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

- PowerPoints
  - Blood PPT (42 slides)
  - Heart PPT (20 slides)
  - Blood Vessels PPT (8 slides)
- Cornell Notes Pages (9 pgs)
  - Editable Versions of all Cornell Notes
  - Cornell Notes Keys & Examples
- Doodle Notes (10 pgs)
  - 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

- Cardiovascular System Station Lab (5 stations)
- Sheep Heart Dissection Lab (9 pgs)
- Components of Blood Lab (1 pg)
- Blood Vessel Microscopy Lab (1 pg)
- Cardiovascular Disease Infographic Activity with Rubric (3 pgs)
- Answer keys or grading rubrics for all activities

Extensions

- Digging Deeper: Artificial Blood*
- Homeostasis in the Blood
- Data Analysis: Blood Volume*
- Digging Deeper: Erythrocyte Life Cycle*
- An Erythrocyte's Story*
- Digging Deeper: Vital Signs & Blood Pressure*

*Honors Options

Review and Assessment

- Editable Task Card Review (40 cards) with answer sheet
- 3 diagrams of the heart- external, internal, & conduction with answer keys
- Blood Quiz through Google Forms
- Heart Quiz through Google Forms
- Cardiovascular System Test (paper)- both Honors and Regular versions with answer sheets

Unit Planning:

What's Included?

Included Resources by Folder:

Unit Planning
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- PowerPoints
  - Blood PPT (42 slides)
  - Heart PPT (20 slides)
  - Blood Vessels PPT (8 slides)
- Cornell Notes Pages
  - Blood (5 pgs)
  - Heart (3 pgs)
  - Blood Vessels (1 pg + reference diagram)
- Doodle Notes Pages
  - Blood (4 pgs)
  - Heart (5 pgs)
  - Blood Vessels (1 pg)
  - Guide to Using Doodle Notes
  - Doodle Note Keys & Examples

Activities
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Student Pages
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Not included:

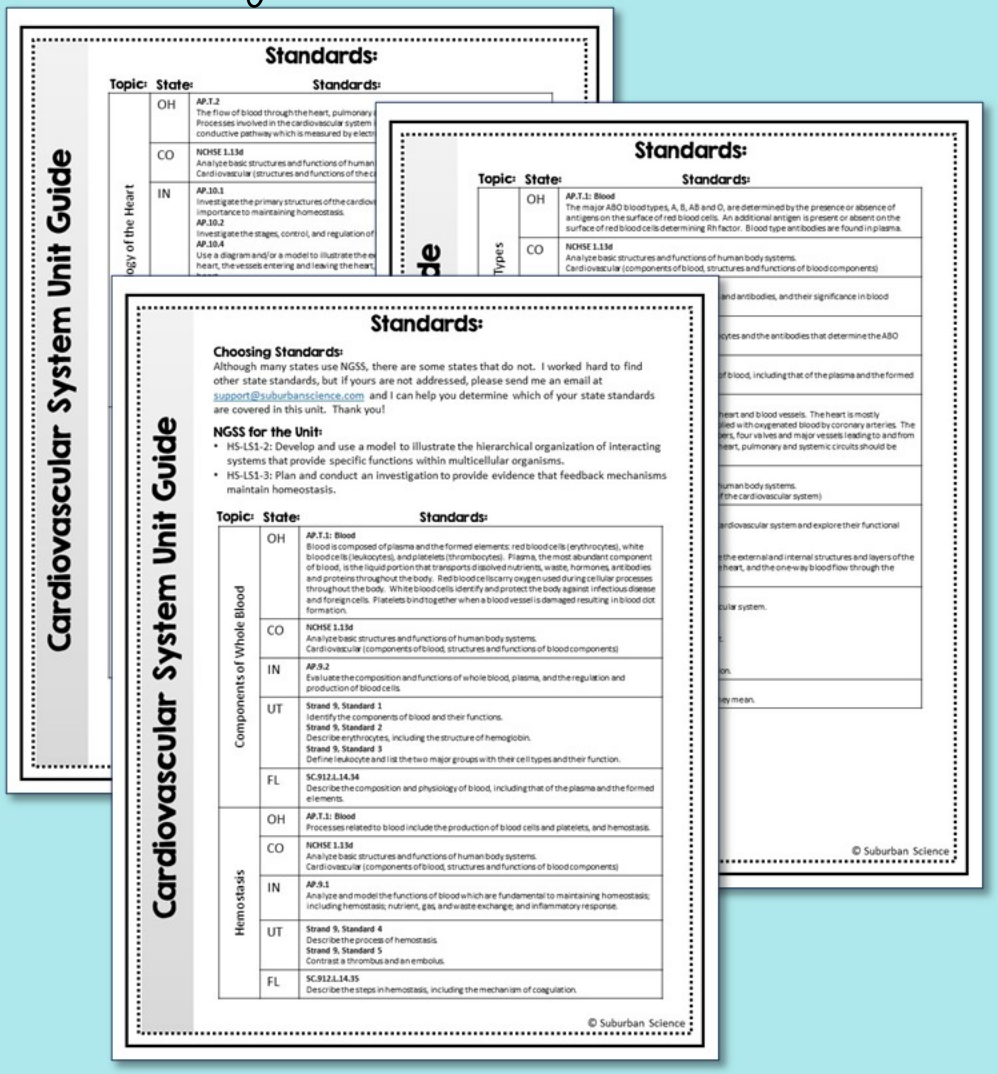
Supplementary Resources
- Do a blood typing lab (either synthetic or real, as permitted). Synthetic options can be found from Carolina Biological™. You can also watch me do an at-home blood typing demonstration.
- Learn about abnormal ECGs and how to use them to diagnose heart disorders.
- Encourage students to take a CPR course.
- Case Study on Carbon Monoxide Poisoning

Materials Needed
- General classroom use: colored pencils, markers, and crayons, index cards for prefixes and suffixes
- Components of Blood Lab: Microscope & blood smear slide
- Cardiovascular System Lab: Sphygmomanometer (optional), computers with internet access
- Heart Dissection Lab: Dissecting tools, trays, gloves, aprons, sheep heart specimens
- Blood Vessels Microscopy: Microscope & Blood vessel cross-section slide

Unit Overview Page
plus
Supplementary Resource Ideas
and **Materials Lists**

NGSS and State Standards Document

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



Editable Pacing Guides

	Day	Intro	Instruct	Assess	Homework
Anatomy & physiology of the heart	7	Put away all belonging to prepare for dissection lab	**Sheep Heart Dissection**	• Collect **Lab Worksheet** (25 pts)	Honors: **An Erythrocyte's Story** (graded for 20 pts- 14 terms accurately used + 6 pts for creativity)
Blood vessels	8	Prefix/suffix flashcards: • vascul, ven, athero,	• Blood Vessels PPT • **Cornell Notes** (Blood Vessels) • **Major Blood Vessels Diagram** (for reference) • **Blood Vessel Microscopy Lab**	• Cornell Notes summaries • Informal discussion and questions • Blood vessel microscopy lab (completion check)	All: Study for Heart Quiz Honors: **Digging Deeper: Vital Signs**
Pathology	9	Prefix/suffix flashcards: • Athero, emia/ema	• Heart Online Quiz (need computers) • **Disease Infographic** research (need computers)	• Informal observation of student progress • **Student planning pages** (simply observe for progress)	
Pathology	10	Review prefix/suffix flashcards	Finish Disease Infographics	• **Infographic grading rubric (20 pts- 5 pts for each category)**	Finish Disease Infographics if not finished
Review	11	Review prefix/suffix flashcards	• Collect Disease Infographics • **Task Card Review**	• Observe student progress during • Inform necess	Study for test
Review	12	Review prefix/suffix flashcards	• Go over Task Card Review making sure students have correct answers to study for test • **External Heart Anatomy Diagram** • **Interior Heart Anatomy Diagram** • **Intrinsic Cardiac Conduction Diagram**	• Asse unde task • Infor • Infor accu	
Assess-ment	13	Review notes for test	**Cardiovascular System Test**	• Form	

Using this Pacing Guide as is? You can print all the student pages in order from the "Stu

The daily topic coincide with the previous standards document.

Lesson planning is now quick and easy!

