

# What's Included?

## Unit Planning

- State & NGSS Standards document
- Unit Pacing Guide for 50 min classes
- Vocabulary terms for prefix/suffix work
- Differentiation ideas for honors students and virtual students **\*Digital links for virtual learning found here**
- Honors assignment list

## Notes

- Editable PowerPoint Presentation (30 slides)
- Cornell Notes Pages
  - Fill-in-the-blank (4 pgs)
  - Editable versions of all Cornell notes
- Doodle Notes Pages
  - 4 pages
  - Guide to Using Doodle Notes
  - Doodle Note Keys & Examples

## Student Pages

- This folder contains duplicate copies of every student page. They are in order according to the pacing guide for QUICK PHOTOCOPYING if you are using the pacing guide as is.

## Activities

- Sun & Your Skin (4 pgs)
- Fingerprint Investigation (3 pgs)
- Integumentary Disease Slide Project (3 pgs)
- Answer keys or grading rubrics for all activities

## Extensions

- Digging Deeper: Moles & Skin Cancer\*
- How Burns Affect Homeostasis
- Data Analysis: Burns & the Rule of Nines\*
- Digging Deeper: Evaluation a Beauty Claim
- Answer Keys for all Extensions

\*Honors Options

## Review and Assessment

- Editable Task Card Review (20 cards) with answer sheet
- 2 diagrams of the integumentary system- Skin (1 pg), Anatomy of the Human Nail (1 pg)
- Integumentary System Test (paper)- both Honors and Regular versions with answer sheets and keys

# Unit Planning:

## NGSS and State Standards Document

If your state isn't listed, contact me by email ([support@suburbanscience.com](mailto:support@suburbanscience.com)) and I'll help you figure out which ones are covered!

### What's Included?

Included Resources by Folder:

**Unit Planning**

- State & NGSS Standards document
- Unit Pacing Guide for 50 min classes
- Vocabulary terms for prefix/suffix work
- Differentiation ideas for honors students and virtual students \*Digital links for virtual learning found here
- Honors assignment list

**Notes**

- PowerPoints: Editable Integumentary System PPT (30 slides)
- Cornell Notes Pages
  - 4 pages + Editable version
- Doodle Notes Pages
  - 5 pages (2 versions of epidermis included- 1 with stratum lucidum & 1 without)
  - Guide to Using Doodle Notes
  - Doodle Note Keys & Examples

**Activities**

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**Extensions**

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**Student Pages**

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**Supplementary Resources**

- [Online Purpose Games: Epidermal Layers Game](#)
- [Ted-Ed Video: What Makes Tattoos Permanent?](#)
- [Video: Doing Your Hair & Nails in Space](#)
- [Video: The Science of Laser Hair Removal](#)
- [Patient Case Study: Scleroderma](#)

**Materials Needed**

- Sun & Your Skin: UV beads, sandwich bags, sunscreen of various strengths, permanent markers, cookie sheets or trays (optional), computers
- Fingerprint Investigation: pencils, scrap paper, clear tape, protractors, calculators

Not included:

Unit Overview Page

plus

Supplementary Resource Ideas

and Materials Lists

### Standards:

Unit Guide

**Choosing Standards:**

Although many states use NGSS, there are some states that do not. I worked hard to find other state standards, but if yours are not addressed, please send me an email at [support@suburbanscience.com](mailto:support@suburbanscience.com) and I can help you determine which of your state standards are covered in this unit. Thank you!

**NGSS for the Unit:**

- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

**Topic: State: Standards:**

Topic	State	Standards
Integumentary System Anatomy	OH	AP.SM.1 The integumentary system consists of skin and accessory structures. The skin is composed of three layers: the epidermis, dermis, and hypodermis (subcutaneous layer). The accessory structures can include sweat glands, sebaceous glands, arrector pili muscles, hair follicles and nails. Skin functions include protection, temperature regulation, excretion and sensory perception. These occur through the processes of perspiration, skin production and shedding, vitamin D synthesis and repair.
	CO	Standard IV. 4 a. Identify the three layers of the skin (epidermis, dermis, subcutaneous) with respect to tissue type, function, and substructures (glands, hair, nails)
	IN	AP.3.1 Analyze the structural characteristics and functional importance of the integumentary system to maintaining homeostasis.
	GA	SAP2 a. Construct an explanation about the relationship between the structures of the integumentary system and their role in protection, eliminating waste products, and regulating body temperature.
	UT	Strand 4, Standards 4-6 -Describe the structures and functions of the integumentary system components: skin, glands, hair, nails. -Describe the major layers of skin: epidermis, dermis, subcutaneous (hypodermis). -Describe the functions of the following: Sudoriferous (sweat) glands, sebaceous (oil) glands.
Integumentary Disease & Injury	FL	SC.912.L.14.50 Describe the function of the vertebrate integumentary system.
	OH	AP.SM.1 Homeostatic imbalances are explored. These include, but are not limited to, burns, skin cancer, anhidrosis, acne, eczema or scleroderma.
	CO	Standard IV. 4 b. Estimate the body surface area of an adult using the Rule of Nines. c. Classify burns based on depth of skin penetration. d. Describe the diseases and disorders associated with the integumentary system (skin cancer, herpes, boils, warts, impetigo).
	IN	AP.3.2 Investigate the injuries, diseases, and causes associated with the integumentary system and evaluate the consequences.
	GA	None
Integumentary Disease & Injury	UT	Strand 4, Standard 7 Identify the following diseases and disorders of the integumentary system: skin cancers, decubitus ulcers, eczema, lesion, burns.

\*Note: NGSS is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards were involved in the production of this product, and do not endorse it.

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50 min  
classes

## Integumentary System Unit Pacing Guide

	Day	Intro	Instruct	Assess	Homework
Review	6	• Review prefix/suffix flashcards	• <b>Task Card Review</b>	• Informal discussion and questions	<u>All:</u> Study for Test
	7	• Review prefix/suffix flashcards	• Discuss answers from Task Card Review • <b>Digging Deeper: Evaluating A Beauty Claim</b>	• Informal assessment of student understanding during task card review • Informal check of Digging Deeper assignment	<u>All:</u> Study for Test
Assess	8	Review notes for test	• Take <b>Unit Test</b>	• Summative grade from unit test	

Using this Pacing Guide as is? You can print all the student pages in order from the "Student Pages" folder.  
(Quizzes and tests not included in Student Pages.)

# Editable Pacing Guides

50 min  
classes

## Integumentary System Unit Pacing Guide

	Day	Intro	Instruct	Assess	Homework
Integumentary System Anatomy	1	Students add to prefix/suffix flashcards: • derm-, epi-, hypo-, kerat-	• Integ. System PPT- Section 1 & Section 2 • <b>Cornell Notes</b> (Epidermis, Dermis & Hypodermis)	• Cornell Notes summaries • Informal discussion and questions	
Integumentary Disease & Injury	2	Prefix/suffix flashcards: • melan-	• <b>Sun &amp; Your Skin Lab</b> Materials: UV beads, zipper sandwich bags, sunscreen of various strengths, permanent markers, cookie sheets or trays (optional), computers	• Informal discussion and questions • Informal questioning during lab activity • Graded lab questions	<u>Honors:</u> <b>Digging Deeper: Moles &amp; Skin Cancer</b>
Integumentary System Anatomy	3	Prefix/suffix flashcards: • pil-, seb-, sudor-, ungu-	• Integ. System PPT- Section 3 & 4 • <b>Cornell Notes</b> (Skin Glands, Hair & Nails)	• Cornell Notes summaries • Informal discussion and questions	<u>All:</u> • <b>Integumentary System Diagram</b> • <b>Anatomy of a Human Nail Diagram</b>
Integumentary Disease & Injury	4	Prefix/suffix flashcards: • papill-	• <b>Fingerprint Investigation</b> Materials: pencils, scrap paper, clear tape, protractors, calculators • <b>Burn Homeostasis</b>	• Informal discussion and questions • Informal questioning during lab activity • Informal check of Homeostasis answers • Graded lab questions	<u>Honors:</u> <b>Data Analysis- Burns</b>
	5	Review prefix/suffix flashcards	• <b>Integumentary System Diagram Quiz</b> (found with Diagram Keys) • <b>Anatomy of a Human Nail Diagram Quiz</b> • <b>Integumentary System Disease Slide</b>	• Diagram quizzes checked for accuracy • Informal observation of student progress	

Coincide with State Standards document in Unit Planning Folder

\***Bold items** must be photocopied.



