



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

**Released Items
Support Materials
2015**

**Grade 11
Science**

**NECAP 2015 RELEASED ITEMS
GRADE 11 SCIENCE**

Grade 11 Science Released Item Information

Item Number	Big Idea ¹	Assessment Target	Depth of Knowledge Code	Item Type ²	Answer Key	Total Possible Points
1	INQ	PS 1-1	2	MC	D	1
2	SAE	PS 2-5	2	MC	C	1
3	INQ	PS 3-8	2	MC	B	1
4	POC	ESS 1-1	2	MC	A	1
5	NOS	ESS 1-2	2	MC	C	1
6	NOS	ESS 3-5	2	MC	C	1
7	SAE	LS 2-4	2	MC	D	1
8	POC	LS 3-7	2	MC	A	1
9	NOS	LS 4-9	2	MC	C	1
10	FAF	LS 3-8	3	CR4		4

Grade 11 Science Released Inquiry Task Information

Item Number	Big Idea ¹	Inquiry Construct	Depth of Knowledge Code	Item Type ²	Total Possible Points
1	INQ	1-1	2	SA	2
2	INQ	2-5	2	SA	2
3	INQ	3-8	3	CR3	3
4	INQ	3-10	2	SA	2
5	INQ	4-11	2	SA	2
6	INQ	4-12	3	SA	2
7	INQ	2-4	2	SA	2
8	INQ	4-12	3	CR3	3

¹Big Idea: NOS = Nature of Science, SAE = Systems and Energy, MAS = Models and Scale, POC = Patterns of Change, FAF = Form and Function, INQ = Scientific Inquiry

²Item Type: MC = Multiple Choice, CR = Constructed Response, SA = Short Answer

**NECAP 2015 RELEASED ITEMS
GRADE 11 SCIENCE**

PS1 (9-11) INQ-1 Use physical and chemical properties as determined through an investigation to identify a substance.

- 1 Four solid black cubes were used in a lab experiment. The results of the lab experiment are displayed in the data table below.

Properties of Four Cubes

Property	Cube W	Cube X	Cube Y	Cube Z
Magnetic	No	No	No	Yes
Floats	Yes	Yes	Yes	No
Malleable	No	No	No	Yes
Combustible	Yes	Yes	No	No

Which cube is **most likely** a metal cube?

- A. Cube W
- B. Cube X
- C. Cube Y
- D. Cube Z

**NECAP 2015 RELEASED ITEMS
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PS2 (9-11) SAE-5 Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).

2 A student wants to know whether soil heats faster than water. He follows the procedure below using identical containers.

- Pour 250 mL of soil into container I, 250 mL of salt water into container II, and 250 mL of tap water into container III.
- Place the three containers an equal distance from a light source.
- Turn on the light source.
- Measure the temperature of the substance in each container every 10 minutes for 30 minutes.

Which additional step would **best** improve the student's investigation?

- A. Use two different types of soil.
- B. Use smaller amounts of soil and more water.
- C. Measure the temperature of soil and water before beginning.
- D. Measure the light intensity using a light meter.

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PS3 (9-11) INQ-8 Given information (e.g., graphs, data diagrams), use the relationships between or among force, mass, velocity, momentum, and acceleration to predict and explain the motion of objects.

Please use the formula guide on the reference sheet to answer the question.

- 3 The table below shows the acceleration rates of a 5-kg mass when acted on by different net forces.

Acceleration Rates of a 5-kg Mass

Acceleration (m/s²)	Net Force (N)
5	25
10	50
15	75

Based on the table, what is the acceleration rate of the 5-kg mass when acted on by a net force of 60 N?

- A. 7 m/s²
- B. 12 m/s²
- C. 14 m/s²
- D. 16 m/s²

**NECAP 2015 RELEASED ITEMS
GRADE 11 SCIENCE**

ESS1 (9-11) POC-1 Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an Earth event (e.g., volcanoes, mountain ranges, islands, earthquakes, tides, tsunamis).

- 4 The table below provides information about Old Faithful geyser in Yellowstone National Park.

Eruptions at Old Faithful Geyser

Duration of Eruption (min)	Time before Next Eruption (min)
1.5	51
2.0	58
2.5	65
3.0	71
3.5	76
4.0	82
4.5	89
5.0	95

Which conclusion about the eruptions does the information in the table **best** support?

