Assessment portfolio for high school biology: Unit 1

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Contents

Introduction

This is the final project for EDTP 645 that consists of a variety of assessments created by the student. It demonstrates knowledge and capability in educational content and assessment design/implementation. It contains seven distinct artifacts that represent a variety of assessment types.

Maryland State Standards

- 1.2 The student will pose scientific questions and suggest investigative approaches to provide answers to questions.
- 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
- 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
- 1.5 The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.
- 1.6 The student will use mathematical processes.
- 3.2 The student will demonstrate an understanding that all organisms are composed of cells which can function independently or as part of multicellular organisms.
- 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

Florida State Standards

- SC.912.N.1.1- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics.
- SC.912.N.1.2 - Describe and explain what characterizes science and its methods.

- SC.912.N.1.3 - Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
- SC.912.N.2.1 - Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
- SC.912.N.2.2 - Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.
- SC.912.N.2.3 - Identify examples of pseudoscience (such as astrology, phrenology) in society.
- SC.912.N.3.1 - Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
- SC.912.N.3.4 - Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Artifact I – Fifteen Item Multiple Choice Test (Higher Level)

Multiple Choice. Please circle the best answer from the list. (15 questions, 2 points each)

1. During an experiment, one of your samples has unchanged conditions. You call this your _____?
    a. Solution
    b. Control
    c. Independent Variable
    d. Dependent Variable
2. What would be a variable in an experiment to conduct to test the effect of antibacterial wipes on a surface?
    a. The use of water as a cleaning medium
    b. The use of antibacterial wipes as a cleaning medium
    c. The use of multiple brands of antibacterial wipes
    d. The replication of the experiment multiple times.
3. If a student wanted to use the microscope to view a slide that contained bacteria on it what would be the correct first step?
    a. Turn the dial to choose 4x objective lens.
    b. Turn the dial to choose 10x objective lens.
    c. Turn the dial to choose 40x objective lens.
    d. The objective lens does not matter.

John cut his hand playing outside. His mother washed the wound and put first-aid cream on the cut. John noticed that the wound did not become infected and wondered why. Let's consider how a biologist might think about this problem.

Step 1) Realize that the wound doesn't become infected.

Step 2) Consider that infection must be being prevented somehow.

Step 3) Decide to grow a bacteria culture and apply first-aid cream to the bacteria.

Use the above information to answer the following questions:

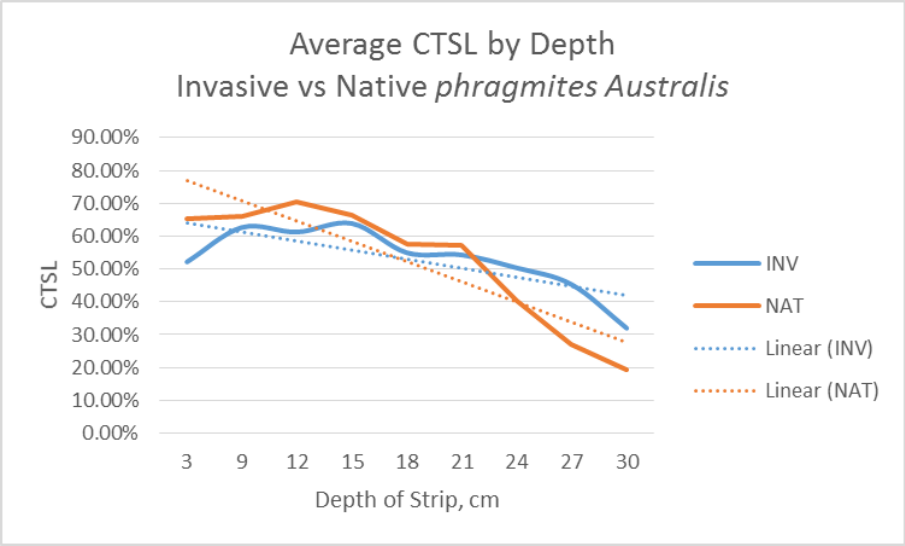
4. Step 1 above would be an example of which step of the Scientific Process?
    a. Hypothesis
    b. Experiment
    c. Observation
    d. Conclusion
5. Step 2 above would be an example of which step of the Scientific Process?
    a. Hypothesis
    b. Experiment
    c. Observation
    d. Conclusion