This icon is found on the top right corner of Honors pages for easy identification.

The daily topic coincide with the previous standards document.

Lesson planning is now quick and easy!



# Differentiation Ideas for:

- Student Interest
- Student Ability
- Teaching Pace
- Teaching Environment (Virtual, in-class, or hybrid)

### Differentiation

Differentiation is a key component to any unit. Here are some tips for differentiating based on student interest, ability and teaching environment.

#### Student Interest/Choice

- Both Cornell notes and Doodle Notes™ are included in this unit. Although most of my students preferred the Doodle Notes™, they may not resonate with everyone. Some students may prefer the structure of the Cornell notes.

standards and student interests, you may want to adjust the list for the Integumentary System Diseases Slide activity.

### Differentiation

#### Teaching Environment

- Virtual or Hybrid students
  - Digital Options:
    - Links for PowerPoints
    - Digital Students pages using Google Slides™ for students to type on
    - Digital Doodle Notes™
- The Sun & Your Skin lab can be completed at home with some simply materials or they can use the results from the pre-made [video demonstration](#).
- Digital drag-and-drop diagrams can be provided for students to self-check and turn it electronically. I have these [available for every body system](#). Digital diagram quizzes are included, as well.

All found on the following page.


### Honors Assignment List

Although there are no official education standards for what makes an "honors" class, **honors assignments generally provide one of three options:**

- Greater depth of knowledge
- Additional critical thinking
- More independent work

In this unit, you can find some additional assignments used to increase knowledge for honors students. **These can certainly be used for all students also be helpful for extra credit, homework, or sub days if you need it.** Because answers to these assignments are often less straightforward, grading for completion and then **discussing the answers** to make sure they are correct.

Assignment	Type of work	Skills addressed
Digging Deeper: Moles & Skin Cancer	Reading assignment	Critical thinking, problem awareness
Data Analysis: Burns	Reading assignment & Math extension	Critical thinking, basic calculations using

All honors assignments are designated by a  in the top right corner for identification.

For additional skill-work in pathology or for students thinking of going to medical field, I also use my Anatomy case studies. There is one for each body system that require critical thinking, research, and allow students to integrate to the body system to another.

[Click here to see the Case Studies](#)

### Differentiation

Differentiation is a key component to any unit. Here are some tips for differentiating based on student interest, ability and teaching environment.

#### Student Ability

- Advanced students**
  - Honors options are included in the student pages. These can be given to a whole advanced class or individual students, as needed.
  - Editable Cornell notes (found in the Notes folder)
    - Delete the fill-in-the-blank notes on the right side leaving only questions for a more independent note-taking experience.
    - Delete the summary and allow students to come up with their own.
  - When using diagram quizzes, use the option without the word bank and/or grade on spelling of the structures.
  - Tests: Don't allow students to use prefix/suffix flashcards on the test. Use more or all of the short answer questions. Delete the word banks on the diagrams.
  - Add a microscopy lab in which students examine a cross-section of the skin.
- Struggling students**
  - Eliminating homework altogether may work well for students that have trouble thinking independently or have home situations that don't allow for work outside of class. Make sure to account for the extra class time needed to complete all assignments in class.
  - For the labs, you may want to read the background information together if students have lower reading abilities. Lab questions can be checked the following day rather than grading the activity for accuracy.
  - Editable Cornell notes (found in the Unit Planning folder)
    - Use the fill-in-the-blank style of notes for these students so they can focus on material and less on summarizing.
    - Using the fill-in-the-blank summary, see if students can come up with the words that go in the blanks before providing the summary to them.
  - Diagram Quizzes: use the option with the word bank or use the option without the word bank but don't grade spelling.
  - Tests: Allow students to use prefix/suffix flashcards on the test rather than memorizing them. Eliminate some or all of the short answer questions. Use word banks for the diagrams.
- For any ability**
  - Both the PowerPoints and the Cornell notes have **editable options** so whole topics or vocabulary words can be added or deleted.

# Every student page also comes in a **digital** version on Google Slides

Virtual, hybrid, or absent students can stay right on track!

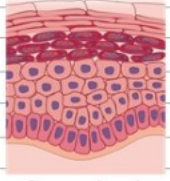
**Epidermis**

What are functions of skin?	<u>Protection</u> from water, air, infection, chemicals, UV radiation <u>Sensations</u> such as pressure, heat, cold & pain Temperature <u>regulation</u> - body can be heated or cooled by sweat and blood flow near surface <u>Excretion</u> of waste through sweat <u>Production</u> of Vitamin D
What are the layers of the epidermis?	The epidermis is the <u>top layer</u> of skin. It is composed of <u>stratified squamous epithelial tissue</u> . Stratum corneum: <u>Layer of dead cells 20-80 thick. Thick, keratinized. Protects deeper layers. Sheds.</u> Stratum lucidum: <u>Thin layer of translucent cells found only in thick skin (palms &amp; feet).</u> Stratum granulosum: <u>Cells begin to flatten. Keratin accumulates (water-proofing).</u> Stratum spinosum: <u>Thick, irregular layer of cells. Contain pre-keratin filaments.</u> Stratum basale: <u>Constantly dividing &amp; pushing cells up into the next layer.</u>
How do melanocytes protect the body?	Melanocytes are <u>spindle-shaped epithelial</u> cells found in the bottom 2 layers of the epidermis. Melanocytes produce a <u>pigment</u> called <u>melanin</u> , which is absorbed by the nearby epidermal cells. How do melanocytes differ in dark-skinned and light-skinned people? <u>Dark-skinned people have the same number of melanocytes, but each one produces more melanin.</u> Melanin <u>protects the skin against harmful UV rays.</u> When <u>UV radiation</u> mutates a skin cell's DNA, the cells begin to divide uncontrollably. This is called <u>skin cancer</u> . Types of skin cancer: <ul style="list-style-type: none"><li>• Melanoma: <u>uncontrolled division of melanocytes</u></li><li>• Basal cell carcinoma: <u>uncontrolled division in stratum basale layer</u></li><li>• Squamous cell carcinoma: <u>uncontrolled division in stratum spinosum layer</u></li></ul>

**Summary:** The skin has several functions, but primarily protects the body. The epidermis is the top layer of the skin and it grows from the stratum basale towards the surface. Melanocytes produce melanin, protecting the body from UV radiation, which can cause mutations that result in cancer.

**Epidermis**

What are functions of skin?	<u>Protection</u> from water, air, infection, chemicals, UV radiation <u>Sensations</u> such as pressure, heat, cold & pain Temperature <u>regulation</u> - body can be heated or cooled by sweat and blood flow near surface <u>Removal</u> of waste through sweat <u>Production</u> of Vitamin D
What are the layers of the epidermis?	The epidermis is the <u>top layer</u> of skin. It is composed of stratified squamous epithelial tissue. Stratum corneum:  Stratum lucidum:  Stratum granulosum:  Stratum spinosum:  Stratum basale:



Draw a melanocyte in the image above.

