

Lesson 3.7: The Circulatory System

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1	2	I can identify structures and explain functions of the circulatory system.
2	3-4	I can use text descriptions to label the parts of the heart.
3	5	I can describe causes and effects of blood pressure.
4	6-7	I can describe cardiovascular disease ...
5	8-9	I can read and interpret graphs in order to determine blood pressure readings.
6	10	I can use a stethoscope to compare my heartbeats to my pulse measured in (bpm).
7	11-12	I can follow a procedure in order to model structures of the circulatory system.
8	13	I can identify the structures and explain the functions of blood parts.
9	14	I can use a healthy blood histology image to identify possible blood disorders.
10	15-16	I can use an analogy that explains how antibodies and antigens interact in order to describe blood transfusion options.
11	17	I can use a simulated model to describe blood transfusions.
12	18-19	I can follow a multistep procedure in order to determine blood transfusion options.
13	20-21	I can create a RAFT writing piece in order to explain structures and functions of blood parts.
14	22-23	I can design an experiment that tests how _____ affects _____.
15	24	I can develop a clear and detailed procedure that describes how to test the effect of _____ on _____.
16	25	I can collect data by conducting an experiment that tests how _____ affects _____.
17	26	I can present data that illustrates how _____ affects _____.
18	27	I can analyze data in order to draw a conclusion about how _____ affects _____.

Task 1 Learning Target: I can identify structures and explain functions of the circulatory system.

1. Cardiovascular System <https://www.edumedia-sciences.com/en/media/358-circulatory-system>

- A. Structures: _____, _____ and blood _____
- B. Function: _____ materials throughout the body
- a. Pulmonary Circulation: flow of blood to and from _____.
- b. Systemic Circulation: flow of blood to and from _____.

2. The Heart <https://www.youtube.com/watch?v=2jPTt23IRB8>

- A. The heart has _____ chambers
- a. The top chambers are called _____.
- b. The bottom chambers are called _____.
- B. Describe "heart valve" structure and function.

3. Blood Vessels: tubes that carry blood to every part of the body

Classify Blood Vessels by completing the chart:

Blood Vessels		
Type	Structure	Function
Artery		
Vein		
Capillary		

Carry blood away from the heart

Have thick elastic walls

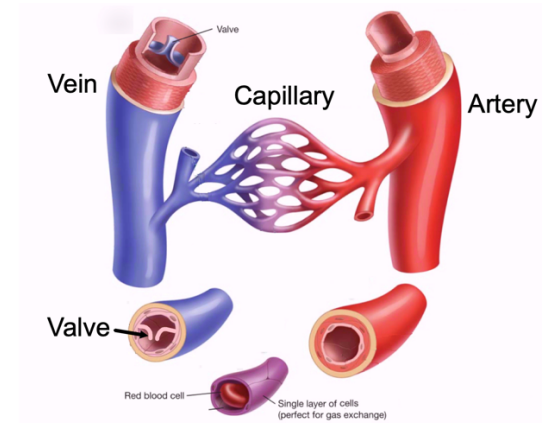
Carry blood back to the heart

Contain one-way valves that keep blood moving toward the heart

Deliver nutrients and oxygen to cells and removes wastes

Connect arteries and veins

Microscopic



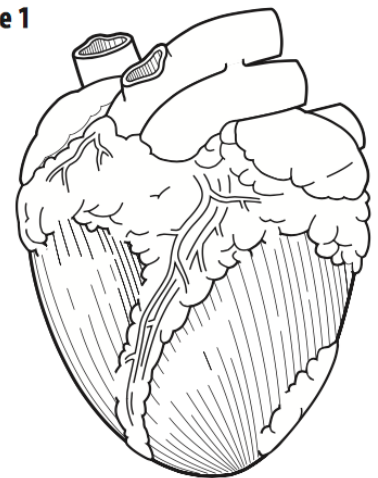
Resource Link: <http://www.tenalpscommunicate.com/clients/siemens/humanbodyOnline/#home>

Task 2 Learning Target: I can use text descriptions to label the parts of the heart.

NOTE: Notice that Figure 2 shows the left and right sides of the heart reversed. The diagram actually shows the position of the heart in a person as it would appear if you were facing the person whose heart is shown.