50 min classes

Cardiovascular System Unit Pacing Guide

	Day	Intro	Instruct	Assess	Homework
Components of Whole Blood	1	Students add to prefix/suffix flashcards: • Erythro, cyte, leuko	• Blood PPT- Section 1 & Section 2 • **Cornell Notes** (Blood composition & plasma, Blood Formed Elements)	• Cornell Notes summaries • Informal discussion and questions	
Components of Whole Blood	2	Prefix/suffix flashcards: • Thrombo, penia, anti	• Blood PPT- Section 3 • **Cornell Notes** (Blood Formed Elements: Part 2) • **Components of Blood Lab** Materials: blood smear and microscopes or virtual slide	• Cornell Notes summaries • Informal discussion and questions • Informal questioning during lab activity • Graded lab questions	Honors: **Digging Deeper: Artificial Blood**
Homeostasis	3	Prefix/suffix flashcards: • Hemo/hemato, poiesis, blast, pluri, potent, stasis	• Blood PPT- Section 4 & 5 • **Cornell Notes** (Blood Processes, Blood Groups)	• Cornell Notes summaries • Informal discussion and questions	All: **Homeostasis in the Blood** Honors: **Data Analysis: Blood Volume** **Digging Deeper: Erythrocyte Life Cycle**
Components of Whole Blood, Anatomy of the Heart	4	Discuss/review homework	**Cardiovascular System Lab** Materials: stopwatch or wall clock with secondhand, computers, sphygmomanometer (optional), stethoscope (optional), colored pencils	• Collect **Cardiovascular System Lab Worksheet** (25 pts)	• Study for Blood Quiz
Components of Whole Blood, Anatomy of the Heart	5	Prefix/suffix flashcards: • Sept, eosin, granulo	• Online Blood Quiz (need computers) • Heart PPT- Section 1 • **Cornell Notes** (Intro to the Heart)	• Cornell Notes summaries • Informal discussion and questions	
Physiology of the Heart	6	Prefix/suffix flashcards: • Myo, endo, peri, epi, cardio	• Heart PPT- Sections 2 & 3 • **Cornell Notes** (Anatomy of the Heart, Physiology of the Heart)	• Cornell Notes summaries • Informal discussion and questions	

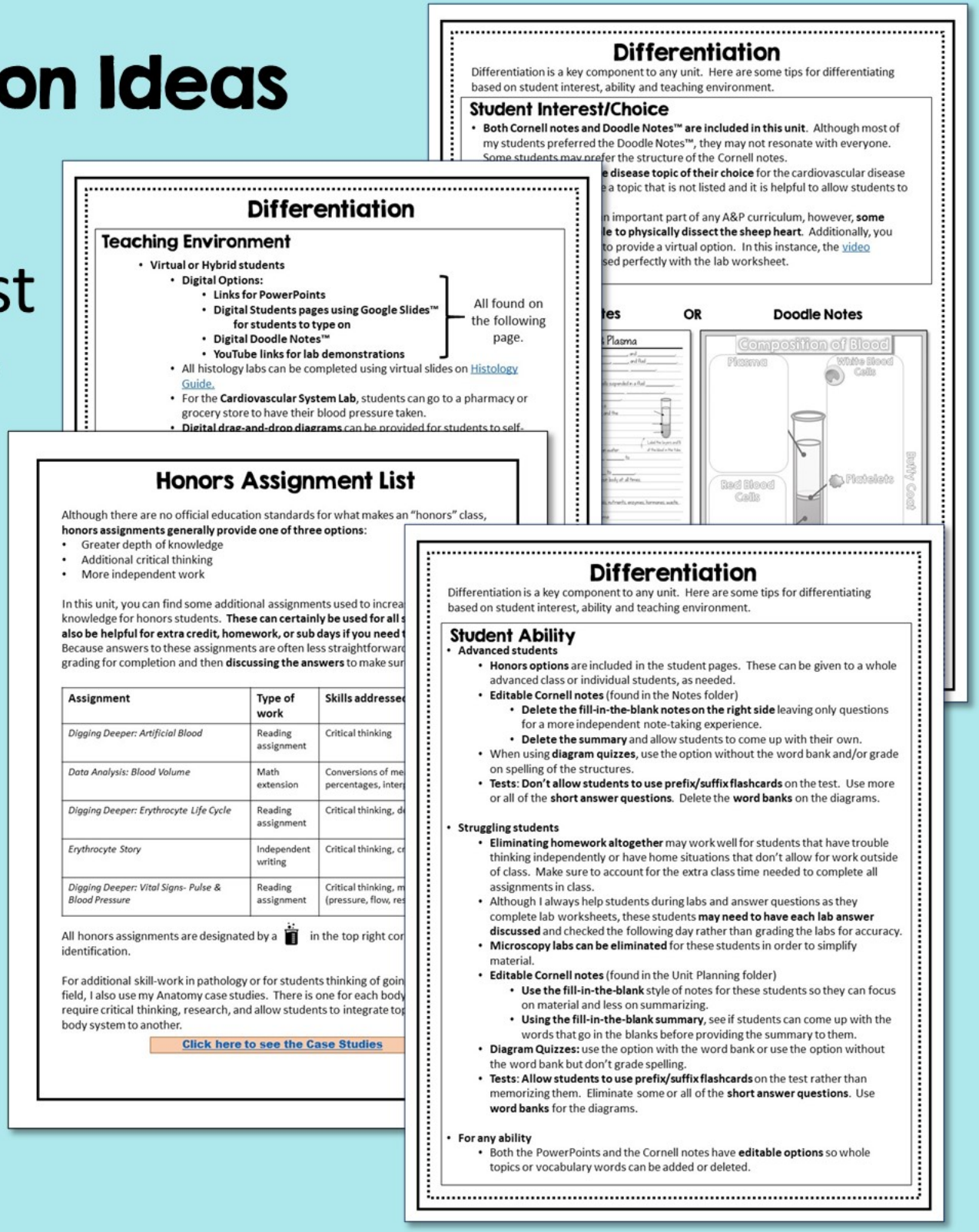
Coincide with State Standards document in Unit Planning Folder

***Bold items** must be photocopied.

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

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.
- **e disease topic of their choice** for the cardiovascular disease e a topic that is not listed and it is helpful to allow students to
- n important part of any A&P curriculum, however, **some le to physically dissect the sheep heart**. Additionally, you to provide a virtual option. In this instance, the video sed perfectly with the lab worksheet.

tes OR Doodle Notes

Plasma

Composition of Blood

Plasma

White Blood Cells

Platelets

Red Blood Cells

Buffy Coat

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™**
    - **YouTube links for lab demonstrations**

  All found on the following page.
  - All histology labs can be completed using virtual slides on Histology Guide.
  - For the **Cardiovascular System Lab**, students can go to a pharmacy or grocery store to have their blood pressure taken.
  - **Digital drag-and-drop diagrams** can be provided for students to self-

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 increa knowledge for honors students. **These can certainly be used for all s also be helpful for extra credit, homework, or sub days if you need t** Because answers to these assignments are often less straightforwar grading for completion and then **discussing the answers** to make sur

Assignment	Type of work	Skills addresse
Digging Deeper: Artificial Blood	Reading assignment	Critical thinking
Data Analysis: Blood Volume	Math extension	Conversions of me percentages, inter
Digging Deeper: Erythrocyte Life Cycle	Reading assignment	Critical thinking, d
Erythrocyte Story	Independent writing	Critical thinking, c
Digging Deeper: Vital Signs- Pulse & Blood Pressure	Reading assignment	Critical thinking, m (pressure, flow, re