Can be used in Google Classroom, Microsoft OneDrive or many other platforms!



# Greek and Latin Roots for Medical Terminology Practice

## Anatomical Prefixes/Roots/Suffixes:

	Term	Definition
Integumentary System	derm-	skin
	epi-	upon
	hypo-	below
	kerat-	hard
	melan-	dark
	papill-	nipple
	pil-	hair
	seb-	oil
	sudor-	sweat
	ungu-	nail

## Using Prefixes/Suffixes in your Classroom:

### Why study prefixes and suffixes at all?

The basis of scientific terminology comes from Latin & Greek. By teaching science students Latin & Greek prefixes, suffixes and root words, they can learn to dissect new scientific terms when they come across them in news articles or textbooks. This is a great way to train our students to be scientifically literate adults. Even if they don't remember all the facts they've memorized in this class, they can interpret scientific information from the media and from their own doctors.

### How can you use them in class?

- **How I do it:**
  - **Beginning of the year:** I ask students to bring in a stack of 300 3"x5" index cards. I always have a few extra on hand for students that forget or can't afford them, although they're fairly inexpensive.
  - **Beginning of (almost) every class:** I write any prefixes and suffixes that are relevant to that day's topic on the board along with the definition. Students record the prefix/suffix on one side of an index card and the definition on the other. If there aren't any terms for that day, students can review the terms they already have written down.
  - **On test day:** I add approximately two scientific words to the end of every unit test. These are words that relate to the unit but are not ones we have discussed in class. Students must use the prefixes/suffixes we've studied to interpret the meaning of the new term. For on-level or advanced classes, I recommend not letting students use their index cards on the test, but for low-level students, it may be beneficial to allow it.

Derm-

## Uses in your Classroom:

### Helpful tips for using cards:

- Always have a master list of the terms you've given out or keep your own set of notecards. It may be helpful to have students write the date in the top corner of the card. This allows absent students to copy the terms they missed when they return.
- Starting class with these terms is a great way to give yourself a few more minutes to get organized. Students can always review their index cards or quiz each other if you need a few more minutes.
- Students will need some way to keep the cards organized- put them on a ring, rubber band them together, or keep them in a bag.
- Students add to these index card stacks throughout the year without removing terms. The course builds on itself, so it's always beneficial to review terms from previous units as well as the current unit. You may find that some terms are duplicated from one unit to another. No need to have students write the same term twice.
- For advanced students, you may want to have them look up the definition in a textbook rather than providing it to them. Be sure to mention these prefixes and suffixes again as they come up in class. Using the terms in context is the best way for students to recognize and remember them.

### Prep sub plans:

Students can type the terms into Quizlet or a similar site and quiz themselves. Students can make up scientific terms (real or not) and have other students interpret the meaning of the term. Use a blank bingo board (provided on the next page) and have students fill in the definitions for the current or past unit in any blank. The sub can call out a prefix or suffix and students mark off the definition until someone wins bingo. \*This is another important reason to have a master list or set of cards for all the terms students have already learned.

A great way to encourage scientific literacy and prepare students for higher level science courses.

# Highly Visual PowerPoint Presentation

30 editable, fully-animated slides

## What are the characteristics of the dermis?

- The dermis is composed of 2 layers:
- The **papillary layer** made of loose connective tissue
- The **reticular layer** made of bundles of collagen fibers
- The arrangement of the collagen fibers cause **lines of cleavage** or **lines of tension**.



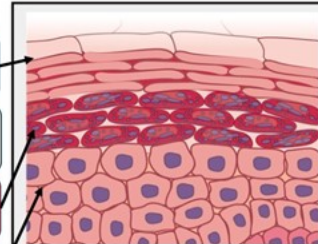
## What are the layers of the epidermis?

- The top layer of the skin
- Composed of stratified squamous epithelial tissue

**Stratum corneum:** Layer of dead cells 20-30 thick. Thick, keratinized cells protect the deeper layers. Regularly shed from the body.

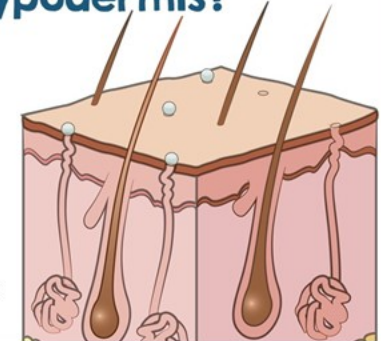
**Stratum lucidum:** (clear layer) - a thin layer of translucent cells only found in thick skin of the palms and soles of feet

**Stratum granulosum:** Cells here begin to flatten and disintegrate. Accumulate keratin granules, responsible for water-proofing the skin.



## What are the characteristics of the hypodermis?

This is also the subcutaneous layer. It is made of loose, connective tissue that protects the skin to bone.



# Sample Slides

- Apocrine sweat glands contain all the traditional components of sweat **PLUS fatty substances and proteins**.
- Originally odorless, but **bacteria begin to break down fat & proteins causing body odor**.
- Increase during puberty & may be similar to scent glands of animals.



## What is the function of hair?

- Hair & nails are made of **hard keratin**
- We have millions of hairs on most parts of our body
- **Functions:**
  - Head hair keeps in heat and protects us from the sun
  - Body hair alerts us to insects
  - Eyelashes protect the eyes
  - Nose hair prevents the entry of foreign objects



## What is the structure of a nail?

Nails are **protective** and useful as **tools**.

Example: picking things up, scratching

Nails have 4 basic parts:

Free edge } visible  
Nail body }  
Nail root } not visible  
Nail bed }





# Two note-taking styles are included:

## Cornell Notes

### Skin Glands

What are the characteristics of sudoriferous (sweat) glands?

There are 2 types of sudoriferous glands:

1. Eccrine: Merocrine sweat glands that are abundant & often found on the palms, soles of feet & forehead
2. Apocrine: found almost exclusively in armpit & genital areas

Eccrine sweat glands are long tubes that open into pores on the surface of the skin.  
Sweat is 99% water, with trace amounts of salts, vitamins, wastes, and an antimicrobial peptide called dermcidin. Sweat is generally acidic.  
How do apocrine sweat glands differ from eccrine sweat glands?

Found all over the body

Produce sweat

Also produce fats & proteins that cause body odor (bacteria)

Eccrine

Apocrine

Produce sebum (oil)  
Because sebum is usually secreted onto hair, there are more oil glands on the scalp and face and none on the palms or soles of feet.  
Sebaceous glands are holocrine glands (whole burst cells).  
Function: lubricates skin & hair, kills bacteria.  
The amount of oil produced is based on inheritance, but usually increases during puberty.

On the image, label the sudoriferous glands & the sebaceous glands.

Summary: The sudoriferous glands are long tubes that release sweat. If they also produced fats and proteins, they are apocrine glands. Sebaceous glands are found near hair and produce sebum (oil).

