New Visions Living Environment
Lab Collection

Spring Semester
Units 5 - 9

Student Name: _____

Class Period: _____
Lab Day: _____

Spring Semester

Unit	Lab Title	Link	Page	Class Periods[1]	Grade
Unit 5: Human Reproduction as Evidence of Evolution	Brine shrimp hatching success	Lab 12		3	
	Flower dissection	Lab 13		1	
	Time for mitosis	Lab 14		1	
Unit 6: Genetics and Biotechnology	Relationships and biodiversity	Lab 15		5	
	Gel electrophoresis	Lab 16		5	
	DNA structure	Lab 17		1	
Unit 7: Ecology and Invasive Species	Water testing field work	Lab 18		4	
	Bottle biology	Lab 19		3	
	Deer: Predation or Starvation	Lab 20		1	
	AMNH's river ecology graphing tool	Lab 21		1	
Unit 8: Climate Change and Human Impact	Beaks of Finches	Lab 22		4	
	Greenhouse effect in a bottle	Lab 23		3	
	Acid precipitation simulation	Lab 24		1	
	Human population growth	Lab 25		1	
Unit 9: Pests in the City	Toxin testing in daphnia	Lab 26		2	
Planned Lab Minutes / Earned Lab Minutes				1800 /	

Minutes earned: Fall	
Minutes earned: Spring	
Minutes earned: Academic Year	
Eligible for Regents Exam (teacher write "yes" / "no" and signature)	

= Student Self-Regulation Opportunity

[1] Based on a 50 minute period

Lab 12: Brine shrimp hatching success[2]	Back to Unit 5

Introduction

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

Brine Shrimp, also commercially known as Sea-Monkeys, are popular aquarium pets and nutritious fish food. They are native to salty aquatic regions such as the Great Salt Lake of Utah and the Mona Lake in California, but are not found in the ocean. Different types of brine shrimps demand unique environmental conditions for survival. Some are the happiest in water of high **salinity** (high salt concentrations,) whereas others are only viable at water at low salinity levels. Seasonal changes and extreme weathers can drastically vary the salinity, temperature and other environmental factors of a lake. In those cases, in order not to be wiped out from their habitat, brine shrimp eggs remain in a **dormant** (sleeping) state until they have reached **optimal** (favorable) conditions. This survival strategy is very important in sustaining the ecology balance. Once they are in their preferred environment, they will begin to hatch within hours.

In this lab, you will investigate how salinity affects hatching of the eggs of a particular type of brine shrimp.

Experimental Question

➔ What is the effect of different salinity levels on hatching of brine shrimp eggs?

Hypothesis

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

➔ *If*

_____,

then

_____,

because

_____.

[2] Adapted from: http://www.BrineShrimpDirect.com - Brine Shrimp in the Classroom AND http://ScienceNetLinks.com - Brine Shrimp Lab AND http://sites.google.com/site/LaurenBasicsBiology - Salinity vs Brine Shrimp Lab AND http://hilo.hawaii.edu - Brine Shrimp Hatching Experiment AND http://www.Carolina.com AND http://ut.water.usgs.gov/greatsaltlake/shrimp/ and lab sheet AND http://ut.water.usgs.gov - US Geology Survey of Brine Shrimp and Geology of Great Salt Lake

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

Materials	
➔ Brine Shrimp Eggs ➔ Water (dechlorinated) ➔ Sea Salt ➔ Fine Tip Brush ➔ Petri Dishes ➔ Graduated Cylinder	➔ Microscope Slides ➔ Double-Sided Tape ➔ Hand Lens (Magnifying Glass) ➔ Sharpie Marker ➔ Dropping Pipettes ➔ Dark construction paper

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.

Day 1

1. Obtain 4 clean petri dishes and label on the tops with various salinity levels being tested: 0%, 3%, 6%, 9%.
2. Add 30 mL of each of the salt water solutions according to the labels into each dish .
3. Place a strip of double-sided tape on one side of a microscope slide.
4. Using the fine tip of a brush, transfer a some of the brine shrimp eggs to your dark construction paper.
5. Count the eggs using the magnifying glass. When you have approximately 50 transfer the eggs to the double sided tape and record the number of eggs on the data table in the "Initial # of eggs" column.
6. Place the slides into the filled petri dishes and place the lid on top.
7. Repeat steps 3 through 6 for the other salt water percentages.
8. Position the dishes under light so that each dish receives equal amount of light intensity.

Day 2

9. After 24 hours, put dishes on dark construction paper, and use a dropping pipette to remove all the swimming brine shrimps from the petri dish and place them into a separate beaker.
10. Record data for numbers of swimming, and unhatched.

Day 3

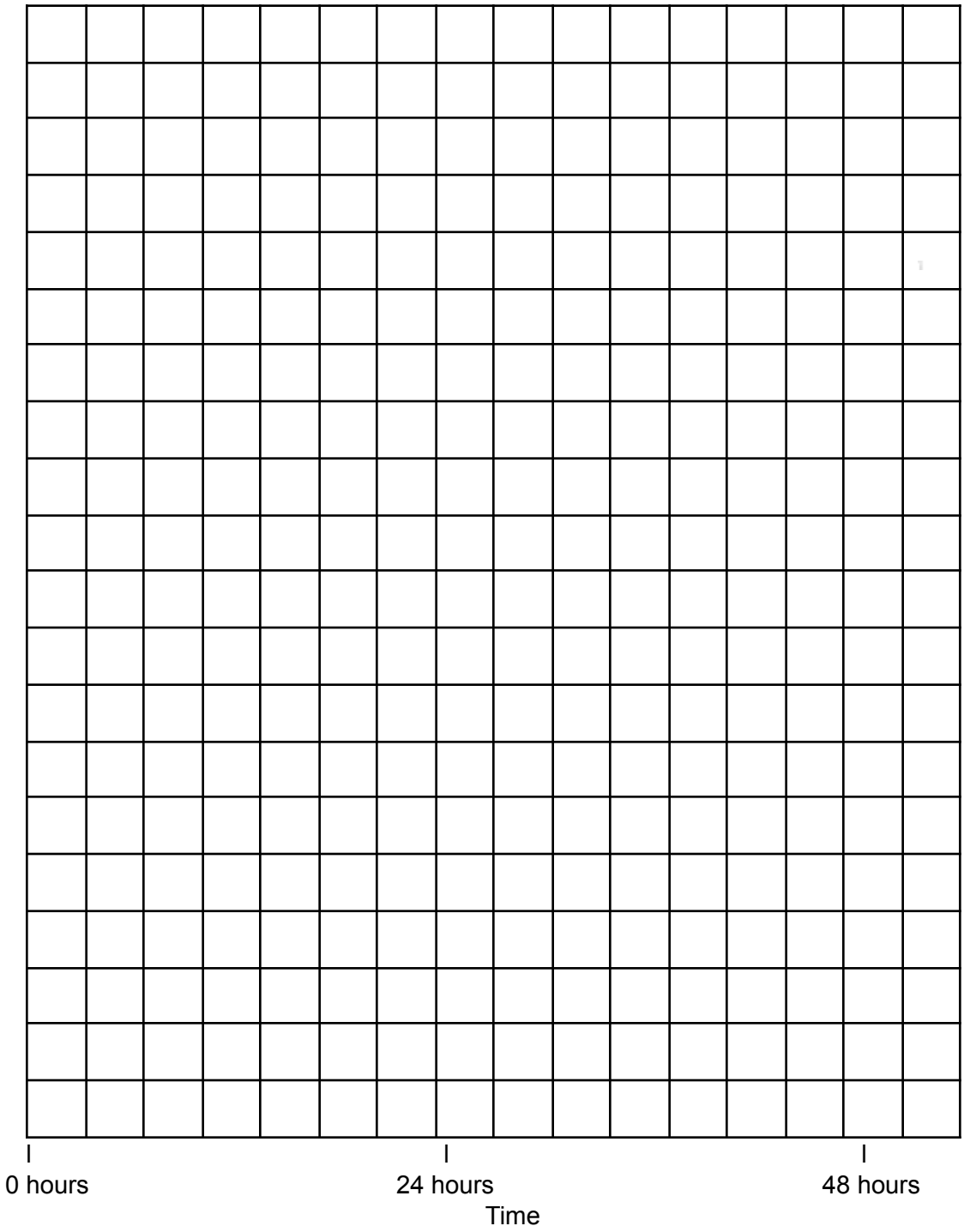
11. Repeat steps 9 and 10 once again after 48 hours.
12. Collect all data, and clear out all of the brine shrimps, empty the petri dishes, and clean-up station.

Data Table							
Salinity	Initial # of eggs	24 hours			48 hours		
		live shrimp	unhatched	% hatched	live shrimp	unhatched	% hatched
0%							
3%							
6%							
9%							

Graph: Create a graph showing the percentages of hatched shrimp at 24 and 48 hours. You should graph 4 lines total: one for each salinity level. Be sure to create a legend that explains each line.

Title:

_____



Analysis

➔ 1. Based on your observations, which salt concentration out of the four tested is most suitable for hatching brine shrimp eggs?

_____

_____

_____

_____

2. Throughout this experiment, why do you think light is required?

_____

_____

_____

3. A female brine shrimp can lay up to 150 eggs each time, whereas some other animals, such as penguins only lay 1 or 2 eggs. Based on the hatching success rate obtained, why do you think brine shrimps lay more eggs than penguins?

_____

_____

_____

_____

4. The four concentrations tested in this lab only provides a rough idea for the optimal concentration for hatching brine shrimp eggs. To determine the optimal salt concentration for hatching, what other concentrations would you test at?

_____

_____

_____

_____

5. In the salinity experiment, you kept all experimental conditions at room temperature. What if you wanted to see if varying the temperature affects the hatching success rate of brine shrimp eggs? Briefly outline an experiment you could conduct to determine this. In your answer, be sure to:

- state two factors that must be kept constant in all the containers
- state what are the different temperatures you will test in the experiment,
- state what data must be collected during this experiment
- describe a result that would indicate the best temperature for hatching brine shrimp eggs.

