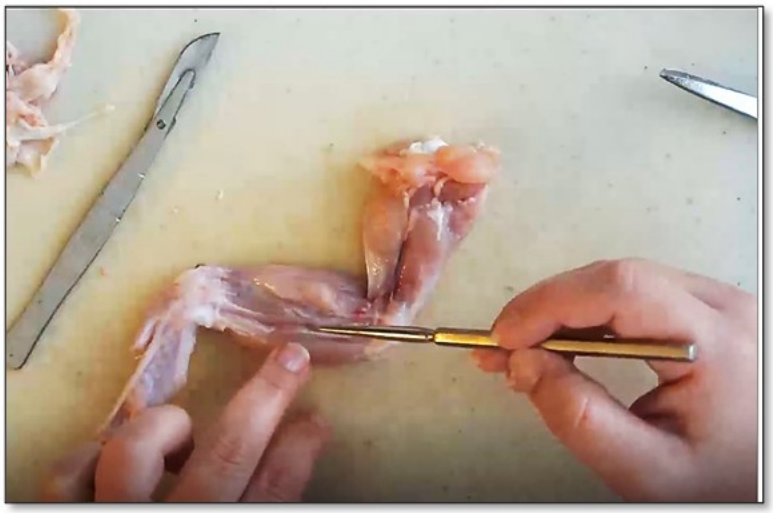
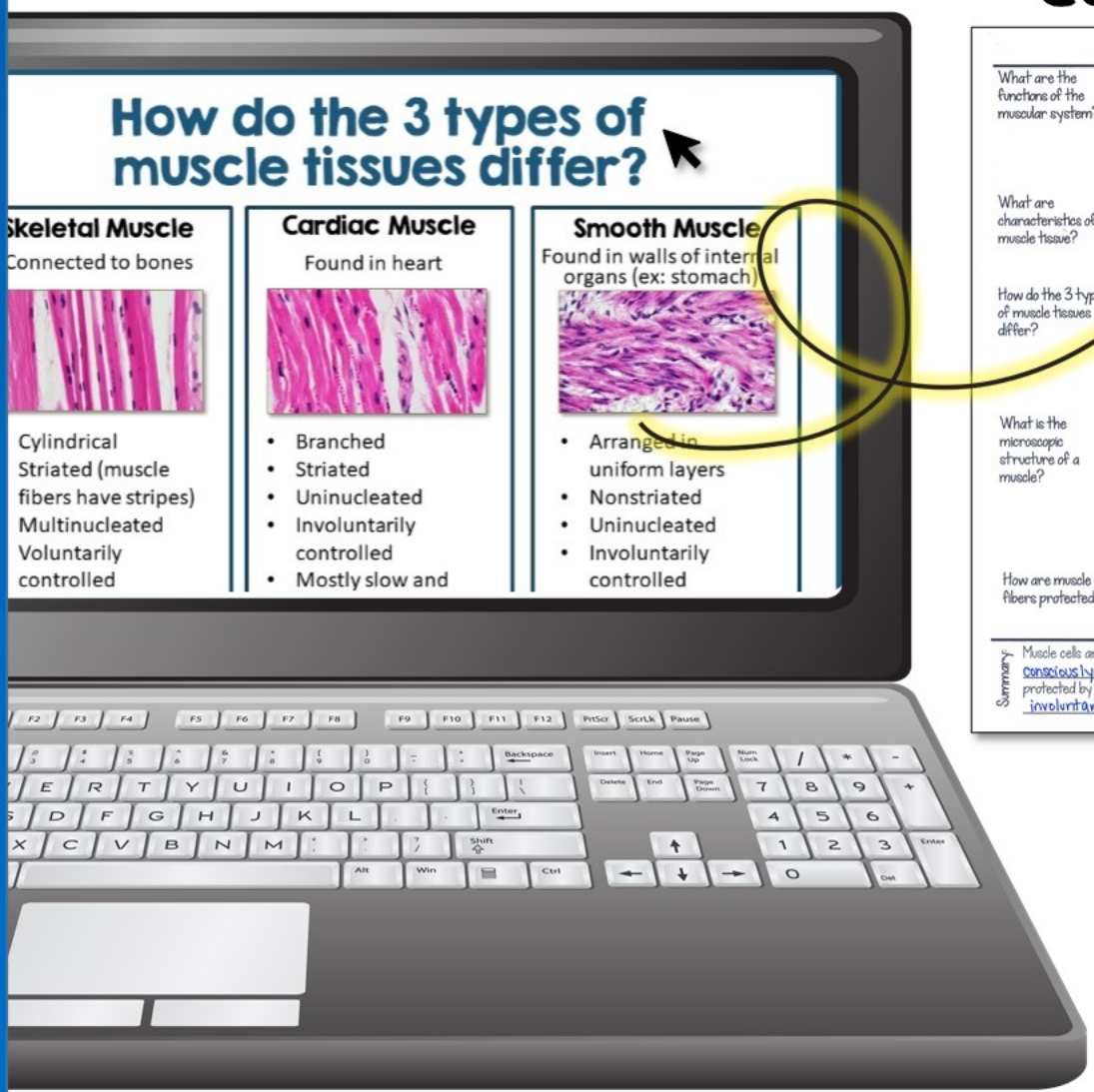
Full Anatomy Curriculum:

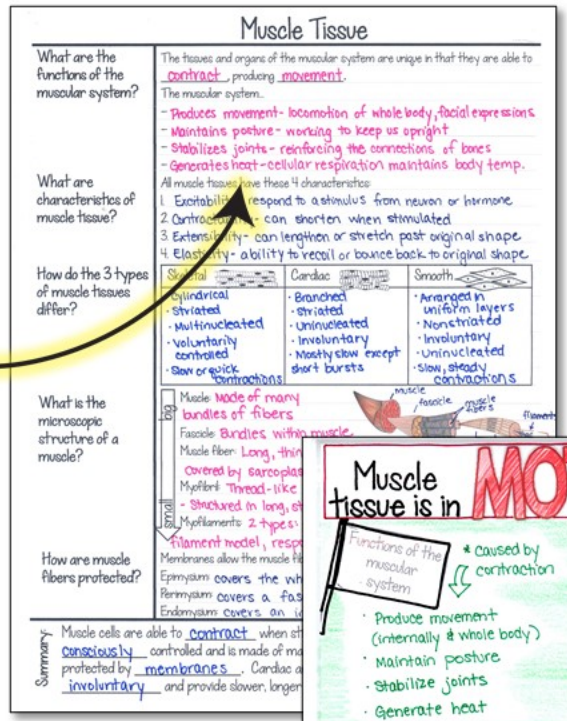
- Editable PowerPoints
- Cornell Notes AND Doodle Notes
- Labs & Activities
- Dissections
- Diagrams
- Math Extensions
- Literacy Extensions
- Task Cards
- Online Quizzes
- Editable Tests

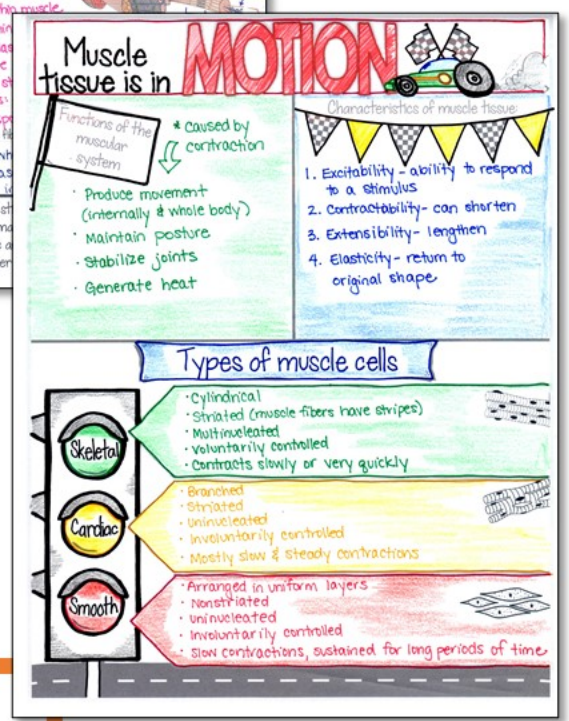


500+ Editable PowerPoint slides
that match perfectly with
Cornell Notes OR Doodle Notes!