## Doodle Notes™

### Appendages of the Skin

#### Hair Shaft

- Hair & nails are made of hard keratin.
- Functions: protects from sun, keeps in heat, alerts us to insect bites, protects eyes, prevents entry of foreign particles into nose.
- Shaft = part of hair that sticks out of skin. ↳ protected by a cuticle

#### Sebaceous gland

- Produce sebum (oil)
- Near hairs & found more on face & scalp, less on hands & soles of feet
- Holocrine glands = whole burst cells
- Function = lubricates skin & hair, kills bacteria
- Amount of oil is based on inheritance

#### Sudoriferous (sweat) gland

- Eccrine = long tubes, abundant on palms, soles of feet & forehead
- Sweat is 99% water + salts, vitamins & dermcidin (acidic)
- Apocrine = sweat + fat/proteins ↳ found in armpits & genitals (cause body odor)

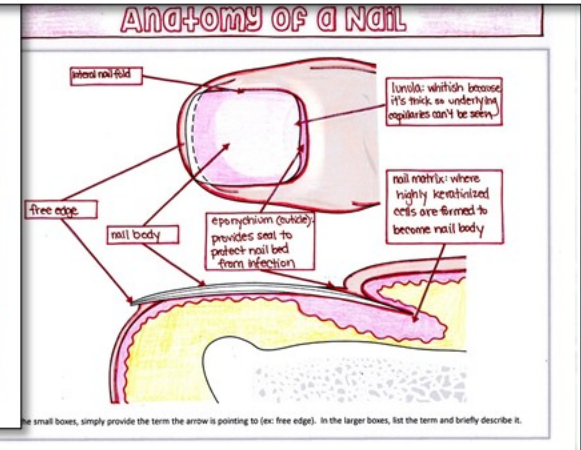
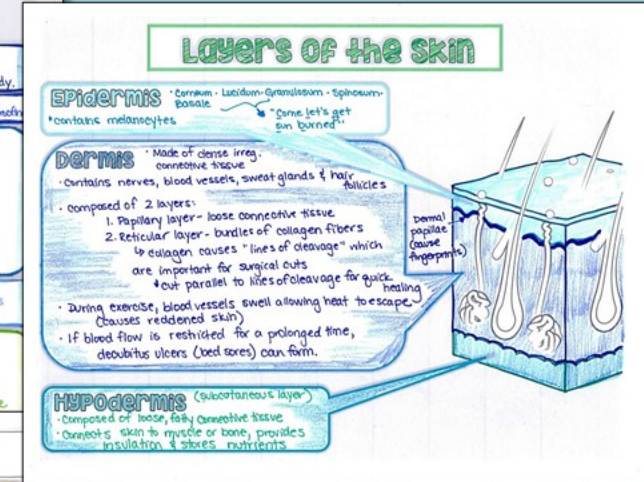
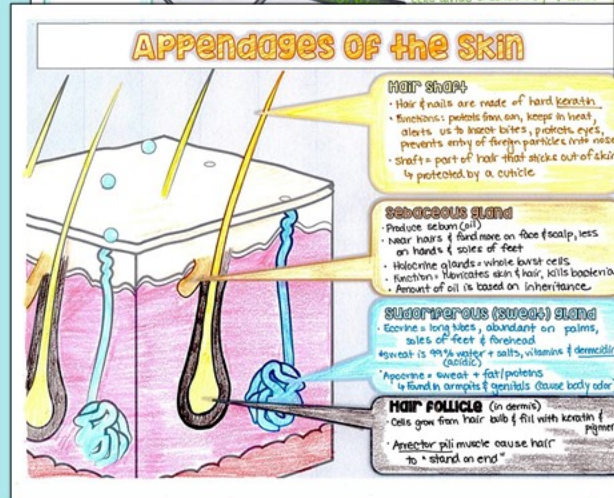
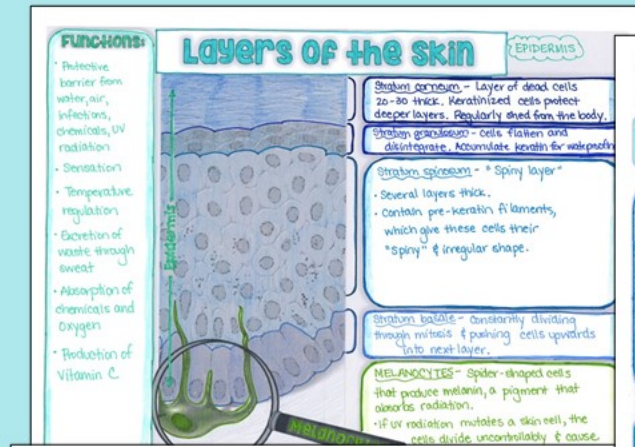
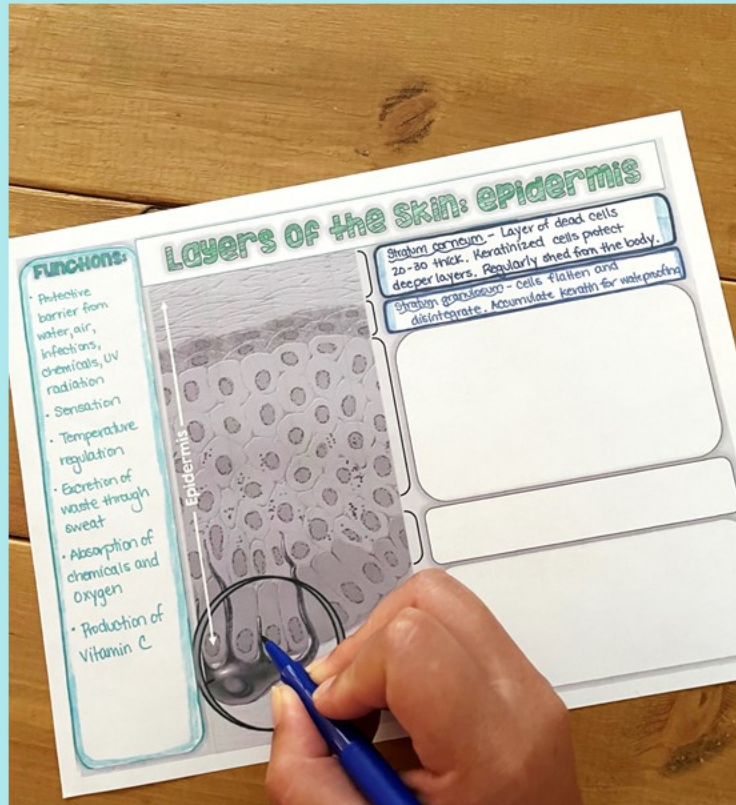
#### Hair Follicle (in dermis)

- Cells grow from hair bulb & fill with keratin & pigments
- Arrector pili muscle cause hair to "stand on end"

Both coincide perfectly with the presentation for  
**error-proof notes!**



# 4 pages of Doodle Notes

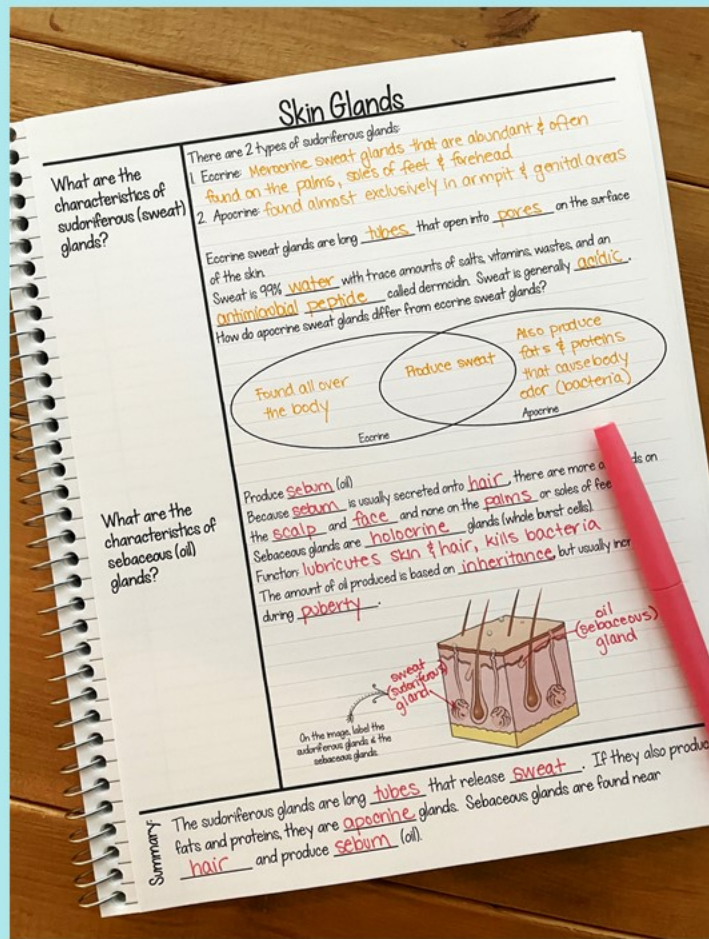


Doodle Notes™ increase student focus and memory- and they're great fun!