_____

_____

_____

_____

_____

_____

_____

_____

_____

6. Are there any other factors, besides salinity and temperature, that you think could influence hatching success of brine shrimp eggs?

_____

_____

_____

⚙ 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 13: Flower dissection[3]	Back to Unit 5

Introduction

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

➔ In this lab, you will examine the intricate structures that compose a flower. Many angiosperms have, in a single flower, both the male and the female sex organs surrounded by **petals**. The egg (female haploid cell) and the pollen (containing one or more haploid sperm nuclei) are contained in the same flower.

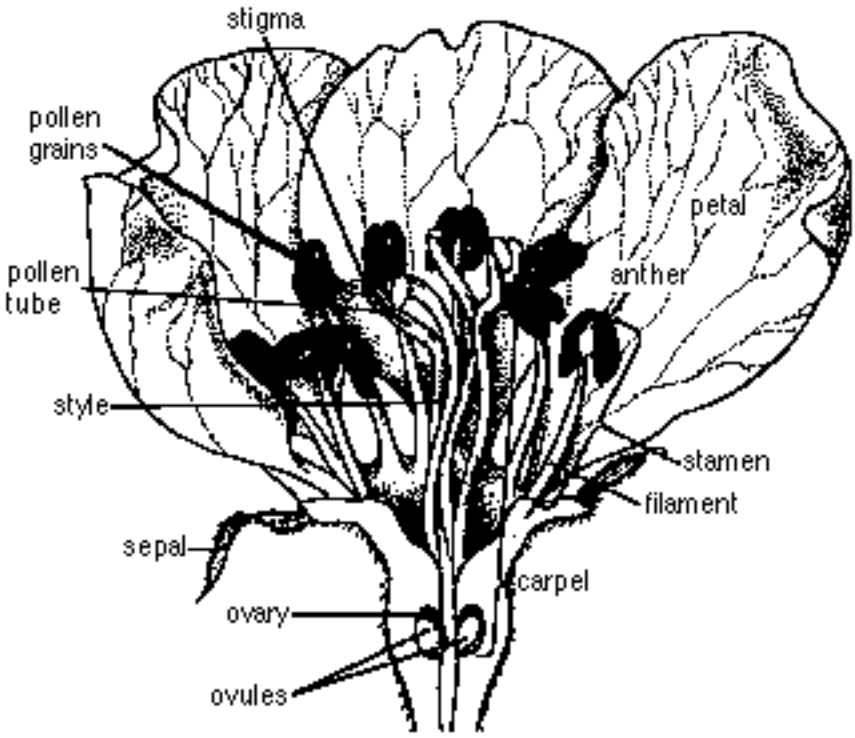


Figure 1: Cross-section of a flower. The various parts of the flower help with the transfer of the pollen to the egg. There are typically four rings of structures in flowers, from outside to inside they are:

- sepals
- petals
- stamens
- carpels

Angiosperms may **self-fertilize** if pollen from a flower is transferred to egg cells in the same flower, or they may **cross-fertilize**. Carried on the wind or by other means, pollen grains from other flowers may land on the sexual organs of a flower and fertilize it.

Can you think of other ways that cross-fertilization of flowers might happen (besides by the wind)?

_____

_____

[3] Adapted from: http://naturalsciences.sdsu.edu/ta/classes/lab2.6/TG.html

Experimental Question

➔ How does pollen reach the female reproductive structures in the flower?

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

➔ Flower
➔ Scalpel

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 a large flower and examine it, using the diagram in Figure 1 as a reference. Look for the **sepals** of your flower. The sepals are typically on the outside of the flower, often green, sometimes small and withered, sometimes as large as the petals. The sepals protect the bud before it opens.
2. The **petals** compose the next "ring" of flower structures. You can think of petals as modified leaves.
3. Examine the texture and color of the petals using a magnifying glass. If your flower is colored, pinch a small piece of a petal between your fingers and examine the colorful pigment released.
   → *Why do you suppose the petals of flowers are so colorful, fragrant, uniquely shaped?*

_____

_____

4. The structures inside of a flower produce the **gametes**, or eggs and **pollen**.

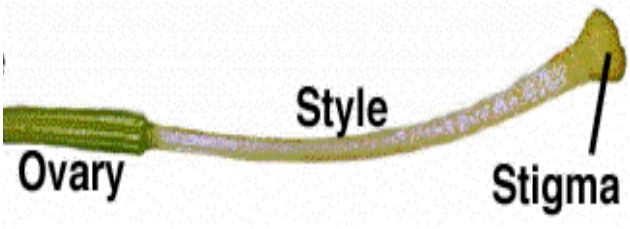
→ *Pollen is the male gamete in flowers. What is the male gamete called in humans?*_____

5. The male reproductive structures of the flower, called **stamens**, may be T-shaped, colored, straight or gently curved. They consist of an anther supported by **filament**. Carefully pull back the petals of the flower to expose the stamens. If necessary, use a scalpel to help expose the internal structures.

→ *How many stamens do you see in your flower?* _____

6. The stamens each have an **anther** at the top of the filament. Pollen grains are released from the anther. Each stamen will produce hundreds of pollen grains. Contained inside of each pollen grain there are two **sperm nuclei**. Examine the anther using a magnifying glass and touch the tip of your finger to the anther.

→ *Did any pollen rub off on your finger?* _____

7. Making up the innermost ring of structures is one or more **carpels**. A carpel (see Figure 2) is the part of the flower surrounding the egg. This structure is usually divided into three parts: the **ovary, style**, 

and **stigma**.

Figure 2: Carpel (the female portion of the flower)

8. To see the carpel clearly, gently separate the flower from the green sepals and base. Note the carpel has three parts: a sticky stigma at the top, a long shaft called a style, and an ovary at the bottom. Cut open the carpel to see the ovary. The ovary contains the haploid eggs.

→ Why do you think the stigma is sticky?

_____

Once a pollen grain has become stuck onto a stigma, it begins to grow a tube through which the sperm nuclei travel down to the ovary. There, the haploid sperm nuclei from the pollen unites with the haploid egg cells to produce diploid **zygotes**.

Analysis

➔ 1. What event does “pollination” specifically refer to? (HINT: What is happening at the cellular level?)

_____

_____

➔ 2. How is the structure of the stigma adapted to help pollination occur?

_____

_____

➔ 3. How is the structure of the anther adapted to help pollination occur?

_____

_____

➔ 4. Describe one way that you think the reproductive structure of the plant is similar to the reproductive structure of humans.

_____

_____

➔ 5. Describe one way that you think the reproductive structure of the plant is different from the reproductive structure of humans.

_____

_____

**BONUS: When fertilized, what will the ovary develop into? _____

☼ 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

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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?

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Lab 14: Time for mitosis[4]	Back to Unit 5

Introduction

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

➔ Do all phases of mitosis require the same amount of time for completion? This question can be answered by counting the number of onion root tip cells in the four phases of mitosis and in interphase. Many cells in one specific phase indicate that a long period of time is required for completion of that phase. Few cells in a specific phase indicate a short period of time is required for completion of that phase.

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

➔ Stages of Mitosis
➔ Onion Root Tip Sample Diagram

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

[4] Adapted from: http://www.mrphome.net/mrp/mitosis_time_for.pdf

circling the step's number.

Part A. Locating and Counting Cells in Mitosis

1. Count and record in Table 16-1 the number of cells in each mitotic phase and in interphase. Count all cells in the field of view.
2. Use Figure 16-1 as a guide to the phases of mitosis.
3. Total the number of cells counted in each phase and interphase. Record this figure in the column marked "Number of Cells in Each Phase" of Table 16-1.
4. Add the number of cells viewed in each phase and interphase together to get the total of all cells counted.
5. Record this number in Table 16-1.

Part B. Determining the Time Required for Each Phase

1. Assume that the number of cells in a phase is an indication of the time spent in that phase during mitosis. Time spent in a mitotic phase and in interphase can be calculated if the total time for mitosis is known. Onion cells require 12 hours (720 minutes) to complete mitosis (from interphase to interphase).

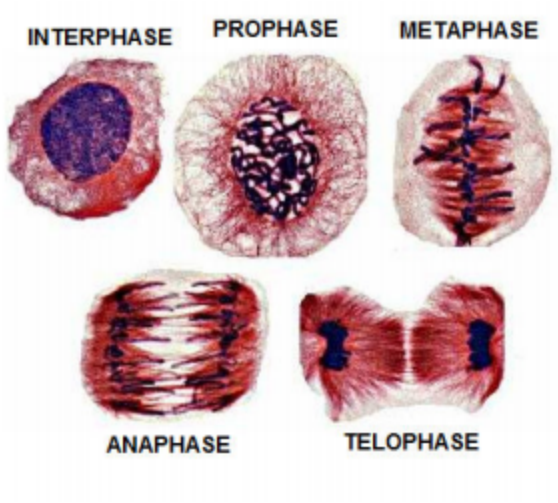


Figure 16-1

Calculations

The amount of time needed for a phase can be calculated using the formula:

$$\text{time for a phase} = \frac{\text{number of cells in a phase}}{\text{total number of cells counted}} \times \text{720 minutes}$$