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

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

Click here to see the Case Studies

Differentiation

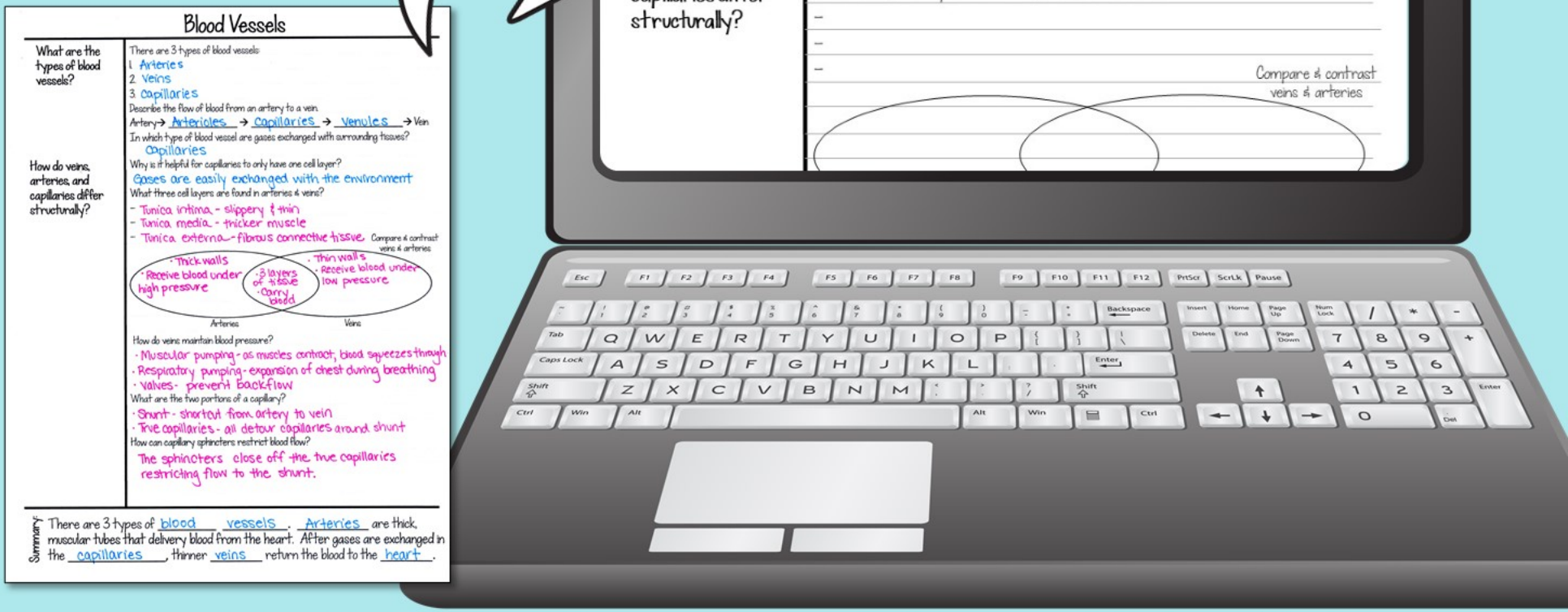
Differentiation is a key component to any unit. Here are some tips for differentiating based on student interest, ability and teaching environment.

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.
- **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.
  - Although I always help students during labs and answer questions as they complete lab worksheets, these students **may need to have each lab answer discussed** and checked the following day rather than grading the labs for accuracy.
  - **Microscopy labs can be eliminated** for these students in order to simplify material.
  - **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!



Blood Vessels

What are the types of blood vessels?

There are 3 types of blood vessels:
1. Arteries
2. Veins
3. Capillaries

Describe the flow of blood from an artery to a vein.
Artery → Arterioles → Capillaries → Venules → Vein

In which type of blood vessel are gases exchanged with surrounding tissues?
Capillaries

How do veins, arteries, and capillaries differ structurally?

Why is it helpful for capillaries to only have one cell layer?
Gases are easily exchanged with the environment

What three cell layers are found in arteries & veins?
- Tunica intima - slippery & thin
- Tunica media - thicker muscle
- Tunica externa - fibrous connective tissue

Compare & contrast veins & arteries

Arteries: · Thick walls · Receive blood under high pressure
Both: · 3 layers of tissue · Carry blood
Veins: · Thin walls · Receive blood under low pressure

How do veins maintain blood pressure?
- Muscular pumping - as muscles contract, blood squeezes through
- Respiratory pumping - expansion of chest during breathing
- Valves - prevent backflow

What are the two portions of a capillary?
- Shunt - shortcut from artery to vein
- True capillaries - all detour capillaries around shunt

How can capillary sphincters restrict blood flow?
The sphincters close off the true capillaries restricting flow to the shunt.

Summary: There are 3 types of blood vessels. Arteries are thick, muscular tubes that delivery blood from the heart. After gases are exchanged in the capillaries, thinner veins return the blood to the heart.

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
Cardiovascular System	erthryro-	red
	-cyte/cyto	cell
	Leuko-	white
	thromb-	clot
	-penia	deficiency
	anti-	against, not
	hemo/hemato-	blood
	poiesis-	to make
	-blast	Immature cell
	pluri-	several
	-potent	power
	-stasis	standing still
	my-/myo-	muscle
	endo-	within
	peri-	surrounding
	epi-	above, upon
	cardio-	heart
	sept-	partition
	eosin-	rosy
	granulo-	small grain
	vascul-	vessel
	ven-	vein
	athero-	plaque

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.

xes 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.

e sure to mention these prefixes and suffixes again as they come p in class. **Using the terms in context** is the best way for students o recognize and remember them.

prep sub plans:

tudents can **type the terms into Quizlet** or a similar site and quiz emselves.

tudents can **make up scientific terms (real or not)** and have other tudents interpret the meaning of the term.

se a blank bingo board (provided on the next page) and have tudents fill in the definitions for the current or past unit in any lank. The sub can call out a prefix or suffix and students mark off e 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.

3 Highly Visual PowerPoint Presentations

70 **editable**, fully-animated slides

What are the component… whole blood?

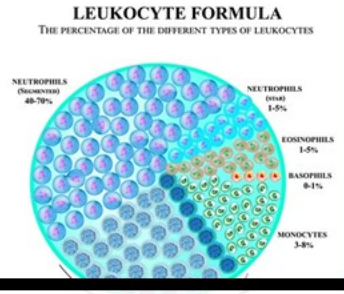
Blood is a **connective** tissue made of cells suspended in a fluid **matrix**.

The suspended cells are known as **formed elements**.

The fluid **matrix** is known as **plasma**.

How common is each type of leukocyte in the blood?

- Neutrophils are the most commonly found leukocyte in the blood.
- A mnemonic device to help you remember the amounts of each type of leukocyte in the blood is:
  - Never (Neutrophils)
  - Let (Lymphocytes)
  - Monkeys (Monocytes)
  - Eat (Eosinophils)
  - Bananas (Basophils)

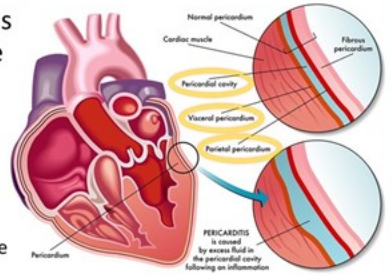


…re the layers of the heart?

…of the heart is …h a protective …ue called the …n.

…dium is …f 2 layers:

…pericardium- …ction & anchors the



…ericardium- Produces lubricating fluid , which collects **…ial cavity**, to reduce friction of the heart against other

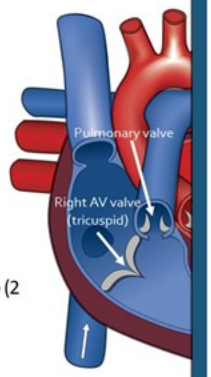
…l pericardium

…l pericardium

Sample Slides

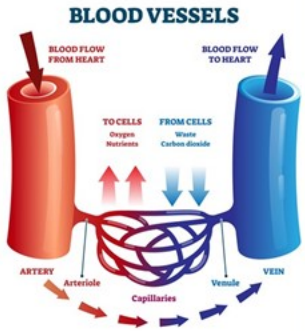
What … the major internal structures of the heart?

- **Valves**= flaps of tissue that prevent blood from flowing backwards
  - Like a set of swinging doors
- Two sets:
  - 1. Between atria & ventricles are **atrioventricular (AV)** valves
    - Right side- **tricuspid valve** (3 flaps of tissue)
    - Left side- **bicuspid valve/mitral valve** (2 flaps of tissue)
  - 2. Between ventricles & blood vessels are **semilunar valves**
    - Right side- **pulmonary valve**
    - Left side- **aortic valve**



What are the types of blood vessels?

- Like a tree, blood vessels branch out.
- **Arteries** carry blood away from the heart, pass them to smaller **arterioles** and then to capillaries.
- In the tiny **capillaries**, blood exchanges gases with the surrounding tissues.

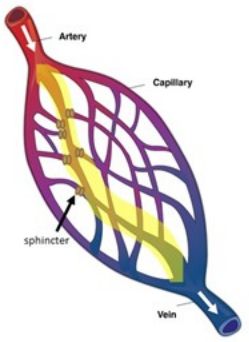


How do veins, arteries, and capillaries differ structurally?