Cornell Notes





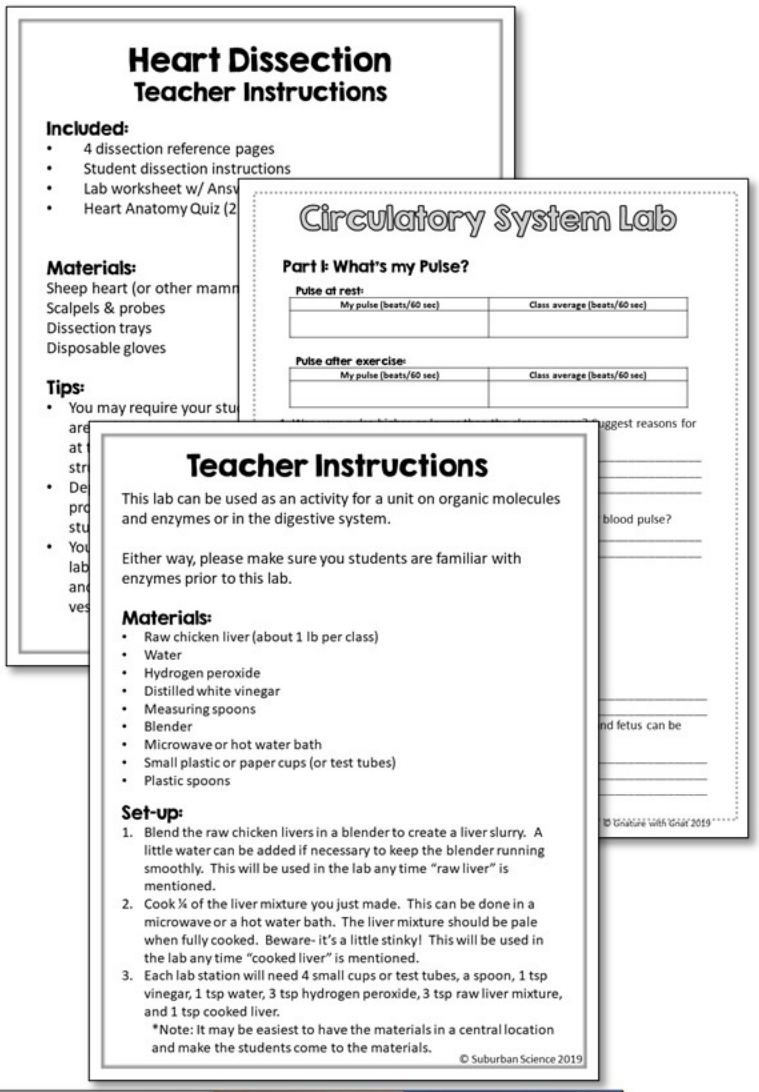


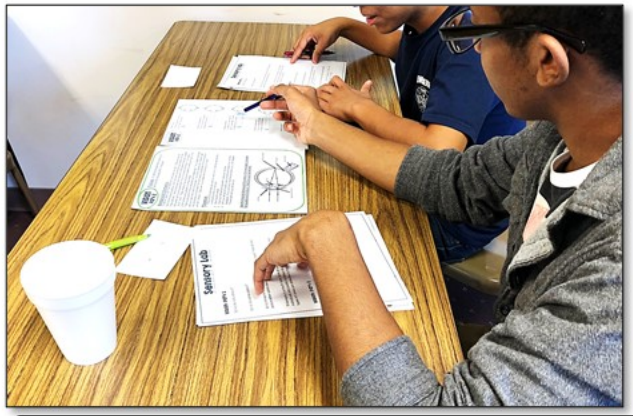
Doodle Notes ™

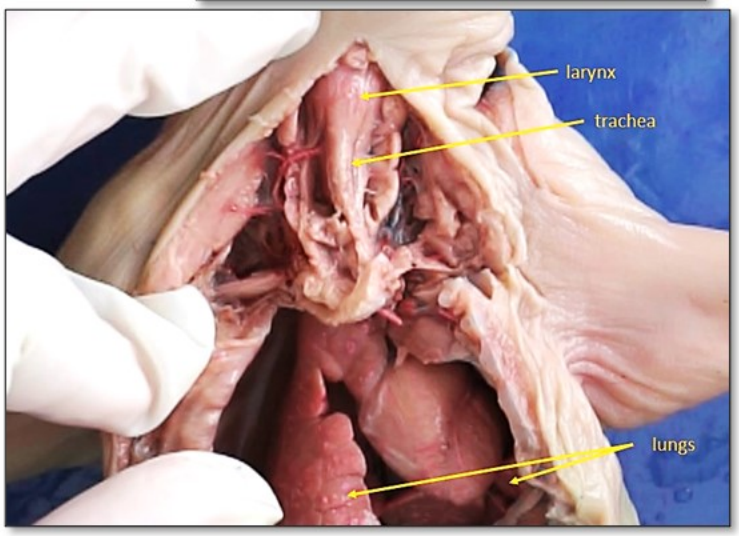
PPTs & all student pages
come in PRINT or DIGITAL!

49 Labs & Activities

- 7 Microscopy Labs
- 5 Dissections
- 9 Inquiry Labs
- 4 Station Labs
- 4 Modeling Labs
- 3 Games
- 17 Paper and/or Research Activities