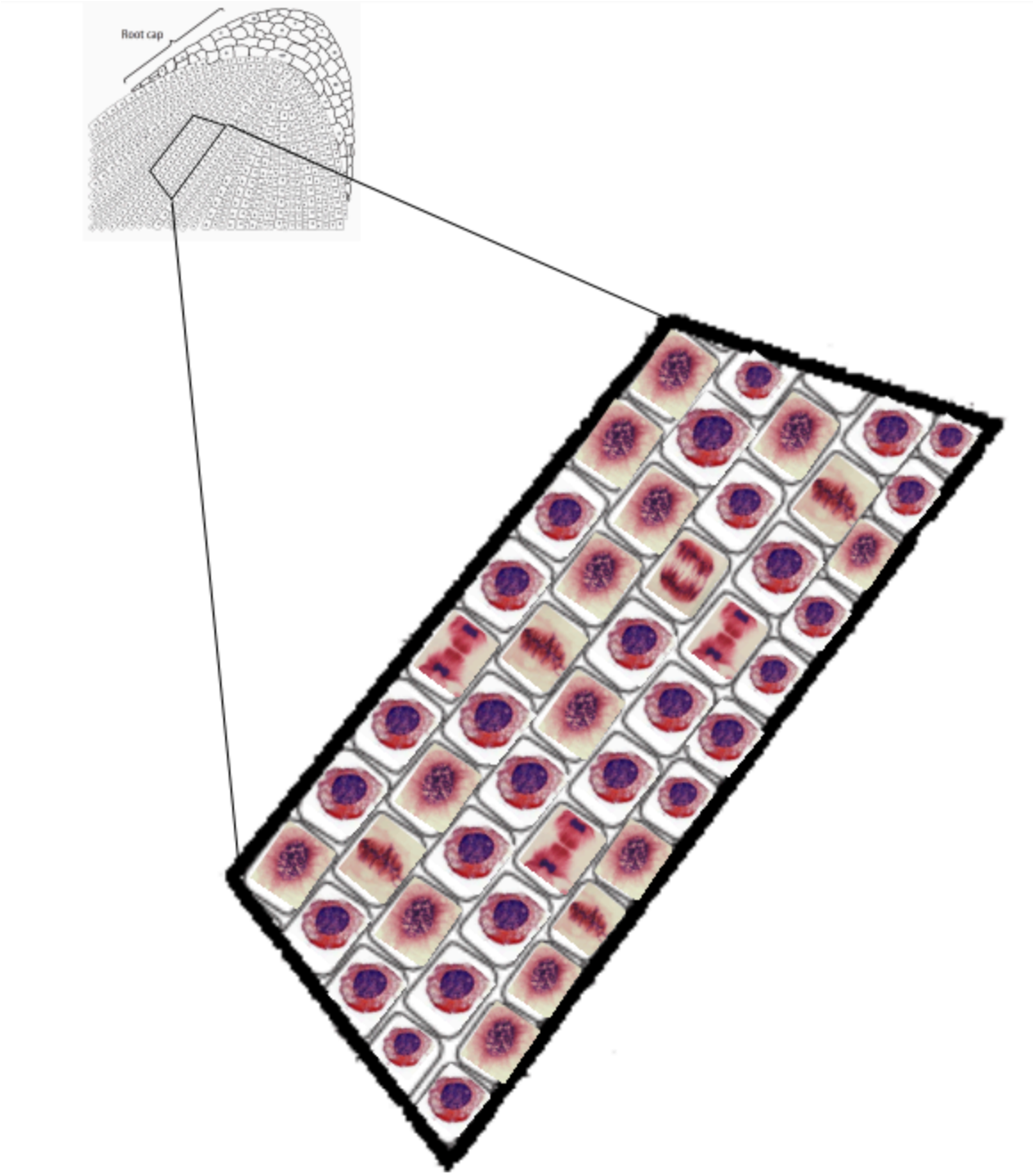
For example: If 109 cells were counted in metaphase and 980 total cells were counted, then:

$$\frac{109}{980} \times 720 \text{ minutes} = 80 \text{ minutes}$$

Calculate the time required for each phase of mitosis using your data. Assume that the total time for mitosis is 720 minutes.

Record the times in Table 16-1.

Stages of Mitosis



Data Table (16-1)

Stage	Cells Counted	Math to determine time in each stage	Time (in minutes) for each stage
Interphase			
Prophase			
Metaphase			
Anaphase			
Telophase			
Total Counted Cells			

Graph

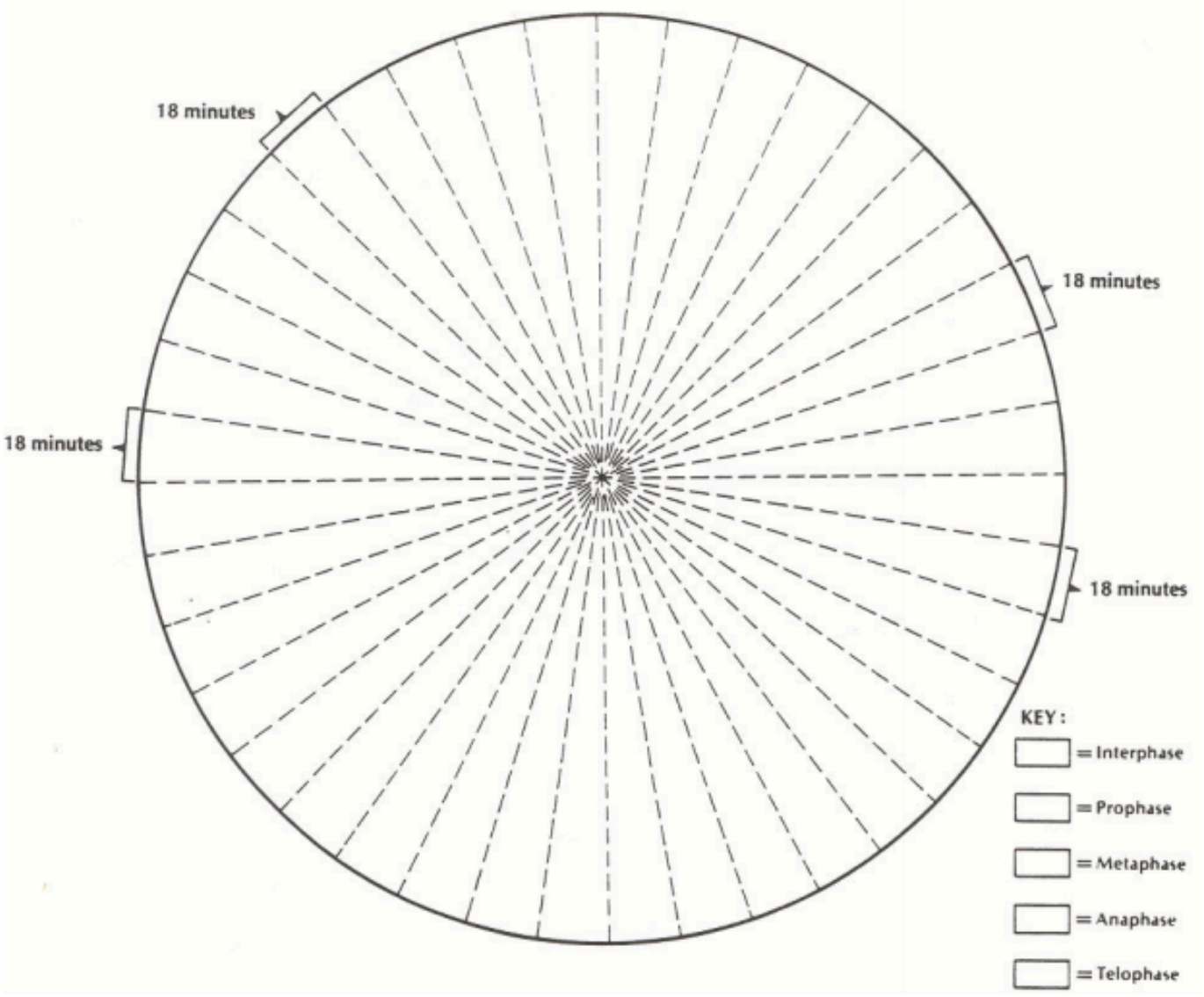
Using your data from Table 16-1 and the outline below, prepare a circle graph which shows the number of minutes that onion cells spend in each phase of mitosis. The following suggestions may aid you in preparing your graph.

a. Graph your data using the “Time in minutes” column from Table 16-1.

b. The circle is divided into 18 minute sections. Each section of the graph equals 18 minutes. If a phase is not exactly 18 minutes long (or some interval close to a multiple of 18 minutes), approximate the position of the line on the graph.

c. Shade each phase on your graph with colored pencils or various degrees of pencil shading.

d. Identify each phase by shading the key to correspond with the shading on your graph.



Analysis

1. Which phase requires the longest time for completion? _____
2. Which phase requires the next longest time for completion? _____
3. Which phase requires the shortest time for completion? _____

Table 16-2

Phase	Normal Chicken Stomach Cells in Minutes	Cancerous Chicken Stomach Cells in Minutes
Interphase	540	380
Prophase	60	45
Metaphase	10	10
Anaphase	3	3
Telophase	12	10

4. In normal chicken cells, which phase requires the longest time for completion? _____
5. In normal chicken cells, which phase requires the next longest time for completion? _____
6. How do your answers to 4 and 5 compare to 1 and 2?

   _____
7. What is the total time needed for a normal chicken stomach cell to complete mitosis? (Total up the time in minutes for each phase.) _____
8. What is the total time needed for a cancerous chicken stomach cell to complete mitosis?

   _____
9. How do cancer cells differ from normal cells in total time required for mitosis? _____
10. How do cancer cells differ from normal cells in time spent for each phase? _____
11. Table 16-3 shows the length of time (in minutes) needed for mitosis to occur in 2 different normal living organisms.
    a. Which organism, salamander or pea, shows time needed to complete mitosis most like the data you recorded in Table 16-1? _____
12. Why might the time required for these two organisms to complete mitosis be similar? (HINT: Where did the cell material you used in Part A come from?) _____

Table 16-3

Species	Prophase	Metaphase	Anaphase	Telophase	Total Cells
Salamander kidney cells	60	50	6	70	186
Pea root cells	80	40	4	12	136

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?

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

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Lab 15: Relationships and biodiversity[5]	Back to Unit 6

Introduction *see State Lab

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

Experimental Question

➔ How can we use structural and molecular evidence to determine which plant species- X, Y or Z- is most closely related to Botana Curus?

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.

Analysis *see State Lab

[5]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.

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

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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 16: Gel electrophoresis[6]	Back to Unit 6

Experimental Question
➔ How can we use DNA evidence and biotechnology to solve a crime?

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
➔ Exploring Electrophoresis and Forensics Classroom Kit from your teacher

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. Follow the instructions provided to you in the "Exploring Electrophoresis and Forensics Classroom Kit

[6] Adapted from:
http://www.carolina.com/exploring-electrophoresis/exploring-electrophoresis-and-forensics-kit/FAM_211012.pr AND
http://www.learnnc.org/lp/media/uploads/2010/11/gel-electrophoresis-lab-sheet.pdf

Data Table

Species Name	*Number of Bands / Banding Pattern*

Graph

Sketch the banding pattern you observed in the space below.