Capillaries consist of two portions:

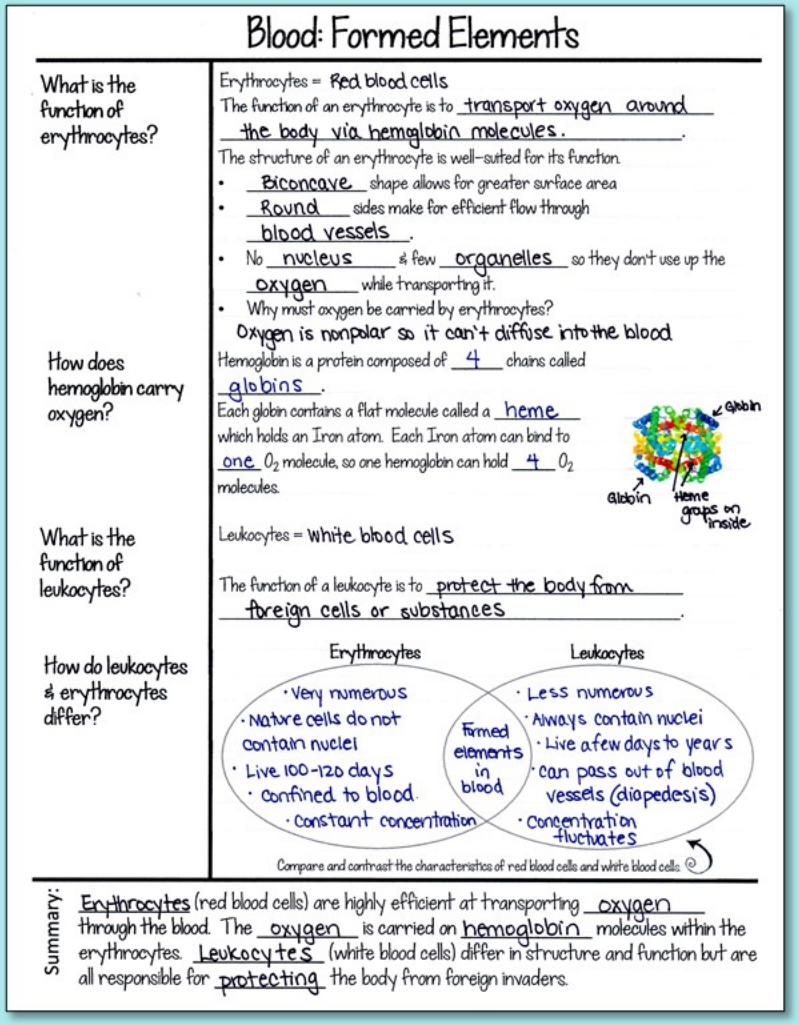
- **Shunt-** a shortcut from the artery to the vein (highlighted)
- **True capillaries-** all the tiny portions that exchange gases with the tissues

Between the arterioles and the shunt are **sphincters**, which can restrict the flow of blood to the tissues when blood is needed elsewhere



Two note-taking styles are included:

Cornell Notes



Blood: Formed Elements

What is the function of erythrocytes?

Erythrocytes = Red blood cells

The function of an erythrocyte is to transport oxygen around the body via hemoglobin molecules.

The structure of an erythrocyte is well-suited for its function.

- Biconcave shape allows for greater surface area
- Round sides make for efficient flow through blood vessels.
- No nucleus & few organelles so they don't use up the oxygen while transporting it.
- Why must oxygen be carried by erythrocytes?
  Oxygen is nonpolar so it can't diffuse into the blood

How does hemoglobin carry oxygen?

Hemoglobin is a protein composed of 4 chains called globins.

Each globin contains a flat molecule called a heme which holds an Iron atom. Each Iron atom can bind to one O_2 molecule, so one hemoglobin can hold 4 O_2 molecules.

What is the function of leukocytes?

Leukocytes = White blood cells

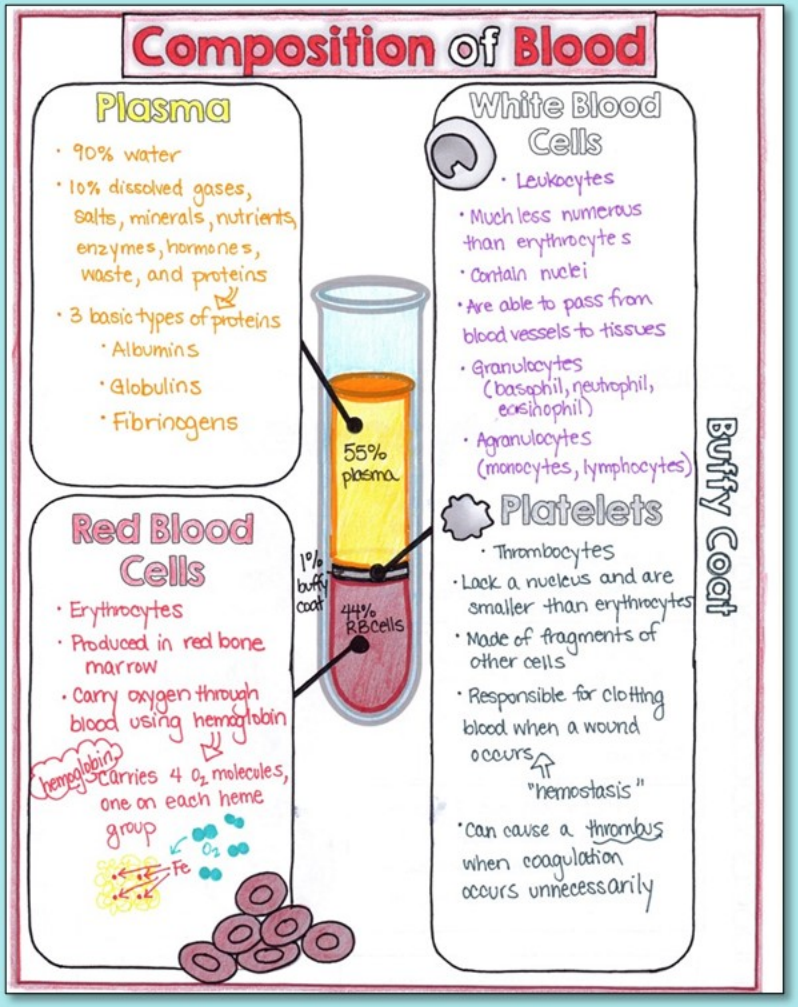
The function of a leukocyte is to protect the body from foreign cells or substances.

How do leukocytes & erythrocytes differ?

Compare and contrast the characteristics of red blood cells and white blood cells

Summary: Erythrocytes (red blood cells) are highly efficient at transporting oxygen through the blood. The oxygen is carried on hemoglobin molecules within the erythrocytes. Leukocytes (white blood cells) differ in structure and function but are all responsible for protecting the body from foreign invaders.