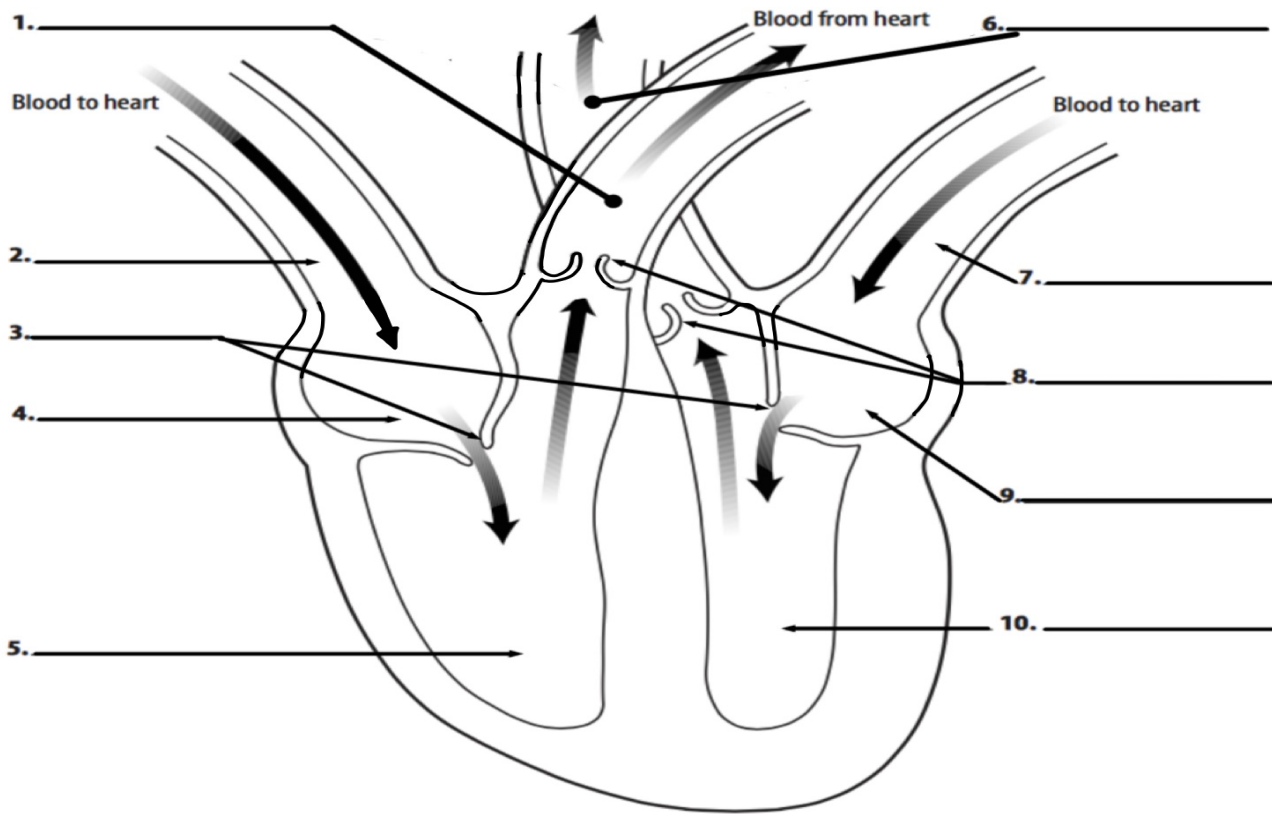
- a. The *vena cava* returns blood to the right side of the heart from body organs. Locate and label the *vena cava*.
- b. The *pulmonary vein* returns the blood to the left side of the heart from the lungs. Locate and label the *pulmonary vein*.
- c. Blood in veins enters the right and left *atrium*, two small chambers at the top of the heart. Locate and label the *right atrium* and *left atrium*.
- d. Pumping action of the heart squeezes blood from the atria into the right and left *ventricles*, two large chambers at the bottom of the heart. Locate and label the *right ventricle* and *the left ventricle*.
- e. Pumping action of the heart squeezes blood from the two ventricles. Blood leaves the heart on the left side by way of an artery called the *aorta*. Locate and label the *aorta*, which carries blood to all body parts.
- f. Blood leaves the heart on the right side by way of another artery, the *pulmonary artery*. Locate and label the *pulmonary artery*, which carries blood to the lungs so that carbon dioxide can be exchanged for oxygen.
- g. Locate and label the heart *valves* between the atria and ventricles. *Valves* keep blood flowing in one direction.
- h. Locate and label the *valves* where the pulmonary artery and aorta are joined to the heart.
- i. Use a blue pencil to color in the spaces on Figure 2 to show where *deoxygenated blood* would be. Blood returning to or pumped from the right side of the heart is *deoxygenated*. This means that the amount of oxygen in the blood is low.
- j. Use a red pencil to color in the spaces on Figure 2 to show where *oxygenated blood* would be. *Oxygenated blood* contains a large amount of oxygen. Those vessels returning to or leaving the left side of the heart carry *oxygenated blood*.

Figure 1



Name: _____ Date: _____ Class: _____

Figure 2



Data and Observations:

Complete Table 1. Use the words *oxygenated* or *deoxygenated* to describe the condition of the blood in each part. If the part does not exist on the specified side, place an X in the box. (Example: the vena cava only exists on the right side, so place an X in the box on the left side vena cava section. Remember: Figure 2 shows the left and right sides of the heart reversed.)

Table 1

Part	Right Side	Left Side
Atrium	13.	14.
Ventricle	15.	16.
Vena cava	17.	18. X
Aorta	19.	20.
Pulmonary Vein	21.	22.
Pulmonary Artery	23.	24.

Analysis Questions:

25. How does the left side of the heart compare to the right side of the heart?
26. Veins are blood vessels that carry blood to the heart and usually carry deoxygenated blood, (appearing blue). Arteries are blood vessels that carry blood away from the heart and usually carry oxygenated blood, (appearing red). Why does the pulmonary artery and pulmonary vein not fully match this description?

Task 3 Learning Target: I can describe causes and effects of blood pressure.

1. Blood Pressure: force of _____ on blood vessel walls

- A. Systolic: ventricles contract and push blood out
- B. Diastolic: _____ relax and fill with blood
- C. Blood pressure is highest in _____ and lowest in veins

2. Cardiovascular Disease: Leading cause of _____ in US and is often caused by:

- A. Atherosclerosis: _____
- B. Hypertension: _____
 - a. can be caused by atherosclerosis

C. What actions prevent against heart disease?

- _____
- _____
- _____

Task 4 Learning Target: I can describe cardiovascular disease

-by designing a model that compares atherosclerosis with a healthy blood vessel.

Or

-by designing a clinical trial to investigate the causes of heart disease.

Or

- by creating a campaign poster or video that urges people to protect themselves from the development of Cardiovascular Disease.

Option 1: Design a model that compares atherosclerosis with a healthy blood vessel.

Draw your models side-by-side. Identify the materials that can be used and the total cost.

Healthy Blood Vessel	Atherosclerosis
Materials: - - -	
Total Cost: _____	

Option 2: Visit the following link to design a clinical trial to investigate the causes of heart disease.

<https://www.centreofthecell.org/learn-play/games/heart-disease/>

Clinical trials are experiments in which doctors and other health care professionals study people in order to improve health treatment. Clinical trials may involve trying to find out more about a particular disease, or to test new kinds of medical equipment. In many cases a clinical trial will test a new form of treatment, e.g. a new medicine, to find out if it works better than current treatments for a particular disease.

Summarize your findings:

What factor did you test? (IV):	
Results for Experimental Group:	
Results for Control Group:	
Explain if you ran a conclusive experiment:	

Option 3: Heart Safety Campaign

Heart disease is the leading cause of death in the United States, according to the Centers for Disease Control and Prevention (CDC) Trusted Source.

In the United States, 1 in every 4 deaths in is the result of a heart disease. That’s about 610,000 people who die from the condition each year.

While heart disease can be deadly, it’s also preventable in most people. By adopting healthy lifestyle habits early, you can potentially live longer with a healthier heart.

Your Goal: Create a campaign poster or video that urges people to protect themselves from the development of Cardiovascular Disease.

Reliable Sources:

<https://www.cdc.gov/heartdisease/index.htm>

<https://www.heart.org>

<https://kidshealth.org/en/kids/heart-disease.html>

1. Research answers to the following questions:
 - A. What are the symptoms and what does it do to your body/organs?
 - B. How is it transmitted or acquired?
 - C. Who is most likely impacted by this disease or condition?
 - D. How is it treated and/or prevented?
2. Discuss/share answers to research questions. Be sure to focus on areas that are confusing.
3. Before designing your campaign poster or video, consider the following:
 - A. Who is your audience? How will you connect with your audience?
 - B. What mood will your poster or video establish? How will you establish this mood?
 - C. What action do you want your audience to take? How will your poster or video urge people to take action?
4. Create your campaign poster or video.