A guide for using them in your classroom is included.



# 4 pages of Cornell Notes



Big  
concept  
questions

Content  
summary for  
each page

## Dermis & Hypodermis

What are the characteristics of the dermis?

The dermis is composed of dense, irregular connective tissue. It contains nerves, blood vessels, sweat glands, and hair follicles.

The boundary between the epidermis and the dermis is a wavy layer called the dermal papillae. This irregular surface is the cause of your fingerprints (or epidermal ridges).

These ridges increase friction allowing us to pick up objects more easily.

The dermis is composed of 2 layers:

- Papillary layer: made of loose connective tissue
- Reticular layer: made of bundles of collagen fibers

On the image, label the epidermis, dermis, papillary layer & reticular layer.

The arrangement of the collagen fibers cause lines of cleavage or lines of tension.

Why are lines of cleavage important for surgeons? If cuts are made along the lines of cleavage, they will heal more quickly & have fewer scars.

Cuts should be made parallel to the lines of cleavage.

During exercise, the blood vessels in the dermis swell causing skin to appear red.

This allows heat from the blood to dissipate, cooling the body.

When blood supply to the skin is restricted for a prolonged time, decubitis ulcers (bedsores) can form.

What are the characteristics of the hypodermis?

Hypodermis is also known as the subcutaneous layer.

Not actually a part of the skin.

Composed of loose, fatty connective tissue that connects the skin to muscle or bone.

Also insulates and stores nutrients.

Summary: The dermis is found just deep of the epidermis and contains blood vessels and nerves. It has a papillary layer and a reticular layer made of collagen that forms lines of cleavage. The hypodermis or subcutaneous layer attaches the dermis to the underlying organs.

Each page is **editable**.

Add and delete text, questions, and summaries to meet the needs of your students.



# Includes 3 Activities

- Fingerprint Investigation
- Sunscreen Lab
- Integumentary Disease Slide Project

## Fingerprint Investigation Teacher Instructions

### Background:

This activity is a quick math and graphing refresher. Students learn about the different fingerprint types and test their own fingerprints. When all class members have determined their fingerprints, the class data can be compiled into a pie chart. Although the data from your class will vary, here are the statistics for the general population:

- Arch
- Loop
- Whorl

## Fingerprint Investigation Student Instructions

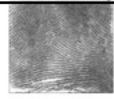
An individual's fingerprints are formed by unique patterns of ridges and valleys in the fingertips. A friction ridge, also known as an epidermal ridge, is a raised portion of the epidermis caused by the dermal papillae of the underlying skin layer. Fingerprints are used to help us identify sensory perceptions like texture and vibrations.

Because individuals' fingerprints are unique, they have been used in forensic science. Fingerprints have been used for biometrics to identify users and control access to technology (think of the recognition used to unlock your cell phone). Since skin's elasticity decreases with age, the ridges and valleys become less apparent and therefore more difficult to identify in older individuals.

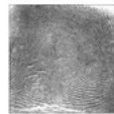
## Sample Page

### Different

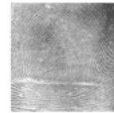
- For
- For



Arch- Ridges start on one side of the finger, rise in the middle and exit on the other side.



Loop- Ridges start on one side of the finger, rise and loop in the middle and exit on the same side. Loops can face towards either side of the finger.



Whorl- Ridges form a round shape in the center of the finger.

### Part I: Identify your own fingerprint.

- Thoroughly color a piece of scrap paper with a pencil.
- Press your thumb gently into the graphite.
- Put a piece of clear tape on your thumb and press the tape onto the space provided.

\*What type of fingerprint does your thumb have?

Place thumbprint tape here.



### Discussion Questions:

Using the information about sunburn in this lab as well as the following video <http://bit.ly/SunscreenLab>, answer the discussion questions below:

- How does ultraviolet light affect your skin cells? Differentiate between UVA and UVB rays.
- What are the two different types of sunscreens and how do they work to protect our skin?
- Consider the sunscreens you used in this lab. How do they differ?



## Sun and Your Skin Student Instructions

- Get enough snack-sized sandwich bags for the number of sunscreens you are testing PLUS a control bag. (4 sunscreens = 5 sandwich bags).
- Get one sandwich bag. On the corner of one side, mark the first type of sunscreen you will use. Then, spread a thin layer of that sunscreen on that side of the bag. Rub it in until the whole side of the bag is evenly covered.

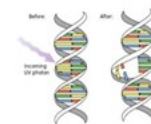


## Sun and Your Skin Student Background Information

I'm sure you've seen or experienced a sunburn. A sunburn is the reddening of the skin from an overexposure to ultraviolet (UV) light. Sunlight is made of "packets" of energy called photons. Photons of visible light are not very dangerous to our skin, but UV photons have shorter wavelengths than visible light and can cause skin damage. UV light comes in two forms- UVA and UVB.

As UVA and UVB photons hit your epidermis, molecules within the skin are energized. This energy can cause molecules to break apart or change shape. For example, DNA is damaged to produce more melanin, which makes your skin look tan. If the damage continues, an immune response is launched and blood flow is increased in the area, which appears as a sunburn.

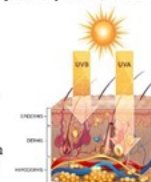
Since melanin is a natural absorber of UVA, tanning is your body's way of protecting itself from additional radiation. Unfortunately, even though you might think you look great with the tan skin, there are other lingering effects from this UV exposure. Both the UVA and UVB rays can be absorbed by DNA within the skin. When this occurs in the rapidly dividing cells of the epidermis, skin cancer can result.



In the picture to the left, you can see one of the possible damage events caused by UV radiation. The UV photons cause adjacent bases to bond with each other, rather than the correct bases. This distorted DNA causes an incorrect type of protein synthesis, which may then cause a tumor.

A good way to remember the effects of each type of UV light is to think UVA= "Aging" and UVB= "Burning". Sunscreens labeled as "broad spectrum" block both UVA and UVB rays, preventing sunburn and aging.

In today's lab, you will get to see how the chemicals in sunscreen can absorb UV radiation so that it isn't able to harm your skin.



## Slide Grading Rubric

\*Above Standard descriptors are blank to encourage you to think about creative ways to WOW your teacher!