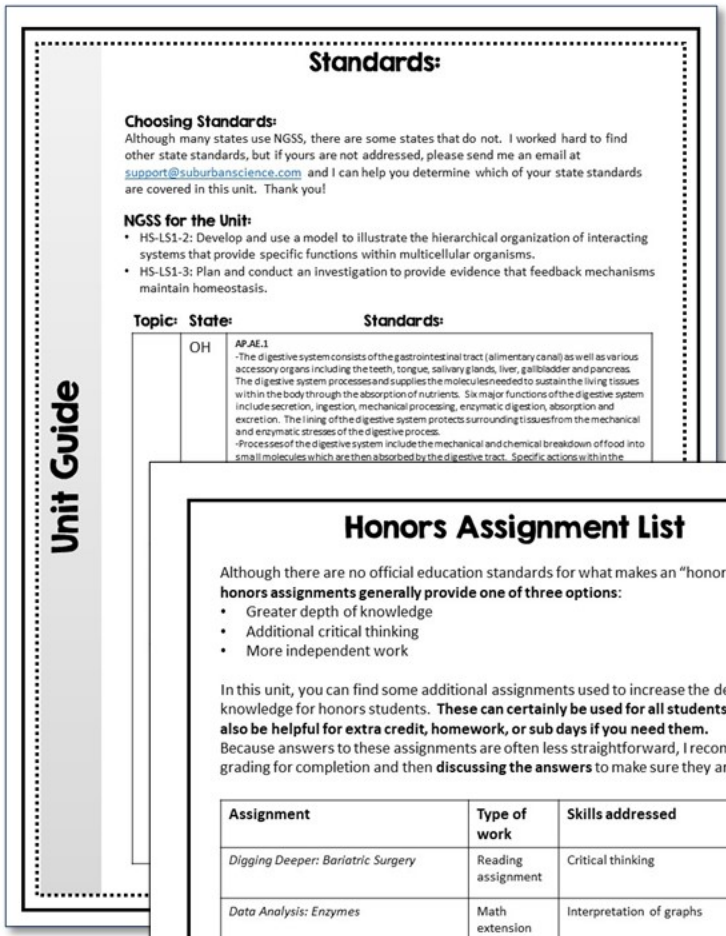




Video demonstrations included for every dissection!

Unit Planning:

- NGSS and State Standards
- Editable Pacing Guides
- Differentiation Guides for various abilities & learning environments



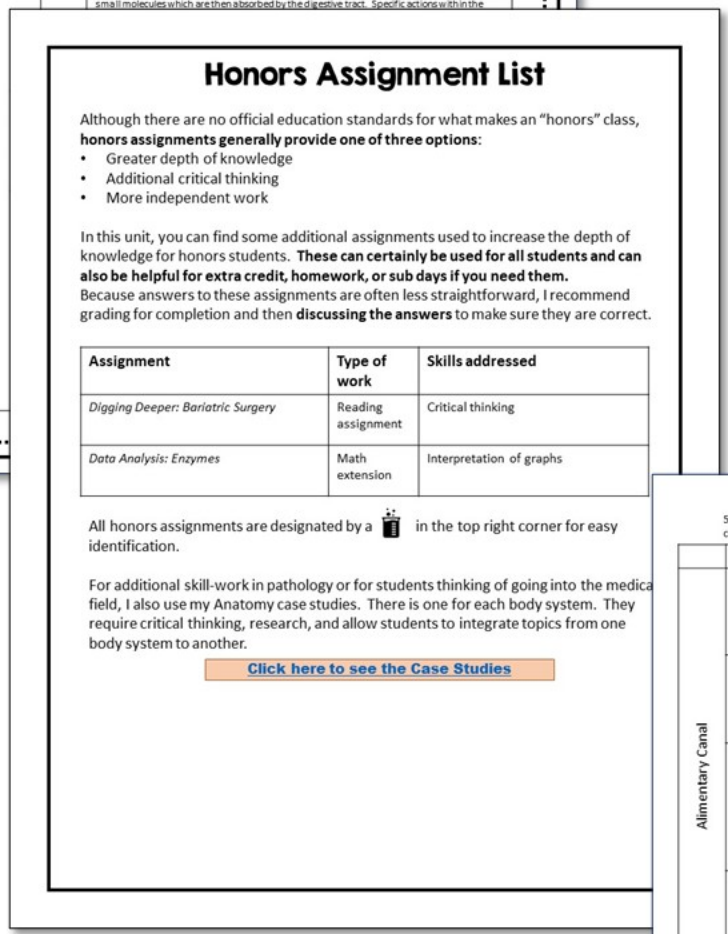
Unit Guide

Standards:

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 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:
	OH	AP.AE.1 -The digestive system consists of the gastrointestinal tract (alimentary canal) as well as various accessory organs including the teeth, tongue, salivary glands, liver, gallbladder and pancreas. The digestive system processes and supplies the molecules needed to sustain the living tissues within the body through the absorption of nutrients. Six major functions of the digestive system include secretion, ingestion, mechanical processing, enzymatic digestion, absorption and excretion. The lining of the digestive system protects surrounding tissues from the mechanical and enzymatic stresses of the digestive process. -Processes of the digestive system include the mechanical and chemical breakdown of food into small molecules which are then absorbed by the digestive tract. Specific actions within the



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

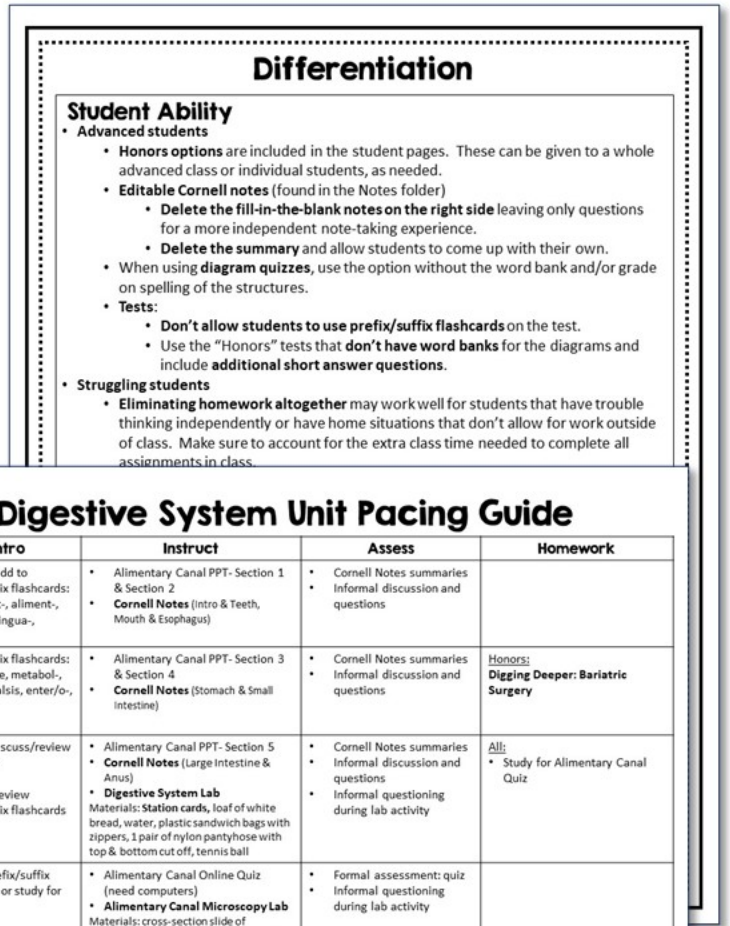
In this unit, you can find some additional assignments used to increase the depth of knowledge for honors students. **These can certainly be used for all students and can also be helpful for extra credit, homework, or sub days if you need them.** Because answers to these assignments are often less straightforward,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

Assignment	Type of work	Skills addressed
Digging Deeper: Bariatric Surgery	Reading assignment	Critical thinking
Data Analysis: Enzymes	Math extension	Interpretation of graphs

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

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

Click here to see the Case Studies



Differentiation

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 the "Honors" tests that **don't have word banks** for the diagrams and include **additional short answer questions**.
- **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.