	3	2	1
Creativity	The entire presentation reflects an exceptional degree of student creativity in idea and display.	The presentation reflects student creativity in idea and display.	Student creativity is limited.
Content	The poster/video clearly and effectively communicates a thorough purpose. All research questions are thoroughly answered with high-quality examples or pieces of data that support the campaign.	The poster/video communicates a purpose. Most research questions are thoroughly answered with high-quality examples or pieces of data that support the campaign.	It was difficult to figure out the purpose of the poster/video. Few research questions are thoroughly answered with high-quality examples or pieces of data that support the campaign.

Task 5 Learning Target: I can read and interpret graphs in order to determine blood pressure readings.

Blood pressure is described by measuring two events: **(a)** Systolic pressure—pressure when the ventricles of the heart contract and push blood into arteries **(b)** Diastolic pressure—pressure when the ventricles relax and blood in the arteries is not being pushed. Blood pressure is a comparison of systolic to diastolic numbers, and is written as a fraction. The systolic number is written as the numerator and the diastolic number is written as the denominator.

Figure 3 shows a person’s blood pressures (measured in mm of mercury) as it changes from birth to age 60. For example, the systolic pressure for the child at 10 years old was 100 mm of mercury. The diastolic pressure for this child was 65 mm of mercury.

Figure 3

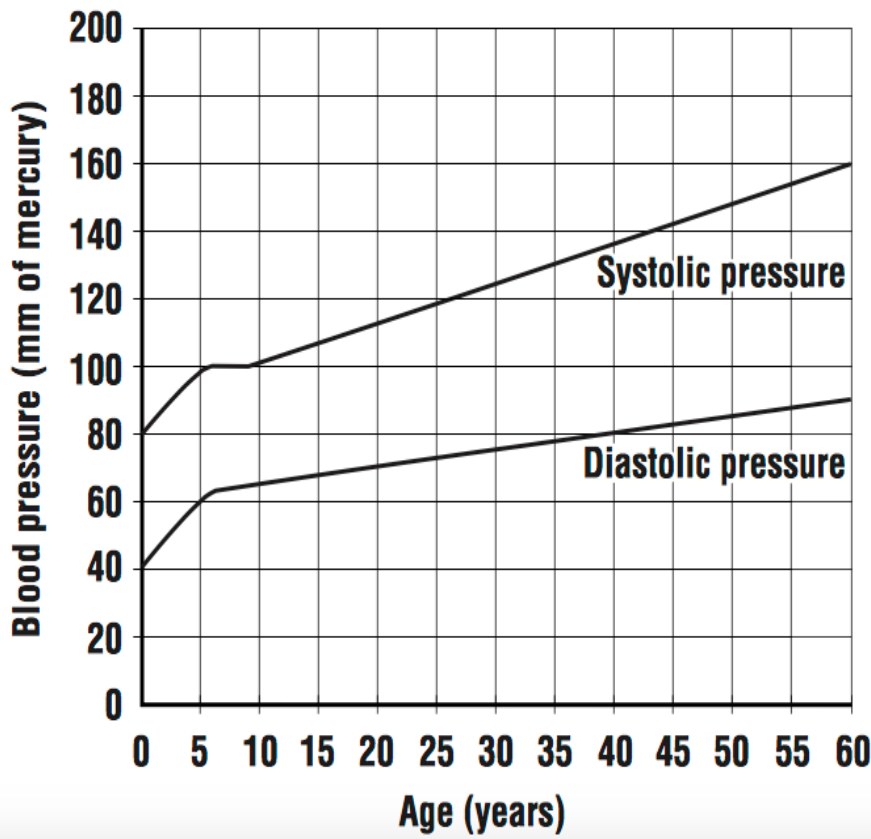
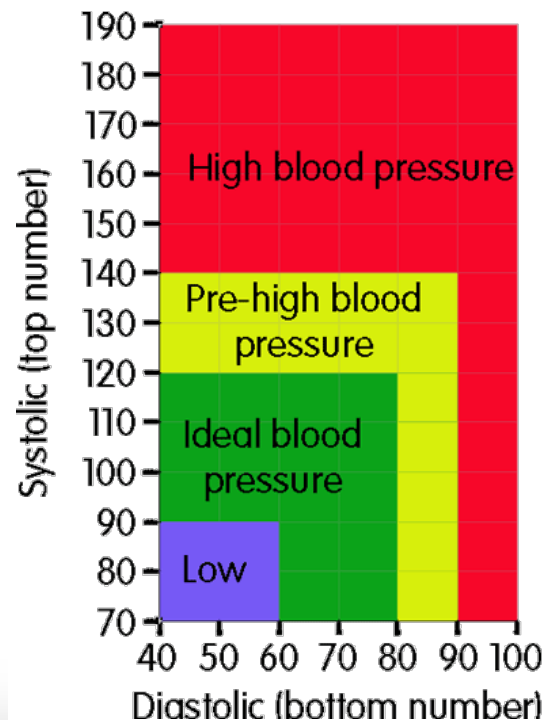


Figure 4



- What is the systolic pressure for this person at age 20? _____
 - What is the diastolic pressure for this person at age 20? _____
- From the graph, determine the blood pressure at the following ages: (to be written as a fraction)
 - 15 years old: _____
 - 30 years old: _____
 - 40 years old: _____

For Numbers 3 and 4, show all work in the space provided. You will not earn credit without showing work.

3. a. How much change occurs in systolic pressure from age 0 to 60? _____
b. How much change occurs in diastolic pressure from age 0 to 60? _____
4. Does systolic blood pressure change more from ages 0 to 20 or from ages 20 to 60? _____
5. a. At what age is there the greatest difference between systolic pressure and diastolic pressure? _____
b. What is the blood pressure at this age? _____
6. At what age did the person have a systolic pressure of about 120 and diastolic pressure of about 75?

A person is said to have high blood pressure if systolic and diastolic pressures are higher than normal. A person is said to have a low blood pressure if systolic and diastolic pressure are lower than normal.

1. Determine the person's blood pressure at each of the following ages (see Table 1 below).
2. Determine if the person has *low*, *ideal (normal)*, *pre-high*, or *high* blood pressure by comparing the pressures in Table 1 with those in the graph in Figure 4.

