Living Environment
Lab Collection

Fall Semester
Units 1 - 4

Student Name: _____

Fall Semester

Unit	Lab Title	Link	Page	Class Periods[1]	Grade
Lab Safety and Contract	Science lab safety	Lab 1		1	
	Safety contract	Safety Contract			
Unit 1: Characteristics of Life	Microscope Basics	Lab 2		1	
	Cell comparison	Lab 3		1	
Unit 2: Nutrients, Energy and Biochemical Processes	Photosynthesis modeling	Lab 4		1	
	Enzymes	Lab 5		2	
	Macronutrient transport (Diffusion through a membrane) [Part 1]	Lab 6a		3	
	Cellular respiration and experimental design	Lab 7		5	
Unit 3: Homeostasis in the Human Body	Human thermoregulation	Lab 8		2	
	Circulation and respiration (Making Connections)	Lab 9		3	
	Macronutrient transport (Diffusion through a membrane) [Part 2]	Lab 6b		1	
Unit 4: Diseases and Disruptions of Homeostasis	Antibiotic resistance simulation	Lab 10		1	
	Urinalysis	Lab 11		1	
Planned Lab Minutes / Earned Lab Minutes				1100 /	

Minutes earned: Fall	
On track for Regents Readiness (teacher write “yes” / “no” and signature)	

⚙ **= Student Self-Regulation Opportunity**

[1] Based on a 50 minute period

Lab 1: Lab safety[2]	Back to Lab Safety

Station 1: Lab Directions

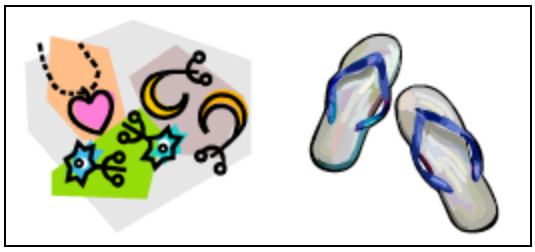
Suppose you and your group were about to begin a laboratory investigation, what should be done first?
Write a rule for this station.

Station 2: Lab Area Safety

Imagine this is your group's lab area, what is wrong here?
What might happen if your lab group had such a cluttered area?

[2] Adapted from: https://www.ocps.net/cs/services/cs/currareas/sci/IR/lessonplans/MID_LP/001Lab%20Safety%20Station%20Activity_0910.pdf

Write a rule for this station.

Station 3: Dress Code

What do you think is the proper clothing to wear when we conduct laboratory investigations? (Include hair, shirts, jewelry, shoes, etc.)
Write a rule for this station.

Station 4: Lab Dress Code

Which picture accurately shows proper lab safety?
Write a rule for this station.

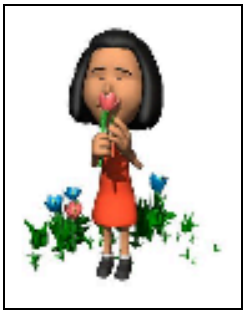
Station 5: Glassware and Sharp Object Safety

What should you do if you break any of the glassware?
Should you use the flask above? Why or why not?
What special precautions should you take if you are using sharp objects like scalpels from the dissecting kit?
Write a rule for this station.

Station 6: Live Animals

If we are conducting an investigation using live animals, how should you treat the animal and why?
What should you do when you are finished handling the animal?

Write a rule for this station.

Station 7: Chemical Safety

Take a whiff of this unknown substance, what do you think the substance is?
If this substance had been poisonous, what might have happened if you sniffed it?
What is the proper way to smell a substance in the lab?
Write a rule for this station.

Station 8: Chemical Safety


Taste the unknown substance, what do you think this substance is?
If the substance had been poisonous, what might have happened if you tasked it?
Write a rule for this station.

Station 9: Chemical Safety

If you spilled a chemical, what should you do?
Write a rule for this station.

Station 10: Chemical Safety

What is the name of this safety equipment?
When would you use it?
Write a rule for this station.

Station 11: Chemical Safety

If you did not use all of the substances given to you for the investigation, what would you do with it?
How would you dispose of substances used in the lab?

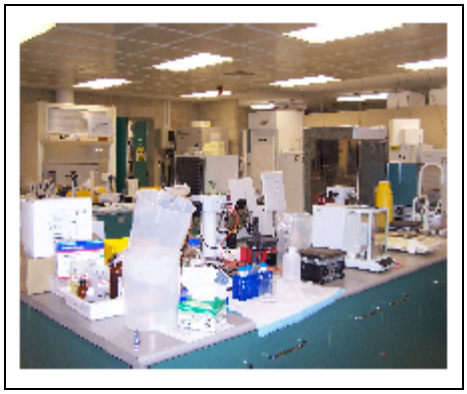
Write a rule for this station.

Station 11: Fire Safety

Where is the nearest fire extinguisher?
Where is the nearest fire alarm?
Where is the nearest fire blanket?
What 3 words do you remember about fire safety if your clothing was to catch on fire?

Station 12: Clean up

What would you always remember to do before leaving the lab?

Station 13: Clean up

Class is about to end, what should happen here?
Write a rule for this station.

Station 13: Clean up

What is the proper conduct in the lab? (The picture should give you a hint.)

Safety contract[3]	Back to Lab Safety

STUDENTS LABORATORY SAFETY CONTRACT

Your health and safety are most important! In the science laboratory, you will be carrying out a number of laboratory activities that could be hazardous to your health and well being UNLESS they are done by following your teacher's instructions both oral and written. The rules listed below will help ensure your safety. They must be followed at all times. The bottom portion requires your signature and that of your parent or guardian. After both of you have signed the tear-off sheet, it must be returned to your teacher so that you can participate in laboratory activities. Failure to carry out laboratory experiments will result in a lowered class grade and might result in a failing grade the course. The upper portion of this contract is to be pasted or taped in your science notebook and should be reread prior to starting each new laboratory activity.

GENERAL RULES

1. Follow all instructions carefully. If you don't understand what you are expected to do, ask your teacher before proceeding.
2. Conduct yourself in a responsible manner whenever you are in the science laboratory. Horse play and pranks are dangerous and have no place in the science laboratory. When you enter the laboratory, do not touch any equipment or chemicals until you are instructed to do so.
3. Eating and drinking is not permitted in the laboratory. Do not use any glassware in the laboratory as a container for food or drinks. Keep your work area neat and clean. If available, wear a lab apron or coat.
4. Know where the safety equipment including the eyewash station, safety shower, fire extinguisher and fire blanket is located. Notify your instructor immediately of any unsafe condition.
5. Use the fume hood when working with gaseous substances. Never put your head inside the fume hood.
6. If a fire drill occurs during a laboratory period, be sure to close all chemical containers, gas and electricity.
7. Keep your hands away from your eyes, mouth and face when using chemicals or handling preserved specimens. Wash your hands with soap and water before leaving the laboratory.
8. Clean and return all equipment when instructed to do so by your teacher.
9. When handling sharp instruments such as scissors and dissecting instruments, always carry them with the tips and points in a downward position. Always cut away from your body. Hold the instruments by their handles. If a sharp instrument falls off the table, don't try to catch it!
10. Wear goggles when instructed by your teacher. There are no exceptions to this rule. If you wear contact lenses, ask your instructor for non-vented safety goggles. If a chemical should splash into your eye or get on your skin, immediately flush the eye or skin with running water from the safety shower or eyewash station for at least fifteen minutes. Notify your instructor at once. Report any accident including a chemical spill or breaking of equipment to your teacher at once. Notify your teacher of any injury no matter how slight. This includes cuts and burns and chemical splashes on any part of the body.
11. Long hair, hanging jewelry, and loose or baggy clothing are hazardous in the laboratory. Long hair must be tied back. Hanging jewelry and loose clothing must be secured. Sandals are not permitted in the science laboratory. Shoes or sneakers must be worn.
12. Follow instructions for handling chemicals. Do not taste, touch, or smell any chemicals unless told to do so. Don't return unused chemicals to their stock containers. Dispose of all chemicals by following your teacher's instructions. Don't use the sink drains for mixing chemicals.
13. Follow instructions for the handling and dilution of acids and bases.
14. Follow directions for inserting and removing glass tubing from rubber stoppers. Never handle broken glass with your bare hands. Use a dustpan and a brush or broom for cleaning up broken glass.
15. Do not use glassware that is chipped or cracked.
16. Make sure your hands are dry before removing an electric plug from a socket. Report any damaged electrical equipment, including, frayed wires and loose connections.
17. Be very careful when using a gas burner. Keep hair, clothing, and your hands safely away from an open flame. Never point the open end of a test tube that is being heated at yourself or anyone else. Hot glass and hot metal stay hot for a long time. Set them aside to cool on an insulated pad. Remember, hot glass and cold glass look exactly alike.

[3] Adapted from: https://www.uft.org/files/attachments/doe-science-safety-manual.pdf

AGREEMENT

I _____ of Class _____ have read and agree to follow all of the safety rules in this contract. I will follow my teacher's directions. I am aware that failure to follow these rules is dangerous and may result in my being barred from the laboratory, and that this may result in a failing grade.

Student Signature Date

Dear Parent or Guardian: Your signature indicates that you have read these safety rules and have instructed your child to follow these rules and procedures in the science laboratory.

Paraprofessional Signature Date

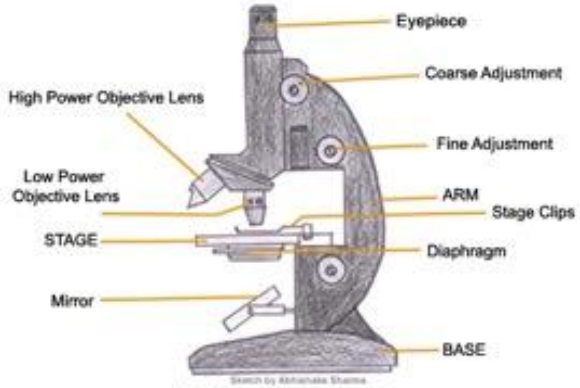
Teacher Signature Date

Lab 2: Microscope basics[4]	Back to Unit 1 Regents Questions

Introduction

➔ Annotate the introduction to the lab by circling words that you think are the most important.