50 min classes

Digestive System Unit Pacing Guide

	Day	Intro	Instruct	Assess	Homework
Alimentary Canal	1	Students add to prefix/suffix flashcards: • digest-, aliment-, glosso-, lingua-, -odonto	• Alimentary Canal PPT- Section 1 & Section 2 • **Cornell Notes** (Intro & Teeth, Mouth & Esophagus)	• Cornell Notes summaries • Informal discussion and questions	
	2	Prefix/suffix flashcards: • -phage, metabol-, peri-, -stalsis, enter/o-, ruga-	• Alimentary Canal PPT- Section 3 & Section 4 • **Cornell Notes** (Stomach & Small Intestine)	• Cornell Notes summaries • Informal discussion and questions	Honors: **Digging Deeper: Bariatric Surgery**
	3	Honors: Discuss/review homework Regular: Review prefix/suffix flashcards	• Alimentary Canal PPT- Section 5 • **Cornell Notes** (Large Intestine & Anus) • **Digestive System Lab** Materials: **Station cards,** loaf of white bread, water, plastic sandwich bags with zippers, 1 pair of nylon pantyhose with top & bottom cut off, tennis ball	• Cornell Notes summaries • Informal discussion and questions • Informal questioning during lab activity	All: • Study for Alimentary Canal Quiz
	4	Review prefix/suffix flashcards or study for quiz	• Alimentary Canal Online Quiz (need computers) • **Alimentary Canal Microscopy Lab** Materials: cross-section slide of esophagus, stomach, or intestines and microscopes (or virtual slide)	• Formal assessment: quiz • Informal questioning during lab activity	
Accessory Organs	5	Review quiz answers and/or answer student questions about quiz	• Accessory Organs PPT- Section 1 • **Cornell Notes** (Accessory Organs) • **Accessory Organs Microscopy Lab** Materials: liver histology slide and microscopes (or virtual slide)	• Cornell Notes summaries • Informal discussion and questions • Informal questioning during lab activity	

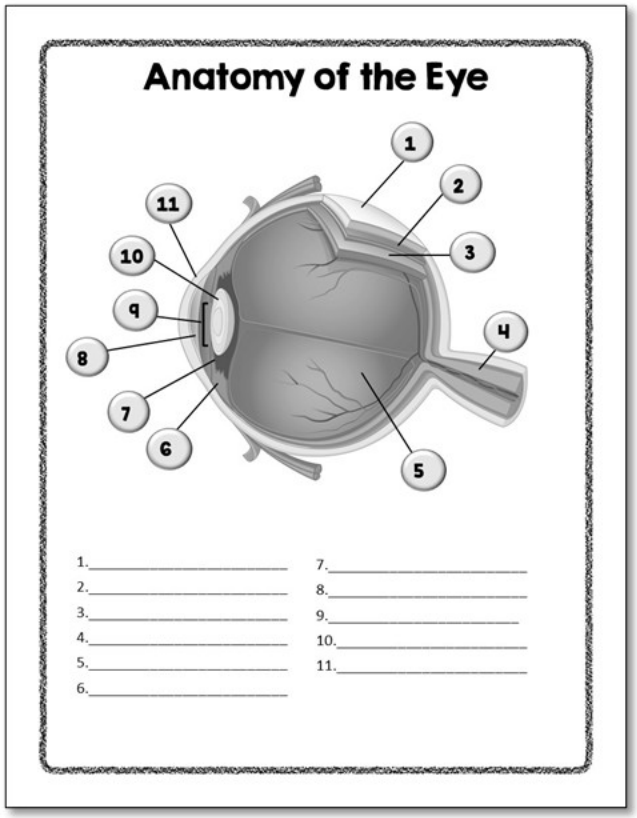
Coincide with State Standards document in Unit Planning Folder

***Bold items** must be photocopied.

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

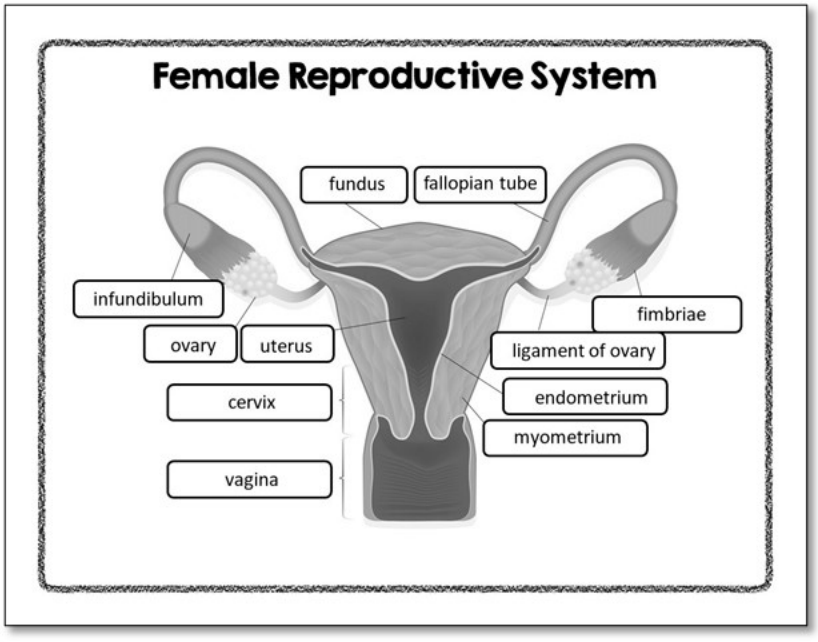
Lesson planning is now quick & easy!

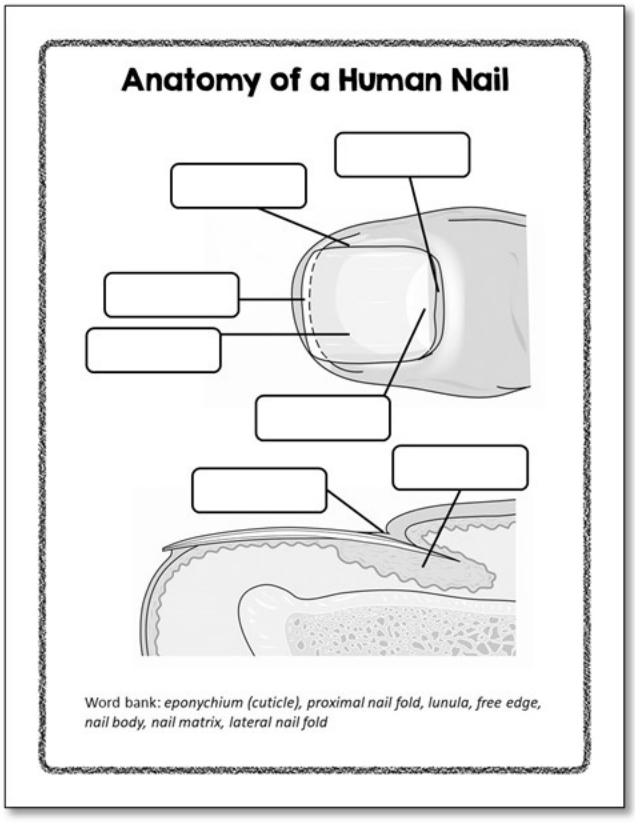
35 Anatomical Diagrams



Come in 4 versions:

-Completed B&W
-With word bank
-Numbered quiz
-Complete color





Two note-taking styles are included:

Cornell Notes

Nutrition

What processes are involved in metabolism?