Using this blood pressure chart (Figure 4): To determine blood pressure readings, just find your top number (systolic) on the left side of the blood pressure chart and read across, and your bottom number (diastolic) on the bottom of the blood pressure chart. Your blood pressure is where the two points meet.

Table 1: Blood Pressure			
Age	Systolic	Diastolic	Pressure
20			
45			
60			

Work Show Here

Task 6 Learning Target: I can use a stethoscope to compare my heartbeats to my pulse measured in (bpm).

- A. Use a stethoscope, listen to your heart. Count the beats you hear in 15 seconds.
- B. Make a table to record your findings:
Name(s); Heartbeat/15 seconds; Heartbeats/1 minute ($n \times \underline{\hspace{1cm}} = \text{heartbeats}/1 \text{ minute}$)
- C. Find your pulse at your wrist or neck. Count your pulse for 15 seconds.
- D. Make a table to record your findings:
Name(s); Pulse/15 seconds; Pulse/1 minute ($n \times \underline{\hspace{1cm}} = \text{Pulse}/1 \text{ minute}$)
- E. What is the relationship between heartbeat and pulse?

Task 7 Learning Target: I can follow a procedure in order to model structures of the circulatory system.

Introduction

In this activity you will learn about all the parts of your circulatory system and what they do. Let's start by building a model that can serve as your guide to the parts of the circulatory system and how they fit together.

Materials

4 Paper cups

1 Straw

Glue

2 Paper towels

2 20cm pieces of blue yarn

2 20cm pieces of red yarn

Tape

Balloon (white)

Colored thread (blue and red) Ruler

Blue and red pencils or pens

3 Lima beans

Scissors

Ruler

Procedure

First, you are going to build a model heart. The heart has four chambers. In each side of the heart, blood enters the upper chamber and leaves the lower chamber. Now follow **Steps 1** through **6** as you build your model heart.

Step 1 Place the open ends of two paper cups together. Secure the cups together with tape. Do the same thing with the other two cups.

Step 2 Stand the two sets of cups side by side. Each cup represents a heart chamber.

Step 3 Carefully poke a hole in the side of each cup using a pencil.

Step 4 Cut a straw into four equal pieces. Color or paint two of the pieces blue and the other two pieces red.

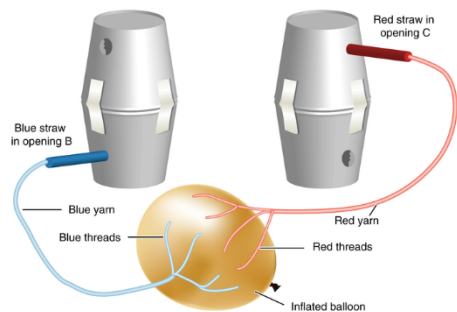
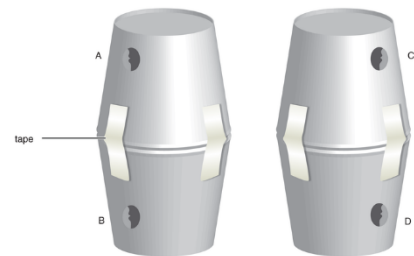
Step 5 Insert and glue one of the blue straws into opening B. Insert and glue a red straw into opening C.

Step 6 Stick a piece of blue yarn into the open end of the blue straw attached to the cups. Stick a piece of red yarn into the open end of the red straw attached to the cups. The straws and yarn represent **blood vessels** coming to and leaving the **heart**.

The straws and yarn represent the system of **blood vessels** through which the **heart** pumps **blood**. This model resembles a figure eight. Half of the figure eight is the lung circuit where **blood** picks up **oxygen**. The other half of the figure eight is the body circuit where **blood** gives **oxygen** to all the cells of the body. Now you know the significance of the blue and red colors. Blue represents vessels carrying **blood** after it gives **oxygen** to cells. Red represents vessels carrying **blood** with a full load of **oxygen**. You can use this information in completing the following steps to finish your model.

Step 7 Inflate a white balloon to about 10cm (4 inches) in diameter and tie it off. The balloon represents the **lungs**.

Step 8 Glue blue and red threads on the surface of the inflated balloon. The threads (or colored lines) represent the tiniest **blood vessels** where the **blood** picks up **oxygen** and delivers **carbon dioxide** to the **lungs**.



Step 9 Glue the free ends of the blue yarn to the surface of the balloon that has the tiny blue vessels. Glue the free ends of the red yarn to the surface of the balloon that has the tiny red vessels. You have completed the part of the model that represents the pump that moves **blood to your lungs and back to the heart**.

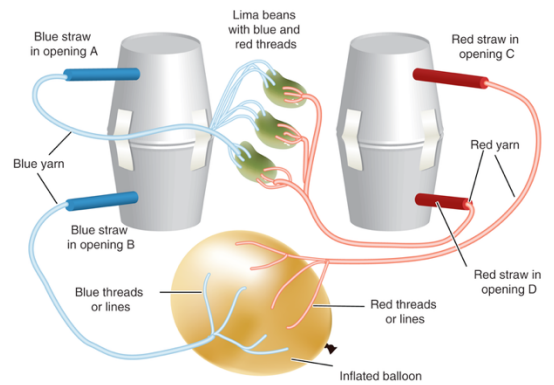
Step 10 Now finish your model of the **heart** by showing how **blood** moves to your **body cells**. Insert and glue the other red straw into opening D. Insert and glue the other blue straw into opening A.

Step 11 Stick a piece of red yarn into the open end of the second red straw. Stick a piece of blue yarn into the open end of the second blue straw.

Step 12 Obtain three or four lima beans to represent **body cells**. Cut about 10 to 12 pieces of thread, each about 3 centimeters long. Half of the pieces should be red. The other half should be blue. Glue one end of several red and blue threads on the surface of each bean.

Step 13 Attach the free end of the red threads to the red yarn. Attach the free ends of the blue threads to the blue yarn.

Step 14 Be sure you can explain to someone the path that a drop of **blood** would take in flowing through your model.



End of Lab Task:

1. Draw a diagram of your completed model including labels for the following:
 - a. What does the balloon represent?
 - b. What do the beans represent?
 - c. What do the cups represent?
 - d. What do the different colored string and yarn represent?

2. Write an explanation of how blood would flow through your model.

Task & Learning Target: I can identify the structures and explain the functions of blood parts.

