in dark hair.
82. The onion-shaped structure at the base of each follicle is the _____.
83. The _____ contains many blood vessels and provides nourishment for the growing hair.

Part IV Using the terms below, complete the following statements.

apocrine	Langerhans cells	follicle	eponychium
cyanosis	decrease	sebaceous glands	vellus
connective	hirsutism	accessory	iron
melanocyte	stratum corneum	sebum	MSH
eccrine glands	stratum lucidum	keloid	melanin
reticular layer	integumentary system	Merkel cells	

(11)

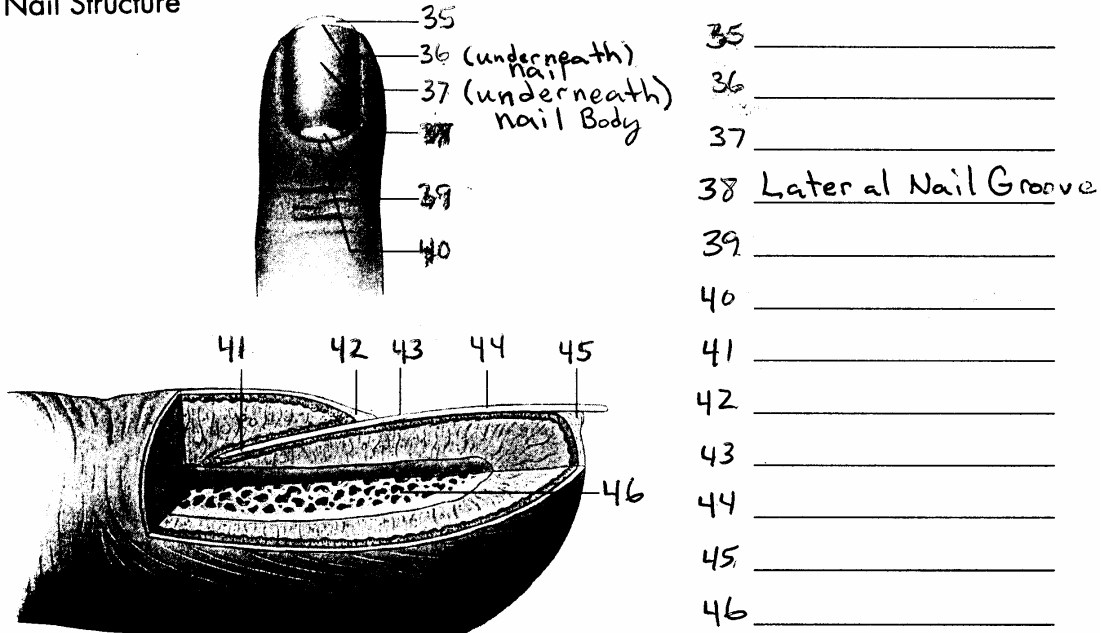
1. _____ structures of the integumentary system include hair, nails, and multicellular exocrine glands.
2. The first line of defense against an often hostile environment is the _____.
3. In areas where the skin is thick, such as the palms of the hands and the soles of the feet, the cells are flattened, densely packed, and filled with eleidin. This layer is called the _____.
4. Keratin, a fibrous protein, would be found primarily in the _____.
5. Mobile macrophages that are a part of the immune system and found scattered among the deeper cells of the epidermis are called _____.
6. The peptide secreted by the pituitary gland which increases the rate of melanin synthesis is MSH.
7. The pigment which absorbs ultraviolet radiation before it can damage mitochondrial DNA is _____.
8. The type of tissue which comprises most of the dermis is _____.
9. The subcutaneous layer, or hypodermis, is extensively interwoven with the connective tissue fibers of the _____ of the dermis.
10. The fine "peach fuzz" hairs found over much of the body surface are called _____.
11. Hair follicles are often associated with _____.
12. Hair develops from a group of epidermal cells at the base of a tube-like depression called a(n) _____.
13. The secretion which lubricates and inhibits the growth of bacteria on the skin is called _____.
14. The glands in the skin which become active when the body temperature rises above normal are the _____.
15. The sweat glands that communicate with hair follicles are called _____.
16. If the body temperature drops below normal, heat is conserved by a(n) _____ in the diameter of dermal blood vessels.
17. The stratum corneum that covers the exposed nail closest to the root is the _____.
18. During a sustained reduction in circulatory supply, the skin takes on a bluish coloration called _____.
19. Growth of hair on women in patterns usually characteristic of men is called _____.
20. The dendrites of sensory neurons and specialized touch receptor cells ^{of Epidermis} provide information about objects touching the skin. These specialized cells are called _____.
21. A thick, flattened mass of scar tissue that begins at the injury site and grows into the surrounding tissue is called the _____.
22. Ceruminous glands are modified sweat glands located in the:
 - a. reticular layer of the dermis
 - b. stratum spinosum of the epidermis
 - c. nasal passageways
 - d. external auditory canal