Metabolism refers to the life-sustaining chemical reactions of the body. It is categorized into 2 types:

1. Catabolism: breaking down of complex molecules while releasing energy (ATP).
2. Anabolism: formation of complex molecules while using energy.

What types of nutrients are required by the body?

Nutrients are substances that provide the body with energy and can be used for growth.

What are the 4 types of macronutrients required by the body?
carbohydrates, lipids, proteins, & water (needed in large amounts)

What are the 2 types of micronutrients required by the body?
vitamins & minerals (needed in small amounts)

How are macromolecules digested?

What are they?	How are they broken down?	Where are they broken down?	What is the process?
Carbohydrates: • sugars • main source of energy	• Salivary amylase • Pancreatic amylase • Brush border enz.	→ Mouth → Small intestine → Small intestine	Cellular respiration (Glycolysis, Cycle, Electron Tran. Chn) • Excess stored as glycogen or fat.
Lipids: • fats • secondary source of energy	• Bile salts • Pancreatic lipase	→ Liver & small intestine → small intestine	• lipids must be emulsified because they are insoluble. • Broken into acetic acid
Proteins: • Majority of cellular structures • Enzymes	• Pepsin • Pancreatic enz. • Brush border enzymes	→ Stomach → Small intestine →	• Polypeptides broken into amino acids. • Pumped into cell

How is water used in the body?

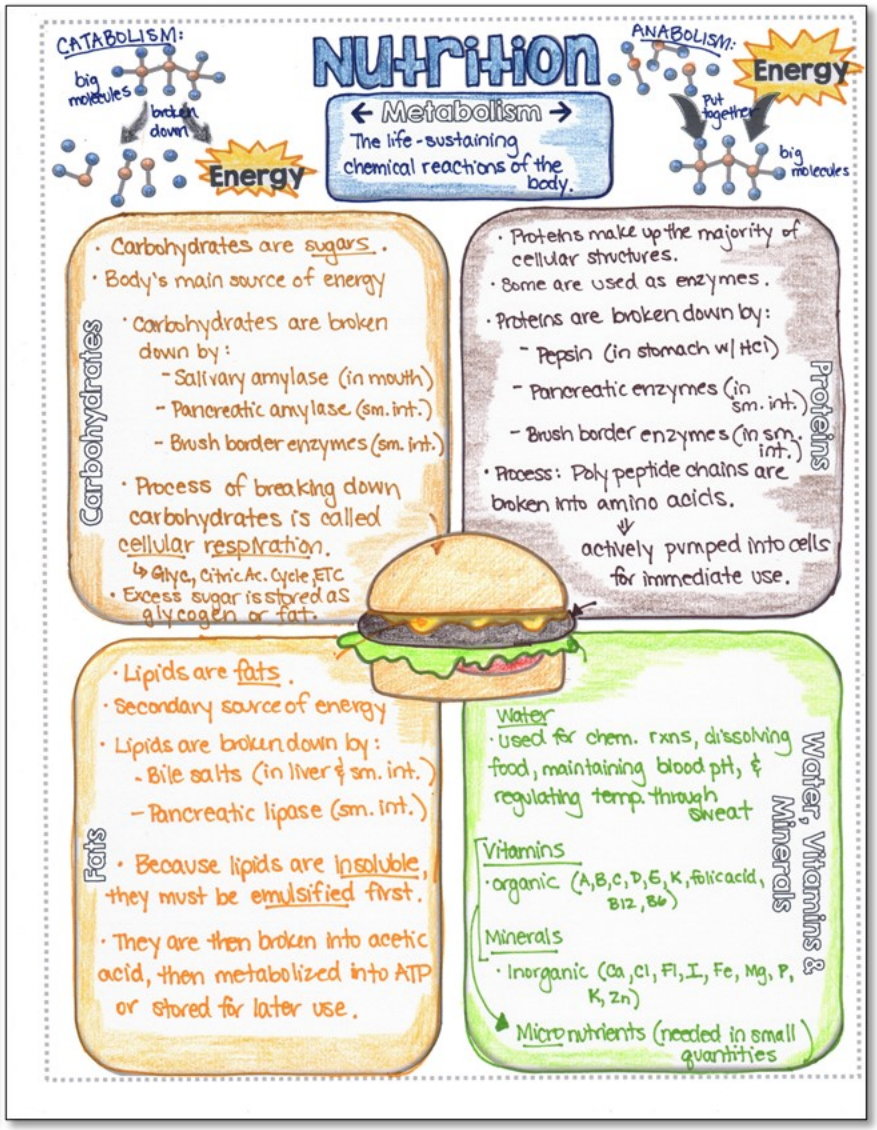
Water is used for: chemical reactions, dissolving foods for digestion, maintaining blood pH, regulating temperature through sweat

What micronutrients are needed by the body?

Vitamins: A, B, C, D, E, K, folic acid, B12, B6 (organic)
Minerals: calcium, chlorine, fluorine, iodine, iron, magnesium, phosphorous, potassium, zinc (inorganic)

Summary: Metabolic processes are required for life. The macronutrients that are metabolized in the digestive system are carbs, lipids, and proteins. Water, vitamins, and minerals are also required for maintaining homeostasis.

Doodle Notes ™



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

50+ pages of Cornell Notes

Big concept questions

Small Intestine

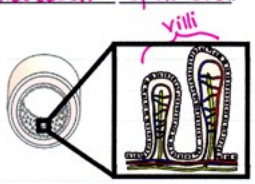
What is the anatomy of the small intestine?

The small intestine is the location of most digestion and nutrient absorption.
It is about 10 ft long in an adult. The small intestine has 3 sections:

- Duodenum
- Jejunum
- Ileum

After the ileum, it joins the large intestine at the ileocecal sphincter.

What are villi and where are they found?
Tiny, finger-like projections in the lining of the intestine filled with blood vessels.



What processes occur in the small intestine?

Many glands line the small intestine and secrete digestive hormones.

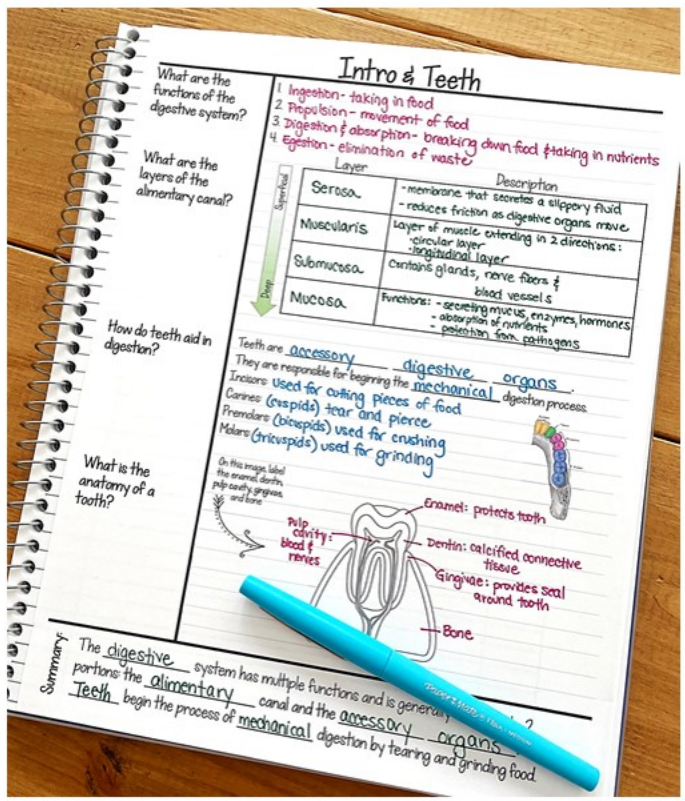
Secretion	Purpose/Function
Mucus	Protects from pathogens
Secretin	Inhibits the release of gastric juices when chyme is very acidic
Cholecystokinin (CCK)	causes gall bladder to release bile
Maltase, Sucrase, Lactase	Break down sugars
Peptidase, Enterokinase	Break down proteins

Because the small intestine needs time to absorb nutrients, the chyme must be slowed down.
Circular muscles in the intestinal wall cause segmentation of the chyme.
This is in contrast to peristaltic contractions which involve longitudinal muscles.