1. Parts of Blood

***Copy and complete the following chart:

Blood Part	Structure	Function	Other:
Plasma			
Red Blood Cell (RBC)			# in 1 cubic millimeter: Lifespan: Made in bone marrow
White Blood Cell (WBC)			# in 1 cubic millimeter: Lifespan: Made in _____
Platelet			# in 1 cubic millimeter: Lifespan: Made in _____

2. Diseases of Blood

- A. Anemia:
- B. Leukemia:
- C. Hemophilia:

3. Blood Types

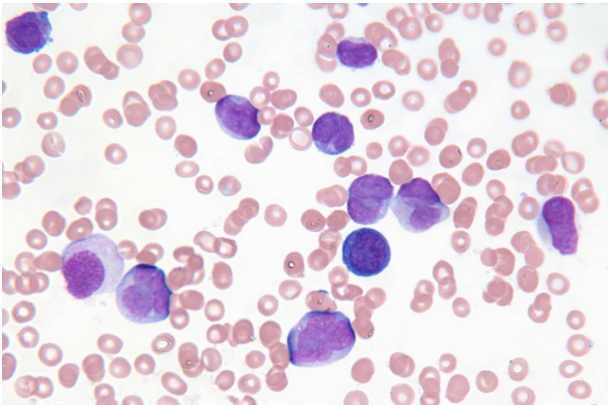
- A. people can inherit 1 of 4 blood types and an Rh factor
 - The RBC is like a jelly donut with sprinkles
 - Sprinkles are like blood markers (A, B, AB)
- B. Antigens: chemical identification tags or "Party Hats"
- C. Antibodies: "Haters" make sure blood types cannot be mixed

Task 9 Learning Target: I can use a healthy blood histology image to identify possible blood disorders.

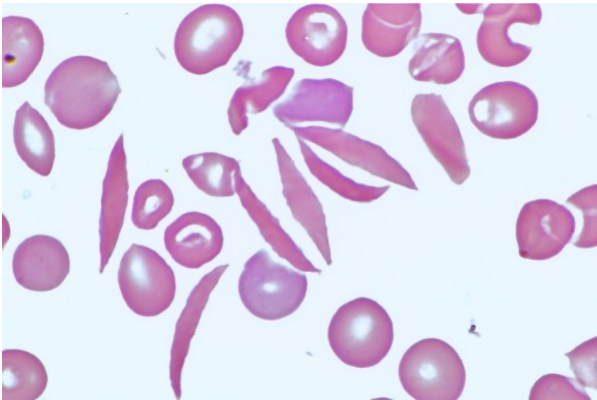
Slide 1:



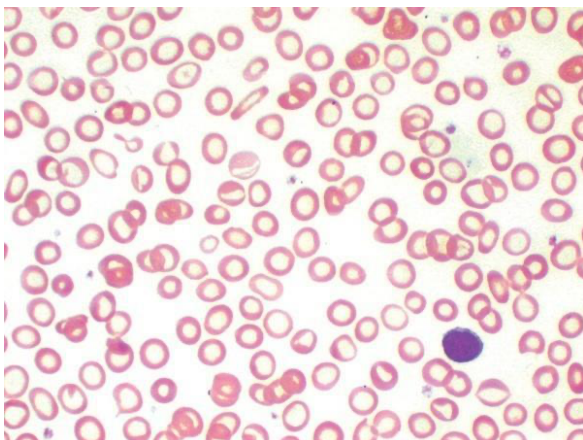
Slide 2:



Slide 3:



Slide 4:



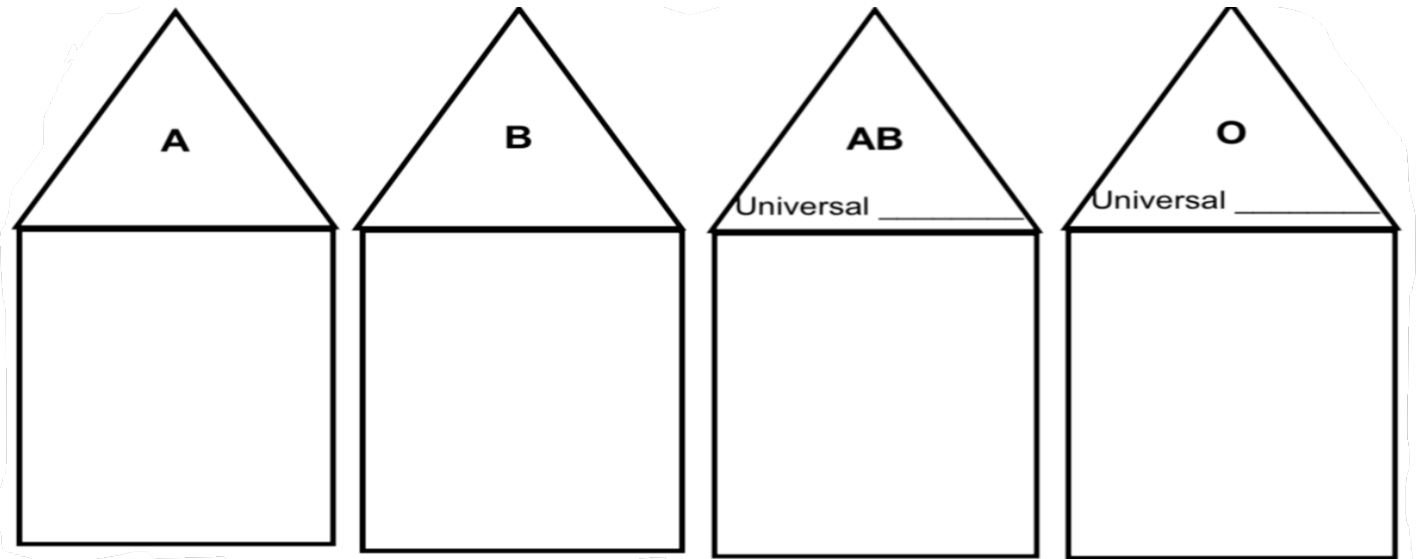
- a. For each slide, draw and label what you see. Be sure to pay attention to detail and scale.
- b. Slide 1 shows a normal, healthy blood slide. Compare slides 2-4 with the healthy blood slide (Slide 1). Describe the abnormality that slides 2-4 show.
- c. Research the disease/condition that the patient may have based on the observed characteristics.

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Task 10 Learning Target: I can use an analogy that explains how antibodies and antigens interact in order to describe blood transfusion options.