- A. The duration of an eruption can be used to predict the amount of time that will pass before the next eruption.
- B. Eruptions with short durations discharge more water than eruptions with long durations.
- C. The next eruption occurs more quickly after a long eruption than after a short eruption.
- D. Eruptions follow a steady progression from eruptions with a short duration to eruptions with a long duration.

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ESS1 (9-11) NOS-2 Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.

- 5 Scientists have collected evidence indicating that
- an ocean was once located in the midwestern United States,
 - a tropical island was once located in Alaska, and
 - swamps were once located in Antarctica.

What is the **most likely** cause for the differences at these locations today?

- A. ice ages
- B. massive earthquakes
- C. plate movements
- D. volcanic eruptions

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ESS3 (9-11) NOS-5 Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes).

- 6 Radio telescopes have been used to observe quasars, pulsars, and gas clouds between stars.

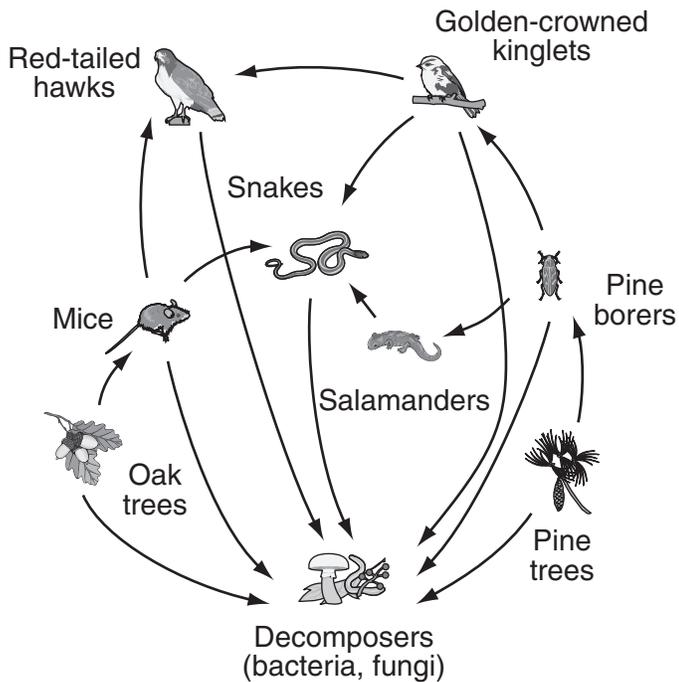
How has using radio telescopes advanced scientists' understanding of the universe?

- A. Radio waves travel faster than visible light, so discoveries are made more frequently.
- B. Radio telescopes are connected in arrays, so more scientists can study the data.
- C. Objects that do not give off visible light can be studied.
- D. Objects that do not have mass can be detected.

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LS2 (9-11) SAE-4 Trace the cycling of matter (e.g. carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g. photosynthesis, cellular respiration).

7 The diagram below shows a food web.



Which two organisms shown in the diagram occupy the tertiary (third) trophic level?

- A. decomposers and pine borers
- B. golden-crowned kinglets and pine trees
- C. red-tailed hawks and mice
- D. snakes and salamanders

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LS3 (9-11) POC-7 Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sachs disease).

- 8** Erminette chickens have an allele for black feathers (B) and an allele for white feathers (W). Heterozygous erminette chickens have a speckled black-and-white appearance.

Two heterozygous erminette chickens with the genotype BW are crossed. What percentage of the offspring will have **only** white feathers?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

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GRADE 11 SCIENCE**

LS4 (9-11) NOS-9 Use evidence to make and support conclusions about the ways that humans or other organisms are affected by environmental factors or heredity (e.g., pathogens, diseases, medical advances, pollution, mutations).

- 9 The Canadian lynx is a wild cat uniquely adapted to hunting snowshoe hares in deep snow. The Canadian lynx is found in the northern United States and Canada.

A climate model predicts the temperature will increase and reduce the area of snow cover in the Canadian lynx's habitat.

Which conclusion about the future of the Canadian lynx is the **most likely** if the climate model is accurate?