6. What would be the appropriate next step using the Scientific Method?
    a. Take pictures of different wounds.
    b. Design an experiment.
    c. Publish a paper on bacteria growth
    d. State that first-aid cream stops bacteria growth.
7. What would be a good example of a control group?
    a. A petri dish containing first-aid cream and bacteria.
    b. Two petri dishes containing first-aid cream and bacteria.
    c. A petri dish containing bacteria only.
    d. A petri dish containing first-aid cream only.
8. What would be a good method for measuring bacterial growth?
    a. Estimate by eye
    b. Measure the bacteria growth once at the end of the experiment
    c. Measure the growth at the beginning and end of the experiment
    d. Measure the growth periodically throughout the experiment.
9. Why might you cover the petri dish(s) used in the experiment?
    a. To help the bacteria stay warm.
    b. To avoid outside contamination.
    c. To make it easy to label the sample
    d. To keep the bacteria from leaving the dish

The ability for a substance to dissolve in a liquid is determined by measuring the maximum amount that dissolves in a specified amount of water at a specific temperature. Given the hypothesis: Salt dissolves more rapidly as the temperature of water increases, answer the following questions:

10. Identify the independent variable.
    a. Water temperature
    b. Amount of salt
    c. Increase in temperature
    d. Amount of water
11. Identify the dependent variable
    a. Water temperature
    b. Increase in temperature
    c. Amount of water
    d. Amount of salt
12. Every time you open the door where you store the dog food, your dog runs towards their bowl. Identify a valid hypothesis for this situation.
    a. The dog is hungry.
    b. The dog is excited to be fed.
    c. Food makes dogs happy.
    d. The dog associates food with opening the door.

13. During an experiment a biologist measures and records values of the weight of different animals. This type of data would be considered:
    a. Numerical
    b. Important
    c. Quantitative
    d. Qualitative



14. Based on the above graph, identify the dependent variable.
    a. CTSL
    b. INV
    c. NAT
    d. Depth of Strip, cm
15. Based on the above graph, what is a valid observation shown by the data.
    a. INV increases in CTSL as depth increases
    b. NAT increases in CTSL as depth increases
    c. At a depth of 18 cm INV has a higher CTSL then NAT.
    d. At a depth of 27 cm INV has a higher CTSL then NAT

Artifact II – Ten Item Multiple Choice Test (Lower Level)

Multiple Choice. Please circle the best answer from the list. (10 questions, 2 points each)

1. Select the correct levels of organization order from smallest to largest.
    a. Cell, organ, tissue, population, biosphere
    b. Atom, molecule, organ, ecosystem, biosphere
    c. Atom, molecule, cell, biosphere, ecosystem
    d. Cell, organ, tissue, community, population
2. How many Domains of species exist?
    a. One
    b. Two
    c. Three
    d. Four
3. Choose the incorrect response: The scientific method is…
    a. Objective
    b. Quantitative
    c. Step by Step
    d. Subjective
4. Select the example of a metric unit.
    a. Pound (lb.)
    b. Tablespoon (tbsp.)
    c. Decigram (dg)
    d. Yard (yd.)
5. Which of the following is one of the Domains of species?
    a. Eukarya
    b. Protozoa
    c. Virus
    d. Humans
6. Quantitative data is usually displayed using _____?
    a. Written descriptions
    b. Graphs
    c. Long lists
    d. All of the above
7. An explanation for a problem that you can test is called a(n)_____?
    a. Law
    b. Synthesis
    c. Hypothesis
    d. Theory
8. What biological theme drives the changes in species over time?
    a. Reproduction
    b. Energy transfer
    c. Evolution
    d. Scientific Process