The microscope is a tool used to study objects that are too small to be seen with the unaided eye. The microscope is an expensive, delicate instrument and should always be used with care.



Labeled Microscope Diagram

Rules:

- ➔ ALWAYS leave the microscope on the table when you are using it.
- ➔ ALWAYS start with the low power objective.
- ➔ When carrying the microscope, ALWAYS hold one hand on the arm and one hand on the base.

The microscope is a tool that uses a lens or several lenses to make objects easier to see because they are too small to see with the naked eye. Resolution is the ability to tell the difference between objects that are very close together. A microscope allows us to see high resolution images like the hairs on a fly or the cells of your body.

The microscope we use have two lenses. The eyepiece is the lens you look through, which magnifies the image 10x (eyepiece magnification). The objective lenses are the three colored lenses closer to the stage. They either magnify the image 4x (low-red), 10x (medium-yellow), or 40x (blue). The total magnification is found by multiplying the two lenses together. For example, if you look through the image on low power (red), you are magnifying the image 10 X 4 = 40 times.

Law enforcement officers in investigations often use microscopes. Today you will gain skills in microscopy while learning about U.S. currency and how special agents from the U.S. Secret Service detect counterfeit notes.

Experimental Question

➔ How can I use microscopy skills to visualize the unseen?

[4] Adapted from: https://www.upb.pitt.edu/uploadedFiles/About/Sponsored_Programs/Science_In_Motion/Biology_Labs/bio022a_Money%20and%20the%20Microscope.doc

Materials

- ➔ 1-compound light microscope
- ➔ 1-$1 U.S. note

Procedure

- ➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

Answer the questions below in the space provided in the Analysis Section.

1. List 3 safety rules that are to be followed while doing lab activities with microscopes. The first one has been done for you!
2. Set the microscope in front of you with the arm nearest to you. If the lenses of the eyepiece or objectives are dirty, clean them with a piece of lens paper*. Wipe the lens gently using a circular motion. *Never use anything other than lens paper to clean the lenses.
3. Raise the objectives far away from the stage. Rotate so that the low-power objective is in line with the stage. When the objective is in position, you will hear a click.
4. Your microscope has a range of magnifications.
    a. This is changed by turning the _____.
    b. What is the magnification of the low-power objective? _____
    c. What is the magnification of the high-power objective? _____
5. Open the diaphragm completely so that the greatest amount of light possible reaches your eye.
6. WITH YOUR NAKED EYE, look at President George Washington's portrait and find the Treasury Seal. Predict which one you think was printed first, the Treasury Seal (green ink) or the word "ONE" (black ink.)
7. Place a $1.00 U.S. note with the portrait face up on the stage of the microscope. President George Washington's portrait should be facing you. Move the note so that the Treasury Seal can be viewed under the scope.
8. Notice whether the Treasury Seal (printed with green ink) or the word ONE (printed in black ink) comes into focus first. Which of these two security features was printed first on the paper? Explain your answer.
9. Move the note so that the background in the portrait of President George Washington can be viewed. What geometric shape is found in the background of the portrait?
10. Aim your dollar so that you view the Serial Number of the lower, left corner of the note. Move the note horizontally along this line of letters and numbers. If you move the note to the left across the stage, in which direction does the Serial Number appear to be moving when viewed through a compound microscope?
11. Observe the image of the Serial Number carefully through the microscope again. What happens to the position of a letter or number as you view it through a microscope? This is the "secret of the microscope."
12. U.S. currency is printed on rag paper made from 75% cotton and 25% linen fibers. The paper appears off-white in color. Two other color fibers have been embedded throughout the paper to help the United States Secret Service special agent detect counterfeit currency. The two fibers are of what colors?
13. You have now completed the Money and the Microscope lab. You may put away your $1.00 note and clean up. List 3 things you should do correctly when putting a microscope away.

Analysis
1a. _____ 1b. _____ 1c. _____ 4a. _____ 4b. _____ 4c. _____ 4d. _____ 6a. _____ 6b. _____ 7. _____ 8. _____ 9. _____ 10a. _____ 10b. _____ 11a. _____ 11b. _____ 11c. _____
☼ What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Think - Talk - Open Exchange

☼ **Describe** ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	☼ **Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you wrote in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

**(see Partner Rubric on the next page)

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 3: Cell comparison[5]	Back to Unit 1

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

➔ In this lab, you will compare two different types of cells: plant cells and animal cells. Plant and animal cells are both types of **eukaryotic** cells. Unlike **prokaryotic** cells, eukaryotic cells contain **organelles** such as the **nucleus**. These organelles act much like organs in the human body. A brain controls a human's actions; a nucleus coordinates the actions of a cell. In this lab, you will observe plant and animal cells and attempt to determine what they have in common and what they do not.

Experimental Question

➔ How are plant and animal cells alike? How are they different?

Hypothesis

A good hypothesis has this format and punctuation: If _____, then _____ because _____. HOWEVER, because we are mainly making observations in this lab, your hypothesis can be formatted as follows: One difference between plant and animal cells will be...

➔ *One difference between plant and animal cells will be*

_____

_____

_____

Materials

Prepared slides: Plant cells: _____ and animal cells: _____ (1 per group)
Empty slides (1 per group)

Slide cover slips (1 per group)
Microscope (1 per group)

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

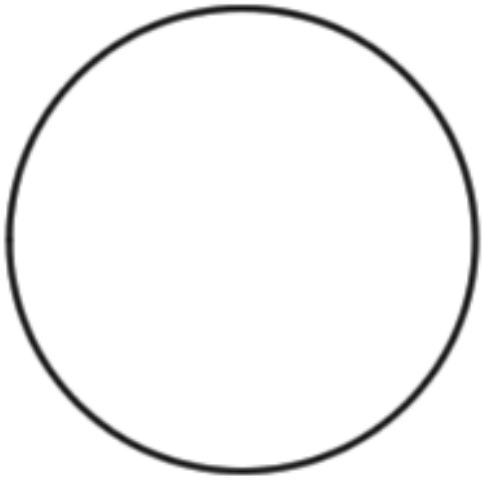
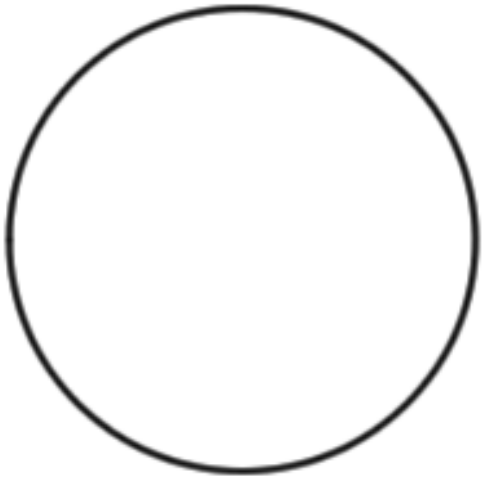
[5] Adapted from: https://www.biologycorner.com/worksheets/comparing_plant_animal.html and http://microscopy4kids.org/Comparing_Plant_and_Animal_Cells

Part 1: Plant Cells

1. Check that your microscope is plugged in and turned on, and that you are starting at the LOWEST magnification with the stage FARTHEST away from the lens.
2. Place your slide on the stage. Move the diaphragm to "1"
3. Slowly lower the course adjust down to within focus.
4. Use the fine adjust to focus better. Move the mirror so that it reflects light from the ceiling lights.
5. Observe the cells at the lowest magnification. You are looking for stretched-out, rectangular cells, forming what looks like a brick wall. You may be able to see a circular nucleus inside some cells. **(What is the objective magnification here?_____ What is the total magnification here? _____)** You may want to change the amount of light by adjusting the diaphragm.
6. Draw your observations below in the "low power" portion of the table.
7. Increase to the second level of magnification and observe again. **(What is the objective magnification here?_____ What is the total magnification here? _____)**
8. Draw your observations below in the "medium power" portion of the table.
9. Clean up your materials according to your teacher's instructions and move on to the second part of the lab.

Part 2: Animal Cells

1. Check that your microscope is plugged in and turned on, and that you are starting at the LOWEST magnification with the stage FARTHEST away from the lens.
2. Place your prepared animal cell slide on the microscope stage and observe the cells at the lowest magnification. You are looking for roughly circular cells with a dark blob in the center. **(What is the objective magnification here?_____ What is the total magnification here? _____)** You may want to change the amount of light by adjusting the diaphragm.
3. Draw your observations below in the "low power" portion of the table.
4. Increase to the second level of magnification and observe again. **(What is the objective magnification here?_____ What is the total magnification here? _____)**
5. Draw your observations below in the "medium power" portion of the table.
6. Clean up your materials according to your teacher's instructions and move on to the second part of the lab.