- A. The Canadian lynx will become extinct in the northern United States and Canada.
- B. The Canadian lynx will hunt other prey within the warmer habitat.
- C. The Canadian lynx will migrate to colder regions to find snowshoe hares.
- D. The Canadian lynx will reproduce with other cat species to survive in warmer habitats.

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LS3 (9-11) FAF-8 Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers).

10 The table below shows traits of different plant groups.

Plant Traits

Group	Flowers	Waxy Cuticle on Leaves	Stomates in Leaves	Xylem and Phloem	Seeds	More Than One Vein in Leaves
Angiosperms	X	X	X	X	X	X
Mosses		X	X			
Ferns		X	X	X		X
Gymnosperms		X	X	X	X	X
Lycophytes		X	X	X		
Liverworts		X				

- a. Identify the two plant groups that are most closely related to mosses, and explain your reasoning.
- b. Draw a diagram to show the evolutionary relationships among the six plant groups shown in the table.

**NECAP 2015 RELEASED ITEMS
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Scoring Guide

Score	Description
4	The response demonstrates a thorough understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The response correctly identifies two plant groups most closely related to moss and explains their reasoning AND draws a diagram that shows the evolutionary relationship between the six plant groups shown in the table.
3	The response demonstrates a general understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The overall response is general.
2	The response demonstrates a limited understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The overall response is limited.
1	The response demonstrates a minimal understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The overall response is minimal.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

Part a. The groups most related to the mosses are the lycophytes, liverworts, and the ferns. They share fewer traits with liverworts and are missing traits held in common by the other groups.

Note: "Missing traits" may be shared for a complete response. Specific traits in common with moss should be identified for full credit.

Part b. The labeled diagram should show each group diverging from a line of common ancestry in the following order:

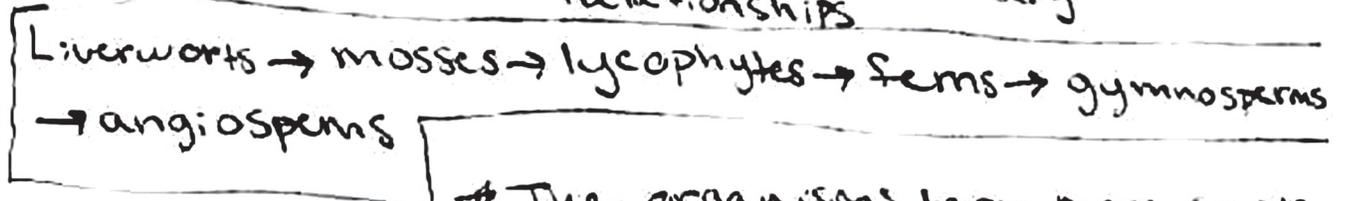
1. liverworts
2. mosses
3. lycophytes
4. ferns
5. gymnosperms
6. angiosperms

Note: Evolutionary relationships should be indicated with arrows or other means to show progression.

- 10 (a) The two plant groups most closely related to mosses are lycophytes and ferns because they have the most similar plant traits to mosses. All three have stomates in ~~the~~ the leaves which gives them a close characteristic of being a mossy plant. They also have waxy cuticles on their leaves which is common for mosses because they grow in shady damp areas which causes the residue formation on the leaves. They also fall close together evolutionarily.

(b)

Diagram of Evolutionary Relationships



* The organisms begin more simple and progress to have more traits and become more complex.

The response demonstrates a thorough understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The response correctly identifies two plant groups most closely related to moss (lycophytes, ferns) and explains the reasoning. The response also provides a diagram with arrows that show the proper progression.

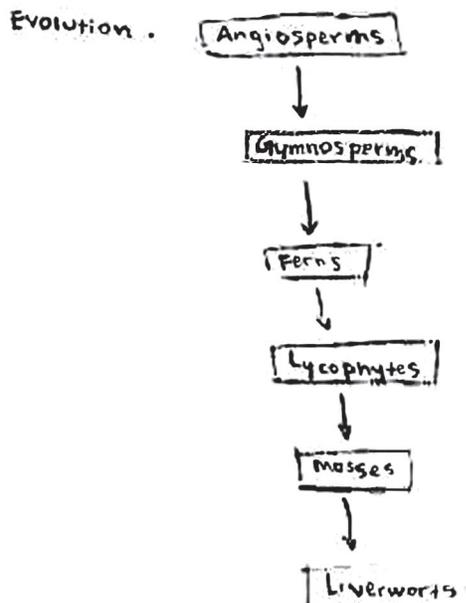
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SCORE POINT 3