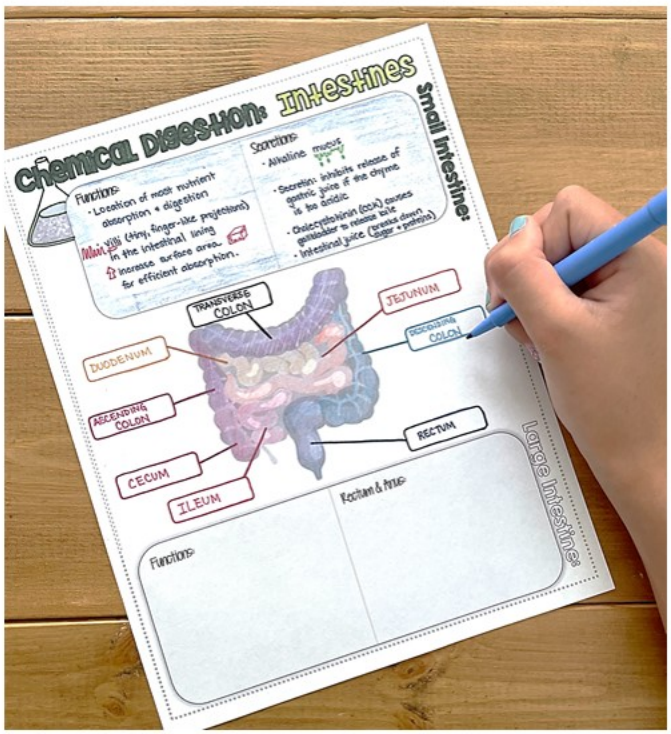
Summary: The small intestine is very long and divided into 3 sections. It contains villi, which absorb nutrients and glands that secrete hormones. To give the small intestine time to absorb properly, segmentation slows down the movement of chyme.

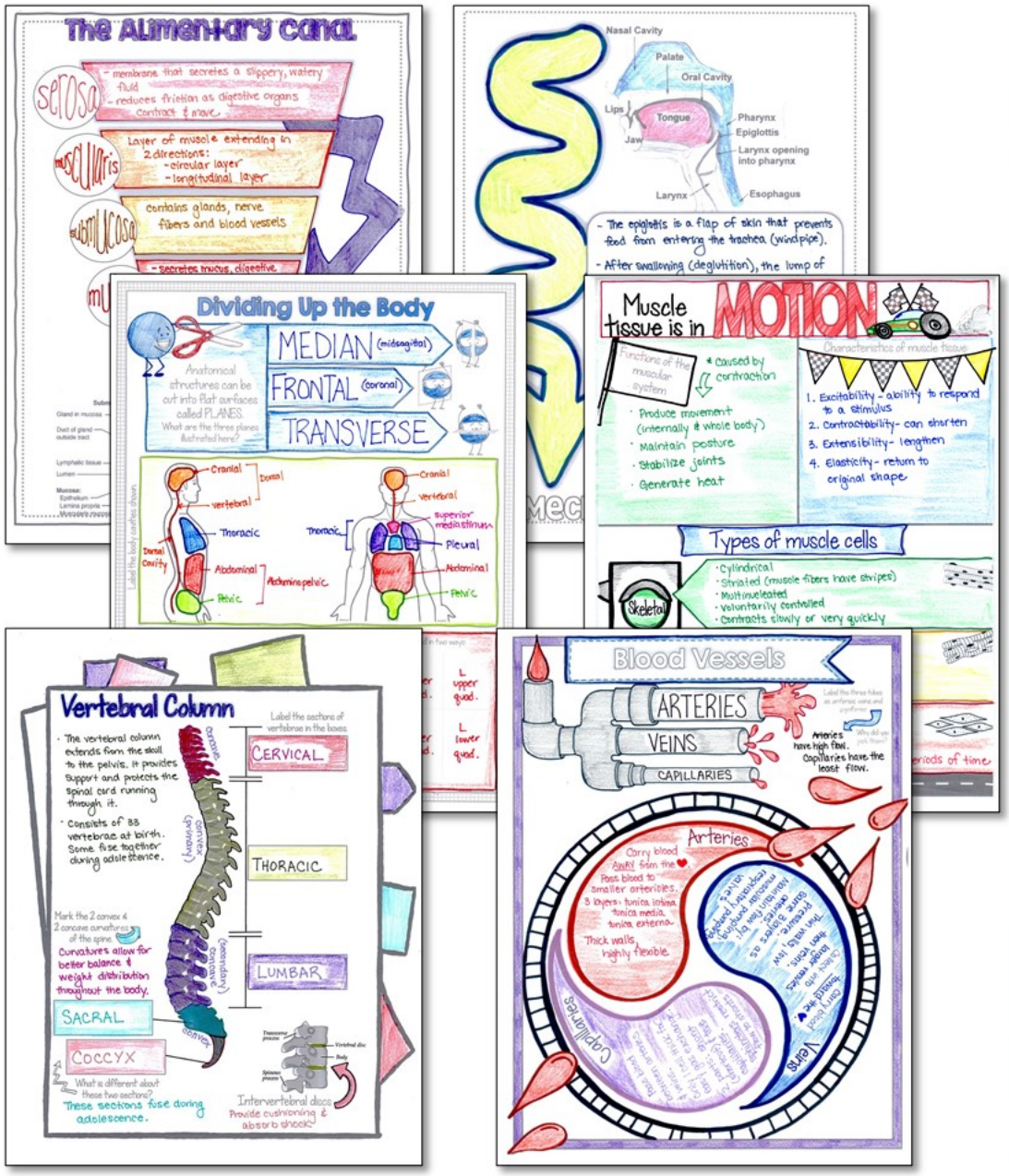
Content summary for each page

Every Cornell Notes page is **editable**. Add and delete text, questions, and summaries to meet the needs of your students.



87 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.

38 Extension Pages

3 Types:

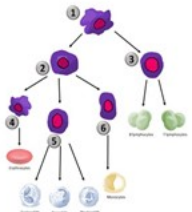
- Literacy Pages
- Math Extensions
- Homeostasis

Great for homework or sub days!