Data Table 1: Plant	
Plant Cell: Low power	Plant Cell: Medium power
	

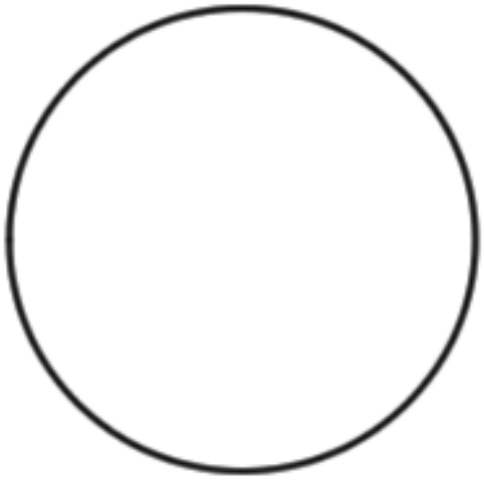
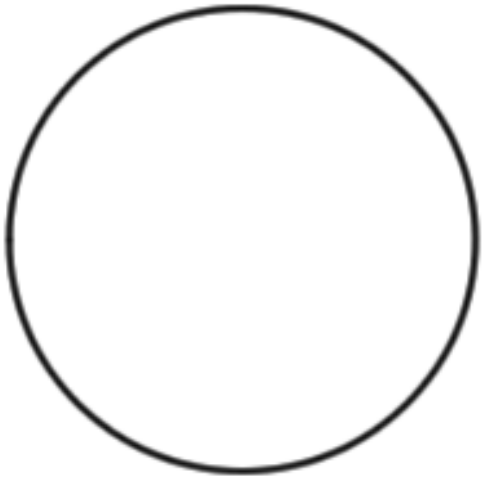
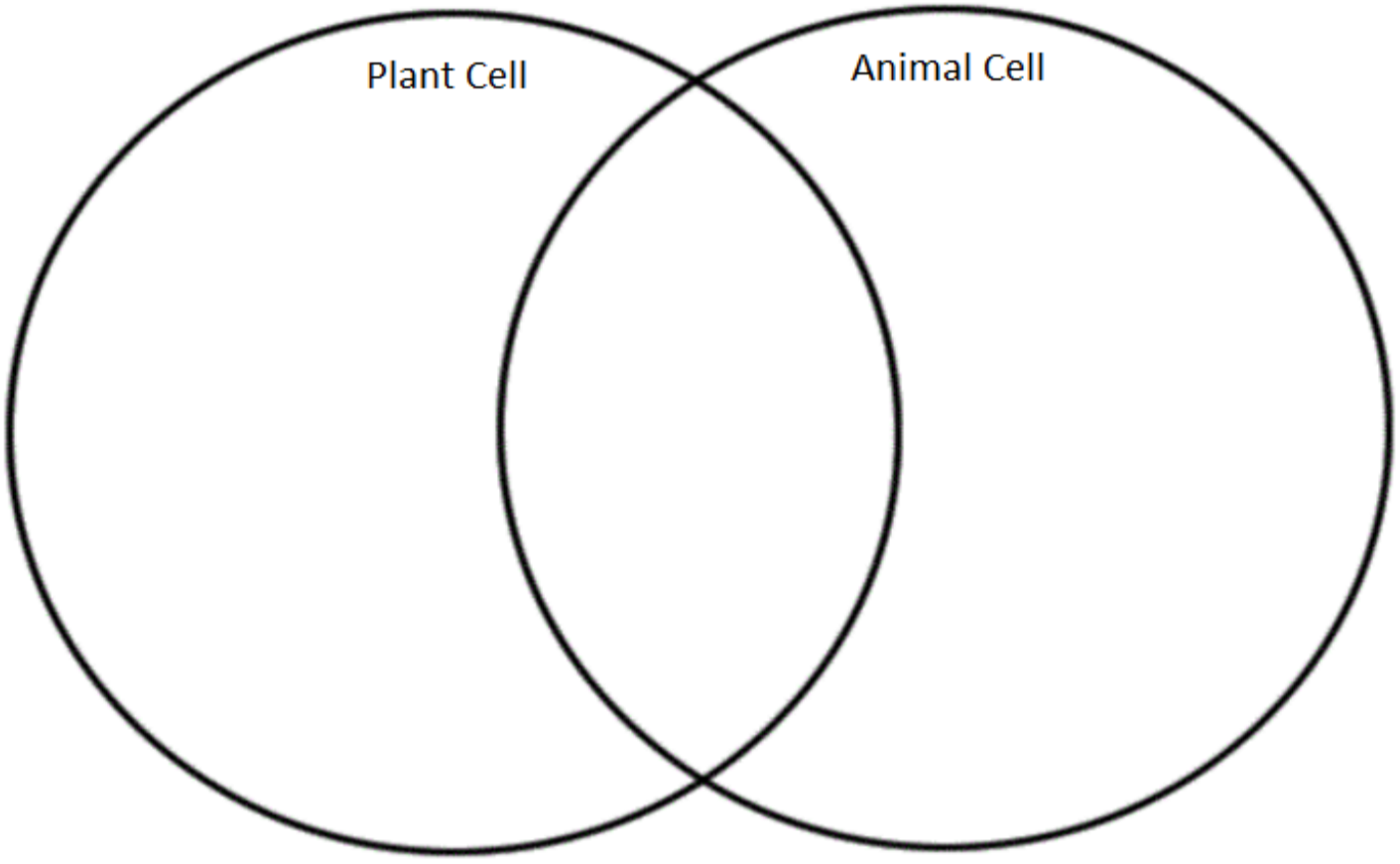
Data Table 2: Animal	
Animal Cell: Low power	Animal Cell: Medium power
	

Diagram
Create a Venn Diagram comparing plant and animal cell parts below.



Analysis

1. Which organelles were visible in both of your samples?

2. Which organelles were not visible in EITHER sample?

3. Compare the shape of the animal cells to the shape of the plant.

4. Compare the cell placement on the slides between the two cell types. For example, were the cells touching each other? Were they in groups or were they separate and not touching?

5. What other observations did you make that might allow you to differentiate between plant and animal cells?

 What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions?

_____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

**(see next page for rubrics!)

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
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Time-Management	Used time well to ensure things get done on time.	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 4: Photosynthesis modeling[6]	Back to Unit 2

Instructions for Modeling Photosynthesis with Paper Atoms
Designed by/adapted from Kathleen M. Vandiver (Copyright MIT 2009)

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

➔ All living things need energy in order to survive. Humans **consume** (eat) food to obtain **glucose**, which can be converted into energy through a chemical reaction. However, plants do not consume food: instead, they make their own food (glucose) through a process called **photosynthesis**. Humans cannot carry out photosynthesis because they do not have the specialized organelle, called a chloroplast, that allows plants to use light energy from the sun to make glucose.

Experimental Question

➔ How do the reactants of photosynthesis compare to the products of photosynthesis?

Hypothesis

A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If the reactants of photosynthesis include 12 hydrogen atoms, 6 carbon atoms, and 18 oxygen atoms,*

➔ *then the products of photosynthesis will contain (circle one)*

- ◆ *The same number of each atom*

OR

- ◆ *A different number of each atom*

➔ *because*

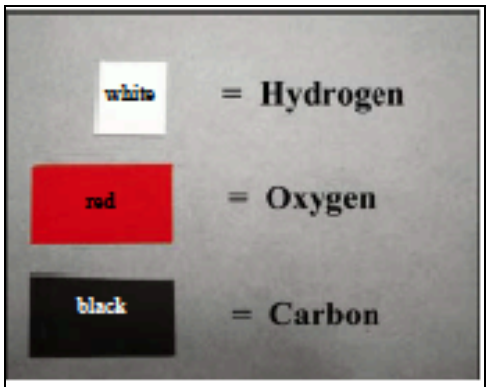
_____.

Materials

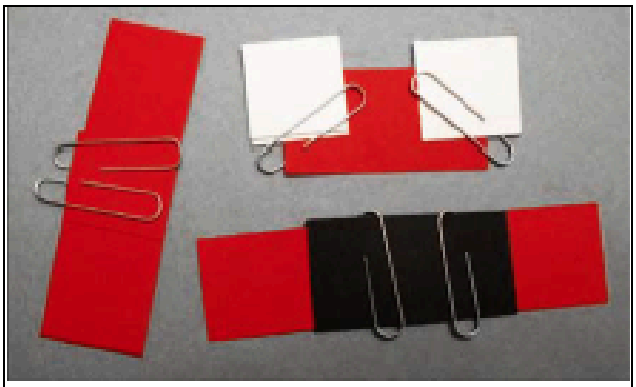
➔ Each group of 2-4 students will need an envelope containing:

Oxygen = 36 red rectangles, 2.5 cm X 5.0 cm.
Carbon = 12 black rectangles, 2.5 cm X 5.0 cm.
Hydrogen = 24 white rectangles, 2.5 cm X 2.5 cm.
Bonds = 50 paper clips to be used to hold atoms together.
Large paper = (11X17 inches) for the photosynthesis equation.

[6] Adapted from: https://blossoms.mit.edu/sites/default/files/video/download/vandiver-activity-3.pdf



Key for the atoms is shown above.


Structures for H_2O, CO_2, and O_2 are shown here.

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

In photosynthesis, 6 molecules of water and 6 molecules of carbon dioxide combine to form 1 molecule of glucose and 6 molecules of oxygen.

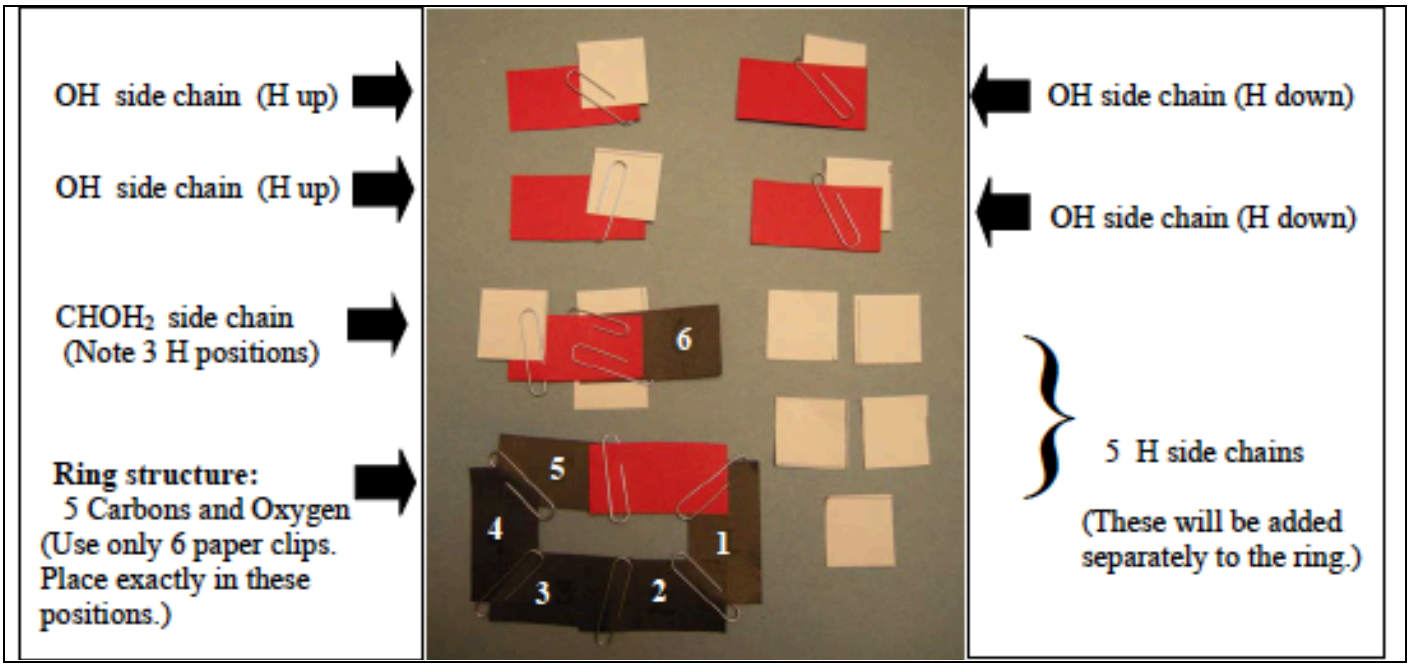
1. To write out the equation in large letters across the page as shown below, place the arrow in the middle first.