10

a.) Ferns and Lycophytes are most closely related to mosses because they all have waxy cuticuls on leaves and stomates in leaves. Other groups have this quality, but Ferns and Lycophytes only have two and one other characteristic respectively. Ferns also have Xylem and Phloem and more than one vein in leaves while Lycophytes only have Xylem and Phloem other than the two characteristics they share. For this reason, Ferns and Lycophytes are most closely related to mosses.

b.)

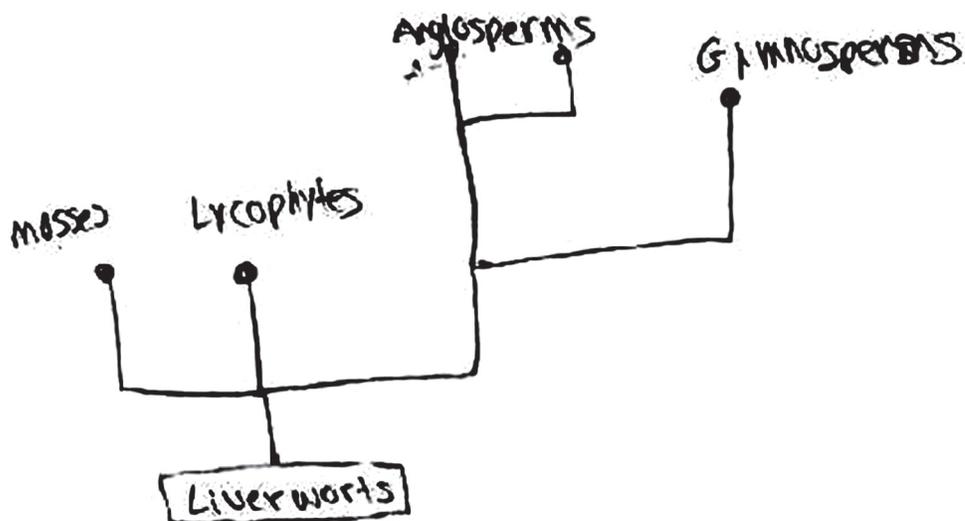


The response demonstrates a general understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The response correctly identifies two plant groups most closely related to moss (lycophytes, ferns) and explains the reasoning. The response also provides a diagram with arrows, but the arrows are reversed.

10

a. Liverworts and Lycophytes are the most closely related to mosses because mosses have waxy cuticle on leaves and stomates in leaves and both Lycophytes have them too. * The other plants that have both of these characteristics also have xylem and phloem, seeds, and more than one vein in leaves (which means they are more complex plants and less closely related to mosses).
* Liverworts also have waxy cuticle on leaves

b.



The response demonstrates a limited understanding of the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment. The response to Part A identifies two plant groups (liverworts, lycophytes) and provides acceptable reasoning. The response to Part B implies that mosses and lycophytes evolved simultaneously from liverworts, and is missing ferns.

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SCORE POINT 1

10

a. Lycophytes and Liverworts. Both have the closest number of similar traits as mosses.

b.