MATCHING:

Match the terms in column B with the terms in column A. Use letters for answers in the spaces provided.

- | COLUMN A | COLUMN B |
|-------------------------------|-----------------------------------|
| ___ 23. skin | A. vitamin D |
| ___ 24. adipocytes | B. 1st degree burn |
| ___ 25. epidermis | |
| ___ 26. melanin | D. eccrine gland |
| ___ 27. ultraviolet radiation | E. nails |
| ___ 28. dermis | F. loss of elastin |
| ___ 29. energy reserve | G. blood vessel and nerve supply |
| | H. stratified squamous epithelium |
| ___ 30. body odor | I. apocrine sweat glands |
| ___ 31. thermoregulation | J. skin pigment |
| ___ 32. accessory structures | K. lipid storage |
| ___ 33. erythema | L. cutaneous membrane |
| ___ 34. wrinkles | M. subcutaneous fat |

Nail Structure



Check your understanding of skin glands. You may use an answer more than once.

- | | |
|-----------------------|--------------|
| apocrine sweat glands | sebaceous |
| ceruminous | sudoriferous |
| eccrine sweat glands | |

- ___ 47. These glands are distributed in the axilla, pubic region, and pigmented areas of the breast.
- ___ 48. The scientific name for a sweat gland.
- ___ 49. With few exceptions, these glands are associated with hair follicles.
- ___ 50. These are modified sudoriferous glands present in the external auditory canal.
- ___ 51. Secrete an oily substance.
- ___ 52. They are distributed throughout the skin except for such places as the margins of the lips, nail beds, glans penis, and eardrum.
- ___ 53. The enlargement of this gland leads to the formation of blackheads, pimples, and boils.

Part V BODY TREK:

Using the terms below, fill in the blanks to complete the trek through the integument.

Stratum lucidum	Stratum granulosum	Sebaceous
Collagen	Hyponychium	Desmosomes
Stem cells	Epidermal ridges	Eleidin
Mitosis	Papillary	Cuticle
Elastic	Stratum spinosum	Keratin
Accessory	Dermal papillae	Keratohyalin
Lunula	Hypodermis	Reticular layer/region