9. Information gathered during an experiment is known as _____.
    a. Materials
    b. Methods
    c. Data
    d. Diction
10. Which of the following is considered pseudoscience?
    a. Astronomy
    b. Astrology
    c. Biology
    d. Chemistry

Artifact III – Ten Item True-False Test

True or False. Write T or F in the blank. If the answer is false write the word that would make the statement true. Example: _F human_ You are a dog. (10 questions, 2 points each)

1. _____ A kilogram is used in the standard system of measurement.
2. _____ Mass is represented by the symbol L which stands for Liter.
3. _____ The control group in an experiment tests the independent variable.
4. _____ A hypothesis is a possible explanation of a question.
5. _____ The number of times you repeat an experiment is known as a Sample Size.
6. _____ A scientific theory is supported by evidence and has never been proven false.
7. _____ Scientists use telescopes to view small objects or organisms such as cells.
8. _____ In a line graph, the independent variable always goes on the *x* (horizontal) axis.
9. _____ An organ is the smallest biological unit of all living organisms.
10. _____ A population may contain many communities.

Artifact IV – Three Essay Questions

Essay Question #1

Directions: Write your answer in complete sentences. Be sure to pay attention to answer length requirements that are stated in the question as completeness will be graded. Unreadable answers will be marked wrong so write neatly. There are 21 points available for this question.

Part 1: ***In a minimum of two paragraphs state and describe two primary causes of desertification and explain how desertification relates to economic instability in a region with specific examples.***

Part 2: ***Then in a minimum of two paragraphs state and describe two land-use practices that could reverse the process of desertification and explain how they might help reduce the specific examples of economic instability you discussed in part 1.***

Essay Question #1 Rubric

	3	2	1	0
Primary Cause	2 correct causes	1 correct causes	2 incorrect causes	No causes given.
Economic Instability	Rational explanation of effects on economy with specific examples	Rational explanation of effects on economy, no specific examples.	Incorrect link of desertification to economic instability.	No attempt to answer.
Land-Use Practice Stated	Two correct land-use practices with two accurate descriptions.	One correct land-use practice and/or Description	Two-incorrect land use practices. Description included for each.	No Land use practices stated.
Land-Use Practice Description	Two accurate descriptions.	One accurate description	Two incorrect descriptions	No descriptions included.
Economic Re-stabilization	Rational explanation of effects on economy with specific examples	Rational explanation of effects on economy, no specific examples.	Incorrect link of land-use practice to economic stability.	No attempt to answer.
Length of Answer (Per part)	Contains at least 2 paragraphs in complete sentences.	Contains 1 or more paragraphs with complete sentences.	Less than 1 paragraph, or incomplete sentences.	Is not written in paragraph form.

Essay Question #2

Directions: Write your answer in complete sentences. Be sure to answer the question fully and write the required stated amount. Unreadable answers will be marked wrong, so write neatly!

There are 15 points available for this question.

Essay Question: ***In a minimum of five paragraphs, write about an important concept or application of Biology in your life that you have experienced. Explain how it relates to Biology and why you find it interesting. When describing how it related to Biology be sure to include specific vocabulary or theory-based examples (at least 2) that you learned about in Unit 1.***

Essay Question #2 Rubric

	3	2	1	0
Concept/Application	Includes a viable concept/application.	Concept/Application connection is weak	No attempt to link concept/application to Biology.	Nothing written.
Relation to Biology	Well-reasoned and applicable relationship to Biology.	Well-reasoned but incorrect relationship to Biology.	Insufficient explanation for reasoning.	No attempt to relate concept to Biology.
Why is this interesting?	Complete explanation of why it is interesting to the student.	Brief or incomplete explanation of why concept is interesting to student	[redacted]	No attempt to explain why concept is interesting to student.
Biology Vocabulary or Theory Link	Includes 2 accurate specific vocabulary and/or theory in explanation.	Includes 1 inaccurate specific vocabulary and/or theory in explanation.	Includes 2 inaccurate specific vocabulary and/or theory in explanation.	No attempt to include specific vocabulary and/or theories in explanation.
Length of Answer	Contains at least 5 paragraphs in complete sentences.	Contains 3-4 paragraphs with complete sentences or 5+ with incomplete sentences.	Contains 1-2 paragraphs with complete sentences or 3-4 paragraphs with incomplete sentences.	No attempt at using complete sentences and/or less than 1 paragraph.