Below standard	Approaching Standard	Meets Standard	Above Standard
Missing visual requirements to communicate information.	Uses space, lettering, and colors that confuse information or does not clearly or accurately communicate.	Information is enhanced through use of space, lettering, and colors. <ul style="list-style-type: none"> <li>Main title</li> <li>headings</li> </ul>	
Graphics are missing.	Graphics are confusing.	Graphics are carefully chosen and include a minimum of <ul style="list-style-type: none"> <li>1 image or chart</li> </ul>	
Slide does not include all topics	Slide includes accurate facts but	Slide includes all required topics and <ul style="list-style-type: none"> <li>describes carefully chosen facts.</li> <li>Accurate information</li> <li>Symptoms of the disease</li> <li>Treatment of the disease</li> </ul>	
		Slide demonstrates effective knowledge and vocabulary that are on an appropriate level.	

### Integumentary Disease Slide Student Planning Page

Project Topic: \_\_\_\_\_

Due Date: \_\_\_\_\_

Research Notes:

### Integumentary Disease Slide Student Instructions

**TASK:** Make a Google slide to explain a skin condition to the rest of your class.

#### STARTING YOUR PROJECT

1. Go to Google and create a new Google Slides presentation.
2. Save your work. When you're finished, share the final project with your teacher.

**REQUIREMENTS:** Your slide presentation must communicate information with a minimum of:

- \* A slide title of the condition
- \* 1 related image or chart
- \* Symptoms of the disease
- \* Treatment of the disease
- \* 3+ scientific facts (e.g., etiology, pathophysiology, etc.)
- \* Your name

#### POSSIBLE CONDITIONS TO RESEARCH:

- ☐ Impetigo
- ☐ Boils
- ☐ Warts
- ☐ Anhidrosis
- ☐ Herpes
- ☐ Eczema
- ☐ Rosacea
- ☐ Acne
- ☐ Psoriasis
- ☐ Ichthyosis
- ☐ Vitiligo

#### SAMPLE PROJECT:

This is an example of an "A" project. It includes the above requirements as well as a first aid video and extra explanation where appropriate. In order to keep the slide brief and informational, full sentences are not required.


### Burns

- Damage to skin tissue from heat, flames, chemicals, or electricity
- Severity is described based on the depth of the tissue damage:
  - First-degree burns: superficial; affects epidermis only
  - Second-degree burns: affects epidermis and portions of dermis
  - Third-degree burns: both epidermis and dermis are destroyed; possible damage to subcutaneous layer
  - Fourth-degree burns: deeper layers of muscle and bone are damaged

**Symptoms:** Depending on severity, skin can be red, black, or white, blistered or leathery, and possibly painful.

**Treatment:** For less severe burns, cool water, over-the-counter pain medication, and antibiotic creams can heal burn wounds.

For more severe burns, fluids must be replenished to prevent shock and skin grafts are necessary to replace damaged tissue. Fourth-degree burns often require amputation.



Second-degree burn

Video: Basic First Aid for Burns

# Integumentary Disease Slide Project Sample Pages

Sources:



# Extension Pages

## Discussion Questions:

1. What are the most immediate concerns when a burn victim is brought into the hospital?
2. A teenager was holding a firework when it exploded. He has burns on the frontal sides of his right arm and his chest. Approximately what percentage of his body is burned?
3. A woman was cleaning with ammonia and spilled it on her leg. She has chemical burns on the front of her upper leg. Approximately what percentage of her body is burned?

A few different methods exist to determine the amount of fluid required by a burn victim. One of the formulas is:

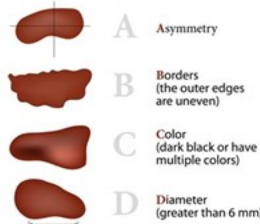
4ml x Total Burn Surface Area % x Body Weight (kg)  
50% given in the first 8 hours  
50% given in the next 16 hours

4. If a 90 kg individual arrives how much of his body (%)
5. How many liters of fluid will be required? (Show your work.)
6. A 110kg man arrives to the hospital. What is the total amount of fluid required in the next 24 hours?
7. Your little sister grabbed a hot pan and is beginning to blister. What are the immediate concerns?
8. Why do third- and fourth-degree burns require amputation?

## Digging Deeper: Moles & Skin Cancer

Moles are a common type of skin growth caused by a cluster of melanocytes. Although some individuals are born with moles (called congenital nevi), most people develop moles throughout their childhood and adolescence. Most moles are harmless (**benign**) but rarely, they can become cancerous. **Melanoma**, a type of skin cancer caused by the uncontrolled growth of melanocytes, can often be detected early by the regular monitoring of moles. Moles can come in many shapes, colors, and sizes but a few guidelines are generally used to determine whether a mole is potentially cancerous. These guidelines can be remembered as the ABCDE Rule. Cancerous (**malignant**) moles may show all of these features or may have just one or two. If you have a mole that meets one of these criteria, a dermatologist can remove it and have it sent for a biopsy to determine if it is malignant. Because

### ABCDE rule for the early detection of melanoma



dermatologists are trained to detect irregular moles, annual dermatological appointments are often recommended to monitor changes in moles. About 10% of people have an increased risk of developing melanoma, including those with a family history of melanoma, a history of many moles, a history of freckles, a history of sunburns, and a history of tanning beds. The use of tanning beds can also be a risk factor since they contain UV rays which can permanently damage skin cells.

## Discussion Questions:

1. Why would moles be common locations for a melanoma to originate?
2. You aunt just noticed a suspicious mole on her forearm and she's made an appointment at the dermatologist. What will likely occur at this appointment?
3. Do you have any risk factors (genetic or lifestyle) that might contribute to an increased risk of melanoma? What, if anything, could you do to reduce that risk?

## Conclusions:

1. Are the claims made on this cosmetic product supported by science based on the anatomy and physiology of the integumentary system? Explain your answer and use 5 terms from this course in your explanation.

## Digging Deeper: Evaluating Beauty Claims

### Background:

Just watch 1 hour of TV tonight and you'll see them- beauty ads. Cosmetic companies claim they can cure acne, give you younger-looking skin, prevent split ends, and much more. But is there any validity to these claims?

The Federal Drug Administration (FDA) does not require that beauty products be approved before they go on the market, but they do have restrictions for claims made on cosmetic labels. They are required to be truthful and not misleading. In this activity, you'll do some research on a cosmetic product to determine if it's not only truthful, but also if it's supported by science.

### Instructions:

1. Using the internet, find a skincare or haircare product with a visible label. You can also search for one of these products at home.
2. Examine the beauty claim and primary ingredients listed.  
Ex: "Cleanses, hydrates & helps restore the protective skin barrier"; "with 3 essential ceramides & hyaluronic acid".
3. Research how these ingredients affect the skin. Search to record your research in the table provided below. Be careful when researching that you are using scientific sites rather than commercial advertising. (Healthline.com is a good place to start.)



Main Ingredient	Description of Ingredient	Use in Integumentary System

Greater depth of knowledge, scientific literacy, & critical thinking

# Extension Pages

## Discussion Questions:

1. What are the most immediate concerns when a burn victim is brought into the hospital?
2. A teenager was holding a firework when it exploded. He has burns on the frontal sides of his right arm and his chest. Approximately what percentage of his body is burned?
3. A woman was cleaning with ammonia and spilled it on her leg. She has chemical burns on the front of her upper leg. Approximately what percentage of her body is burned?

A few different methods exist to determine the formulas is:

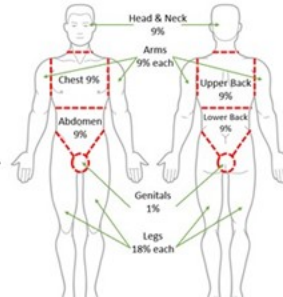
4ml x Total Burn Surface Area % x Body Weight  
50% given in the first 8 hours  
50% given in the next 16 hours

4. If a 90 kg individual arrived in the emergency how much of his body (%) would you estimate?
5. How many liters of fluid would you give this (Show your work.)
6. A 110kg man arrives to the hospital with this. What is the total amount of fluid (in Liters) the next 24 hours?
7. Your little sister grabbed a hot skillet that she is beginning to blister. What type of burn is this?
8. Why do third- and fourth-degree burns require medical attention?