The body trek begins as the micro-robot is placed on the nail plate of the thumbnail, a(n) (1) _____ part of the integument. Looking over the free edge of the nail, Robo observes a thickened stratum corneum, the (2) _____. Turning around and advancing toward the proximal end of the nail plate, a pale crescent known as the (3) _____ comes into view. This area serves as the "entrance" to a part of the stratum corneum which is folded and extends over the exposed nail nearest the root, forming the (4) _____, or eponychium. Robo expresses confusion as the message relayed to Mission Control says, "I thought I would be trekking on a living surface, but I sense nothing but layers of dead, flattened cells." A chemical analysis confirms the presence of a fibrous protein called (5) _____, which makes the cells durable and water resistant and allows them to exist for about two weeks until they are shed or washed away. Robo treks along the "dead" surface until it arrives at the palm of the hand, a "thick" area of the skin. The robot's descent is carefully controlled because of the presence of a "glassy" (6) _____, a clear layer of flattened, densely packed cells filled with (7) _____, a protein derived from (8) _____ which is produced in great quantities in the "grainy" layers below, the (9) _____. Below these strata the layers are several cells thick and bound together by (10) _____. Some of the cells act as if they are in the process of dividing. Due to the arrangement and activity of these cells, Robo confirms that its location is the (11) _____. The deeper Robo probes, the more lively the activity becomes. In the deepest stratum of the epidermis, the dominant cell population consists of (12) _____, which are actively involved in the process of (13) _____. The deeper layers of the epidermis that Robo has trekked through form (14) _____, which extend into the dermis, increasing the area of contact between the two regions and providing a route for the trek into the dermis. The dermis consists of a (15) _____ layer of loose connective tissue, and the first appearance of capillaries and nerves is evident. The region derives its name from nipple-shaped mounds called (16) _____, which project between the epidermal ridges. Probing deeper, Robo senses an area of dense, irregular connective tissue, bundles of collagen fibers, lymphatics, fat cells, muscle cells, and accessory sweat and (17) _____ glands. These structures give rise to a layer known as the (18) _____. The (19) _____ provides strength, and scattered (20) _____ fibers give the dermis the ability to stretch and contract during normal movements. The fibers of the deepest dermal layer are continuous with a subcutaneous layer, the (21) _____, an area of loose connective tissue and an abundance of fat cells. Sensory receptors in the dermal and deep epidermal layers interfere with Robo's movements and the search for an exit is imminent. Mission Control instructs Robo to find a hair follicle on the dorsal side of the hand, mount the hair shaft, and proceed to the distal end of the hair where the robot is removed and re-energized for the next trek.

Dermis; answer (T) true or (F) false to the following questions.

- 22 _____ The cells associated with the dermis include the fibroblast, macrophage, and chondrocyte.
- 23 _____ The dermis is very thick on the palms and soles.
- 24 _____ There are relatively few blood vessels, nerves, and glands embedded in the dermis.
- 25 _____ The outer region of the dermis is called the papillary region.
- 26 _____ Corpuscles of touch are often found within the dermal papillae.
- 27 _____ The reticular layer consists of dense, irregular connective tissue containing collagen and elastic fibers.
- 28 _____ Lamellated corpuscles are sensitive to light touch.
- 29 _____ Striae are the red lines that occur with stretching.

- ___ 30 Sagging and wrinkling of the integument occurs from:
- the decline of germinative cell activity in the epidermis
 - a decrease in the elastic fiber network of the dermis
 - a decrease in vitamin D production
 - deactivation of sweat glands
- ___ 31 The layers of the epidermis, beginning with the deepest layer and proceeding outwardly, include the stratum:
- corneum, granulosum, spinosum, germinativum
 - granulosum, spinosum, germinativum, corneum
 - spinosum, germinativum, corneum, granulosum
 - germinativum, spinosum, granulosom, corneum
- ___ 32 The layers of the epidermis where mitotic divisions occur are:
- germinativum and spinosum
 - corneum and germinativum
 - spinosum and corneum
 - mitosis occurs in all the layers
- ___ 33 For a cell to move from the stratum germinivatum to the stratum corneum, it takes approximately:
- 6 weeks
 - 7 days
 - 1 month
 - 14 days
- ___ 34 Epidermal cells in the strata spinosum and germinativum function as a chemical factory in that they can convert:
- steroid precursors to vitamin D when exposed to sunlight
 - eleidin to keratin
 - keratohyalin to eleidin
 - a and c
- ___ 35 Differences in skin color between individuals and races reflect distinct:
- numbers of melanocytes
 - melanocyte distribution patterns
 - levels of melanin synthesis
 - U.V. responses and nuclear activity
- ___ 36 The reason the subcutaneous layer is useful for subcutaneous injection by hypodermic needle is that it has a:
- large number of sensory receptors
 - large number of lamellated corpuscles
 - limited number of capillaries and no vital organs
 - all of the above
- ___ 37 When the body temperature becomes abnormally high, thermoregulatory homeostasis is maintained by:
- an increase in sweat gland activity and blood flow to the skin
 - a decrease in blood flow to the skin and sweat gland activity
 - an increase in blood flow to the skin and a decrease in sweat gland activity
 - an increase in sweat gland activity and a decrease in blood flow to the skin