Objectives Checklist. After completion of this lab you should be able to:

- o list the general functions of the integumentary system and explain how the skin and its accessory organs carries out these functions
- o identify the structures of the skin and its accessory organs as well as the different types of tissues and cells that make up the major layers of the skin
- o compare the structure and function of different types of cutaneous glands
- o identify and describe the composition of the various layers of the epidermis
- o distinguish between first, second and third degree burns
- o explain the basis of skin color and its link to skin cancers
- o observe and describe the distribution of sweat pores, and touch and temperature receptors

I. Pre-Lab Activities. *These activities are to be completed before coming to lab.*

A. Introduction to skin and its functions

1. Fill in the blanks of the following sentence using the wordlist provided below.

dermis	nails	dermatology	glands
hair	hypodermis	epidermis	

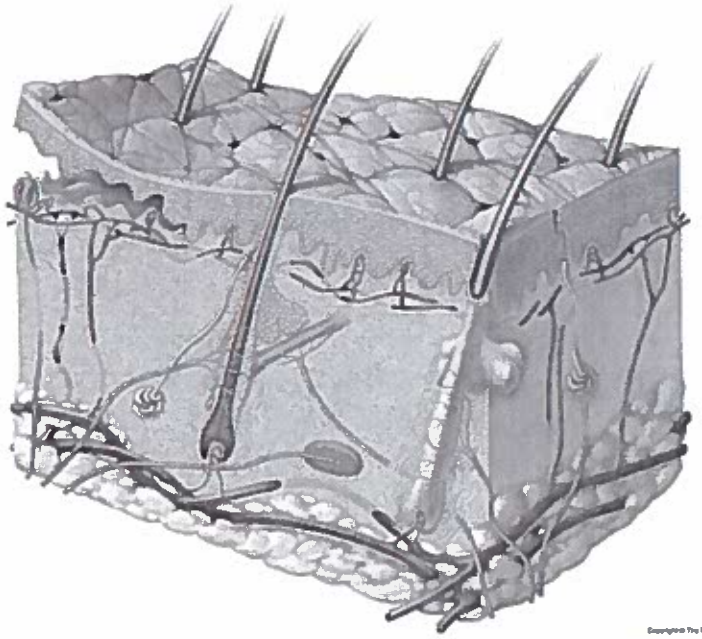
The integumentary system consists of the skin, and its accessory organs (_____, _____, and _____). The skin has two major layers: _____ & _____. The subcutaneous region of the skin is called _____. The study of the integumentary system is called _____.

2. The general functions of the skin and subcutaneous layer include the following:
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____

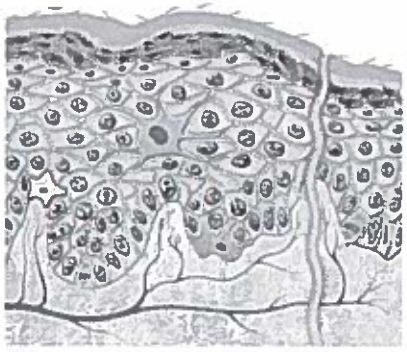
B. Layers of the Skin

a) Label the diagram on the following page with each of the structures in the table below WITHOUT using your textbook (yet). After you are done, check your answers in the book.

hypodermis	not technically a layer of the skin; primarily composed of adipocytes
arrector pili muscle	smooth muscle that gives you goose bumps
sebaceous gland	associated with hair follicles
hair follicle	cells that surround and give rise to hair
sudoriferous (sweat) gland	coiled gland sometimes associated with hair follicles, but not always
epidermis	layer of skin
dermis	layer of skin
cutaneous blood vessels	deliver O_2 and nutrients to cells of dermis and epidermis
pacinian corpuscle	pressure receptor; associated with neuron; senses deep touch
tactile receptor	touch receptor; associated with neuron; senses superficial touch



b) Label the figure of the layers of the epidermis on the right with the terms in the box below. Then answer the questions that follow.



stratum basale stratum corneum stratum granulosum stratum lucidum stratum spinosum

c) For each of the terms in the box above, write what the term makes you think of. For instance, *lucidum* might make you think of light (and indeed that's where the term comes from—because you can see light through that layer—it's somewhat transparent).

basale	
corneum	
granulosum	
lucidum	
spinosum	

II. Lab Activities. *These activities are to be completed during lab.*

A. Introduction to skin and its functions

1. Describe three ways in which the structure of the skin (and its accessory organs) is suited to the FUNCTION of protection.
   a)

   b)

   c)

2. Describe two ways in which the skin carries out the function of thermoregulation.

B. Terminology related to integumentary system (15 min)

1. Examine the following table of roots, prefixes and suffixes used in the integumentary system. Meanings are in italics. Then practice your terminology by matching the terms with the correct descriptions below.