Species Name

Analysis

- ➔ Gel Electrophoresis is used often in forensics. Look at the following gel to the left. From the evidence DNA, which individual matches the DNA evidence left at the crime scene? _____
- ➔ When running a gel, you need to have a positive control and a negative control. _____
- ➔ What do these mean and what are they each used for?

_____

_____

➔ Name and discuss a source of error in performing and evaluating gel electrophoresis.

_____

_____

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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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 17: DNA structure[7]	Back to Unit 6

Introduction

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

➔ DNA was first discovered in 1869 but not much was known about the molecule until the 1920s. It was then discovered that it consisted of repeated subunits. Each subunit contains a part called a nitrogen base. There are 4 bases found in DNA:

Adenine (A) **Cytosine (C)** **Thymine (T)** **Guanine (G)**

➔ In the 1920s it was believed that these bases occurred in all living things in the same repeated pattern ATGC ATGC ATGC. But, if this were true, how could DNA carry the genetic code? That would mean humans would have the same genetic code as a worm! If all species have the same repeated pattern, DNA could not provide the variety needed for the genetic code.

➔ After World War II the biochemist Chargaff made major discoveries about the DNA bases. Chargaff obtained DNA samples from different organisms, and counted the DNA bases for each one. Now you will have the opportunity to make the same discovery Chargaff made 70 years ago.

Experimental Question

➔

Hypothesis

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

➔

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

[7] Adapted from: http://www.upsd.wednet.edu/cms/lib07/WA01000687/Centricity/Domain/123/Ch%2012%20Chargaffs%20Data%20worksheet.doc

Materials

- ➔ DNA Sample
- ➔ Poster Paper for Group Graph

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 package you'll have "DNA samples" that have been chopped up into smaller subunits.
2. Your job will be to count your subunits and record your data in the table provided.
3. Once you have your table filled, plot your data in a graph space below
4. When your group has discussed your individual graphs to assure they are the same, construct a graph on the paper provided to you.
5. Hang your graph in the room for others to see (they'll need it for the analysis questions).
6. Answer the questions.

Data Table

Organism	Percent / Number of Bases			
	A	T	C	G

Graph

Analysis

1. Look at your data above. Which bases are present in equal numbers? _____ and _____
2. Look at the graphs. What observations can you make about the data in the graphs? (Which bases are present in equal number here- are they all the same as on your chart?

   _____

   _____
3. Look at the graphs again. Do you notice differences between organisms? What is different?

   _____

   _____

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 18: Water testing field work[8]	Back to Unit 7

Introduction

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

➔ New York State's Hudson River has seen many changes, but perhaps none more dramatic than the arrival of the zebra mussel in 1991, and its rapid spread. Understanding the how the environment changed means that scientists have to look at the whole ecosystem: that is, they have to explore the abiotic and biotic factors. You have already seen in introductory videos about the Hudson river how the scientists at the river performed some of these tests and collected data. IN this lab, you will collect your own data about either abiotic or biotic factors in order to draw conclusions of your own. You will look at factors like the cloudiness of the water, its temperature, how much gas is dissolved in the water and how many and what types of organisms live in it. You will then share your data with your classmates in order to get a full picture of what is happening in the body of water your sample was taken from.

Experimental Question

➔ How do different abiotic and biotic factors affect one another in an aquatic ecosystem.

Hypothesis

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

➔ *If*

_____,

then

_____,

because

_____.

Abiotic Groups

Independent Variables	Dependent Variables
➔ ➔	➔ ➔ ➔

[8] Adapted from: http://www.amnh.org/education/resources/rfl/web/riverecology/index.html AND http://www.carolina.com/environmental-science-water-quality/lamotte-green-estuary-kit/652569.pr AND https://earthforce.org/GMGREEN/wp-content/uploads/2016/03/Estuary-and-Marine-Monitoring-Manual.pdf

Control Group	Controlled Variable(s)
➔	➔ ➔

Materials
➔ Earth Force LaMotte Estuary and Marine Monitoring Kit

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.

These directions come from the EarthForce Water Monitoring Kit. Page numbers have been included as some tests include diagrams which may be helpful for students to complete the activities.

Temperature (page 36)

1. Wear protective gloves. At each site, place the thermometer four inches below the water surface for one minute.
2. Remove the thermometer from the water, read the temperature and record the temperature as degrees Celsius.
3. Record data in data table below, report data for other necessary water samples as required.

Dissolved Oxygen (page 21)

1. Submerge the small tube (0125) into the water sample.
2. Carefully remove the tube from the water sample, keeping the tube full to the top.
3. Drop two *Dissolved Oxygen TesTabs® (3976A) into the tube. Water will overflow when tablets are added.
4. Screw the cap on the tube. More water will overflow as the cap is tightened. Make sure no air bubbles are present in the sample.
5. Mix by inverting the tube over and over until the tablets have disintegrated. This will take about 4 minutes.
6. Wait 5 more minutes for the color to develop.
7. Compare the color of the sample to the dissolved oxygen color chart. Record the result as ppm dissolved oxygen.
8. Record data in data table below, report data for other necessary water samples as required.

pH (page 30)

1. Fill the test tube (0106) to the 10 mL line with the water sample.
2. Add one pH Wide Range TesTab (6459A).
3. Turn the submerged container into the current and away from you.
4. Allow the water to flow into the container for 30 seconds.
5. Cap the full container while it is still submerged.
6. Remove it from the water immediately.
7. Record data in data table below, report data for other necessary water samples as required.

Turbidity (page 39)

1. Remove the backing from the secchi disk icon sticker.
2. Adhere sticker on the inside bottom of the large white jar (kit container). Position the sticker slightly off center.
3. Fill the jar to the turbidity fill line located on the outside kit label.
4. Hold the Turbidity Chart on the top edge of the jar.
5. Looking down into the jar, compare the appearance of the secchi disk icon in the jar to the chart.

Record the result as turbidity in JTU.

6. Record data in data table below, report data for other necessary water samples as required.

NOTE: Allow jar to dry thoroughly before replacing kit contents for storage.

Data Table

Type of Water Tested	*Temperature (°C)*	*Dissolved Oxygen - cold water (% Range)*	*Dissolved Gases - warm water (% Range)*	*pH*	*Turbidity (JTU Range)*
Distilled water (DW)					
Pond water (PW)					

Graph

Your teacher will assign you to complete a bar graph that compares the data you collected for one of the abiotic factors. Please complete that graph in the space provided below.

Biotic Groups

Materials

- ➔ Compound Light Microscope (x100 minimum available) OR Dissecting Microscope OR Magnifying Glass
- ➔ Petri Dish (if using Dissecting Microscope or Magnifying Glass)
- ➔ Glass slide
- ➔ Cover slip
- ➔ Pipette
- ➔ Cotton ball
- ➔ iPad / Computer to access reference images

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.

To prepare a microscope slide. Use your dropper to take some water from your sample.

1. Then place a few drops of the water in the center of your slide.
2. If you are using a flat slide, add a few fibers of cotton
3. Gently lower a cover slip over your water. Touch one edge of the coverslip on the slide and slowly lower the coverslip at an angle until the coverslip is flat over the water sample.
4. If using a petri dish or similar container, simply pour a little of your sample into the dish and place on the stage of your microscope.
5. When identifying plankton in your samples, you can reference this site: SERC.si.edu for comparision images.
6. Record your observed plankton and perform a quick sketch.

Organisms Observed	Sketch

Analysis

1. What are some of the abiotic factors that are required for plankton to survive in an ecosystem?
   _____
   _____
2. Why are plankton important to aquatic and marine ecosystems?
   _____
   _____
3. Where do you think you would find phytoplankton in the water column (would they be down deep or close to the surface)?
   _____
   _____
4. Are the algae you might find in a pond phytoplankton? If so, how can we see it without a microscope?
   _____
   _____
5. When looking under a microscope, how do phytoplankton and zooplankton differ?
   _____
   _____
6. What would happen to zooplankton if there were no phytoplankton?
   _____
   _____
7. What would happen to fish if there were no zooplankton? How would humans be affected if there were no zooplankton?
   _____
   _____

☼ 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.

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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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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 19: Bottle Biology[9]	Back to Unit 7

Introduction

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

➔ The U.S. generates 190 million tons of solid waste a year — enough to fill a bumper-to-bumper convoy of garbage trucks halfway to the moon. So why aren't we up to our necks in garbage?

➔ Nature recycles garbage all the time, and this recycling is essential to the availability of nutrients for living things. Nature's recyclers are tiny bacteria and fungi, which break down plant and animal waste, making nutrients available for other living things in the process. This is known as decomposition.

➔ Decomposition involves a whole community of large and small organisms that serve as food for each other, clean up each other's debris, control each other's populations and convert materials to forms that others can use. The bacteria and fungi that initiate the recycling process, for example, become food for other microbes, earthworms, snails, slugs, flies, beetles and mites, all of which in turn feed larger insects and birds. You can think of the Decomposition Column as a miniature compost pile or landfill, or as leaf litter on a forest floor. Through the sides of the bottle you can observe different substances decompose and explore how moisture, air, temperature and light affect the process.

➔ Many landfills seal garbage in the earth, excluding air and moisture. How might this affect decomposition? Will a foam cup ever rot? What happens to a fruit pie, or tea bag? Which do you think decomposes faster, banana peels or leaves? If you add layers of soil to the column, how might they affect the decomposition process? What would you like to watch decompose?