$$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$$

2. Next, build the molecules H_2O, CO_2, and O_2. See the photo above for building them correctly with the paper clips. Place each model near its molecular formula on the paper.
3. Finally, build the glucose molecule. Instructions for building the glucose molecule ($C_6H_{12}O_6$)can be found below:

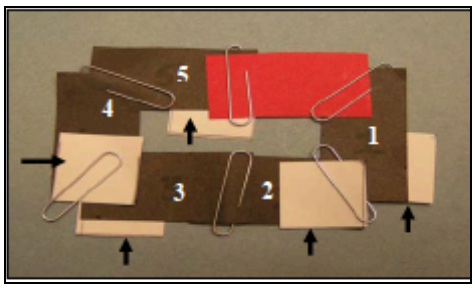
Instructions for building glucose.

1. Prepare the ring structure and the side chains exactly as shown below. *Note positions of the paper clips.*



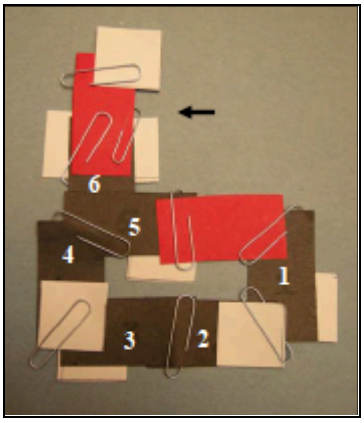
Add the 5 hydrogen atoms as shown in the figure on the right. The five hydrogens are marked with arrows.

- Each hydrogen atom attaches to a different carbon.
- Do not use more paper clips. Use the original 6 paper clips in the ring.
- Look carefully. Some hydrogen atoms are added on top of the carbon and some below the carbon.

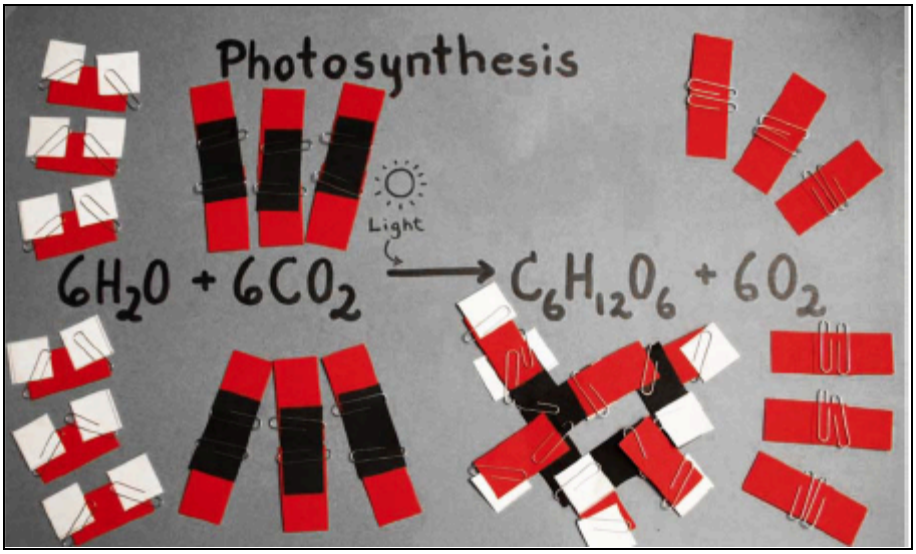


Add the $CHOH_2$ side chain as shown in the figure to the right. It is marked with an arrow.

- Do not use more paper clips. Use the original 6 paper clips in the ring.
- Add this side chain to back of carbon 5 as shown.
- This side chain contains the 6th carbon.



Finally, compare your reaction to the example below.



Does your model match what appears here? Explain your response.

Data and Observations

Draw your final product in the space below, being sure to include the formulas:

Analysis

1. How many different molecules were present in this formula? _____
2. How many different atoms were present in this formula? _____
3. What did the arrow represent? _____
4. What provided the energy for this reaction? _____
5. What did the paper clips represent? _____
6. Make two piles of molecules: one with all of the reactants and one with all of the products. Take out the paper clips so that you have a pile of separate atoms.
    a. How many atoms of oxygen were present…
        i. In the REACTANTS (on the LEFT side of the arrow)? _____
        ii. In the PRODUCTS (on the RIGHT side of the arrow)? _____
    b. How many atoms of hydrogen were present…
        i. In the REACTANTS ? _____
        ii. In the PRODUCTS? _____
    c. How many atoms of carbon were present…
        i. In the REACTANTS ? _____
        ii. In the PRODUCTS? _____

d. What do you notice about these sets of numbers?

e. Were any atoms present on one side of the equation but not the other? _____ Why or why not?

What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

**(see next page for rubric!)

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

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Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
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Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 5: Enzymes[7]	Back to Unit 2

Introduction

➔ Annotate by circling words that you think are the most important.

What would happen to your cells if they made a poisonous chemical? You might think that they would die. In fact, your cells are always making poisonous chemicals. They do not die because your cells use enzymes to break down these poisonous chemicals into harmless substances. Enzymes are proteins that speed up the rate of reactions that would otherwise happen more slowly. The enzyme is not altered by the reaction. You have hundreds of different enzymes in each of your cells.

Each of these enzymes is responsible for one particular reaction that occurs in the cell. In this lab, you will study an enzyme that is found in the cells of many living tissues. The name of the enzyme is catalase (KAT-uh-LAYSS); it speeds up a reaction which breaks down hydrogen peroxide, a toxic chemical, into 2 harmless substances--water and oxygen. Light can also break down H_2O_2 which is why the chemical is sold in dark containers.

The reaction is: $2H_2O_2$ ----> $2H_2O + O_2$

This reaction is important to cells because hydrogen peroxide is produced as a byproduct of many normal cellular reactions. If the cells did not break down the hydrogen peroxide, they would be poisoned and die. In this lab, you will study the catalase found in liver cells. You will be using chicken or beef liver. It might seem strange to use dead cells to study the function of enzymes. This is possible because when a cell dies, the enzymes remain intact and active for several weeks, as long as the tissue is kept refrigerated.

Experimental Question

➔ Will changing the conditions of catalase (temperature and pH) affect the activity of the enzyme?

Hypothesis

A good hypothesis has this format and punctuation:
If _____, then _____ because _____.

➔ Procedure 1: *If tissues contain catalase, then they will react with hydrogen peroxide to produce bubbles, because the enzyme catalase breaks down hydrogen peroxide to produce water and oxygen.*

➔ Procedure 2: *If catalase (present in liver) is boiled, then* _____

_____

because _____.

➔ Procedure 3: *If* _____*, then the activity of catalase will decrease*

because _____.

[7] Adapted from: http://www.biologycorner.com/worksheets/enzyme_lab.html

Independent Variable (Procedure 1)	**Dependent Variable (Procedure 1)**
➔ Presence of catalase	➔ bubbles
Control Group (Procedure 1)	**Controlled Variable(s) (Procedure 1)**
➔	➔ temperature ➔ Amount of H_2O_2 ➔

Independent Variable (Procedure 2)	**Dependent Variable (Procedure 2)**
➔ temperature	➔
Control Group (Procedure 2)	**Controlled Variable(s) (Procedure 2)**
➔	➔ ➔ ➔

Independent Variable (Procedure 3)	**Dependent Variable (Procedure 3)**
➔	➔
Control Group (Procedure 3)	**Controlled Variable(s) (Procedure 3)**
➔	➔ ➔ ➔

Materials		
1 molar HCl solution 1 molar NaOH solution 6 Test tubes Measuring Pipette	10-ml Graduated cylinder 40 ml 3% Hydrogen peroxide (H_2O_2) solution (found in stores) Straight-edged razor blade Scissors and Forceps (tweezers) pH paper (optional)	Stirring rod Fresh liver, Apple, and Potato Test tube holders Ice bath Warm water bath Boiling water bath

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

Part 1: What Tissues Contain Catalase	
You will now test for the presence of catalase in tissues	

other than liver. Place 2 ml of hydrogen peroxide in each of 3 clean test tubes and then add each of the three test substances to the tubes. As you add each test substance, record the reaction rate (0-5) for each tube.

Substance	Rate of Reaction (0-5)
Potato	
Apple	
Chicken	

Based on your observations, which tissue(s) contained catalase? _____

Do some contain more catalase than others? How can you tell?
_____

Part 2: What is the Effect of Temperature on Catalase Activity?

Put a piece of liver into the bottom of a clean test tube and cover it with a small amount of water. Place this test tube in a boiling water bath for 5 minutes.

Remove the test tube from the hot water bath, allow it to air cool, then pour out the water. Add 2 ml of H_2O_2.

CAUTION: Use a test-tube holder for hot test tubes.