Essay Question #3

Directions: Write your answer in complete sentences. Be sure to answer the question fully and write the required stated amount. Unreadable answers will be marked wrong, so write neatly! There are 15 points available for this question.

Write an essay of at least 3 paragraphs in which you discuss three of the major themes within biology. Be sure to state the theme clearly and explain why it is important through the use of specific examples and appropriate scientific vocabulary. Be sure to write in complete sentences with correct grammar, punctuation, and spelling.

Essay Question #3 Rubric

	3	2	1	0
Biological Theme (3)		Theme is identified correctly	Theme is incorrect	No theme identified
Statement of Importance (3)	Complete explanation of why it is important.	Incomplete explanation of theme		No explanation of theme
Use of specific examples (3)	Appropriate specific examples included	Inappropriate specific examples included		No specific examples included
Use of scientific vocabulary	Includes at least 3 accurate scientific terms.	Includes 2 scientific terms or 3+ with 1 inaccurate.	Includes 2+ inaccurate scientific terms	No use of scientific terms.
Grammar, Punctuation, and Spelling	No major errors in punctuation, grammar, or spelling.	<3 major errors in punctuation grammar or spelling	>3 major errors in punctuation grammar or spelling	>5 major errors in punctuation grammar or spelling
Length of Answer	Contains at least 3+ paragraphs in complete sentences.	Contains 2 paragraphs with complete sentences or 3+ with incomplete sentences.	Contains 1 paragraphs with complete sentences or 2-3 paragraphs with incomplete sentences.	No attempt at using complete sentences and/or less than 1 paragraph.

Artifact V – Five Short Answer Questions

Short Answer: Write a short explanation of the following concepts. You may draw and label a picture to help explain your answer. All answers must be in complete sentences unless otherwise stated. All answers should include proper spelling and grammar for basic words.

Short Answer Question #1

State and describe the 5 steps of the scientific process. Include 1-2 sentences per description. (12 pts)

Short Answer Question #1 Rubric:

Point Value	Component	Total Possible
1	Correctly stated step of Scientific Process (per step)	5
1	Accurate description of step (Per Step)	5
1	Use of complete sentences	1
1	Proper grammar and spelling	1

Short Answer Question #2

Convert 135 mi to kilometers, decimeters, meters, centimeters, and millimeters. Use scientific notation. (1 mi = 1.62km) Answers do not need to be in complete sentences but you **must show your work for full credit**. (10 pts)

_____ km | _____ dm | _____ m | _____ cm | _____ mm

Short Answer Question #2 Rubric

Point Value	Component	Total Possible
1	Correct conversion (per answer)	5
1	Work Shown (per answer)	5

Short Answer Question #3

In the study of biology we look at how one species interacts with another species. Choose any species that we discussed in class or that you are familiar with and in no more than three paragraphs explain how that species and humans interact. Be sure to write in full, complete sentences with proper spelling and grammar.

Short Answer Question #3 Rubric

	3	2	1	0
Species Selection	Accurate selection of a species that humans interact with.		Inaccurate selection of a species that humans interact with.	Failure to select a species.
Interaction Description	Comprehensive and accurate description of interaction.	Description of interaction accurate information. Or comprehensive description w/inaccurate information.	Weak description of species with accurate information or comprehensive description of species with inaccurate information.	Failure to describe interactions.
Spelling and Grammar	No major spelling or grammar mistakes.	2-3 major spelling or grammar mistakes.	4 or more major spelling or grammar mistakes.	Unreadable or failure to write in complete sentences.
Length	Three paragraphs written in complete sentences.	Two paragraphs written in complete sentences or three paragraphs in fragments.	One paragraph written in complete sentences or two paragraphs in fragments.	No formal paragraphs (less than two sentences)

Short Answer Question #4:

You conduct an experiment where you test the effect of sunlight on the growth rate of two small houseplants. Plant 1 receives 50% sunlight and the Plant 2 receives 100% sunlight. You end up with the following data.