Digging Deeper: Erythrocyte Life Cycle

Hematopoiesis

The formation of blood cells is known as hematopoiesis. Hematopoiesis occurs in the red bone marrow, which can be found within the bones of the axial skeleton, the girdles, and the epiphyses of the humerus and femur. All formed elements develop from hematopoietic stem cells in the red bone marrow. These hematopoietic stem cells differentiate into myeloid stem cells and lymphoid stem cells. The lymphoid stem cells go on to become lymphocytes, while the myeloid stem cells further differentiate into erythroblasts, myeloblasts, and monoblasts. Myeloblasts form granular leukocytes, while the monoblasts form monocytes.



Erythrocyte Maturation

It takes about 15 days for an erythrocyte to mature before it can leave the bone marrow and enter the bloodstream. During this maturation process, the erythrocyte accumulates huge numbers of ribosomes to synthesize proteins, but these ribosomes are eventually ejected from the cell before it is fully mature.

Destruction of Erythrocytes

Red blood cells only circulate for 100-120 days. After this time, they begin to get rigid and the hemoglobin they are carr

Homeostatic Imbalance: Stress

Stress Response

Although the adrenal glands get most of the glory when we discuss the body's response to stress, the signal actually begins in the **hypothalamus**. When you sense a stressful situation, the neurons in the hypothalamus are stimulated. The progression of the signal from that point differs depending on the type of stress.

In periods of short-term stress (like a truck barreling down the street towards you), the hypothalamus continues the action potential through nerves to activate the sympathetic nervous system. These nerves stimulate the **adrenal medulla**, which produces epinephrin and norepinephrine for the "fight or flight" response. This results in an increased heart rate and blood pressure, quicker breathing for more oxygen, and increased blood glucose levels for additional energy.

Long-term or ongoing stress affects the adrenal glands differently. In this situation, multiple stressors cause the hypothalamic neurons to release corticotropin-releasing hormones. These hormones are transported to the **anterior pituitary** and cause it to release adrenocorticotropic hormone (ACTH). ACTH travels through the bloodstream to activate the **adrenal cortex**, which produces glucocorticoids (like cortisol) and mineralocorticoids. The glucocorticoids cause the breakdown of fat and muscle tissue causing blood glucose levels and blood lipid levels to rise. They also suppress the immune response. Mineralocorticoids result in water retention and increase blood pressure.

Digging Deeper: Types of Membran

Body membranes form the boundary between the external environment and the cells of the body. They are more complex than tissues because they are usually formed from two types of tissues: epithelial tissue and connective tissue proper. These membranes can be generally dry like the cutaneous membranes of the skin, or moist like the mucous membranes of the respiratory system. The four types of membranes found in the body are described in the table below.

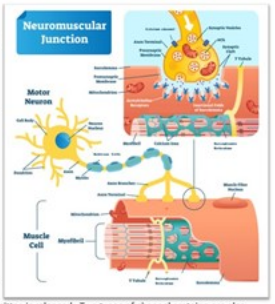
Type of Membrane	Location	Function
Cutaneous	skin	covers body surface

Digging Deeper: Neuromuscular Junction

Background:

Skeletal muscles require nerves called motor neurons to stimulate them to contract. The location at which the end of the motor neuron meets the plasma membrane of the muscle fiber (the **sarcolemma**) is called the **neuromuscular junction**. Each neuron has several axon terminals at the end of it. These axon terminals can stimulate several muscle fibers. The group of fibers that is collectively controlled by one neuron is called a **motor unit**. The strength of a muscle contraction is determined by the number of motor units involved.

Perhaps you'd like to pick up your fork. Your brain sends a stimulus (called an **action potential**) to the motor neurons in your hand and arm. The motor neuron does not directly touch the muscle fiber. Instead, a gap called the **synaptic cleft** exists between them. Since an action potential can not jump this gap, an intermediary molecule known as a neurotransmitter is released. Two types of channel proteins are also involved in this process: voltage-gated channels which open in response to an action potential, and chemically-gated protein channels that are opened when a particular molecule attaches to them.



Events at the Neuromuscular Junction:

1. The action potential arrives at the axon terminal of a motor neuron.
2. Calcium channels open, allowing Ca^{2+} to enter the axon terminal.
3. Ca^{2+} causes bubble-like vesicles of Acetylcholine (a neurotransmitter) to release their contents into the synaptic cleft.
4. Acetylcholine (ACh) binds to ACh receptors on the sarcolemma of the muscle fiber, causing protein channels to open.
5. Sodium ions (Na+) enter through the protein channels and Potassium ions (K+) leave through the protein channels, causing the action potential to continue through the muscle fiber.
6. As the action potential progresses through the muscle fiber along T-tubules, more Ca^{2+} is released causing the actin and myosin fibers to interact, contracting the muscle fiber.

Discussion Questions:

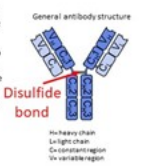
1. Why are neurotransmitters necessary at the neuromuscular junction?
2. Which specific neurotransmitter is released during this process?
3. Identify the following protein channels as either voltage-gated channels or chemically-gated channels:
   a) The Calcium channels on the axon terminal: _____
   b) The channels found on the sarcolemma of the muscle fiber: _____
   c) The channels along the T-tubules: _____

Data Analysis: Antibodies

Antibodies, or **immunoglobulins** (Igs) are soluble glycoproteins secreted by plasma B-cells. They are found in blood serum, tissue fluids, and mucosal surfaces. Antibodies bind with a specific antigen so there is a huge variety of them, but every antibody has a similar structure.

All antibodies consist of four polypeptide chains- two **light chains** and two **heavy chains**. Heavy and light are words used to describe the length of the chains since the heavy chains are about twice as long as the light chains. The chains are arranged symmetrically into a Y-shape, with each side consisting of one heavy chain and one light chain. The two heavy chains are connected by a **disulfide bond**.

General antibody structure

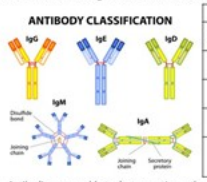


In addition to these two types of chains, antibodies are made of two regions- **constant regions** and **variable regions**. The variable regions are found on the ends of the "Y" and form the particular antigen-binding sites that are necessary for recognizing specific antigens. The constant regions form the stem of the "Y" and are common to every antibody within a class. They determine the function of the antibody and what cells it can bind with.

There are 5 classes of immunoglobulins: IgM, IgA, IgD, IgG, IgE. You can remember them using the acronym MADGE. IgG, IgE and IgD exist as single, Y-shaped **monomers** while IgA can be a monomer or **dimer** and IgM is a **pentamer**.

Each class of immunoglobulins has a distinct function and location:

ANTIBODY CLASSIFICATION



Ig	*Location*	*Function*
IgM	Surface of B-cells and circulating in blood plasma	Activates complement proteins
IgA	In saliva, sweat, intestinal juice & breastmilk	Prevents pathogens from attaching to epithelial tissues
IgD	Surface of B-cells	Acts as B-cell antigen receptor/activator
IgG	Circulating in blood plasma & passes through placenta	Activates complement proteins
IgE	Skin, tonsils, and mucosal membranes	Causes histamines to be released during allergic response

Antibodies are unable to destroy antigens themselves, but they are essential for marking antigens so other cells can attack them. Antibodies work in four basic ways. It is helpful to remember these as the antibodies' P.L.A.N. of attack.