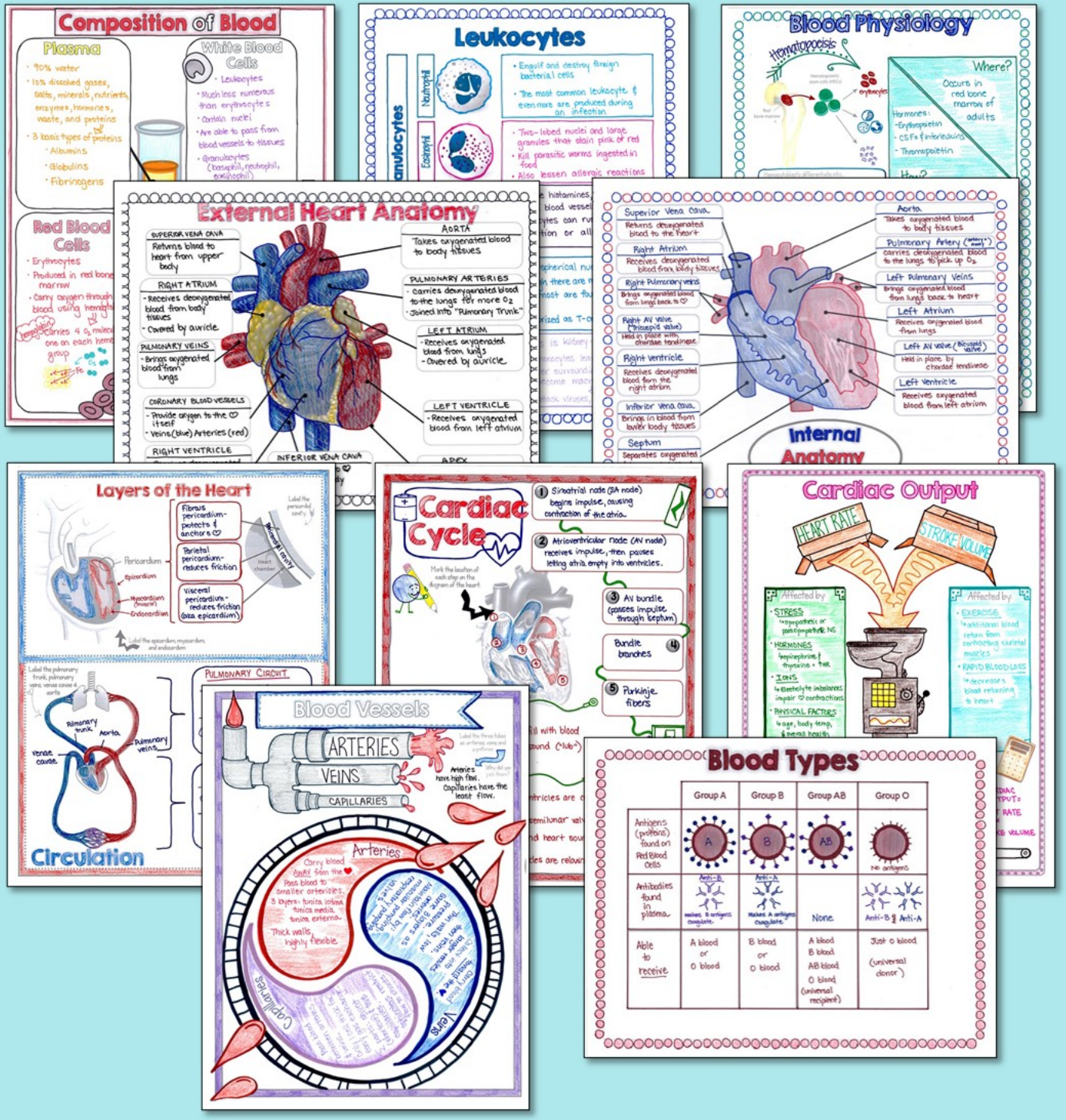
Doodle Notes ™



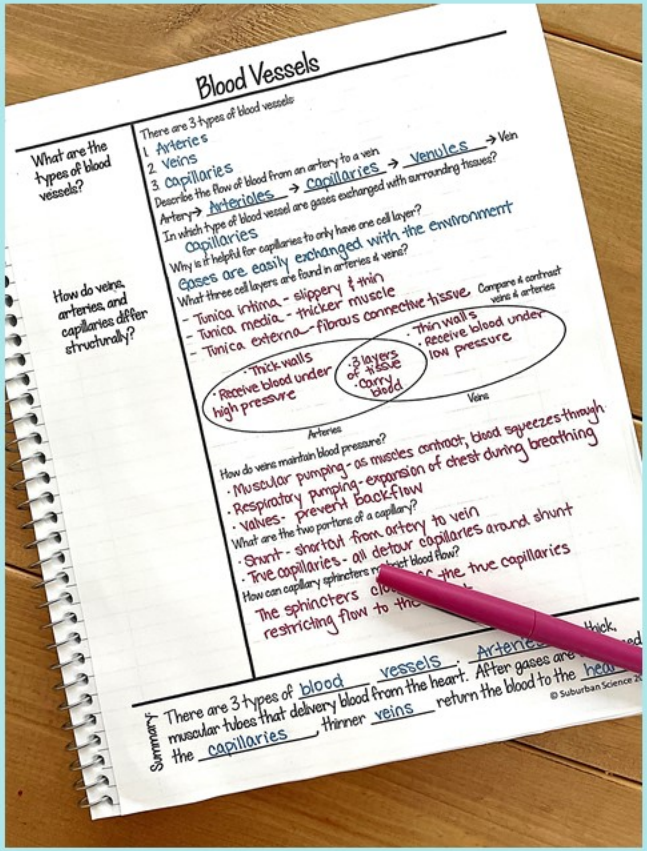
Both coincide perfectly with the presentation for **error-proof notes**!

10 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.

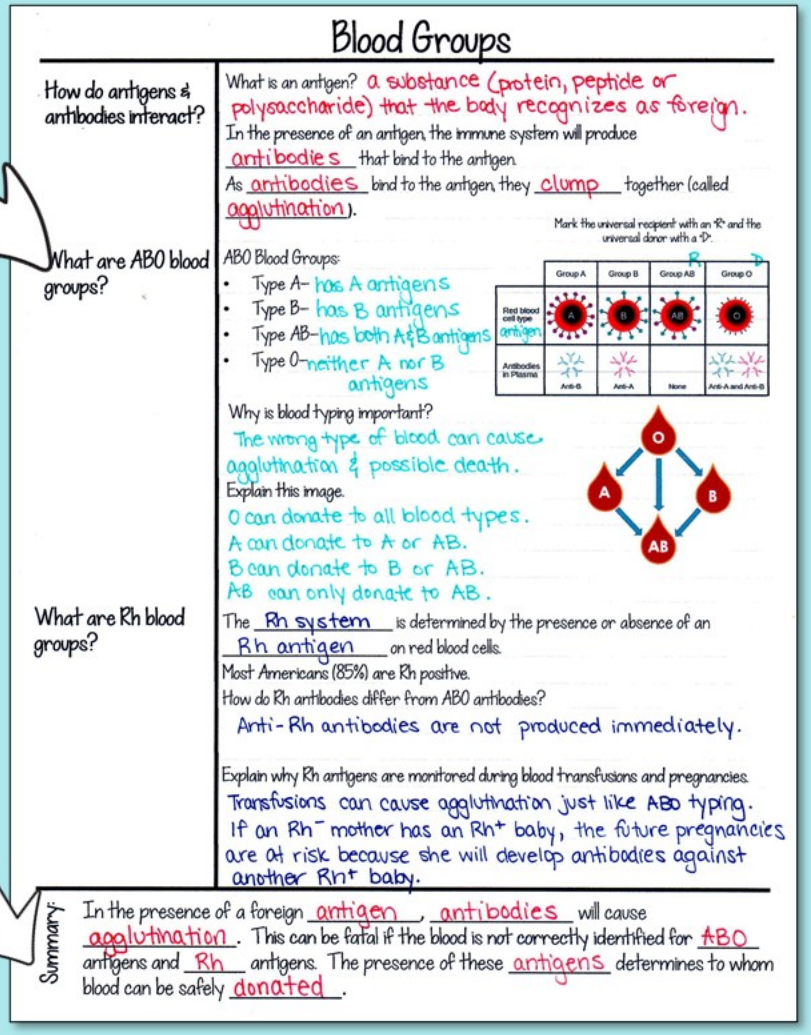


9 pages of Cornell Notes



Big concept questions

Content summary for each page



Each page is **editable**.

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

Includes 5 Activities

- Cardiovascular System Station Lab
- Sheep Heart Dissection Lab
- 2 Microscopy Labs
- Writing Assignment
- Cardiovascular Disease Infographic Activity with Rubric

Blood Vessels Microscopy

Structures to identify and label:

- Tunica intima
- Tunica media
- Tunica externa (or adventitia)

Components of Blood Lab

Part I:
A common activity when small children are learning about the components of blood is to make a model out of kitchen items.

Here's an example:

- Red cinnamon heart candies

1. In the model above, explain which component of whole blood is represented by each ingredient.

Part 2:
Look at a slide of a blood smear, either in class or using the virtual slide given to you. Draw what you see.

Structures to identify and label:

- Erythrocytes
- Leukocytes (label the type)
- Thrombocytes
- Plasma

Explain how the structure of an erythrocyte complements its function.

Magnification: _____

Microscopy Labs Sample Page

Station 1: What's My Pulse?

Background Information:

Your pulse can easily be felt the arteries of your wrist or in your neck (just below your jaw). Arteries carry blood away from your heart. A valve (called the aortic valve) is responsible for keeping the blood inside your heart until it is full enough to be ...ns and the blood rushes out of your left

...the amount of strain you are putting on your ...heartrate, as the heart works harder to pump ..., you will be testing your heartrate at rest and

...he groove between the radius bone (on thumb ...ess lightly to find your pulse.
...nds.
...f beats in 60 seconds (this # your pulse).
...et and add your pulse to the class data.