Materials

- ➔ Three 2-liter soda bottles
- ➔ one bottle cap
- ➔ Box top or drawer to stabilize bottle while making cutting lines
- ➔ Marker, wax pencil or crayon for drawing cutting lines
- ➔ Cutting blade or utility knife to start cut
- ➔ Scissors to cut bottle
- ➔ "Poke," darning needle or diaper pin to make air holes
- ➔ Awl to make holes in bottle caps and film cans
- ➔ Tapered reamer for enlarging holes
- ➔ Paper punch for making large holes in thin plastic
- ➔ Clear waterproof postal or bookbinding tape to join columns
- ➔ Silicone sealant to waterproof joints
- ➔ Clothes line, polyester or nylon craft cording
- ➔ Small inexpensive electric soldering iron
- ➔ Hair dryer

[9] Adapted from: http://www.bottlebiology.org/investigations/decomp_main.html

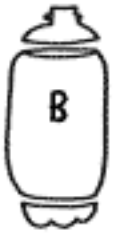
Procedure (This construction is for a table top, if you want a hanging construction, go to http://www.bottlebiology.org/investigations/decomp_build.html)

➔ 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. Remove labels from all three 2-liter bottles.

2. Cut the top off bottle #1 2-3 cm below shoulder so that cylinder has straight sides.

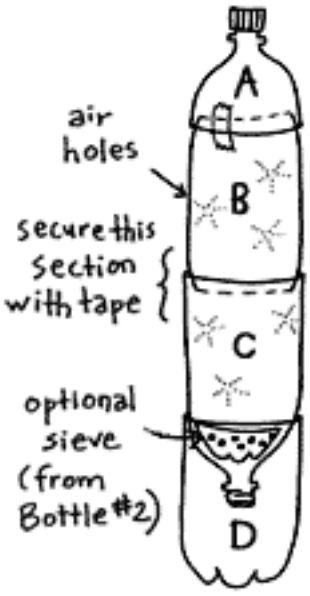
3. Cut top off of Bottle #2 2-3 cm above shoulder. Cut bottom off 2-3 cm below hip so the resulting cylinder has two tapered ends.



4. Cut bottom off Bottle #3 1-2 cm above hip, so cylinder has a straight end.

5. Invert "C" and stack into base "D." Stack "B" and tape middle seam securely. Poke air holes. Add top "A" with a piece of tape for a hinge to the bottle column.

6. Poke air holes in column. Optional: Poke holes in the cap.



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
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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 20: Deer: Predation or Starvation[10]	Back to Unit 7

Introduction

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

➔ In 1970 the deer population of an island forest reserve about 518 square kilometers in size was about 2000 animals. Although the island had excellent vegetation for feeding, the food supply obviously had limits. Thus the forest management personnel feared that overgrazing might lead to mass starvation. Since the area was too remote for hunters, the wildlife service decided to bring in natural predators to control the deer population. It was hoped that natural predation would keep the deer population from becoming too large and also increase the deer quality (or health), as predators often eliminate the weaker members of the herd. In 1971, ten wolves were flown into the island.

Experimental Question

➔ How does the changing population of one species affect the population of another?

Hypothesis

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

➔ *If*

_____,

then

_____,

because

_____.

Independent Variable	Dependent Variable
➔	➔

Materials

➔ Calculator
➔ Multiple colors for graphing

Procedure

1. The data collected during this program are shown in the following table.

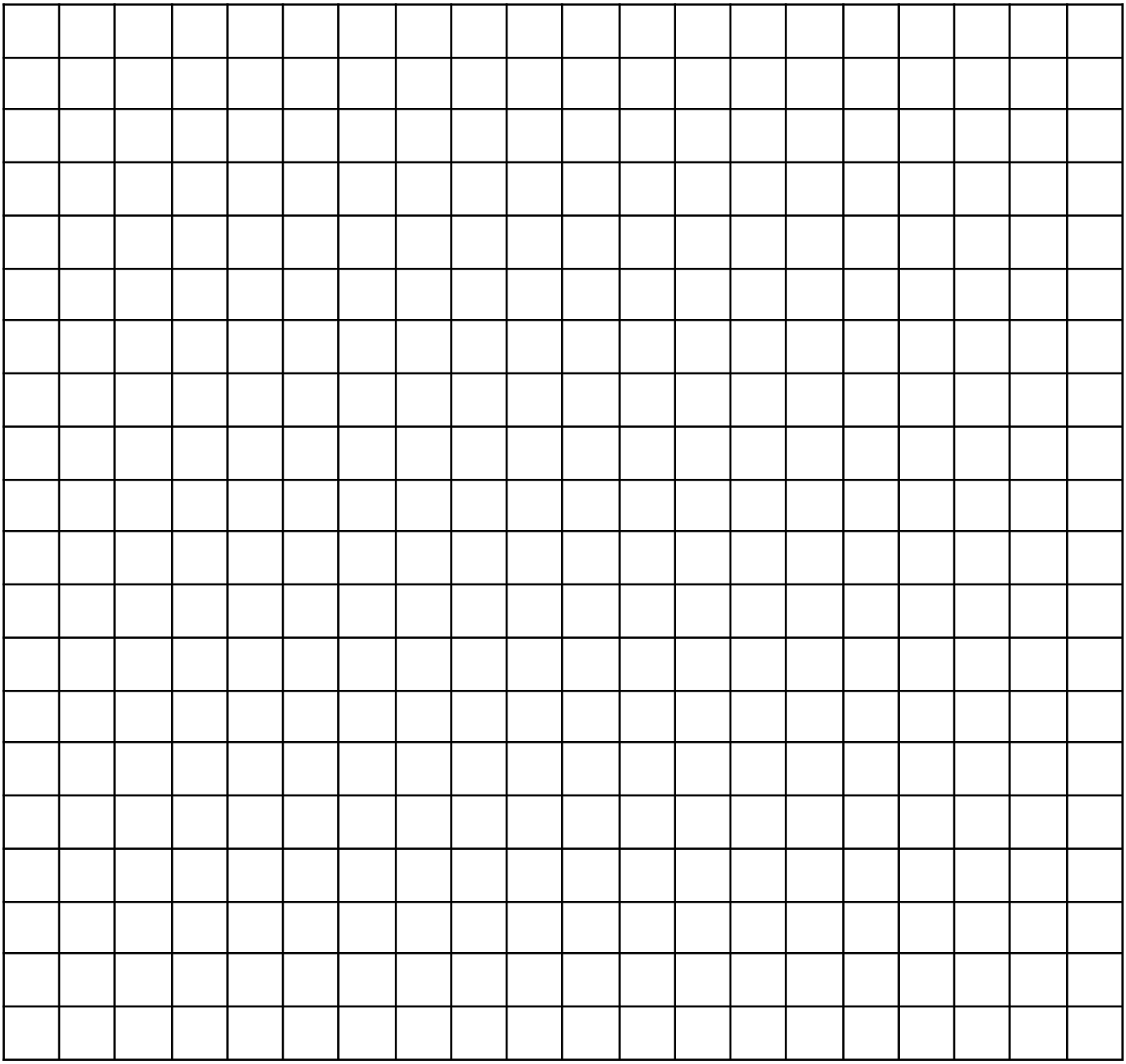
[10] Adapted from: https://www.biologycorner.com/worksheets/predator_prey_graphing.html AND https://www.tracy.k12.ca.us/sites/jhaut/Documents/PreAP_Biology/handouts/ch.%2018-19/Population%20Growth%20Activity-2012.pdf

2. The Population Change is the number of deer born minus the number of deer that died during that year. Fill in the last column for each year. The first has been calculated for you.
3. Graph the deer and wolf populations on the graph below.
4. Use one color to show deer populations and another color to show wolf populations.

Data Table

Year	*Wolf Population*	*Deer Population*	*Number of Deer Offspring*	*Predation*	*Starvation*	*Deer Population change*
1971	10	2000	800	400	100	+300
1972	12	2300	920	480	240	
1973	16	2500	1000	640	500	
1974	22	2360	944	880	180	
1975	28	2224	996	1120	26	
1976	24	2094	836	960	2	
1977	21	1968	788	840	0	
1978	18	1916	766	720	0	
1979	19	1952	780	760	0	
1980	19	1972	790	760	0	

Graph



Analysis

1. What is a density-dependent limiting factor?

➔ _____

_____

2. When do density-dependent factors operate most strongly?

➔ _____

_____

3. List four density-dependent limiting factors?
    a. _____
    b. _____
    c. _____
    d. _____
4. Describe what happened to the deer and wolf populations between 1971 and 1980.

➔ _____

_____

5. What happened to the deer population when the number of wolves was low?

➔ _____

_____

6. What do you think would have happened to the deer on the island had wolves NOT been introduced? Explain your answer.

➔ _____

_____

7. What is the relationship between the deer and the wolves on the island?

➔ _____

_____

8. Is the number of deer on the island a density-dependent or density-independent limiting factor for the wolf? Explain your answer.

➔ _____

_____

9. Read each situation in the chart below. Then, state if it is a density-independent limiting factor or a density-dependent limiting factor. Then, state the specific limiting factor that is occurring. The first one is done for you as an example.

➔ _____

_____

Situation	Density independent or Density dependent	Factor?
Your teacher has 32 students assigned to their Biology class, but she only has room for 28. Because the room is so crowded, the extra 4 students leave the room to go to Guidance and have their schedules changed.	Density Dependent	Emigration
Northern pike (it's a fish) feed on another fish, the yellow perch. An increase in the yellow perch population causes an increase in the northern pike population.		
The BP oil spill in the Gulf of		

Mexico has harmed many aquatic organisms that live in the Gulf region.		
A new strain of influenza (the flu) breaks out in New York City. A population of rabbits and a population of deer are both feeding off the same plants in the same habitat.		
Hurricane Katrina forced thousands of people to leave New Orleans.		
65 million years ago, a large asteroid collided with the Earth. As a result, large amounts of ash were ejected into Earth's atmosphere.		

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	**Explain**
➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	➔ 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 21: AMNH's river ecology graphing tool[11]	Back to Unit 7

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

Experimental Question
➔

Hypothesis *A good hypothesis has this format and punctuation: If _____, then _____ because _____.*
➔ *If, during the initial stage of the zebra mussel invasion (through 2006), as the population of zebra mussels increased _____, then (abiotic or biotic factor) would _____ (increase/decrease/stay same), because _____.*

The online tool may be found here:
www.tinyurl.com/hudsontool1

Independent Variable	**Dependent Variable**
➔	➔

Materials
➔ Computer or iPad to access the online graphing tool

[11] Adapted from: http://www.amnh.org/education/resources/rfl/web/riverecology/

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. Follow the prompts below and provide your answers in the spaces provided.