Put equal quantities of liver into 2 clean test tubes and 1 ml H_2O_2 into 2 other test tubes. Put one test tube of liver and one of H_2O_2 into an ice bath. Place the other set in a warm water bath (not boiling).

After 3 minutes, pour each tube of H_2O_2 into the corresponding tube of liver and observe the reaction.

Substance	Reaction Rate (0-5)
Boiled Liver	
Cold Liver	
Warm Liver	

Part 3: What is the Effect of pH on Catalase Activity?

1. Add 2 mL hydrogen peroxide to each of 5 clean test tubes.
2. Now add liver to each of the test tubes (try to do it all at abou the same time, so you can easily compare.)

Substance	pH of Solution (Acid/Base/Neutral)	Reaction Rate (0-5)
Liver with acetic acid		
Liver with sodium bicarbonate		
Liver with water		

Analysis

1. Describe the relationship between catalase and hydrogen peroxide. Indicate which is the enzyme, which is the substrate and what occurs during the reaction. It may be helpful to write the equation. (2)

2. Is catalase reusable? Use your data to support your answer. (1)

3. How does temperature and pH affect the reaction rate of catalase? Propose a way to refine your experiment to find the exact, or OPTIMAL pH and temperature of catalase. (3)

4. In 2-3 sentences, summarize the data and information displayed in this graph.

☼ What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions?
_____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

**(see next page for rubric!)

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

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Lab 6: Macronutrient transport (Diffusion through a membrane)[8]	Back to Unit 2

Introduction

➔ Annotate "Part 1: Diffusion Through a Membrane" by circling words that you think are the most important.

Experimental Question(s)

➔ 1. What characteristic determines the ability of certain molecules to pass through a membrane?
➔ 2. Will starch, glucose, and starch indicator (iodine) be able to pass through a membrane?

Hypothesis

A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ Using the format above, create a hypothesis in response to experimental question #2.

➔ *If* _____,

then _____,

because _____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

Materials *see State Lab guide

Procedure *see State Lab guide

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

[8] From: This lab is not adapted in anyway: It is the New York State Department of Education (NYSDOE) State Mandated Lab. All rights belong to NYS; the document is included as it is part of the NYSDOE mandate and is tested in Part D of the exam.

Analysis

What analysis question did you think was the most difficult; annotate it by circling the question number.

What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions?

____

Explain:

_____

_____

_____

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

As you go through the lab, use this tool

Evidence *What are the relevant science observations or data that address the research question?*	**Claim** *What claim can be made based on the evidence? Does the evidence support your hypothesis?*	**Science Concepts** *What scientific concepts are connected to the evidence and help explain the claim?*	**Science Vocabulary** *What scientific terms must be included in this explanation?*

Scientific Reasoning *How do the evidence and scientific concepts link to support the claim? Why does this evidence support the claim? How are the scientific concepts and vocabulary connected to the claim?* Because of (evidence) and (science concepts), then (claim)	**Scientific Reasoning Brainstorm** _____, because _____ _____, so _____ _____, therefore _____

Construct a Scientific Explanation

Using the steps below and the information in the boxes you have completed, write a scientific explanation.

Scientific Explanation = Claim + Evidence + Scientific Reasoning

1. State your claim
2. Explain the evidence (from the Explore) that supports your claim
3. Explain the science concepts that support the evidence
4. Explain the scientific reasoning that links the evidence and science concepts to the claim

Scientific Explanation

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

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Lab 7: Cellular respiration and experimental design[9]	Back to Unit 2

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

➔ Have you ever wondered why bread dough will "rise?" Bread dough contains yeast, a single-celled organism, that gets its energy from sugar- just like the cells in your body do.

➔ All living things need to energy to survive. **Cellular Respiration** is a reaction that takes place in our cells in order to produce that energy. And while ONLY plants are able to undergo photosynthesis, both plants AND animals undergo cellular respiration. **Mitochondria**, the organelle associated with energy production in cells, is where respiration takes place. Inside the mitochondria, a complex reaction takes place over and over in order to produce molecules of **ATP**, which living things use for energy to support all necessary functions. In order to undergo cellular respiration, two different molecules are needed:

- **Glucose.** Plants make their own glucose, and humans and other animals obtain glucose by consuming foods.
- Oxygen. Plants make their own oxygen, and humans breathe in the oxygen produced by those plants.

The final reaction for cellular respiration looks like this:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

➔ How can we measure the rate of cellular respiration in yeast? We could measure the amount of glucose or oxygen being used up in the reaction, but that is very difficult to do! Instead, we will measure the amount of carbon dioxide that is being produced. Since carbon dioxide is a product of the reaction, we know that the presence of carbon dioxide indicates that cellular respiration is taking place. We can measure the amount of carbon dioxide in two ways:

- Size of balloon: carbon dioxide is a gas, and by placing a balloon over the reaction, we can capture the amount of the gas that is produced by measuring the increase in the volume of the balloon.
- Height of foam: when yeast undergoes respiration, bubbles are produced. These bubbles are full of carbon dioxide. By measuring the height (volume) of foam, we can estimate how much cellular respiration is taking place.

Experimental Question

➔ How does sugar affect the rate of cellular respiration in yeast?

[9] Adapted from: http://newyorkscienceteacher.com/sci/files/download.php?id=607&file=Yeast_Respiration.pdf

Hypothesis
A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If I add sugar to a yeast solution,*

then _____,

because _____.

Independent Variable	**Dependent Variable(s)* *in this lab, we are using two different measurements to show evidence of cellular respiration**
➔	➔ 1. Size of balloon ➔ 2.
Control Group	**Controlled Variable(s)**
➔ Beaker <u>without</u> sugar added	➔ ➔

Materials

Each group will need:
- ➔ 2 glass beakers
- ➔ 2 packets yeast
- ➔ 2 balloons
- ➔ 200mL warm water
- ➔ Sugar
- ➔ Measuring tape

Procedure
- ➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

Select a balloon and inflate/deflate it three times.
1. Add 1 packet of yeast to beaker #1.
2. Add 100 mL warm water to the bottle. [Water should feel warm to touch, but not too hot.]
3. Swirl gently for 5 seconds to mix the yeast and water.
4. Add the appropriate number of packets of sugar, and swirl again to mix. (See below for the amount of sugar to be added- it's based on your group.)
5. Begin timing NOW. Do not disturb this beaker after this point.
6. Repeat steps 2-4 with beaker #2.
7. ADD sugar to beaker #2 and swirl again to mix. **The amount of sugar that my group will add is _____.**

8. Immediately after swirling, place the second balloon over the mouth of the beaker.
9. Begin timing for second beaker NOW. Do not disturb this beaker after this point.
10. Measure the size of each balloon after 15 minutes and after 30 minutes. Record your data in Table 1 below.
11. Measure the height of the foam for each beaker after 15 minutes and after 30 minutes. Record your data in Table 2 below.
12. Create a graph showing data for both circumference and height of foam.

Data Tables

Table 1. Balloon Circumference

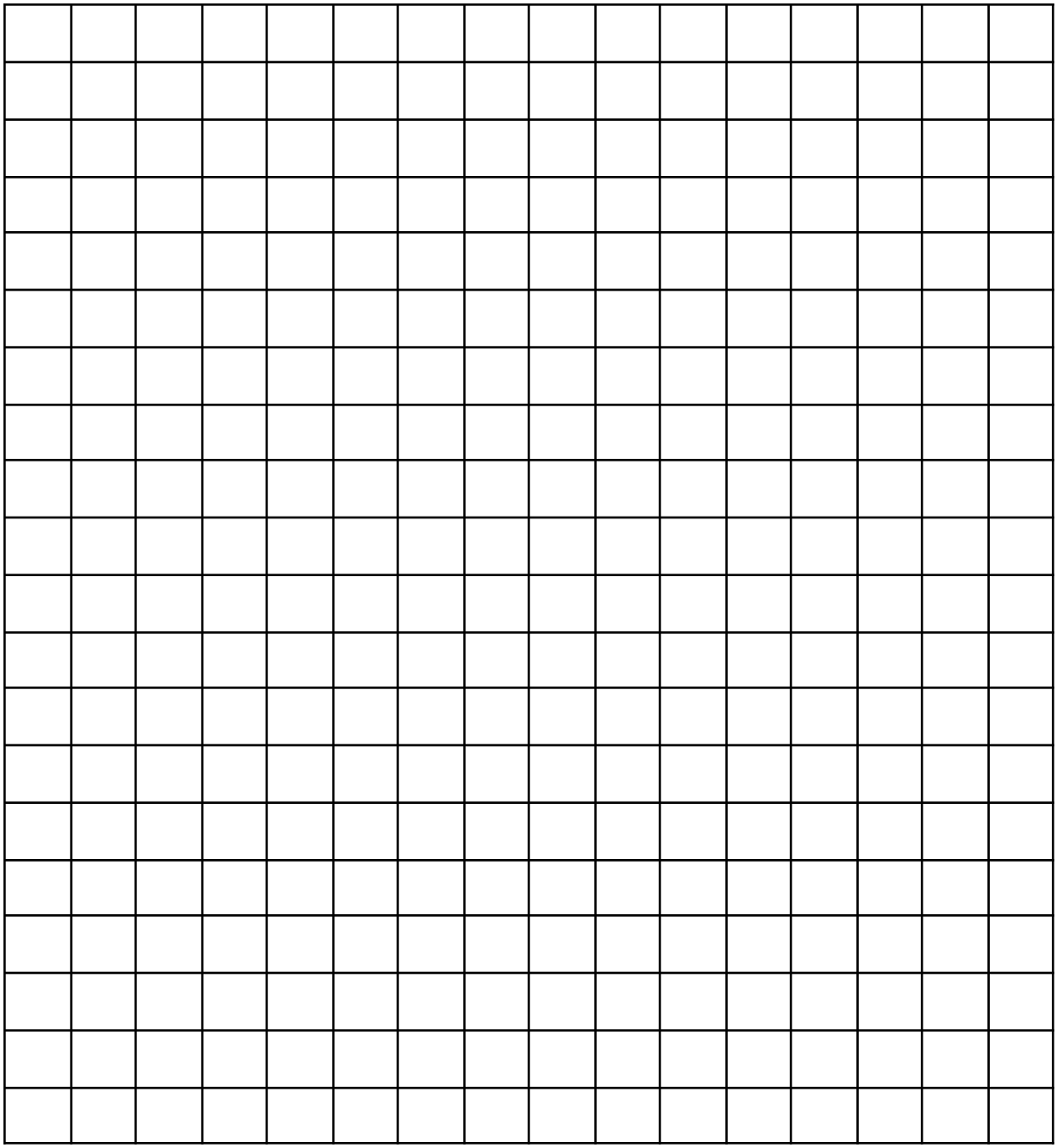
	Circumference of balloon after 15 minutes	Circumference of balloon after 30 minutes
Warm water and yeast		
Warm water, yeast and sugar		