Table 1. Total Height (cm) of Plants over 7 weeks

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Plant 1	1	2	3	4	5	6	7
Plant 2	2	4	6	8	10	12	14

In the above experiment there are other variables that are not accounted for which could influence plant growth. State three of these possible variables and explain how you could control for each. (What would your control group be?) Each variable should be explained in a single paragraph using complete sentences, proper grammar, and correct spelling. (18 pts)

Short Answer Question #4 Rubric:

	3	2	1	0
Variable Selection	Three feasible variables stated.	Two feasible variables stated.	One Feasible variables stated	No feasible variables stated.
Explanation of Control (Per variable)	Comprehensive and accurate description.	Description of control contains accurate information. Or comprehensive description w/inaccurate information.	Weak description of control with accurate information or comprehensive description of control with inaccurate information.	Failure to describe controls.
Spelling and Grammar	No major spelling or grammar mistakes.	2-3 major spelling or grammar mistakes.	4 or more major spelling or grammar mistakes.	Unreadable or failure to write in complete sentences.
Length	Each variable contained within a single paragraph for a total of three paragraphs.	Only two distinct paragraphs.	One large paragraph.	No formal paragraphs (less than two sentences)

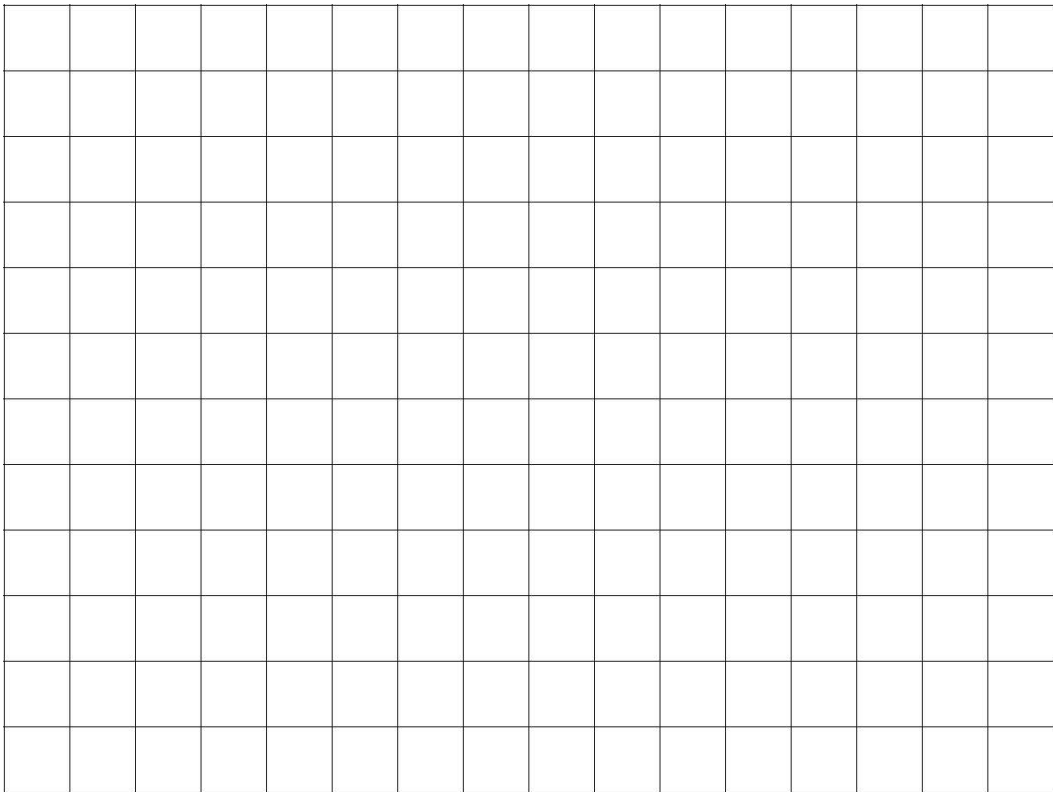
Short Answer Question #5

You conduct an experiment where you test the effect of sunlight on the growth rate of two small houseplants. Plant 1 receives 50% sunlight and the Plant 2 receives 100% sunlight. You end up with the following data.