Step 1 - Explore the River Ecology Data Set - use these prompts

Work alone for 5 minutes to explore the River Ecology data set. Take notes as you explore the tool and work with it. Discuss with a partner and share your findings.

Prompt	Observation	Usefulness
What happens if you pick different locations on the map?		
What happens if you pick "temperature" as a parameter?		
What happens when you pick a different "parameter"?		
How does the graph look different if you select one parameter vs. two parameters?		
How do you change the number of years shown on the graph?		

Step 2 - Explore the River Ecology Data Set- come up with your own prompts

Work alone for 5 minutes to explore the River Ecology data set. Take notes as you explore the tool and work with it. Discuss with a partner and share your findings.

Prompt	Observation	Usefulness

Step 3 - Develop a process for using the tool to write your DSET.

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).

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 22: Beaks of finches[12]	Back to Unit 8

Introduction *see State Lab
➔ Annotate the purpose of the lab by circling words that you think are the most important.

Experimental Question

➔ Why are certain beak characteristics more advantageous than others?

Hypothesis *see State Lab questions 1 and 2
A good hypothesis has this format and punctuation: 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.

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? _____

[12] 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.

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 23: Greenhouse effect in a bottle[13]	Back to Unit 8

Introduction

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

Carbon dioxide is a gas that has existed in our atmosphere for billions of years. Carbon dioxide is released to the atmosphere when fossil fuels are burned in factories, and through animal respiration. Along with methane and nitrous oxide from industrial and agricultural practices, carbon dioxide contributes to greenhouse gases in the atmosphere. Recently, the highest levels of carbon dioxide on record have been observed.

Gases like carbon dioxide are referred to as “greenhouse gases” because they act like a greenhouse in our atmosphere. A greenhouse is a structure that holds heat from the sun and produces a warm environment for plants to grow. Greenhouse gases, similarly, act to hold heat from the sun around our planet, causing temperatures to rise. An increase in greenhouse gases traps more and more of the sun’s heat, causing Global Warming. Among other changes, Global Warming is causing the polar caps to melt and get smaller at an alarming rate.

In this experiment, we will mimic the effects of greenhouse gases by using plastic wrap to represent carbon dioxide in our atmosphere. You will study the effect of the sun on the temperature of two different containers; one exposed and one covered with plastic wrap. The air in the exposed container is constantly changing, and as the temperature increases, warm air will rise out of the container and be replaced by cooler air. The air in the covered container, however, is trapped, so this air will continue to get warmer and warmer over time.

Experimental Question

➔ How does the addition of carbon dioxide and other greenhouse gases to the atmosphere cause global warming?

Hypothesis

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

➔ *If*

_____,

then

_____,

because

_____.

[13] Adapted from: https://pmm.nasa.gov/education/sites/default/files/lesson_plan_files/climate%20change%20inquiry/climate%20change%20inquiry%20carbon%20dioxide%20lab.pdf

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

Materials

- ➔ Beaker or clear plastic container (two per group)
- ➔ Plastic wrap and rubber band or string (one per group)
- ➔ Thermometers or temperature probes (two per group)
- ➔ 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.

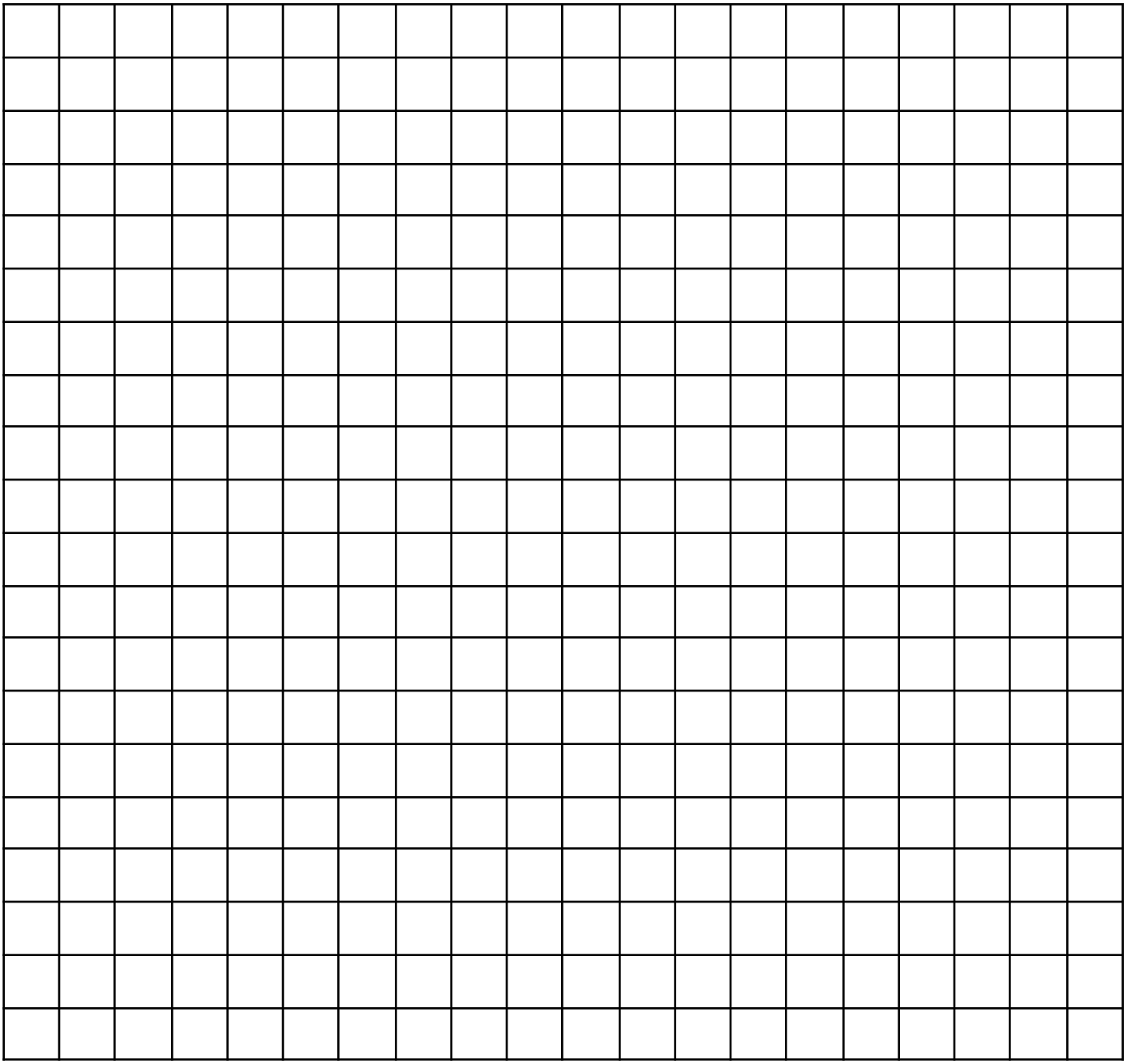
1. Tape the thermometers into the beakers or other containers, making sure you can read the temperature easily. If you are using lightweight plastic cups, it may help to tape them down the table for stability.
2. Cover one of the beakers (the experimental group) with plastic wrap and secure it with a rubber band. Leave the other beaker (the control group) uncovered.
3. Observe the initial temperature of each beaker and record your data in Table 1.
4. Put both containers into the sunshine. Make sure they receive the same amount of sun. NOTE: A heat lamp may be substituted for the sun, but you must be careful to place the containers the same distance from the lamp, and beware that the bulb and shade may get quite hot.
5. Observe the temperature of each beaker every two minutes for the next 20 minutes. Record all data in Table 1.
6. Calculate the temperature change by subtracting the initial temperature from the final temperature for both of the beakers.
7. Create a graph showing the change in temperature over time for each beaker.

Data Table 1

Independent Variable: Time (minutes)	***Dependent Variable: Temperature (degrees Celsius)***	
	Uncovered beaker (control group)	***Covered beaker (experimental group)***
0 (initial temperature)		
2		
4		
6		
8		
10		
12		
14		
16		
18		
20		
Temperature change (final - initial)		

Graph 1

Title:



Analysis

1. Did the temperatures in the beakers change during the 20-minute experiment? If yes, how did they each change?
2. What do you predict would have happened if we had continued the experiment for another 20 minutes?

3. How did this activity demonstrate Global Warming?

⚙ 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 24: Acid precipitation simulation[14]	Back to Unit 8

Introduction

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

➔ Acid rain is defined to have a pH lower than 5.6. In New York, the average pH of rainfall is 4.0-4.5 and individual storms as low as 3.0 are not unusual. Freshwater lakes commonly are slightly basic, which gives the lake a natural "buffer" to acid rain. The pH in the range of 6.5 to 8.2 is optimal for most organisms, and below 5.0 is lethal to many fish species. The susceptibility of lakes to changes in pH varies depending on how well buffered they are. Measured as alkalinity, the buffering capacity of water is primarily dependent on the concentration of carbonate (CO_3^{2-}) and bicarbonate (HCO_3^-) ions.

➔ In areas with limestone ($CaCO_3$) bedrock, surface waters have high concentrations of carbonate and bicarbonate and therefore are able to resist change in pH. The pH of a well-buffered lake does not change dramatically following a storm or snowmelt period because the acidity becomes neutralized by these ions. In regions where the bedrock is granite, the soils and surface waters are naturally low in alkalinity. There are some regions in the United States where many of the lakes are too acidic to support fish life. One approach to restoring acidic lakes is to add lime to the lake itself, to the influent streams, or to the watershed land.

Experimental Question

➔ What are the effects of acid rain on our environment?

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: http://eeinwisconsin.org/content/eewi/101704/acidrainlab.doc

Materials

- ➔ Distilled water
- ➔ 1.0M HCl
- ➔ pH paper
- ➔ Na_2CO_3 / $NaHCO_3$
- ➔ Limestone
- ➔ 6 beakers
- ➔ Dropper
- ➔ Graduated cylinder

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.