...h up stairs, push-ups, jumping jacks, etc.).
...Multiply by 6 ...ur pulse.
...ur pulse ...ata.

...data to the board, find the class averages.

Major arteries

Cardiovascular System Lab

Part I: What's my Pulse?

Pulse at rest:

My pulse (beats/60 sec)	Class average (beats/60 sec)

Pulse after exercise:

My pulse (beats/60 sec)	Class average (beats/60 sec)

1. Was your ...se higher or lower than the class average? Sugg... reasons for ...

2. What is actually happ... ...g ... ...r b...

3. Which artery is felt when taking the pulse ... the wrist?

4. Which artery is felt when taking the pulse at the neck?

Part 2: What are Blood Types?

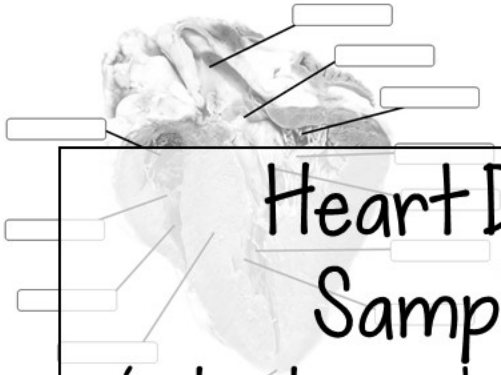
1. What makes a blood type?

2. Explain how a difference in Rh factors between mother and fetus can be problematic.

Cardiovascular System Lab Sample Pages

5 Stations!

5. Label the following structures on the *dorsal side* of the heart using the following terms: **left ventricle, chordae tendineae, right atrium, right ventricle, left atrium, aorta, tricuspid valve, bicuspid valve, aortic semilunar valve, papillary muscles, interventricular septum, apex**



5. Follow the flow of blood through the heart.

Body tissues → superior & inferior vena cava → _____ _____ → _____ _____ → _____ → lungs → pulmonary veins → _____ _____ → _____ _____ → aorta → body tissues

Heart Dissection
Lab Worksheet

External Anatomy

1. Label the **apex**, **right auricle**, **left auricle**, and **interventricular sulcus** on the image below.

2. Name and describe the two loops of the mammalian cardiovascular system.

Internal Anatomy

4. What is likely different between the *tri*cuspid valve and the *bi*cuspid valve?

Heart Dissection Sample Pages
(video demonstration also included)

An Erythrocyte's Story

Task: Write a short story that tells the adventures of a single red blood cell in the human body. Choose a name for your red blood cell and give it a reason for delivering its package to the tissue of your choice.

REQUIREMENTS:

- Start the story in the left atrium of the heart.
- Describe exactly which tissue the red blood cell is traveling to.
- Include the names of distinct blood vessels in the story.
- Be creative!
- Use all of the following terms in your story:
  - Tricuspid valve
  - Mitral/bicuspid valve
  - Left atrium
  - Pulmonary veins
  - Pulmonary artery
  - Aorta
  - Superior or inferior vena cava (dependent on pathway)
  - Left ventricle
  - Right ventricle
  - Capillaries
  - Specific arteries/arterioles your RBC flows through
  - Specific tissue to which oxygen is being delivered
  - Specific veins/venules your RBC flows through

Your story should be approximately 1 page typed (single-spaced).

Erythrocyte Story Sample Page

Cardiovascular Disease Infographic
Student Planning Page

Project Topic: _____ **Due Date:**

Research Notes:

Sources:

Cardiovascular Disease Infographic
Student Instructions

An **INFOGRAPHIC** is a visual representation of information. They present information clearly and concisely. They can also communicate data, patterns and trends.

TASK: Make an infographic to communicate information about your disease or disorder.

STARTING YOUR INFOGRAPHIC:

1. Go to Canva.com or a similar visual creation website. (You can do this simply in PowerPoint, as well.)
2. Create a **free account** using a valid email address.
3. Browse the free **templates** for infographics to get ideas or simply start your own from scratch.
4. Add images and text.
5. Save your work. When you're finished, **share** your final project with your teacher.

Infographic Requirements: Be sure to include the following information with a minimum of:

- A main title for the infographic
- Eye-catching section headings
- 3 colors
- 4 graphics
- 1 chart or statistic
- Symptoms of the disease
- Treatment of the disease
- 10 scientific or vocabulary words (erythrocyte, etc.)
- 3 separate blocks of information
- Your name

SAMPLE PROJECT:
This is an example of an "A" project. It includes the above requirements as well as extra graphics, charts, and sections where appropriate. Remember, you must communicate thorough information in a concise way. This may mean going above the minimum requirements.

Infographic 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
Visual Appearance	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. • 3+ colors • Main title • headings	
Graphics	Graphics are confusing and do not meet minimum requirements for images.	Graphics are confusing or do not meet minimum requirements for images.	Graphics are carefully chosen and include a minimum of • 1 graph or chart • 4 images	
Content Information	Information. Does not demonstrate student understanding of the disease.	Infographic includes accurate facts but does not show a high-school level understanding of the content.	Infographic includes all required topics and uses carefully chosen facts • 3 blocks of consistent information • Symptoms of the disease • Treatment of the disease	
Vocabulary	Infographic does not meet vocabulary requirements for disease topic.	Infographic uses 10 vocabulary words, but words are too elementary or used incorrectly.	Infographic demonstrates effective and knowledgeable use of 10 vocabulary words that are on a appropriate level.	

Additional Teacher Comments:

Disease Infographic Sample Pages

Extension Pages

Digging Deeper: Artificial Blood

History of Blood Transfusions

It has long been known that a major loss of blood can result in death. In fact, your body can compensate for blood loss up to a certain extent by contracting the blood vessels and increasing the production of red blood cells. A loss of over 30% blood volume, however, can be fatal.

The ancient Incas were responsible for the first documented blood transfusions, but discoveries came slowly in the following decades. In the 1616, physicians tried to substitutions such as milk, urine, animal blood, and even beer- none with much success.

In 1883, a breakthrough occurred with the creation of Ringer's solution. This saline solution composed of sodium, potassium, and calcium salts is still used as a substitute for plasma to restore blood volumes but does not have the oxygen-carrying capabilities of whole blood. Artificial blood developments slowed until the early 1900s, when renowned immunologist Karl Landsteiner classified blood into the groups A, B, AB, and O. This solved the mystery of many unsuccessful and fatal blood transfusions. In the 1920s and 1930s, injuries from World War II and the newfound knowledge of blood typing reignited interest in finding an artificial blood supply and the formation of blood banks a few years later (in 1947).

Artificial Blood

More recently, two new blood substitutes have been studied. The first is perfluorocarbons (PFCs), which are synthetic polymers that can be injected into the bloodstream. They carry high amounts of oxygen, but not nearly at the same rate as hemoglobin found in real blood. They are also insoluble in water, which means they must be emulsified with lipids to suspend them in the blood.

Hemoglobin-based products have also been studied. Hemoglobin-based products come in two types: synthetic products or those isolated from humans. These products are difficult to produce and only last a little more than 24 hours in a recipient's body. In contrast, whole blood from a blood bank is still effective up to 34 days.

Discussion Questions:

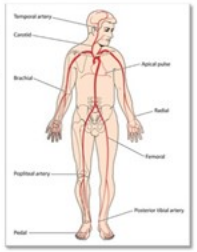
1. Make a timeline marking at least 5 events or discoveries in the development of artificial blood.

2. Ringer's solution is still used today, but is not a true substitute for human plasma. What is it missing?

3. You are starting a company working on the next artificial blood substitute. In order to be considered a successful substitute, name 3 requirements for this artificial blood:

Digging Deeper: Vital Signs- Pulse and Blood Pressure

Pulse



The last time you went to the doctor's office, your appointment likely started with the nurse taking your vital signs. Although there's a little discrepancy on the true number of vital signs, they generally include body temperature, arterial pulse, respiratory rate, and blood pressure.

Your **pulse** is simply a wave of blood coming from the left ventricle and making your arteries expand and contract. Arteries are generally deeper than veins to protect them from injury. Because the blood is under high pressure in the arteries, you could lose blood very quickly. There are, however, a few locations on your body where arteries can be felt at the surface and these are the best locations for taking a pulse (see image).