Table 2. Height of foam

	Height of foam after 15 minutes	Height of foam after 30 minutes
Warm water and yeast		
Warm water, yeast and sugar		

Graph

Effect of Sugar on Respiration in Yeast



Analysis

➔ 1. Which amount of sugar was associated with the greatest balloon circumference? _____

_____

2. Was the same amount of sugar also associated with the most foam? Explain: _____

_____

2. What is the equation for cellular respiration?

_____+_____→ _____+_____+_____

3. Why did the balloon expand more in the presence of sugar than without it?

_____

_____

4. What waste product of cellular respiration caused the balloon to expand? _____

Why is this product also useful in baking bread? _____

_____

_____

⚙ What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

**(continued on next page)

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

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**(see next page for rubrics!)

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What other resources could I have used to make this lab easier to understand? (circle all that apply)
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Design Your Own Cellular Respiration Lab

Experimental Question
➔

Hypothesis *A good hypothesis has this format and punctuation: If _____, then _____ because _____.*
➔ *If* _____, *then* _____, *because* _____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

Materials
➔

Procedure ➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.
1. 2.

3.

4.

5.

6.

7.

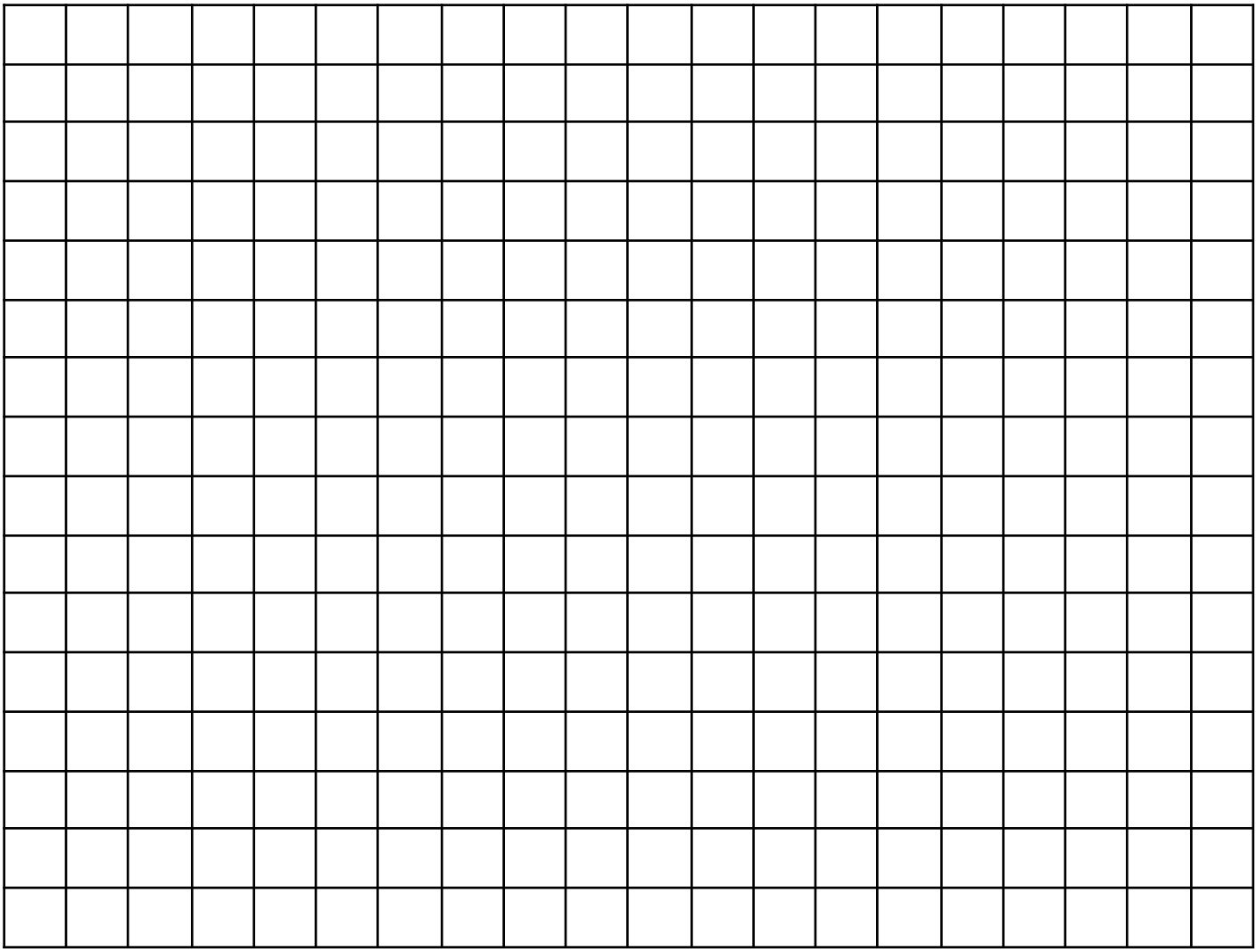
8.

9.

10.

Data Table

Graph



Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

As you go through the lab, use this tool

Evidence *What are the relevant science observations or data that address the research question?*	**Claim** *What claim can be made based on the evidence? Does the evidence support your hypothesis?*	**Science Concepts** *What scientific concepts are connected to the evidence and help explain the claim?*	**Science Vocabulary** *What scientific terms must be included in this explanation?*

Scientific Reasoning *How do the evidence and scientific concepts link to support the claim? Why does this evidence support the claim? How are the scientific concepts and vocabulary connected to the claim?* Because of (evidence) and (science concepts), then (claim)	**Scientific Reasoning Brainstorm** _____, because _____ _____, so _____ _____, therefore _____

Construct a Scientific Explanation

Using the steps below and the information in the boxes you have completed, write a scientific explanation.

Scientific Explanation = Claim + Evidence + Scientific Reasoning

1. State your claim
2. Explain the evidence (from the Explore) that supports your claim
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4. Explain the scientific reasoning that links the evidence and science concepts to the claim

Scientific Explanation

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
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What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

**(see rubric on next page!)

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 8: Human thermoregulation[10]	Back to Unit 3

Introduction

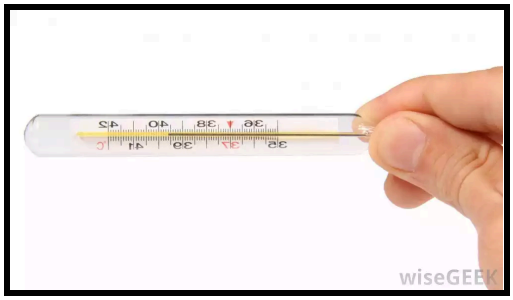
➔ Annotate the purpose of the lab by circling words that you think are the most important.

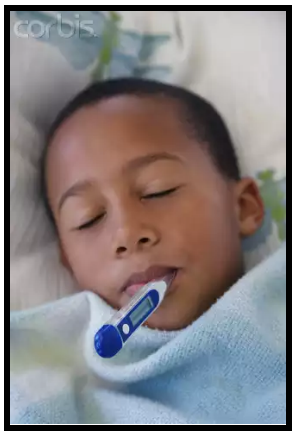
➔ Normal human internal body temperature ranges between about 97.6 - 99.6℉ (36.1°C to 37.8°C). In this activity, you will explore the relationship between your **internal body temperature** and the **skin surface temperature** of your hand under different conditions. This exploration will help you understand how the body moderates specific external changes with specific internal responses.

1. Do you think that dipping your hand in cold water will cause the **skin surface temperature** of your hand to increase or decrease? Why?

2. Do you think that dipping your hand in cold water will cause your **internal body temperature** to increase or decrease? Why?

3. In the pictures to the right, which one illustrates (shows) someone taking their **skin surface temperature**? Which one illustrates someone taking their **internal body temperature** temperature?





Experimental Question

➔ Does the human body regulate **internal temperature** in response to changes in **external temperature**?

10

Hypothesis
A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If*

_____,

then

_____,

because

_____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

Materials

➔ Needed per group:

Oral thermometer
Beaker of hot water
Stopwatch / timer / clock
Thermometer probe (2)
Beaker of cold water

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

Lab Roles: Record the name of the group member who will fulfill each role below.

- Directions Reader: _____ - Reads all the directions to group!
- Test Subject _____ - Test your internal temperature and skin temp!
- Data collector: _____ - Reads the thermometer for each measurement!
- Data Recorder: _____- Record all data in data table! Group must copy it!

Sketch the two types of thermometers we will be using in the lab today in the space below!

Sketch of **Oral Thermometer**	Sketch of **Thermometer Probe**:

Procedure #1: How does dipping my hand in ice water affect my internal temperature and my skin external temperature?

1. Data collector should read the initial ambient temperature (temp of room) using the thermometer probe. Data recorder should record it here: _____
2. Data collector should measure the initial temperature of the **surface of the skin** of the test subject by gently grasping the thermometer probe between their thumb and fingers
3. Record initial skin surface temperature in the group data table below.
4. Measure initial internal body (core) temperature using the **oral thermometer**
5. Record initial internal temperature in the group data table
6. Fill a cup with water and put a few ice cubes inside. Measure and record the temperature of the icy water here using the thermometer probe: _____.
7. Test subject should dip their hand into icy water for 30 seconds.
8. Measure and record the **surface skin temperature** by gently grasping the thermometer probe between your thumb and fingers
9. Record observations about the test subject's response to the icy water (i.e. skin color change, shivering, etc)
10. Measure and record internal (core) body temperature using the oral thermometer

Procedure #2: How does dipping my hand in warm water affect my internal temperature and my skin external temperature?