Preparation

1. Gather materials and in 3 of the beakers place an aliquot of each: distilled water, HCl and Na_2CO_3 / $NaHCO_3$

Effect of acid on distilled water

1. Add 10 ml of distilled water to a 50 ml beaker and record initial pH
2. Add 2 drops of 1.0 M HCl and record pH
3. Repeat step (b) until pH reaches 2
4. Record results in the table at the bottom of the page

Effect of acid on an artificial buffering system

1. Place 10 ml of .1 M Na_2CO_3 / .1 M $NaHCO_3$ into a 50 ml beaker and record the initial pH.
2. Add 2 drops of 1.0 M HCl and record initial pH
3. Repeat step (b) until the pH reaches 2
4. Record results in the table at the bottom of the page

Effect of acid rain on natural limestone

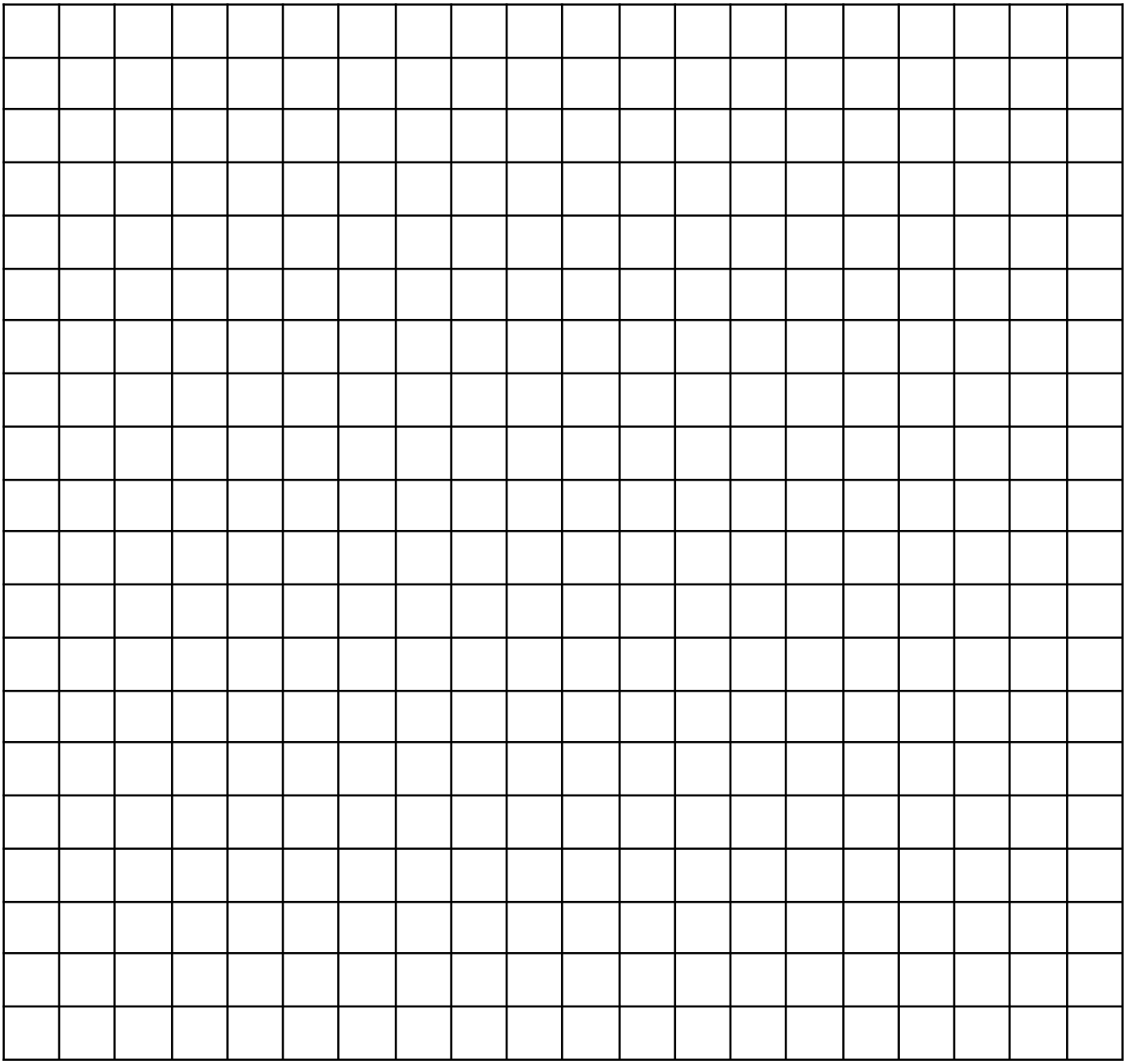
1. Add 1 level spoonful of limestone to a 50 ml beaker
2. Add 20 ml of distilled water and record the pH
3. Add two drops of 1.0 M HCl and record the pH
4. Repeat step (c) until you run out of space on the chart

Data Table

Drops HCl	*Distilled Water*	*Na_2CO_3 / $NaHCO_3$*	*Limestone*
0 (initial pH)			
2			
4			
6			
8			
10			
12			

14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			

Graph



Analysis

➔ Graph the 3 different reactions on one graph (each reaction should be a different color).

1. Why did the pH drop so quickly in the distilled water?

➔ _____

_____

➔

2. What correlations exist between the artificial buffer (Na_2CO_3 / $NaHCO_3$) and the natural buffer system?

➔ _____

_____

3. Which buffering system worked the best? Why do you think this is so?

➔ _____

_____

4. Which of these two lakes is more likely to experience large drops in pH due to acid precipitation? Why?

	Mirror Lake	Loon Lake
pH	7.5	6.0
Temperature	6ºC	4ºC
Alkalinity	50 ppm	200 ppm
Dissolved Oxygen	13 ppm	7 ppm

➔ _____

_____

5. If you steadily add acid to a well-buffered solution, what would you expect the pH to do?

➔ _____

_____

6. Universal Indicator Solution is used to indicate the pH of liquids: it turns red in acidic solutions, green in neutral solutions, and purple in basic solutions. When Universal Indicator Solution is added to a sample of water from Mystery Lake, the water turns green. Adding some weak acid turns the solution red, but after mixing it returns to green. Why is this?

➔ _____

_____

7. Acid precipitation causes greater changes in lake acidity in the Adirondacks than in other parts of New York State. Why?

➔ _____

_____

8. Suppose you are the lake manager for an exclusive fishing club. You have read news accounts about acid precipitation, and you are worried about its possible effects on your fish populations. Design a study to determine whether acid precipitation is likely to cause problems in your club's lakes. What will you study, and why?

➔ _____

_____

9. Lime is commonly applied to gardens and agricultural fields to neutralize acidity. Experimental programs have been carried out to lime lakes and streams. What problems do you think might have been encountered?

➔ _____

_____

⚙ 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**	⚙ **Explain**
➔ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?	➔ 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 25: Human Population Growth[15]	Back to Unit 8

Introduction

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

➔ Prior to 1950, the death rate was high, which kept the numbers of humans from increasing rapidly. In the 19th Century, the agricultural revolution increased food production. The industrial revolution improved methods of transporting food and other good. In the 20th Century, advances in medicine, sanitation and nutrition have decreased the death rates further. These factors combined to produce the rapid growth of the human population in the 20th century. As with any population, humans are also limited by factors such as space, amount of food and disease. The carrying capacity is the number of individuals that a stable environment can support. Authorities disagree on the maximum number of people that the earth can support, though the numbers generally range for 8 to 10 billion. As the population approaches its limit, starvation will increase. Some countries have a much higher growth rate than others. Growth rate is the number of people born minus the number of people that die. Most countries are trying to reduce their growth rate. Zero population growth means that as many people are being born as there are dying - to achieve zero population growth, each couple would need to have no more than two children (to replace the parents). Even if this number is achieved, the population will continue to grow because the parents will still live on for decades, as their children have children and their children have children, and so forth. The United States reached zero population growth in the 1980's, and yet the overall population of the US still increases. The earth's known human population size is reported in the table below. First graph the data and then answer the analysis questions. Make sure to use all of the space given for the graph.

Experimental Question

➔ How has the world's population changed in recorded history?