Table 2. Total Height (cm) of Plants over 7 weeks

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Plant 1	1	2	3	4	5	6	7
Plant 2	2	4	6	8	10	12	14

On the grid provided please graph the above data in a line graph. Be sure to include all necessary parts of the graph as taught in class. (18 pts)



Short Answer Question #5 Rubric:

	3	2	1	0
Plotting	All data correctly plotted.	50-75% correctly plotted	1-25% correctly plotted.	No data plotted.
Line	Two Lines properly drawn	>50% drawn correctly	<50% drawn correctly	Failure to draw line
Legend	Legend included and 2 lines properly identified.	Legend included 1 line correctly identified	Legend included 0 lines correctly identified	No legend included.
Scale	Proper use of scale for data values on both axis.	Proper use of scale for data values on 1 axis.	Improper use of scale on both axis.	Failure to include scale values.
Labels	Both axis correctly labeled	1 axis correctly labeled	Both axis incorrectly labeled	No label on either axis.
Title	Graph contains suitable title with description of data.	Graph contains suitable title without description of data	Graph contains unsuitable title	No title included

Artifact VI – Fifteen Item Matching Question

Matching. Select the answer from the word bank that best represents the question. Write the corresponding letter in the blank. (15 questions, 2 points each)

A) Observation	B) Archaea	C) Eyepiece Lens	D) Evolution	E) Eukarya
F) Independent Variable	G) Slide	H) Dependent Variable	I) Hypothesis	J) Animalia
K) Species	L) Reproduction	M) Objective Lens	N) Energy Flow	O) Data

1. _____ Explanation of an observation.
2. _____ Gradual change in the characteristics of a species over time.
3. _____ Quantitative representation.
4. _____ Located on the *x* axis of a graph.
5. _____ Domain humans belong too.
6. _____ 10x Power
7. _____ Biological process that creates offspring
8. _____ Data collected during an experiment.
9. _____ Plate that holds object under observation
10. _____ Contains extremophiles.
11. _____ Group of organisms that can produce fertile offspring.
12. _____ Measured during an experiment.
13. _____ Variable power (4X, 10X, 40X).
14. _____ Kingdom that includes the Phylum *Arthropoda.*
15. _____ Cyclical biological process.

Artifact VII – Assignment Using a Report

Student Name: _____ Date: _____ Period: _____

Fire Lab

Purpose: To illustrate the three requirements for fire and how fire dies in a vacuum.

Hypothesis: When a lit candle is covered with a beaker, then the candle flame will be extinguished in _____ seconds.

Materials: Candles; stop watch; matches; beaker; clay

Procedure:
1. Secure candle to lab table with clay.
2. Light candle with matches.
3. Simultaneously cover the candle with a beaker and start the stop watch.
4. Stop the stop watch at the instant the candle frame has been extinguished.
5. Record the time in the data table to the tenth place.

Data: Seconds till extinguish: _____sec. (to the tenth place).

REFER TO THE FIRE LAB RUBRIC BEFORE YOU FILL OUT THIS SECTION

Results: _____

_____

_____

_____

_____

Conclusion: **Write your concluding statements in full sentences using proper scientific methodology.**

Claim: _____

_____

Evidence: _____

_____

Reasoning: _____

_____

_____

Fire Lab Rubric (40 points)

Lab Data	Point Value
1) Name/Date/Period	5
2) Hypothesis in second to the tenths place value	5
3) Data table time to the tenths place value	5
4) Results in sentence form	5
Conclusion	
5) Claim: Restate Hypothesis	5
6) Evidence: Data in sentence form	5
7) Reasoning: Accept or Reject hypothesis in sentence form with data.	10