Blood Pressure

The pressure that your blood exerts on the inner walls of the blood vessels is known as **blood pressure**. There are two ways to change the pressure of a liquid: add more liquid or cram the same liquid into a smaller space. The formula we use is:

BP= CO x PR (Blood pressure = Cardiac output x Peripheral resistance)

Cardiac output is the amount of blood produced from a heartbeat and can be changed by the effectiveness of the heart.

Fluid resistance is a measure of the amount of friction a liquid encounters as it moves. The resistance blood encounters is primarily in the systemic circuit, since many blood vessels are involved. Therefore, we call this resistance of blood **peripheral resistance**.

There are three sources of peripheral resistance:

- Blood viscosity
- Blood vessel length
- Blood vessel diameter

Sources of Resistance

Viscosity is the ability of a fluid to flow. Honey is very viscous, while water is not. Blood viscosity is fairly consistent, but can be altered if there is an imbalance in the number of cells in the bloodstream.

The length of a blood vessel can also change the overall blood pressure. A long blood vessel provides a greater area of friction for the blood, so longer vessels yield higher resistance.

The diameter of a blood vessel can also affect the peripheral resistance. As more blood is in contact with the sides of the blood vessel, friction levels are higher. Therefore, blood vessels with a larger diameter will have lower resistance because less of the blood contacts the sides.

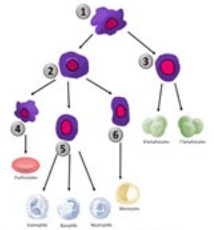
Your body does not have much ability to regulate the viscosity of the blood or the length of your blood vessels. The diameter of your blood vessels, however, change many times a day through the processes of **vasoconstriction** (narrowing) and **vasodilation** (widening). Standing up or sitting down, exercise, temperature of the environment and stress can all cause your blood vessels to expand and contract. These mechanisms allow for blood to be redirected to necessary locations and your blood pressure to remain stable.

Blood Pressure & Health

Chemical substances like nicotine and alcohol, among others, can cause vasodilation or vasoconstriction. In
blood pressure by causing
nsion) is thought to coin
a cause for concern beca
hereditary, it can be cau

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 carrying degenerates. These worn-down erythrocytes often get lodged in the spleen, where macrophages engulf and destroy them.

The hemoglobin, however, is partially recycled. The globins from the hemoglobin are circulated back into the blood stream and the iron atoms are stored in the liver for reuse. Only the heme groups remain and are degraded into a substance known as bilirubin. Bilirubin is passed from the liver to the intestines and is excreted in the feces.

Discussion Questions:

1. Identify the number of each stem cell type in the diagram above. Write the correct number for each stem cell on the line provided.
   - _____ myeloid stem cell
   - _____ erythroblast
   - _____ lymphoid stem cell
   - _____ hematopoietic stem cell
   - _____ monoblast
   - _____ myeloblast

2. Hematopoietic stem cells are called **pluripotent** stem cells. Using your knowledge of prefixes and suffixes, explain why this term is appropriate.

3. Which numbers on the diagram would be part of the process of **leukopoeisis**?

4. Immature erythrocytes have large numbers of ribosomes to synthesis proteins. What protein specifically are these ribosomes manufacturing in large quantities?

scribed iron supplements to encourage blood cell
o wait (at a minimum)to see if the supplements were

Homeostasis in the Blood

Hormone Control

The rate of erythrocyte production is controlled by erythropoietin, a hormone produced in the kidneys and, to a lesser extent, the liver. When blood oxygen levels drop below normal limits, the produce greater levels of erythropoietin, which stimulates the bone marrow to manufacture additional

Discussion Questions:

1. Fill in the following statements on the cycle above: *erythropoietin stimulates bone marrow, fewer red blood cells are manufactured, oxygen levels in blood rise, bone marrow stimulation is depressed, additional red blood cells are manufactured, kidney & liver release erythropoietin, kidney & liver release less erythropoietin, oxygen levels in blood drop*

2. What type of feedback loop is illustrated by this process?

3. At high altitudes, a homeostatic imbalance can occur even though the same number of red blood cells are circulating in the bloodstream. From this observation, you can conclude that it is the availability of _____ and not the lack of erythrocytes that stimulates the production of erythropoietin.

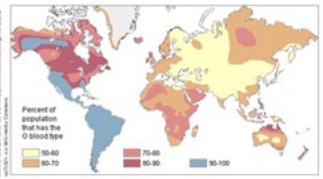
4. Athletes that participate in "blood doping" inject themselves with erythropoietin. They run the risk of highly viscous blood that can cause abnormal clots. Why do you think they do this?

Data Analysis: Blood Volume

For reference:
1 liter = .26 gallons

Calculate. For each of the following questions, show your work.

1. Adult females have an average of
   approximately
   liters of blood at any given time. Adult males have
   % more blood by volume than females. How many *liters* of blood would you expect
   a
2. How many gallons of blood does an adult female have in her body?

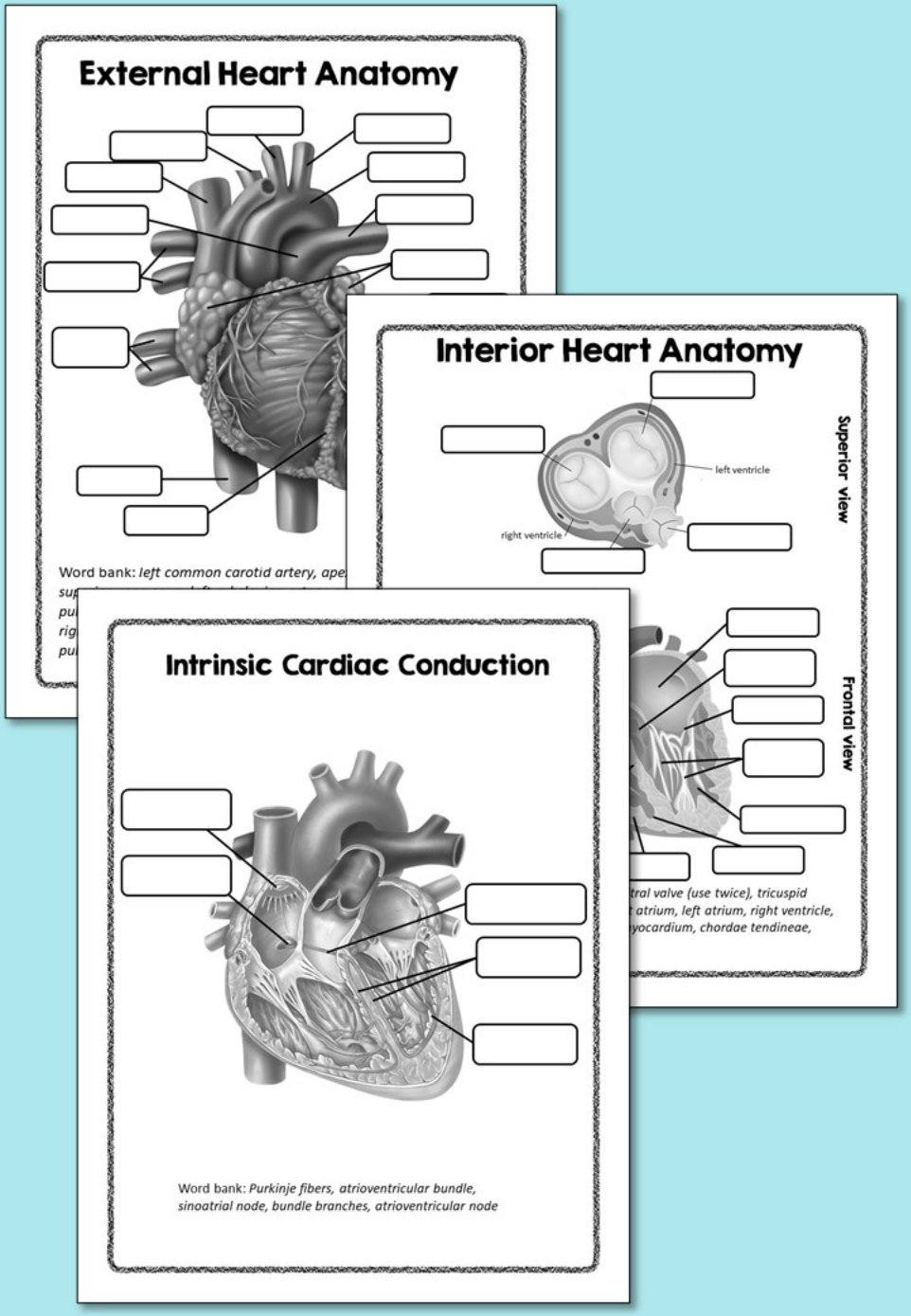


Blood types do vary in frequency by region. The map to the left has been proposed to show the frequency of blood types worldwide.