1a. If whole blood types are represented as homes, complete the following illustration by showing:

- red blood cells with their appropriate antigen (or “party hats”)
- antibodies (or “haters”)



Key

 =	 =
 =	 =

1b. What is **agglutination** and why can this be harmful? *(Be sure to use the words *antigen* and *antibody* in your answer.)

2a. Complete the following tables:

Table 1: Blood Types		
Blood Type	Antigen	Antibody
A		
B		
AB		
O		

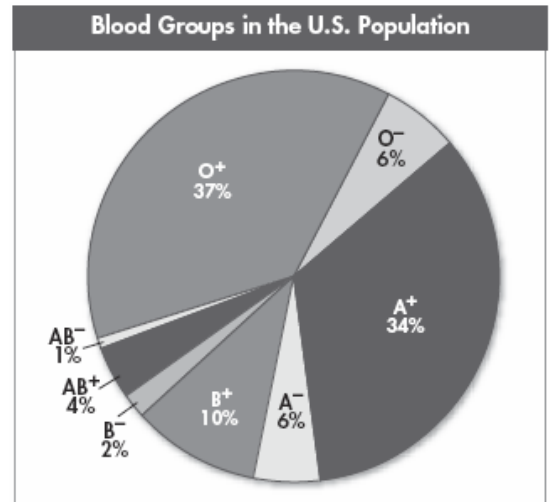
Table 2: Blood Transfusion Options		
Blood Type	Can Receive From	Can Donate To
A		
B		
AB		
O		

2b. Which blood type(s) are referred to as the **universal donor** and the **universal recipient**? Why?

*(Be sure to use the words *antigen* and *antibody* in your answer.)

3a. Which blood type is **most common** in the U.S. population?
 What percentage of the population has this blood type?

3b. Which blood type is **least common** in the U.S. population?
 What percentage of the population has this blood type?



3c. Positive blood types can receive from other positive and negative blood types. Negative blood types can only receive from other negative blood types.

Which blood type (and Rh factor) would have the **most difficulty** receiving a blood transfusion? Explain.

3d. Positive blood types can receive from other positive and negative blood types. Negative blood types can only receive from other negative blood types.

Which blood type (and Rh factor) would have the **least difficulty** receiving a blood transfusion? Explain.




4. Why is it important to know your blood type? *(Be sure to use a specific example to support your claim.)




	3	2	1
Diagram and Explanation	Diagram accurately shows whole blood types with no errors. Agglutination is accurately and thoroughly described.	Diagram accurately shows whole blood types with few errors. Agglutination is accurately described but explanation is limited.	Diagram shows whole blood types with many errors. Agglutination is described with several errors.
Data Table	All data is recorded accurately and precisely with no errors.	Most data is recorded accurately and precisely with no more than 3 errors.	Little data is recorded accurately and precisely with 4 or more errors.
Analyze Data	<i>Universal donor</i> and <i>universal recipient</i> are thoroughly and correctly described, referencing antibodies and antigens.	<i>Universal donor</i> and <i>universal recipient</i> are described correctly, however description is limited.	<i>Universal donor</i> or <i>universal recipient</i> is described incorrectly.
Interpreting Graphs	The pie graph is interpreted accurately and thoroughly with no errors.	The pie graph is interpreted with a partial understanding. There are no more than 2 errors.	The pie graph is interpreted with a limited understanding. There are 3 or more errors.
Conclusion	The importance of knowing blood type is thoroughly explained and a specific example supports the claim.	The importance of knowing blood type is partially explained and an example that supports the claim is limited.	The importance of knowing blood type is partially explained and an example that supports the claim is missing.

Task 11 Learning Target: I can use a simulated model to describe blood transfusions.

1. Watch the tutorial videos:
 - a. <https://www.youtube.com/watch?v=3T558hMytIs>
 - b. <https://www.youtube.com/watch?v=Kcx8YqkKmLY>
2. Visit the link and complete the charts for a minimum of 2 patients:

<https://educationalgames.nobelprize.org/educational/medicine/bloodtypinggame/>

Patient 1	
Draw your observations:	Explain your observations:
<div style="display: flex; justify-content: space-around; text-align: center;"> <div style="width: 30%;"> <p>A antibodies</p>  </div> <div style="width: 30%;"> <p>B antibodies</p>  </div> <div style="width: 30%;"> <p>Rh antibodies</p>  </div> </div>	<p>In test tube A, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> an A antigen.</p> <p>In test tube B, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> a B antigen.</p> <p>In test tube Rh, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> an Rh antigen.</p> <p>The blood type is _____.</p> <p>The person can receive blood from blood type(s) _____.</p>

Patient 2	
Draw your observations:	Explain your observations:
<div style="display: flex; justify-content: space-around; text-align: center;"> <div style="width: 30%;"> <p>A antibodies</p>  </div> <div style="width: 30%;"> <p>B antibodies</p>  </div> <div style="width: 30%;"> <p>Rh antibodies</p>  </div> </div>	<p>In test tube A, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> an A antigen.</p> <p>In test tube B, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> a B antigen.</p> <p>In test tube Rh, agglutination <u>DID/ DID NOT</u> happen. This means that the RBC <u>HAS/DOES NOT HAVE</u> an Rh antigen.</p> <p>The blood type is _____.</p> <p>The person can receive blood from blood type(s) _____.</p>

Task 12 Learning Target: I can follow a multistep procedure in order to determine blood transfusion options.

Transfusion Matching With Synthetic Blood

You are a clinical blood technician of a hospital. You are called to the emergency room, where you find an injured man. His right thigh has been ripped open, and the emergency room medical team is trying to stop the flow of blood from a major artery. You know that the hospital's blood bank was depleted when accident victims from a major pile-up on the Interstate were airlifted to the hospital. A nurse quickly explains that the man has four friends in the emergency waiting room who are eager to donate blood. You collect blood samples from the injured man (Mike) and his four friends (Kim, Ajax, June, and Frank.) You must now determine which, if any, of these people can donate blood to save their friend's life. Go to your workstation and proceed as follows.

NOTE: Before using any solution, shake well!

1. Using the dropper vial, place a drop of the accident victim's blood sample in each well of the blood typing slide. Always close the cap on one vial before opening the next vial to prevent **cross contamination**.
2. Add a drop of synthetic anti-A to the well labeled A. Close the cap.
3. Add a drop of synthetic anti-B serum to the well labeled B. Close the cap.
4. Add a drop of synthetic anti-D (Rh) serum to the well labeled Rh. Close the cap.
5. Using a different mixing stick for each well, gently stir the synthetic blood and anti-serum drops for 30 seconds. Remember to thoroughly clean each mixing stick after a single use to avoid contamination of your samples.
6. Carefully examine the thin films of liquid mixture left behind.