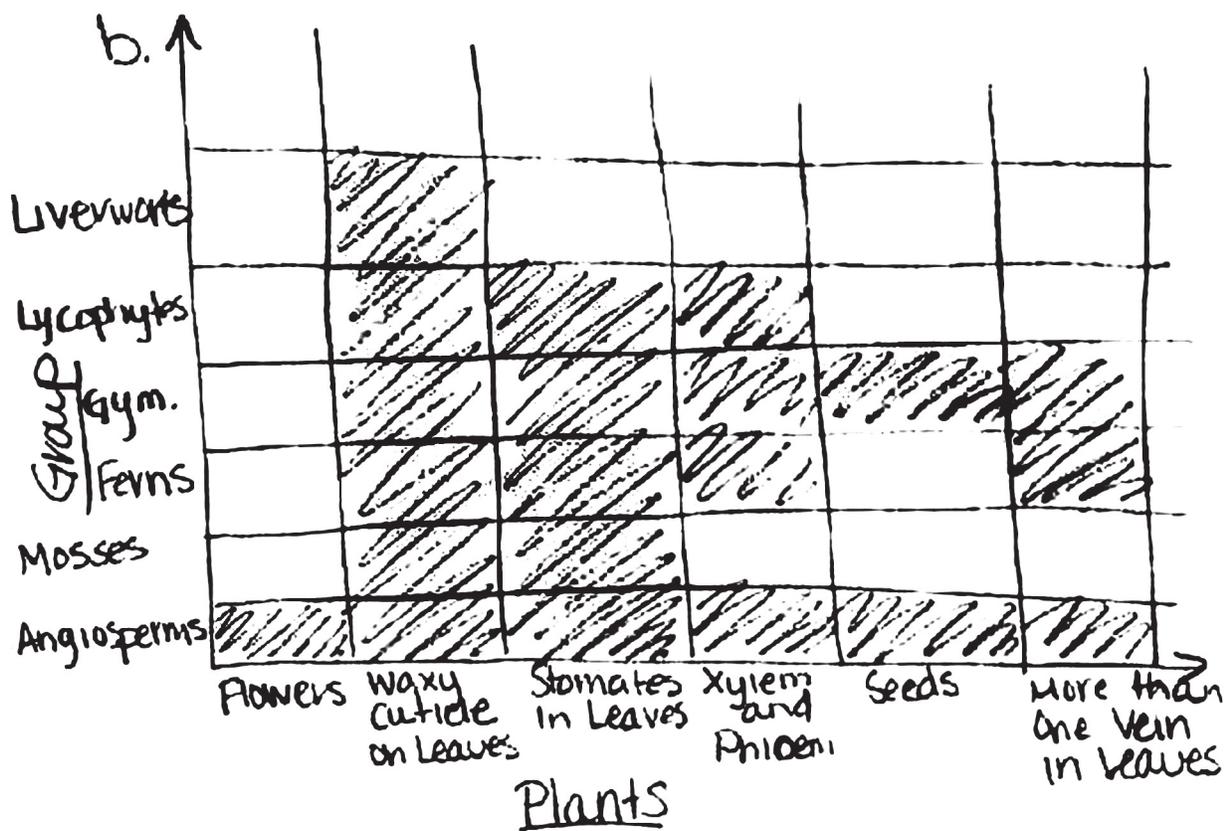
The response demonstrates a minimal understanding by identifying two acceptable plant groups and providing a minimal explanation.

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SCORE POINT 0

10

a. waxy cuticle on Leaves, and Stomates in leaves. These were the only two that have mosses x'ed off.



The response is incorrect or irrelevant to the skill or concept being measured. The response to Part A interprets the prompt to read "trait" instead of "group." No credit. Part B does not clearly show any evolutionary relationship between the plant groups.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 1:	Formulating Questions and Hypothesizing Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction.
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- 1 Based on Diagram 1 and Table 1, write a prediction about how the changes in populations of kelp and sea urchins affect the flow of energy in the ecosystem of the Aleutian Islands.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of analyzing information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction. The response includes a prediction about how the changes in the populations of kelp and sea urchins affect the flow of energy in the ecosystem of the Aleutian Islands.
1	The response demonstrates a limited understanding of analyzing information from observations research, or experimental data for the purpose of formulating a question, hypothesis, or prediction. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by the following sample response:

Prediction: A decrease in kelp and an increase in sea urchins will cause less energy to flow to sea urchins and fish that feed on kelp. This will also cause more energy to flow to fishes that feed on sea urchins and to sea otters.

Scoring note: This alternate relationship is also acceptable: an increase in kelp and a decrease in sea urchins will result in more energy flow to sea urchins and fishes that eat kelp, and less energy flow to fishes that eat sea urchins and to sea otters.

NECAP 2015 RELEASED INQUIRY TASK
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SCORE POINT 2

- ① I predict that the changes in population of kelp will affect the sea urchin population, because that is what urchins feed on. If there are more urchins in one specific area there will most likely be less kelp there. If there are less urchins then there will be more kelp in that area. If there were to be less kelp then competition will rise for food and the food chain will be imbalanced and each species will eventually start to decline.