## Data Analysis: Burns

Burns are one of the most serious tissue injuries that can happen to an individual. Burned tissue can result from heat, overexposure to the sun or other radiation, or contact with flames, chemicals, or electricity. Without skin as a barrier, two life-threatening concerns arise: limiting fluid loss and preventing infection.

It is important to immediately replenish any fluids lost from the burn site without overhydrating the victim. Loss of fluids can cause the kidneys and heart to shut down, resulting in shock. To efficiently determine the amount of fluids required, medical professionals use a method called **The Rule of Nines** to estimate the extent of the tissue damage. Burns near the head, face, and neck can be particularly dangerous because they can cause the airway to become swollen or restricted. To prevent infection, the burned tissue begins to decay and is eventually wrapped and treated. It is essential that burn victims with serious burns receive medical attention quickly.



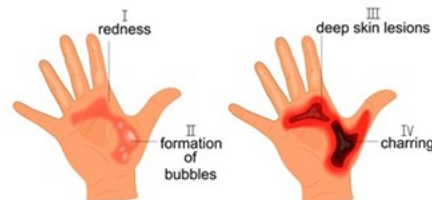
Burns are categorized by their severity, which is determined by the depth of the burned tissue. The deeper the tissue damage, the more severe the burn.

**First degree burn** - The epidermis is damaged, but the dermis is intact. The burn is red, painful, and blisters.

**Second degree burn** - The epidermis and part of the dermis are damaged. The burn is red, painful, and blisters.

**Third degree burn** - Both epidermis and dermis are destroyed and possibly portions of the hypodermis, as well (known as full-thickness burns). Blisters and blackened skin is present, but the burns are not painful because the nerve endings have been damaged.

**Fourth degree burn** - Damaged tissue extends into deeper layers such as bone and muscle. First and second degree burn leave some epithelial tissue intact, so regeneration is likely and scars usually don't develop. Third and fourth degree burns require skin grafts to recover the damaged area because epithelial tissue is no longer present for regrowth.

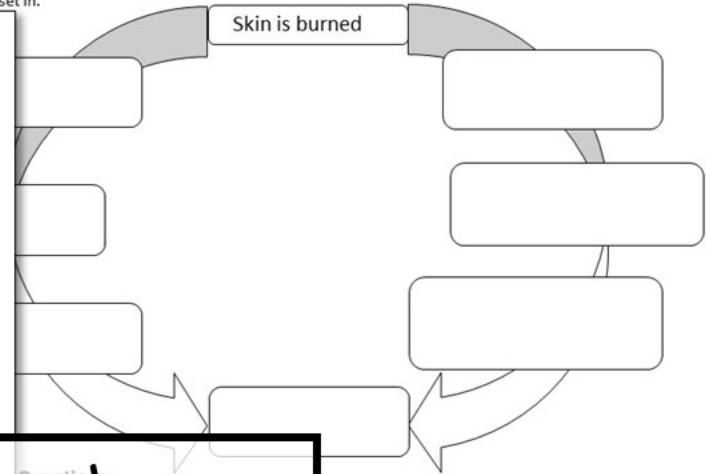


## Burn Homeostasis



### Burn Dehydration

When skin is burned, the damaged tissue can no longer protect the body. Burned skin is no longer able to retain fluids and electrolytes within the underlying tissue, protect the body from infectious agents, and thermoregulate through the dilation and contraction of blood vessels. If the burns are not deep or extensive, the skin can regenerate to restore homeostasis. However, if the burn is severe, the burn victim must receive medical intervention immediately to offset these losses before dehydration, hypothermia and shock set in.



### Questions:

Which elements on the image above: **intact dermis regenerates, homeostasis restored, skin is able to regenerate, fluids & heat are lost (use twice), temperature & fluid levels through medical intervention, fluid & temperature stabilizes**

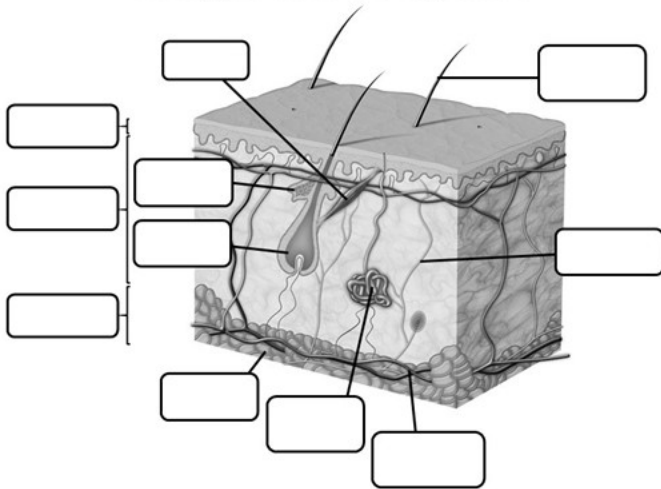
Arrows above, label one arrow **severe burn** and label the other **superficial burn**. Choose the arrows based on the steps involved.

What would be the next concern a medical professional would have while the burns were healing?



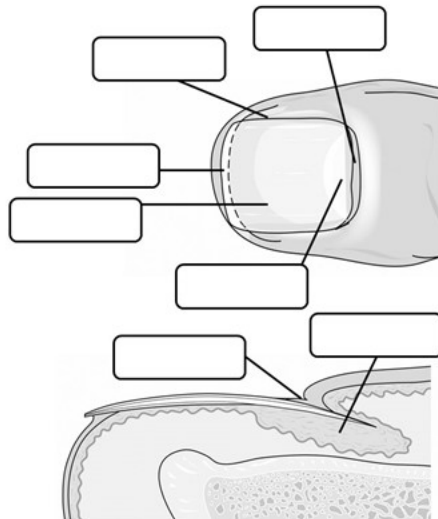
# Anatomical Diagrams

## Integumentary System



Word bank: adipose tissue, epidermis, sweat gland, sebaceous gland, nerve, hair follicle, hair shaft, blood vessels, arrector pili, dermis, hypodermis

## Anatomy of a Human Nail

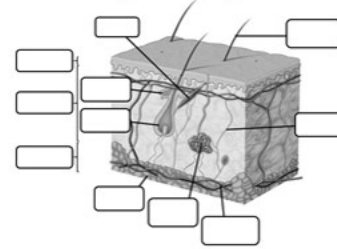


Word bank: eponychium (cuticle), proximal nail fold, lunula, free edge, nail body, nail matrix, lateral nail fold

## Each diagram comes in 4 versions:

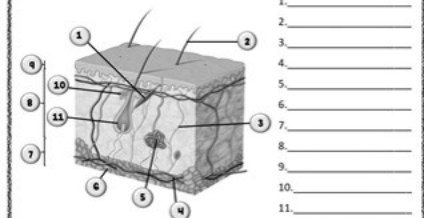
1. Fill-in the blank with word bank
2. Numbered quiz
3. Labeled black & white
4. Labeled color

### Integumentary System

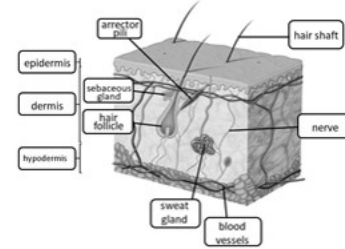


Word bank: adipose tissue, epidermis, sweat gland, sebaceous gland, nerve, hair follicle, hair shaft, blood vessels, arrector pili, dermis, hypodermis

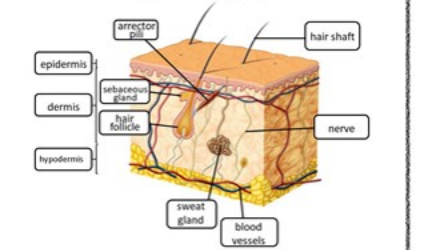
### Integumentary System



### Integumentary System



### Integumentary System



# 20 Editable Task Cards for Review

1 Name 4 functions of skin.

2 Which layer of the epidermis is only found in the palms and soles of the feet?

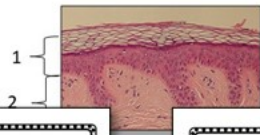
3 Name the layers of the skin from bottom to top.