The Incas were one of the first cultures documented to use blood transfusions successfully. Explain why their transfusions had a high level of success even though they did not yet understand blood types.

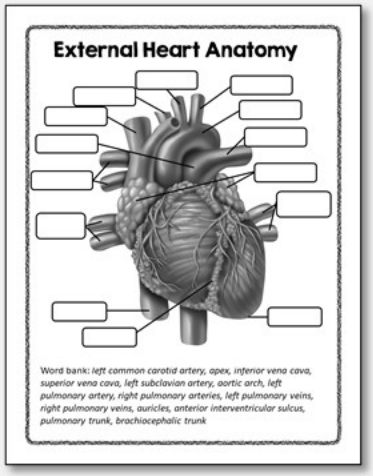
Greater depth of knowledge, scientific literacy, & critical thinking

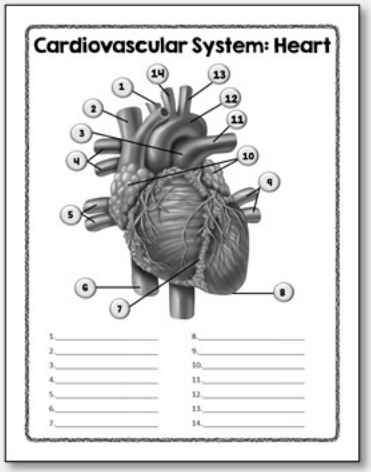
Anatomical Diagrams

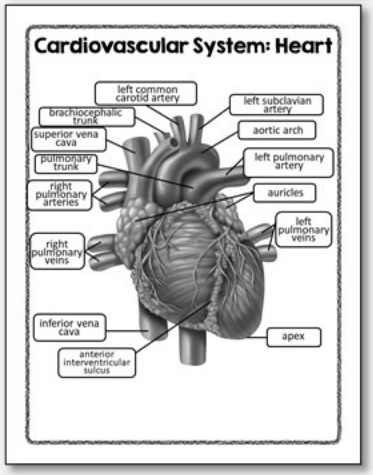


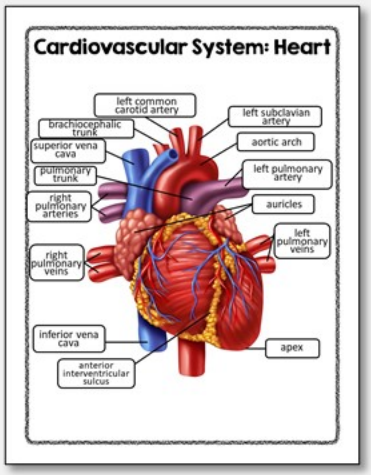
Each diagram comes in 4 versions:

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









40 Editable Task Cards for Review

1 Name 3 formed elements found in whole blood. (Use scientific terms.)

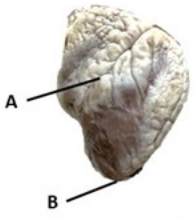
2 Which formed element is used to determine a hematocrit?

3 Which layer is the buffy coat?

4 Blood plasma is primarily made of water. What else is found in it?

33 Where are auricles found?

34 Name these structures.



Sample Task Cards

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 for how long students have. Usually 2-3 minutes is appropriate. Without a timer, students will get backed up while rotating and chaos will ensue. ☺

Teacher Tips

Modifications:

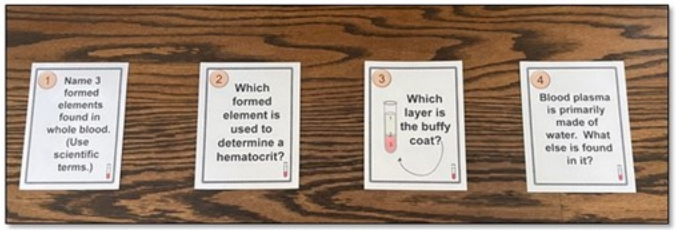
- These task cards are editable so you can change the text on any card.
- There are additional cards at the end of the document for adding questions. Be sure to add the correct number, as well!
- Each card has an icon in the bottom right corner.

Questions about blood

Questions about the heart & blood vessels

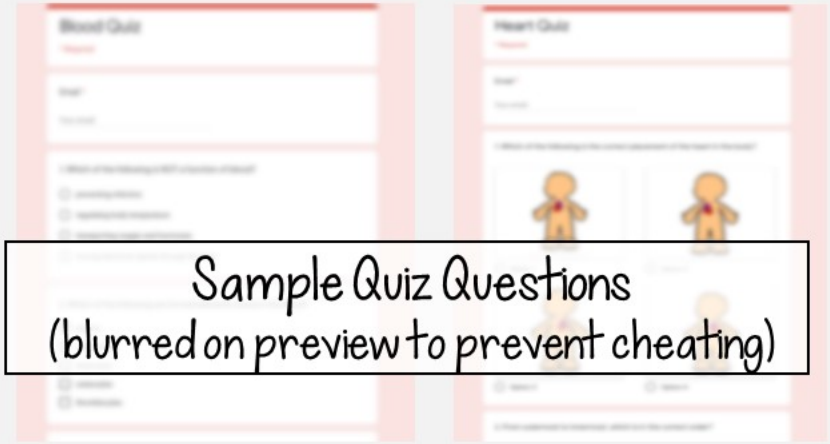
If you'd prefer to divide the unit, you can use the blood task cards only, then use the heart & blood vessel questions later.

- 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

2 Editable Online Quizzes through Google Forms



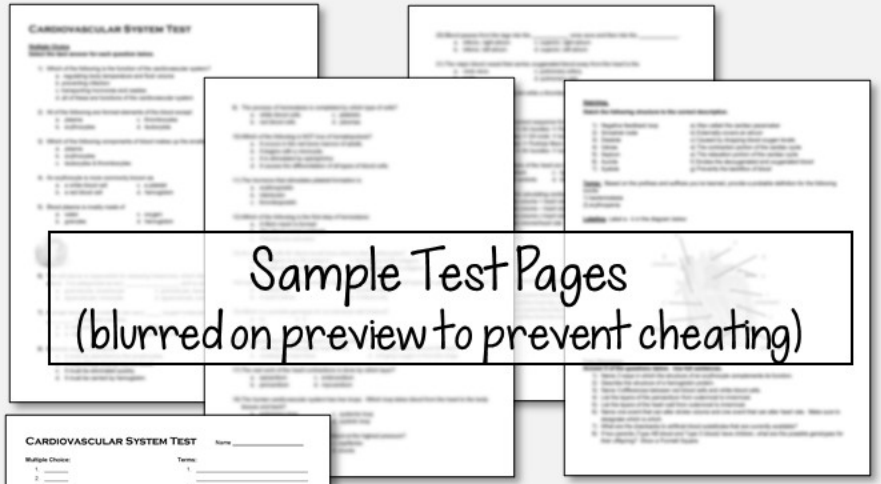
Sample Quiz Questions
(blurred on preview to prevent cheating)

- 26 multi-part questions
- Fully editable
- Answer keys included for automatic grading

Editable Unit Test

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

Two Versions: Honors & Regular



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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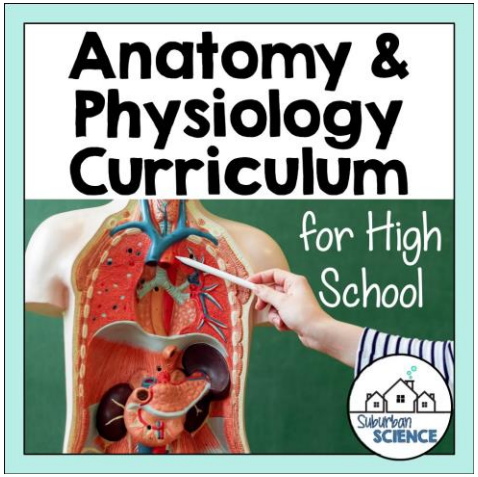
This unit is part of my Full Anatomy & Physiology Curriculum.



The full course includes resources for every body system. If you **choose to purchase this full curriculum** after purchasing this unit, you can **receive a refund for the duplicate** unit. See the TpT return policy for details.

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Sincerely,
Anne from Suburban Science