If a film remains uniform in appearance, **no** agglutination has occurred.

If the sample appears granular or clumpy, _____.
Determine the blood type of the sample using Table 1.

To complete the table, answer **yes** or **no** as to whether agglutination occurred in each sample.

A positive agglutination reaction indicates _____.

7. Record the results for the victim's blood sample in the Data Table.
8. Repeat steps 1 through 7 for the blood samples from the man's four friends, recording the results of each test as you go.
9. When you are complete and your teacher approves your data, thoroughly clean the materials.

Data Table: Victim and Donor Blood Reactions to Antisera

	Victim Mike	Donor Kim	Donor Ajax	Donor June	Donor Frank
Anti-A					
Anti-B					
Rh					
Blood Type					

Conclusion Questions:

1. You must use a donor whose blood will not agglutinate when mixed with that of the accident victim. Which of Mike’s friends is your first choice to donate blood because he/she has the same blood type? Explain your answer. (Be sure to use words: antigen and antibody)
2. The transfusion is made, but the emergency team needs more blood. Mike’s first friend has donated all the blood that he or she can. Does Mike have a friend who, although not a preferred donor, can be used in this emergency? Explain why this person can be used as a donor even though the blood types are not the same. (Be sure to use words: antigen and antibody)

Participation					
I often contributed good ideas that were relevant to the topic and task. I came to meetings prepared. I did my share of the work.	4	3	2	1	I seldom contributed good ideas. Sometimes I was talking off-task. I did not come to meetings prepared. I did not do my share of the work.
Working with Others					
I often compromised and cooperated. I did take initiative when needed and/or listened and respected the ideas of others.	4	3	2	1	I seldom compromised and cooperated. I did not take initiative when needed and/or did not listen and respect the ideas of others.
Product					
My part of the task is complete and accurate. My work was submitted on time.	4	3	2	1	I did not complete my part of the task. The information I presented was inaccurate and/or not done correctly. It was not completed on time.
Understanding Content					
I can speak about the topic and group work knowledgeably. I can sum-up the lesson.	4	3	2	1	I do not understand what I did in my group. I did not ask or answer questions. I cannot sum-up the lesson.

How you will be graded:

1. Data table is neat and appears professional <i>O Your table is neat and appears professional. O Your table should be created on the computer or using a ruler.</i>	Possible Points: 10	
2. Each data piece is worth 3 points <i>O Way to go! All blood results are correct. O Job well done! Most blood results are correct. O There are many errors. Next time, work to carefully observe, record and interpret data.</i>	Possible Points: 60	
Conclusion Question 1 <i>O You thoroughly describe who Mike can receive from by explaining how specific antibodies and antigens react. O Review and explain how specific antibodies and antigens react to allow for blood transfusions. You may want to revisit the “house analogy.”</i>	Possible Points: 15	
Conclusion Question 2 <i>O You thoroughly describe who Mike can receive from by explaining how specific antibodies and antigens react. O Review and explain how specific antibodies and antigens react to allow for blood transfusions. You may want to revisit the “house analogy.”</i>	Possible Points: 15	
5. Lab Participation will count towards overall grade	Possible Points: 16	

Task 13 Learning Target: I can create a RAFT writing piece in order to explain structures and functions of blood parts.

Overview:

1. In this project, you will produce a creative writing piece in which you convey the point of view of a red blood cell. Your presentation may take the form of a letter, advertisement, memo, speech, or journal/diary entry. You are encouraged to be creative! Although the platform by which you choose to present is for your choice, all presentations will be held to the same standards.

Your report should demonstrate an accurate and thorough understanding of scientific concepts. The description should:

- ✓ Convey a role: Who are you?
- ✓ Relate to a target audience: Whom are you addressing in your writing?
- ✓ Assume an appropriate format: What form will your writing take?
- ✓ Effectively communicate a topic that highlights at least 3 key points:

- The difference between arteries, veins, capillaries
- How blood moves throughout the heart
- The functions of the pulmonary and systemic circulation systems
- Cardiovascular disease
- The parts and functions of the blood
- Blood types
- The difference between antibodies and antigens
- Diseases of the blood

✓ Use at least 4 vocabulary words and underline them in your writing.

2. You will also work to create a visual aid that illustrates a major point of your writing piece. You are expected to label and briefly describe your illustration. Be sure to follow the following guidelines:

- ✓ Your visual aid should be labeled and briefly described.
- ✓ Your visual aid should be creative, colorful, easy to read, and used effectively.

	4	3	2	1
Diagram	Visual aid is creative, colorful, and easy to read, and effectively illustrates the topic.	Visual aid is colorful, readable and used somewhat effectively.	Visual aid is lacking color, is difficult to read, and used somewhat effectively.	Visual aid is not colored, difficult to read, and/or is not used effectively.
Labels	Every item that needs to be identified has a label. It is clear which label goes with which structure.	Most items (at least 3) that need to be identified have labels. It is clear which label goes with which structure.	Few items (at least 2) that need to be identified have labels. It is clear which label goes with which structure.	Only 1 item is identified with a label OR it is not clear which label goes with which item.
Topic	The topic is clear and well-focused. At least 3 key points are thoroughly addressed. All facts presented in the story are accurate.	The topic is clear and well-focused. At least 2 key points are thoroughly addressed. Almost all facts presented in the story are accurate.	The topic is clear and focused, however key points were only partially addressed. Most facts presented in the story are accurate.	The topic is unclear and not focused and/or only 1 key point is addressed. There are several factual errors in the story.
Creativity	The dialogue contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his/her imagination.	The dialogue contains several creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his/her imagination.	The dialogue contains a few creative details and/or descriptions. The author has tried to use his/her imagination.	There is little evidence of creativity in the dialogue. The author does not seem to have used much imagination.
Vocabulary	A minimum of 4 vocabulary words were used correctly in context and underlined.	A minimum of 3 vocabulary words were used correctly in context and underlined.	A minimum of 2 vocabulary words were used correctly in context and underlined.	Only 1 vocabulary word was used correctly in context and underlined.