4 What pigment protects skin from UV radiation? Where is this pigment produced?

## Sample Task Cards

5 In which layer of the skin would a basal cell carcinoma begin?

6 Identify these skin layers:



7 Dermal papillae found between the epidermis and dermis form what commonly known feature?

8 What are the 2 major layers of the dermis? How does their structure differ?

## Using Editable Task Cards 🍏

### How to set-up:

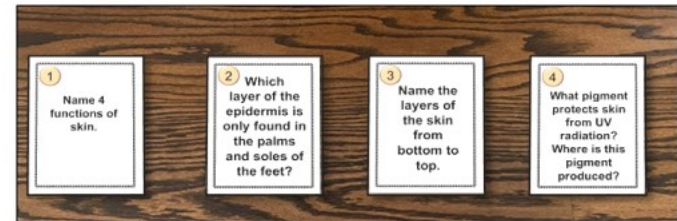
1. Print the cards on cardstock or paper.
2. Cut the pages so that each card is separate. If you'd like to use them in future years, it may be worth laminating them to protect them from student writing and other damage.
3. Place each task card at a seat around the room.
4. Students will rotate to each seat until all cards are finished. Answers are recorded on their "Task Card Answer Sheet" or notebook paper.

\*TIP: It is important to set a timer. Usually 1-2 minutes is appropriate. Without a timer, students will get backed up while rotating and chaos will ensue. ☺

## Teacher Tips

### Modifications:

- These task cards are editable so you can change the text on any card.
- There are additional cards at the end of the document for adding questions. Be sure to add the correct number, as well!
- If moving around your room isn't possible, you can have students pass the cards in one direction.
- Other options:
  - Students can use notes or not depending on the level of memorization you expect prior to reviewing.
  - Students can work in pairs, which adds confidence.





# Assessments

## Editable Unit Test

- 19 multiple choice questions
- 7 matching questions
- 2 Greek/Latin term questions
- 1 labeled diagram
- 7 free response questions

Two Versions: Honors & Regular

**INTEGUMENTARY SYSTEM TEST** Name \_\_\_\_\_

**Multiple Choice:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_

**Labeling:**

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_
- F. \_\_\_\_\_
- G. \_\_\_\_\_
- H. \_\_\_\_\_

**Free Response:**

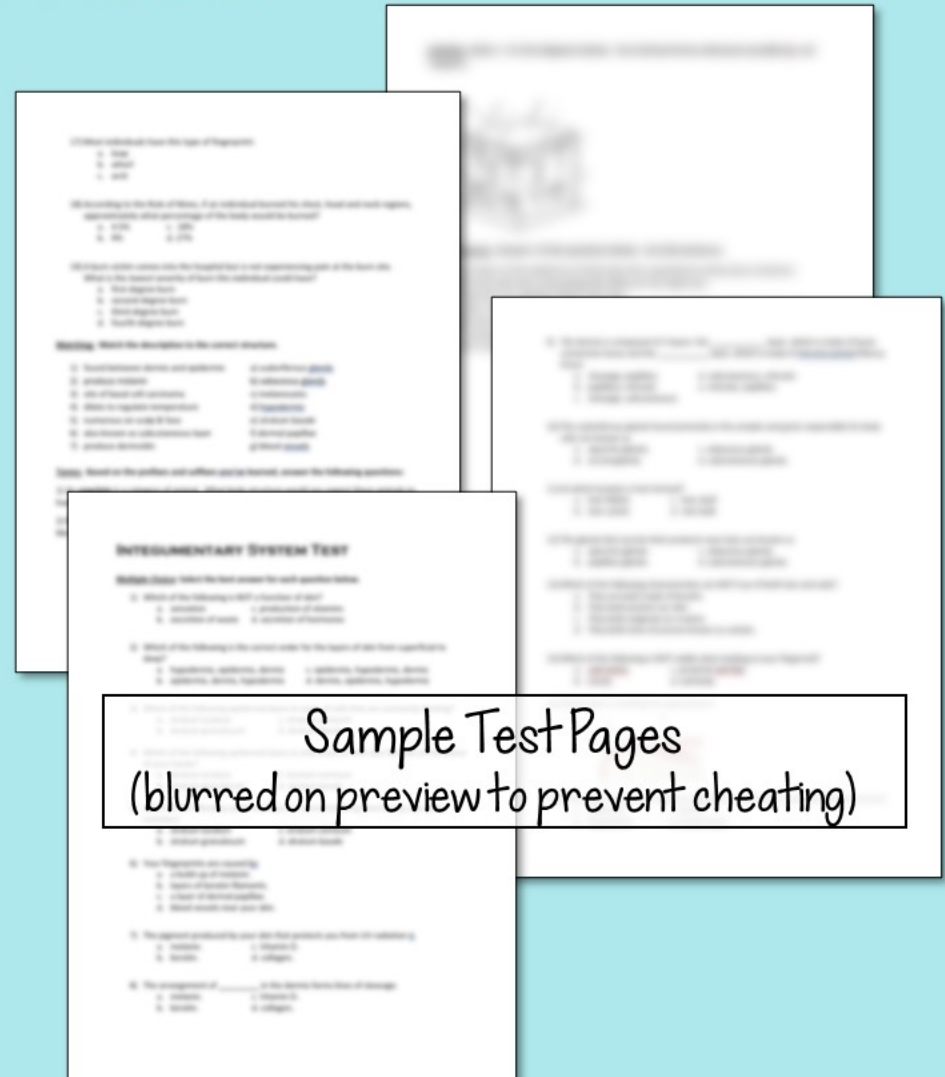
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_

**Matching:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_

**Terms:**

1. \_\_\_\_\_
2. \_\_\_\_\_



Sample Test Pages  
(blurred on preview to prevent cheating)

Student answer  
sheet & answer keys  
included  
(both fully editable)

# I'd love to hear from you!

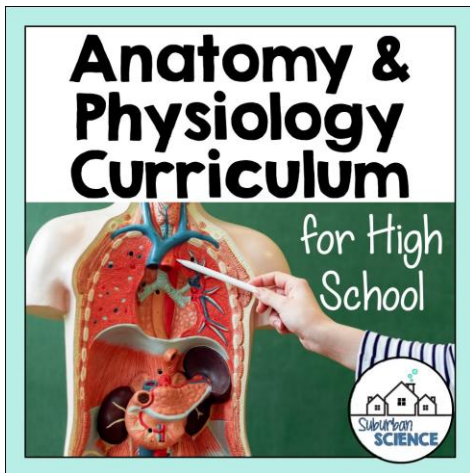
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## Want to connect?

I sincerely hope this resource will make your school year easier and more fun.

For more teaching tips and ideas, [subscribe](#) to my email list or [check out my blog](#).

You can also follow me on TpT or social media:



Sincerely,  
Anne from Suburban Science