Word Roots		Prefixes		Suffixes	
cutis, derma, integument	*skin*	epi-	*upon, outer*	-cyte	*cell*
pilum	*hair*	hypo-	*below, less*	-crine	*secretion*
sudoris	*sweat*	mero-	*part, piece*	-oma	*tumor, mass*
sebum	*oil*	apo-	*pinched off*		
melanin	*black pigment*	holo-	*whole, entire*		
keratin	*tough protein*				

_____ outer layer of the skin
_____ cell that produces the tough protein found in skin, hair, and nails
_____ cell that produces the pigment responsible for skin color
_____ smooth muscle that makes hair stand erect
_____ oil producing gland
_____ cell with long branches involved in protection against pathogens
_____ sweat producing gland
_____ gland that secretes parts of a cell that have been "pinched off"
_____ gland that secretes parts of a cell
_____ touch receptor
_____ gland that secretes entire cells
_____ layer of tissue that lies below the skin
_____ this layer makes up the major part of the skin

A. apocrine gland
B. merocrine gland
C. holocrine gland
D. sudoriferous gland
E. sebaceous gland
F. arrector pili muscle
G. hypodermis
H. dermis
I. epidermis
J. melanocyte
K. keratinocyte
L. dendritic cell
M. tactile cell

C. Layers of the Skin (30 min)

~~1. Now find each of the structures in the box on the previous page (Activity B1) on skin models. Remember, you will be asked to identify these on models for your exams! Once you've identified the structures, fill in the table below by placing a check in the box if the structure is present.~~

which layer is each in?

Structure or Tissue	Epidermis	Dermis	Hypodermis
stratified squamous epithelium			
dense irregular connective tissue			
adipose tissue			
blood vessels			
sensory receptors			
Glands			
keratin & melanin			
hair follicle			
smooth muscle			

2. Now examine the skin on the microscope (slide #17—cornified skin, slide #18—pigmented skin) *using the 4X or 10X objective*. Sketch what you see in the space below. Use the diagram of the layers of the skin to help you label each of the layers that you see. Note: be sure to draw and label adipose or dense irregular tissue where you see it so that it will help you to identify the skin later on.

C. Layers of the Epidermis (30 min)

1. Now examine the *epidermis* on the microscope (slides #17 and 18) *using the 40X objective*. Sketch what you see in the space below. Use the diagram of the layers of the epidermis to help you label.

a) What type of tissue is the epidermis?

b) In which layer of the epidermis are cells dividing?

c) Are the cells of the most superficial layer living?

d) Which cells would you predict live longer: epidermal cells or dermal cells?

e) Where is the basement membrane?

2. Where on your body would you expect to find cornified skin?

3. Examine the epidermis on the pigmented skin slide carefully.

a) Which layer contains melanocytes?

b) What is the name of the pigment that they produce? What purpose does it serve?

c) Which layer(s) show pigmentation?

d) Are dark-skinned people protected from skin cancer? Is there a link between quantity of melanin and skin cancer?

e) How would the location of the pigmentation differ in someone with light-colored skin?

f) Name two other pigments that contribute to skin color and describe how each influences the color.

D. Layers of the skin: application (15 min)

1. Shylaja is getting a henna tattoo, which is not permanent. The dye is applied to the outer surface of the skin and seeps inside.
   a) List the layers that the dye will encounter in order from the outside to the inside. Remember, it isn't permanent, so think about how deep the dye will actually go.

   b) Why does the henna dye fade after a while?

2. Shylaja liked the look of her temporary tattoo so much that she decided to get a permanent one. In this kind of tattoo, the ink is applied using a needle that pierces the skin.
   a) How deep does the ink have to go in order for the color to be permanent?

   b) The tattoo artist accidentally pierces Shylaja's skin with the tattoo needle all the way down to the bone (ouch!). Arrange the tissues listed below in the order that the needle encounters them.
      A. dense irregular connective tissue
      B. skeletal muscle tissue
      C. stratified squamous epithelium
      D. osseous tissue
      E. areolar tissue
      F. adipose tissue

3. The figures below show the extent of damage to the skin in various degree burns. Label each of the following as first, second, or third degree. Then beneath each diagram, describe the skin layers and subcutaneous region that are affected.



do this

E. Accessory organs of the integumentary system (15 min)

1. Fill in the table with the names of the cutaneous glands and their functions.

Gland	Characteristic	Function
	most common type of sweat gland	
	modified merocrine sweat gland found in the ear canal	
	modified apocrine sweat gland located in the breasts	
	oil producing holocrine gland	
	sweat glands found in the axillary and groin regions that produce a characteristic scent	

2. Answer the following questions about nails and hair.
   a) What type of cells are hair and nails made of?

   b) Which layer of the epidermis is this most similar to?

   c) What type of structural protein is present in nails and hair? Is this protein in its primary, secondary, tertiary, or quaternary configuration?

F. Sweat Pores and Receptors (45 min) – OPTIONAL ACTIVITIES

1. Observing sweat pores. In this activity, you will observe sweat emerging from the pores on your hand directly. Obtain a dissecting microscope, and put your finger in the observation field and focus. Remove your hand then open & close your fist about 20 times. Now put your finger back under the dissecting scope and observe the small droplets of sweat at the openings to the pores. Describe your observations below.

2. The density and distribution of tactile receptors varies from one part of your body to another. This has a direct effect on your ability to localize touch. Areas with a higher density of receptors should allow you to pinpoint touch more accurately than areas with fewer tactile receptors. Follow the directions below. (source: http://northonline.sccd.ctc.edu/plortz/mystery/lab4touch&reflexes.htm)
   a) With your eyes closed, have your lab partner touch the palm of your hand with a pen. The touch should be gentle enough not to hurt, but firm enough to leave a small mark.
   b) Keeping your eyes closed, try to place the eraser end of a pencil or the tip of the pen on the spot touched by your lab partner. Once you think you've found it, hold it there.
   c) Have your lab partner measure the difference in distance between the two spots. Record the distance in the table below.
   d) Repeat the steps two more times. Average the results.
   e) Repeat the experiment on the back of the hand, a fingertip, the ventral surface of the forearm, and the back of the neck. Record and average the results.