	I assumed the role of:
	My audience is:
	My format is:
	<p>Key points include:</p> <ul style="list-style-type: none"> ○ The difference between arteries, veins, capillaries ○ How blood moves throughout the heart ○ The functions of the pulmonary and systemic circulation systems ○ Cardiovascular disease ○ The parts and functions of the blood ○ Blood types ○ The difference between antibodies and antigens ○ Diseases of the blood
	<p>New Vocabulary <u>underlined</u> in writing:</p> <ol style="list-style-type: none"> 1. 2. 3. 4.
	My visual aid is labeled and briefly describes:
	My visual aid is creative, colorful, easy to read, and used effectively because it shows:

Task 14 Learning Target: I can design an experiment that tests how _____ affects _____.

1. Read and summarize the lab purpose and background.

Purpose: In this lab, you will use data evidence to determine a factor that affects heart rate.

Background:

Your heart rate, or pulse, is the number of times your heart beats per minute. Normal heart rate varies from person to person. Your resting heart rate is the heart pumping the lowest amount of blood you need because you're not exercising. If you're sitting or lying and you're calm, relaxed and aren't ill, your heart rate is normally between 60 (beats per minute) and 100 (beats per minute).

But a heart rate lower than 60 doesn't usually signal a medical problem. Highly trained athletes may have a resting heart rate below 60 bpm, sometimes reaching 40 bpm. A lower heart rate is common for people who get a lot of physical activity or are very athletic. Active people often have lower heart rates because their heart muscle is in better condition and doesn't need to work as hard to maintain a steady beat.

The average adult male heart rate is between 70 and 72 beats per minute, while the average for an adult woman is between 78 and 82 beats. This difference is largely accounted for by the size of the heart, which is typically smaller in females than males. The smaller female heart, pumping less blood with each beat, needs to beat at a faster rate to match the larger male heart's output.

How Other Factors Affect Heart Rate

- **Air temperature:** When temperatures (and the humidity) soar, the heart pumps a little more blood, so your pulse rate may increase, but usually no more than five to 10 beats a minute.
- **Body position:** Resting, sitting or standing, your pulse is usually the same. Sometimes as you stand for the first 15 to 20 seconds, your pulse may go up a little bit, but after a couple of minutes it should settle down.
- **Emotions:** If you're stressed, anxious or "extraordinarily happy or sad" your emotions can raise your pulse.

2. What factor that affects pulse rate can we test?

3: Predict: How can we use a **stopwatch** to test pulse rate?

4a. Watch the video link below:

<https://www.youtube.com/watch?v=oAjnIDZH9H8>

4b. Answer the following question on your lab sheet: *How is a stopwatch used to measure pulse rate?*

5. Investigation Design Diagram:

Independent Variable:				
Levels of IV (How you will change it)				
Number of Trials (Number of times you will test IV)				

Dependent Variable: _____

Constants: _____

6. **Title:** _____

*Hint: **The Effect of** (the IV) **on** (the DV)

7. **Question:** _____

*Hint: **How will** (the IV) **affect** (the DV)?

8. **Hypothesis:**

*Hint: **If** (change of the IV) **then** (change in the DV) **because** (use reasoning from prior knowledge and/or research).

Task 15 Learning Target: I can develop a clear and detailed procedure that describes how to test the effect of _____ on _____.

1. List **materials** and quantities
2. Develop a **procedure**: As a team, create and order a MASTER procedure.

Task 16 Learning Target: I can collect data by conducting an experiment that tests how _____ affects _____.

1. Conduct your experiment to test how _____ affects pulse rate.

2. Create **Data Tables** that will organize your data.

Tables should show individual and larger sample data with:

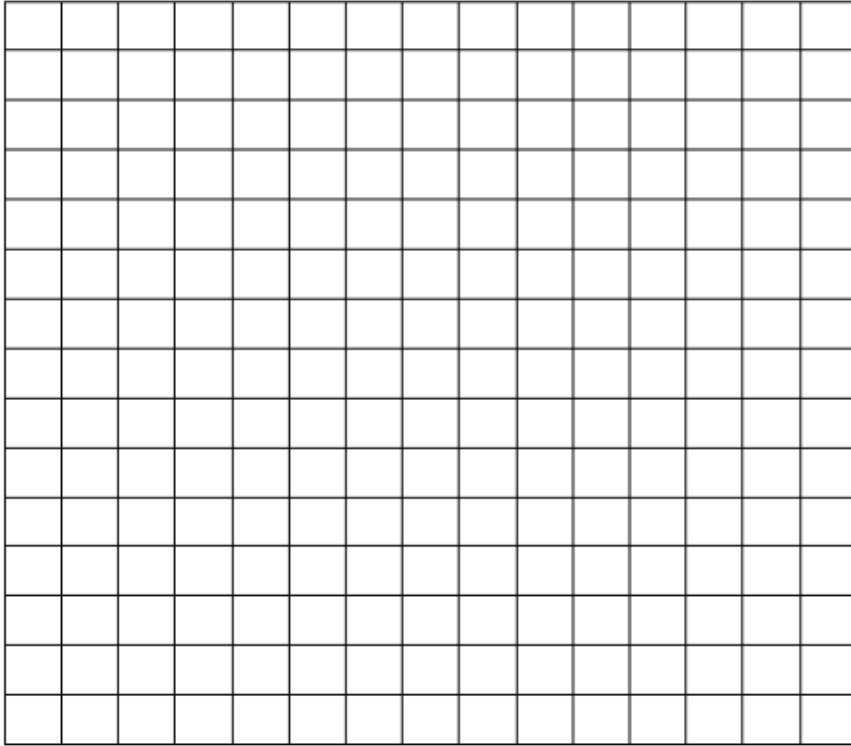
-Title(s)

-Units of measure ()

-Numbers (including averages) rounded to the nearest tenth

Task 17 Learning Target: I can present data that illustrates how _____ affects _____.

1. Make a **graph** that shows individual and larger sample averages.



- X axis Label
 - Units (measure)
 - Constant scale
- Y axis Label
 - Units (measure)
 - Constant scale
- Points and line **or** bar
- Title (both axes labels)
- Key includes all lines or bars

Task 18 Learning Target: I can analyze data in order to draw a conclusion about how _____ affects _____.

A. **Conclusion:**

1. What was the purpose of the lab?	
2. What was your hypothesis?	3. Was your hypothesis supported?
4. Evidence: (What observations/data supports or disproves your hypothesis?)	5. Scientific Reasoning: (Why do you think this happened based on background knowledge and /or research?)

B. **Analysis:**

1. How do you know that your data is reliable?
2. Why is it important to control variables? How did you do this?
3. Discuss possible sources of error.
4. Explain how the data or ideas from this investigation could be used in future investigations.