P- **Precipitation:** Antibodies bind soluble antigens together so they can be engulfed easily by phagocytes.
L- **Lysis:** By activating the complement system, pores are formed on the invading cell's surface until it explodes.
A- **Agglutination**: Using both antigen-binding sites at once, the antibodies can cross-link invading cells into a network of clumped molecules that is easily engulfed by phagocytes.
N- **Neutralization**: By blocking the active sites on toxic chemicals or viruses, the invaders are unable to bind to the target cells, thereby effectively neutralizing them until they can be destroyed.

Although antibodies are quite effective at eliminating foreign antigens before they infect our cells, some pathogens can skirt their defenses and quickly enter body cells. At this point, the humoral response is no longer effective, and the cell-mediated response is required.

Data Analysis: Bone Density in Space

One of the major obstacles to long-term space flight is the loss of bone density in astronauts. For a short-duration space flight, bone loss may be minimal but as long-duration space flights become more common, it becomes a serious health concern. In the microgravity environment of space, astronauts often lose 1%-2% of their pre-flight bone density. To combat this threat, astronauts on long-duration flights to the International Space Station exercise about 2.5 hrs per day using resistance bands to simulate weight-bearing activities.

The table below shows the bone density loss of the upper and lower body in ten astronauts during a range of space flight durations.

Individual	1	2	3	4	5	6	7	8	9	10	Avg
Mission Duration (days)	6	252	63	81	14	47	5	166	104	12	
Bone Density Loss (%) in upper body	.5	.8	.4	.7	.2	.5	0	1.3	1.1	.7	
Bone Density Loss (%) in lower body	.4	3.2	1.8	2.1	.7	1.2	.2	4.7	3.4	.5	

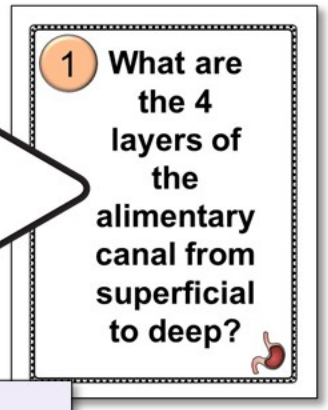
Discussion Questions:

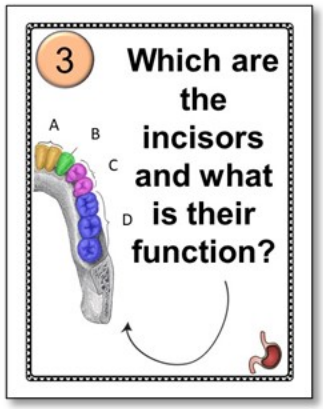
1. Calculate the averages for all three rows of data. Add these numbers to the blank spaces on the table.
2. What is the average amount of bone loss per day in microgravity...
   -For the upper body? _____ -For the lower body? _____
3. On average, is bone density loss greater in the upper body or the lower body? Provide an explanation.
4. Plot the points from the table above on the graph below. Put mission duration on the X-axis and bone density loss on the Y-axis. Make two trend lines: one showing the bone density loss for the upper body and one showing the bone density loss for the lower body.

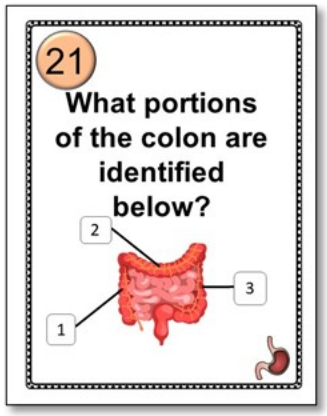
Greater depth of knowledge, critical thinking, & data analysis skills!

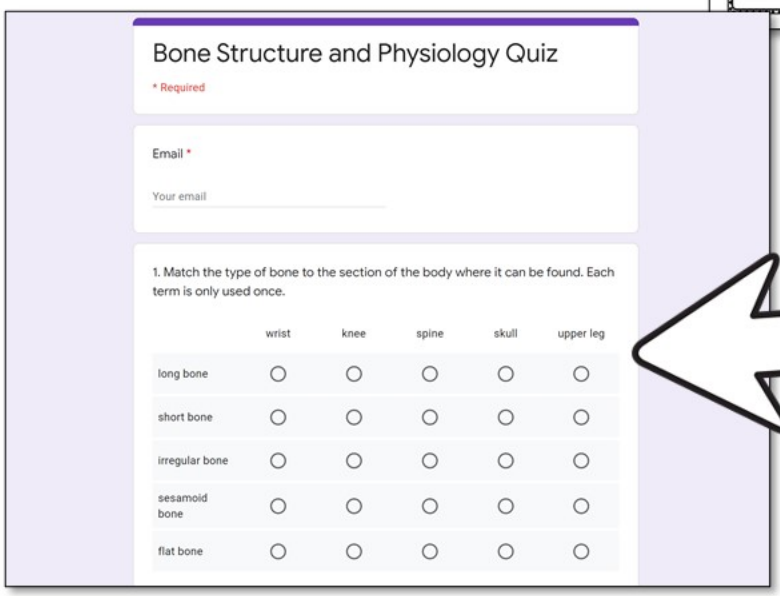
Review & Assessment

Nearly 250 Editable Task Cards for Class Review





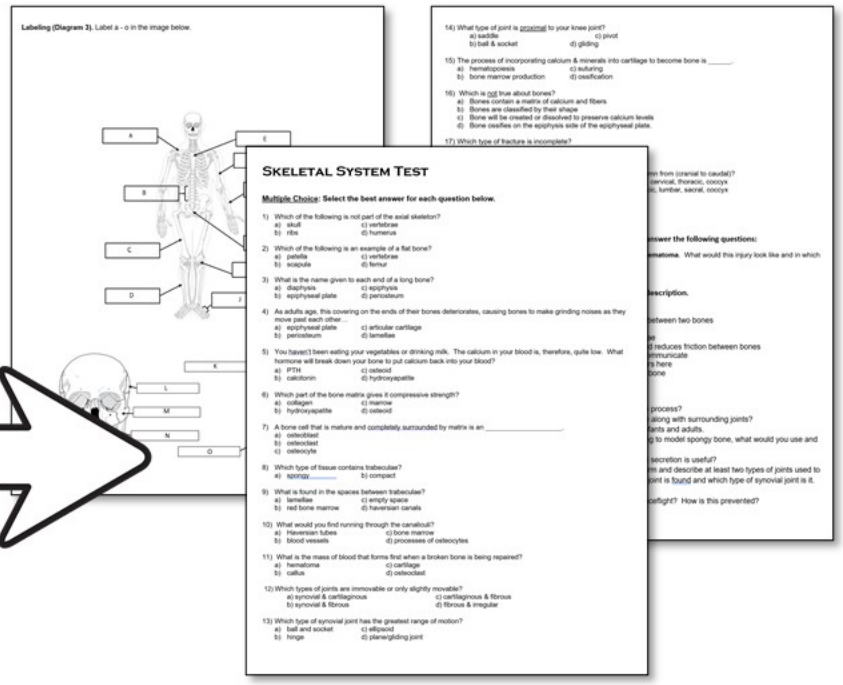




10 Google Forms Quizzes for easy grading!

Editable paper tests (both honors & regular versions)

- Multiple-choice
- Matching
- Diagram labeling
- Short Answer



For more details about each unit, click on the individual body system units and select "Preview".

Questions? Contact me at support@suburbanscience.com.