1. Wait for 2 minutes
2. Measure and record **surface skin temperature** by gently grasping the thermometer probe between your thumb and fingers
3. Measure and record the **temperature of the warm water here: _____**.
4. Immerse the hands of the test subject into warm water for 30 seconds
5. Measure and record surface skin temperature by gently grasping the thermometer probe between your thumb and fingers
6. Record observations about the test subject's response to the hot water (i.e. skin color change, shivering, etc)
7. Measure and record internal (core) body temperature using the oral thermometer
8. Record final ambient temperature (temperature in the room): _____.

**ONCE all of your data has been collected, your data recorder should add your group data to the class data table. Use this data set to create a graph showing temperature *changes* for icy and warm water. Include one line for skin surface temperature and one for core body temperature.

Data Table 1			
	Skin Surface Temperature (℉)	Internal (core) Body Temperature (℉)	Observations
Initial Temp			
After exposure to icy water			
Temperature change (Initial - after icy water)			

Data Table 2			
Initial$_2$			
After exposure to warm water			
Temperature change (Initial - after warm water)			

Graph

Analysis

➔ 1. What trends or patterns do you observe in your data?

2. What do you predict is going on inside the body to create this trend?

⚙ What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions?

_____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 9: Respiration and Circulation (Making Connections)[11]	Back to Unit 3

Introduction

➔ Annotate the “Discovering Connections” portion of the lab by circling words that you think are the most important.

Experimental Question A1
➔

Hypothesis A1 *A good hypothesis has this format and punctuation:* *If* _____, *then* _____ *because* _____.
➔

Independent Variable A1	**Dependent Variable A1**
➔	➔
Control Group A1	**Controlled Variable(s) A1**
➔	➔ ➔

Experimental Question A2
➔

Hypothesis A2 *A good hypothesis has this format and punctuation:* *If* _____, *then* _____ *because* _____.
➔

[11] From: This lab is not adapted in anyway: It is the New York State Department of Education (NYSDOE) State Mandated Lab. All rights belong to NYS; the document is included as it is part of the NYSDOE mandate and is tested in Part D of the exam.

Independent Variable A2	Dependent Variable A2
➔	➔
Control Group A2	**Controlled Variable(s) A2**
➔	➔ ➔

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

Analysis

☼ What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Conclusion: Was your hypothesis for A1 supported? A2? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔ My hypothesis for A1 ***was / was not*** supported...

➔ My hypothesis for A2 ***was / was not*** supported...

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

As you go through the lab, use this tool

Evidence *What are the relevant science observations or data that address the research question?*	**Claim** *What claim can be made based on the evidence? Does the evidence support your hypothesis?*	**Science Concepts** *What scientific concepts are connected to the evidence and help explain the claim?*	**Science Vocabulary** *What scientific terms must be included in this explanation?*

Scientific Reasoning *How do the evidence and scientific concepts link to support the claim? Why does this evidence support the claim? How are the scientific concepts and vocabulary connected to the claim?* Because of (evidence) and (science concepts), then (claim)	**Scientific Reasoning Brainstorm** _____, because _____ _____, so _____ _____, therefore _____

Construct a Scientific Explanation

Using the steps below and the information in the boxes you have completed, write a scientific explanation.

Scientific Explanation = Claim + Evidence + Scientific Reasoning

1. State your claim
2. Explain the evidence (from the Explore) that supports your claim
3. Explain the science concepts that support the evidence
4. Explain the scientific reasoning that links the evidence and science concepts to the claim

Scientific Explanation

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
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Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 10: Macronutrient transport (Diffusion through a membrane)[12]	Back to Unit 3

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

Experimental Question

➔ What will happen if an onion cell is placed in a solution with a *higher* solute concentration?
➔ What will happen if an onion cell is placed in a solution with a *lower* solute concentration?

Hypothesis

A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If*

_____

_, then

_____,

because

_____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

Materials *see State Lab

Procedure *see State Lab

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

[12] Adapted from: This lab is not adapted in anyway (except that Parts 1 and 2 are split, in order to introduce relevant topics during relevant units of study): It is the New York State Department of Education (NYSDOE) State Mandated Lab. All rights belong to NYS; the document is included as it is part of the NYSDOE mandate and is tested in Part D of the exam.

Analysis *see State Lab

What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

As you go through the lab, use this tool

Evidence *What are the relevant science observations or data that address the research question?*	**Claim** *What claim can be made based on the evidence? Does the evidence support your hypothesis?*	**Science Concepts** *What scientific concepts are connected to the evidence and help explain the claim?*	**Science Vocabulary** *What scientific terms must be included in this explanation?*

Scientific Reasoning *How do the evidence and scientific concepts link to support the claim? Why does this evidence support the claim? How are the scientific concepts and vocabulary connected to the claim?* Because of (evidence) and (science concepts), then (claim)	**Scientific Reasoning Brainstorm** _____, because _____ _____, so _____ _____, therefore _____

Construct a Scientific Explanation

Using the steps below and the information in the boxes you have completed, write a scientific explanation.

Scientific Explanation = Claim + Evidence + Scientific Reasoning

1. State your claim
2. Explain the evidence (from the Explore) that supports your claim
3. Explain the science concepts that support the evidence
4. Explain the scientific reasoning that links the evidence and science concepts to the claim

Scientific Explanation

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 10: Antibiotic resistance simulation[13]	Back to Unit 4

Pre-Lab

1. Why would a drug used to treat a bacterial infection 10 years ago not have the same effect today?

2. Explain the effects of antibiotic resistance in society.

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

➔ If you have taken antibiotics lately, you probably have seen the label on the bottle that you must follow the directions completely and take the medicine until it is gone. Why?

Millions of harmless bacteria naturally live on and inside of your body. When harmful bacteria appear on the scene, your body's immune system can usually keep a small population of them under control. If, however, these bacteria reproduce too quickly, you suffer consequences—and this is called an infection. Antibiotics help your body fight off an infection by killing off these harmful bacteria. Unfortunately, a small number of bacteria in any population may not be affected by the antibiotic add quickly. These bacteria, which are considered more resistant to the treatment, continue to reproduce and grow. Completing the full course of the antibiotic as prescribed helps make sure that these bacteria do not survive and therefore won't make you ill or infect anyone else.

Investigating A Bacterial Infection

Today you are going to simulate what happens when someone has a bacterial infection. The doctor prescribes an antibiotic to be taken every day for at least eight days. The colored disks in this simulation will represent the harmful bacteria that are in the body.

Level of Resistance	**Represented by**
Least resistant bacteria	blue disks
Resistant bacteria	green disks
Extremely resistant bacteria	red disks

Each time you roll the dice, the number you roll will determine what action should be taken.

Experimental Question

➔ What happens if you don't take your entire prescription of antibiotic?

[13] Adapted from: http://www.flinnsci.com/media/1167812/bf11236.pdf

Hypothesis
A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If* _____,

then _____,

because _____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

Materials

- ➔ Lab for each student
- ➔ 50 disks (20 blue, 15 green, 15 red) (per group)
- ➔ 1 die (per group)

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

➔ 1. In this activity, you and your partner will work together to simulate what happens during the clash between antibiotics and bacteria during an infection. Begin with 20 disks: 13 blue, 6 green, and 1 red. These disks represent the harmful bacteria living in your body before you begin to take the antibiotic. Set extra disks to the side for now.

2. Time to take the antibiotic… Toss the dice and follow the directions below:

Number Tossed	Event	Result
2, 3, 4 or 5	Antibiotic was taken at appropriate time--bacteria killed.	Remove 5 squares in the following order: remove blue squares first, followed by green, then red as needed.
1 or 6	Antibiotic was not taken at appropriate time.	Do not remove any squares.

3. **Record** in Table 1 the number on the dice and how many of each type of bacteria are left in the body.

4. Bacteria are constantly reproducing in the host; in this case, the host is the patient's body. If one or more bacteria of any type (color) are still present in the patient's body after the dose of antibiotics, **add 1 disk of that color** to the population.
EXAMPLE: A patient takes antibiotics and there are 0 blue, 5 green and 3 red bacteria left: add 1 green and 1 red disk to the population.

5. **Repeat** steps 2-4 until the bacteria at least 8 times (or until all bacteria have been eliminated) and record in the the data table.

6. Using the data from the table, **construct a graph** displaying the number of each type of bacteria vs. the number of doses. Use different color pencils (or symbols) to plot the following data:

- Total number of bacteria
- Least resistant bacteria
- Medium resistant bacteria
- Extremely resistant bacteria.

7. **Connect** each set of data points by drawing a colored line.

8. **Create a title and legend** to explain your graph.