Materials

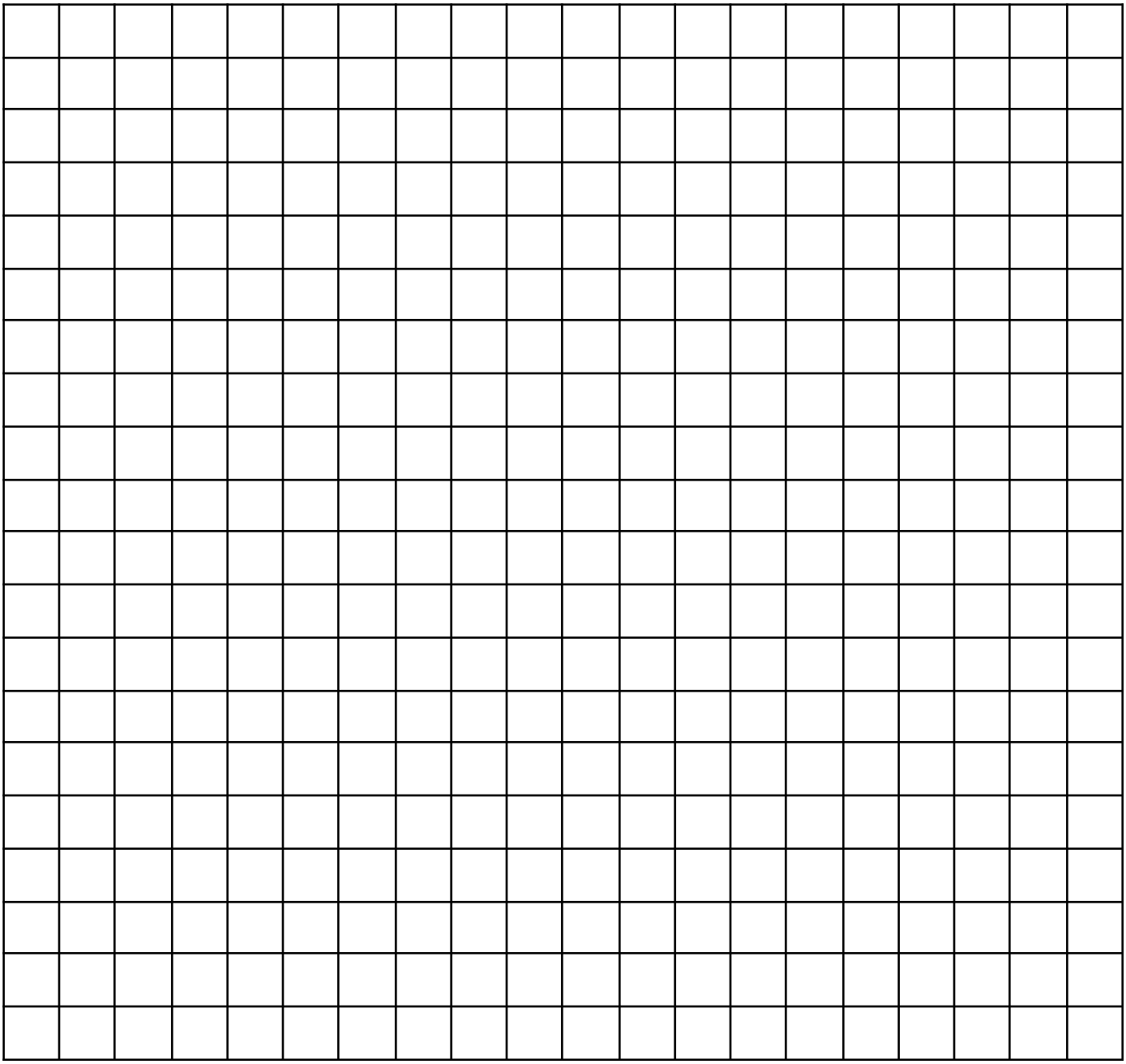
➔ Human population on Earth data
➔ Graph paper

[15] Adapted from: http://www.biologycorner.com/worksheets/humanpop_graph.html AND https://www.tracy.k12.ca.us/sites/jhaut/Documents/PreAP_Biology/handouts/ch.%2018-19/Population%20Growth%20Activity-2012.pdf

Data Table

Year	*Population (in Billions)*
1650	0.50
1750	0.70
1850	1.00
1925	2.00
1956	2.50
1966	3.30
1970	3.60
1974	3.90
1976	4.00
1980	4.40
1991	5.50
2000	6.00
2004	6.40
2008	6.70

Graph



Analysis

1. It took 1,649 years for the world population to double, going from 0.25 billion people to 0.50 billion people. How long did it take for the population to double a second time? _____
2. How long did it take for the population to double a third time? _____ A fourth time? _____
3. Based on your graph, in what year will the population reach 8 billion? _____
4. Define the following terms:

a. Exponential growth

➔ _____

_____

b. Logistic growth

➔ _____

_____

c. Carrying capacity

➔ _____

_____

d. Limiting factors

➔ _____

_____

5. What factors contributed to the world's overall population growth in the last 150 years?

➔ _____

_____

6. If the carrying capacity of the earth was 9 billion people, when would this number be reached (according to your graph)?

➔ _____

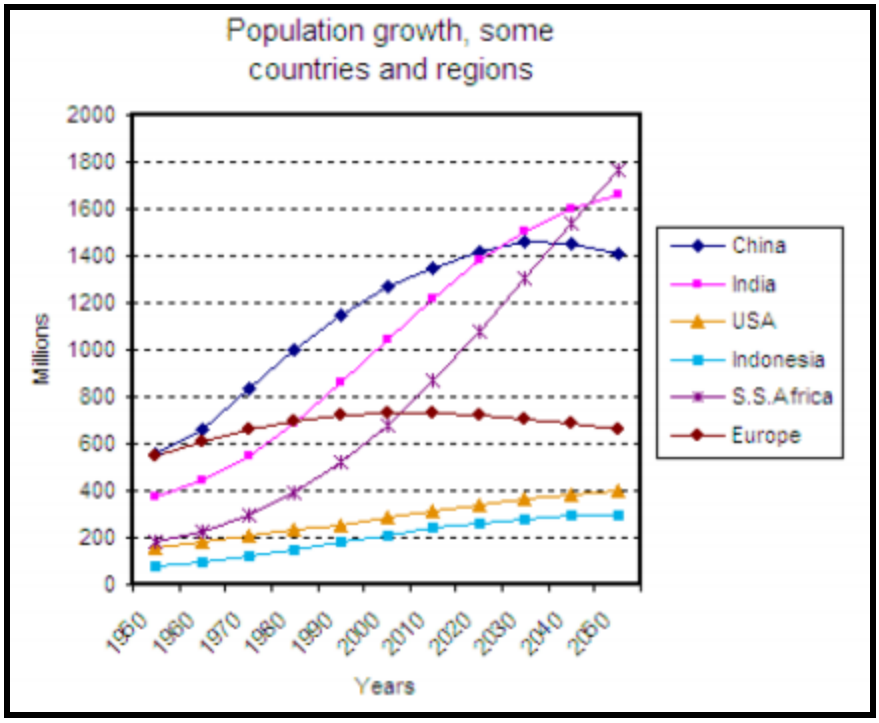
_____

7. What will happen when the human population exceeds the earth's carrying capacity?

➔ _____

_____

8. Use the graph below to answer the questions that follow.



a. Which country looks like it is experiencing exponential growth? _____

b. Which country looks like it has reached its carrying capacity? _____

c. Because it has reached its carrying capacity, describe the relationship between its birth rates

and death rates.

d. Describe what is happening to Europe's population size in terms of birth rates and death rates.

➔ _____

_____

e. Which country or countries could be experiencing:
   i. emigration: _____
   Explain your answer.

   ii. immigration: _____
   Explain your answer.

9. Read the CAUSE on the left hand side of the table below. Then, predict the EFFECT of the cause in the right-hand column. For the last one, fill in the CAUSE portion of the table.

CAUSE	EFFECT
During the 1920s, many Eastern European people leave their countries to come to the United States.	
During the 1920's, many Eastern European people enter the United States.	
Many more babies were born in the post-World War II era than in the pre-World War II era.	
China imposed a "one child only" policy in 1979 which is still in effect today.	
Seals are hunted for their meat and fur in some regions, resulting in many deaths of seals.	

 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).

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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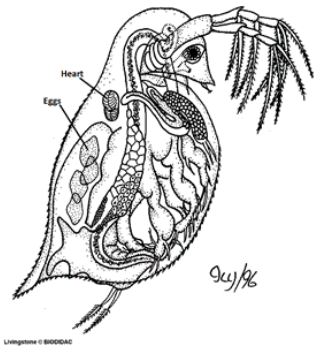
Focus on Class Work	Consistently stayed focused on in-class work and what needed to be done. Very self-directed.	Focuses on in-class work and what needs to be done most of the time.	Rarely focuses on class work and what needs to be done.

Lab 26: Toxin testing in daphnia[16]	Back to Unit 9

Introduction

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

➔ Daphnia Magna (water flea) is a small crustacean that lives in a variety of aquatic habitats ranging from swamps to freshwater ponds and streams. The water flea's carapace (upper section of the exoskeleton) is translucent, allowing one to observe the inner workings of the circulatory and other body systems. Daphnia's heart is located on on the top portion of the body near the head, and it is possible to view and count the heart rate of an individual. The water flea, like all animals, are sensitive to changes in their environment and attempt to maintain homeostasis when faced with external pollutants, toxins, and other changes to their surroundings (such as temperature.)



Experimental Question

➔ Research Question: How do toxins, such as caffeine and ethanol, impact heart rate in Daphnia?

Hypothesis

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

➔ Caffeine:

➔ Ethanol:

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

[16] Adapted from: https://www.biologycorner.com/worksheets/daphnia_heartrate.html

Materials

- ➔ Small aquarium with multiple Daphnia
- ➔ Pipette
- ➔ Petri dish
- ➔ slides
- ➔ Microscope
- ➔ Ethanol solution
- ➔ Caffeine solution

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. Before starting, watch this video of Daphnia's heart rate (http://tinyurl.com/daphniahr)
2. Use the pipette to carefully transfer one Daphnia and one drop of water onto the petri dish. Keep the drop of water small so that the Daphnia cannot swim out of your field of view
3. Place the microscope over the petri dish and find the heart. Remember it is on the back of Daphnia.
4. As quickly as possible, begin counting the number of heart beats in 10 seconds
5. Repeat steps 2-4 two more times, recording all of your data in the data table
6. Use a pipette to transfer caffeine solution to a petri dish, so that the bottom of the petri dish just fills with the solution (careful to not cross-contaminate pipettes)
7. Using a pipette, transfer a Daphnia to the solution, leaving it in solution for 5-10 seconds.
8. Using a pipette, transfer the Daphnia along with one drop of solution to a clean slide.
9. As quickly as possible, begin counting the number of heart beats in 10 seconds.
10. When finished, transfer the Daphnia to a clean petri dish (not back to the general aquarium)
11. Repeat steps 6-10 two more times, recording all of your data in the data table
12. Repeat steps 6 - 11, using ethanol solution.

Data Table

Trial	*Number of Heartbeats Before Exposure (per 10 second count)*	*Number of Heartbeats After Exposure to Ethanol Solution (per 10 second count)*	*Number of Heartbeats After Exposure to Caffeine Solution (per 10 second count)*
1			
2			
3			
Average Number of Heartbeats PER MINUTE			

Graph

Analysis

- ➔ Average BPM in Water: _____
- ➔ Average BPM in Ethanol: _____
- ➔ Average BPM in Caffeine: _____
- ➔ Did the ethanol increase or decrease the heart rate? _____
- ➔ Did the caffeine increase or decrease the heart rate? _____
- ➔ Would you classify the ethanol as a stimulant or a depressant? _____

- ➔ Was there a difference between your average BPMs and your partners? _____

➔ If yes, why? _____

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…")

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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

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