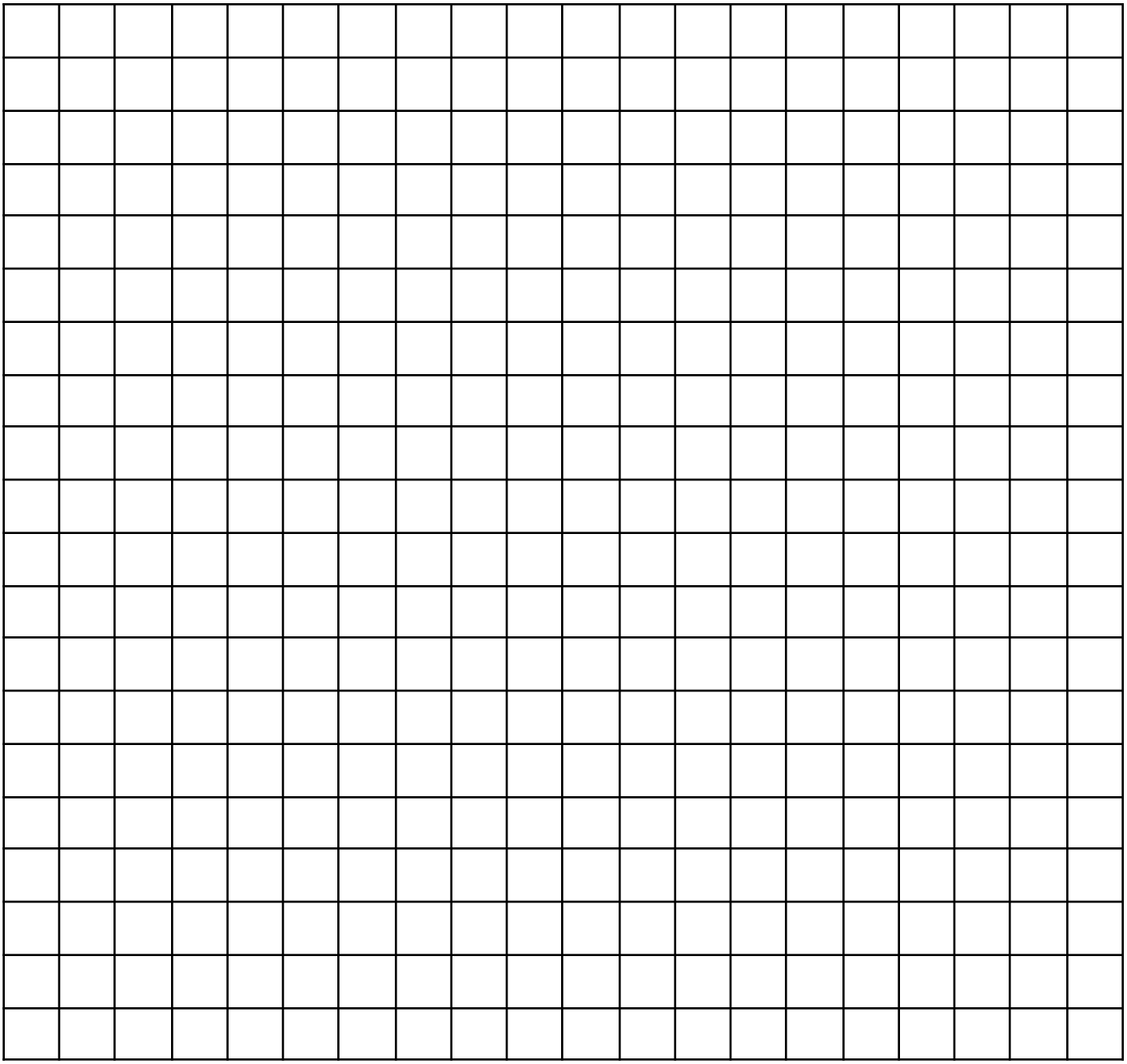
Data Table

Table 1.

Days of Antibiotic	Number on dice	Least Resistant Bacteria (blue)	Resistant Bacteria (green)	Extremely Resistant Bacteria (red)	Total Population
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Graph

Title: _____



Analysis

➔ 1. Did the antibiotic help you to completely kill all of the harmful bacteria living in your body? Explain.

2. Suppose most infected people stopped taking the antibiotic when they began to feel better. (For example, consider the point in the simulation when there are only three harmful (red) bacteria left.) What do you predict might happen to an antibiotic's ability to kill the harmful bacteria if the infection returns?

3. Use your data and graph to describe how the population of <u>each</u> type of bacteria changed over the course of the antibiotic treatment?. (Your answer should describe **all three** of the types of bacteria.)

4. Why is it important to complete the full course of an antibiotic as prescribed?

What analysis question did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
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Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 11: Urinalysis[14]	Back to Unit 4

Introduction

➔ Annotate the purpose of the lab by circling words that you think are the most important.

➔ Cellular reactions are happening in our body at all times- even while we are sleeping! When reactions occur in our cells, chemical wastes are formed. Many of the wastes are toxic. These wastes are sent out of our cells and into our blood vessels, which carry them to the kidneys for processing and removal from the body. These waste products, mixed with excess water and other materials, are called urine.

➔ Urinalysis (analysis of our urine, or "urine-analysis") can reveal diseases that have gone unnoticed because they do not produce striking signs or symptoms. Examples include diabetes, various forms of kidney disease and **chronic** (constant or repetitive) urinary tract infections.

➔ Today you will be working with two urine samples, one from a healthy adult (known sample) and one from an adult with a mystery illness (unknown sample.) It is your job to diagnose the illness of the unknown sample by performing a number of tests on it. Once you have determined the illness, you will need to create a report documenting the person's health (unknown sample.)

Experimental Question

➔ What diseases, if any, are present in a urine sample?

Hypothesis

A good hypothesis has this format and punctuation: If _____, then _____ because _____.

➔ *If*

_____,

then

_____,

because

_____.

Independent Variable	**Dependent Variable**
➔	➔
Control Group	**Controlled Variable(s)**
➔	➔ ➔

[14] Adapted from: J de la Cruz, UA Gateway School for Technology

Materials

Needed for each group:

Healthy adult sample	unknown sample	pH paper
silver nitrate	4 test tubes	test tube rack
glucose indicator	hot water	test tube holder

Procedure

➔ What part of the procedure do you think is going to be the most difficult; annotate with an arrow that points to the step. What part of the procedure do you think is going to take the most time; annotate by circling the step's number.

1. Obtain two test tubes: one known (healthy) sample and unknown sample.

2. Observe the samples for clarity (is it clear or cloudy?) Record your results in Table 1 (below.)

3. Observe the samples for color. Record your results in Table 1.

4. Observe the samples for odor (smell.) **DO NOT PUT YOUR NOSE OVER THE TEST TUBE AND INHALE**: place the tube instead a couple of inches away from your nose and fan it with your hands. Record your results in Table 1.

5. Test each sample for pH: use a strip of pH paper and get it a little wet with the unknown sample by tilting the test tube a little bit. Match the color that appears on the paper to the pH color scale. Repeat with the healthy sample. Record pH in Table 1.

6. Test each sample for glucose: place seven drops of glucose indicator in each test tube, and place the test tube in hot water bath for one minute. Record the presence or absence of glucose in Table 1 (remember how an indicator works!).

7. Finally, test for chlorides (an important electrolyte in the body that works to maintain fluid balance in your cells.) Obtain a second set of test tubes with the known and unknown samples. Add two drops of silver nitrate (a chloride indicator) to each test tube. If there are chlorides present (positive test), a white precipitate will form. Record the presence or absence of chlorides in Table 1

8. Use the data you collected from the procedures above (for the unknown sample ONLY) to complete Table 2. Complete the analysis questions to create a report based on the proposed health status of your unknown individual.

Data Tables

Table 1 and observation

Test	Known Sample (circle the answer)	Unknown Sample (circle the answer)
Clarity	Pale/clear or cloudy color	Pale/clear or cloudy color
Color	Dark yellow/concentrated, reddish brown, blue, or neon yellow	Dark yellow/concentrated, reddish brown, blue, or neon yellow
Odor	stinking, sweet, ammonia or musty odor	stinking, sweet, ammonia or musty odor
pH	Write the pH number :_____	Write the pH number :_____
Glucose	Positive or negative	Positive or negative
chlorides	Positive or negative	Positive or negative

Table 2: Urinalysis diagnostic chart – check appropriate characteristics for the unknown sample:

Results	Check if applied	Condition
Pale, clear color		Healthy
Dark yellow, concentrated color		Healthy, possibly dehydrated
Reddish brown cloudy color		Contains blood
Blue urine		Taking medication containing Methylene-Blue
Neon yellow		Excess B vitamins
Stinking odor		Yeast infection
Sweet odor		Diabetes
Ammonia odor		Healthy to dehydrated
Musty odor		Liver disease
6 to 7.5 pH		Healthy
Very low pH (acidic 1-5)		Respiratory disease
Very high pH (base 8-14)		Pyloric obstruction
No to little glucose		Healthy
High level of glucose		Diabetes
High level of chlorides		Inflammation of the kidney
Very low level of chlorides		Cushing disease

Analysis

Write your report (a paragraph) interpreting the results of your experiment. In your analysis, be sure to:
- Evaluate whether or not the unknown sample is healthy by comparing it to the known healthy sample
- Identify any conditions that the unknown sample may have due to the results of your urinalysis
- Explain how urinalysis can help determine one's level of health

_____
_____
_____
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_____
_____

What part of the analysis questions did you think was the most difficult; annotate it by circling the question number. What question are you unsure about; annotate it by giving it a star (*); did you annotate the same questions? _____

Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: "Yes, my hypothesis was supported. I know this because…" or "No, my hypothesis was not correct. It was proven to be false because…")

➔

Think - Talk - Open Exchange

Describe ➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	**Explain** ➔ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

➔ Write down new ideas that you heard during your discussion with your lab partner(s).

**(see next page for rubric!)

Student Lab Check-In Rubric: How did YOU do on the lab?

I know how today's experiment connects to our current unit.	Yes!	Almost	No- I need help!
I was able to answer all of the analysis questions.	Yes!	Almost	No- I need help!
I used my time well today.	Yes!	Mostly	No
I plan to come in for extra help/to complete parts of the lab/to ask questions.	Yes!		No

What other resources could I have used to make this lab easier to understand? (circle all that apply)
More time *More resources* *More information* *More help from my partners*
More help from my teacher *Other:*

Student Lab Check-In Rubric: How did your PARTNER(S) do on the lab?

Think back to how your partners participated in the lab. For EACH of the four categories, place your partner(s') names in the appropriate box.

	Excellent!	Pretty Good	Unsatisfactory
Contributions	Provided useful ideas when participating in lab discussion.	Did the minimum of what was required of the lab.	Refused to/did not participate.
Working with Others	Listened to, shared with, and supported the efforts of others.	Usually listened to, shared with, and supported the efforts of others.	Rarely listened to others. Disrupted or discouraged others' attempts to participate.
Time-Management	Used time well to ensure things get done on time .	Mostly used time well, completed lab on time.	Procrastinated, did not use school time or schedule provided to get work completed.
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.