The response demonstrates a general understanding of analyzing information from observations, research, or experimental data to formulate a prediction. The response includes a prediction about how the changes in the populations of kelp and sea urchins affect the flow of energy in the ecosystem of the Aleutian Islands.

SCORE POINT 1A

- ① I predict that the changes in populations of kelp and sea urchins will affect the flow of energy in the ecosystem of the Aleutian Islands because the amount of kelp will be affected. If there are less sea urchins then there are more kelp. The energy flow from kelp to urchins is a huge factor in how the matter is distributed on the food web.

The response demonstrates a limited understanding of analyzing information from observations, research, or experimental data to formulate a prediction. The response predicts an inverse relationship between populations of kelp and sea urchins, but does not link to energy flow throughout the food web.

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SCORE POINT 1B

- ① As the number of sea urchins increases, the population of kelp decreases. Conversely, as the number of sea urchins decreases, the population of kelp increases. Having a lower population of sea urchins will allow the kelp to prosper, building up to a healthy ecosystem for all organisms.

The response demonstrates a limited understanding of analyzing information from observations research, or experimental data to formulate a prediction. The response predicts an inverse relationship between populations of kelp and sea urchins, but does not discuss the impact on the rest of the food web.

SCORE POINT 0

- ① I predict that the sea urchin and sea otter populations will diminish and all other populations will increase in size.

The response is incorrect or irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 5:	Planning and Critiquing of Investigations Develop an organized and logical approach to investigating the question, including controlling variables.
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- 2 Suppose you are setting up an investigation to test your prediction in question 1. Describe one variable that will need to be controlled and one variable that will need to be measured to provide the **best** evidence to support or refute your prediction. Explain how each variable should be controlled or measured.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response describes one variable that will need to be controlled and one variable that needs to be measured to provide the best evidence to investigate the prediction in question 1 and explains how each variable should be controlled or measured.
1	The response demonstrates a limited understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by identification and explanation for one variable in each of the following groups:

- a controlled variable
 - o time
 - o location or area
 - o data collection methods/procedures
 - o immigration/emigration of individuals into/out of populations
 - o abiotic factors such as pollution, nutrient temperature, sunlight, ocean currents
- a measured variable
 - o changes in populations of subject organisms over time (or before/after)
 - o changes in diet(s) of subject consumers over time

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SCORE POINT 2

1 If there is a smaller kelp population, then the sea urchin and fish populations will also be smaller. The same is true for the populations of animals that feed on fish or sea urchins, if the population decreases continues up the food chain. This means that although the direction that the energy flows is the same, there is less energy overall because there is less kelp to provide it for the rest of the system.

2 The temperature of the environment in which the experiment takes place would have to be controlled because if the temperature was higher or lower than the organisms were used to, it could affect their health, population, and/or feeding habits. If any of those were altered, unintentionally, it would skew the results. The temperature could be controlled by conducting the experiment in a closed setting.

The independent variable should be the amount of kelp present, so the populations of the other organisms would have to be measured. This could be measured by only using a small, specific, and enclosed area for the experiment so that populations could be easily counted.

The response demonstrates a general understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response describes one variable that will need to be controlled (temperature) and one variable that needs to be measured (kelp population) to provide the best evidence to investigate the prediction in question 1, and explains how each variable should be controlled or measured.

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SCORE POINT 1

① I predict that when kelp increases in population sea urchins decrease in population, and when kelp decreases sea urchins decrease.

② one variable that would need to be controlled is location, and one variable that would need to be measured is population.

The response demonstrates a limited understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response identifies a controlled variable (location) and measured variable (population) without explanation.

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SCORE POINT 0

① If the Keppor Seaurchin's Die all the other animals will Die Because there is no food Which they need to eat to get energy to Survive.

② I would put the sea urchins in a controlled and the kelp in an uncontrolled because it can't swim away.

The response is incorrect or irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry:	Conducting Investigations
Inquiry Construct 8:	Use accepted methods for organizing, representing, and manipulating data.

- 3 Construct a graph of the data in Table 2 that shows how the sea urchin biomass and kelp biomass are related to the three otter population statuses. Provide a key to identify the urchin data and the kelp data.

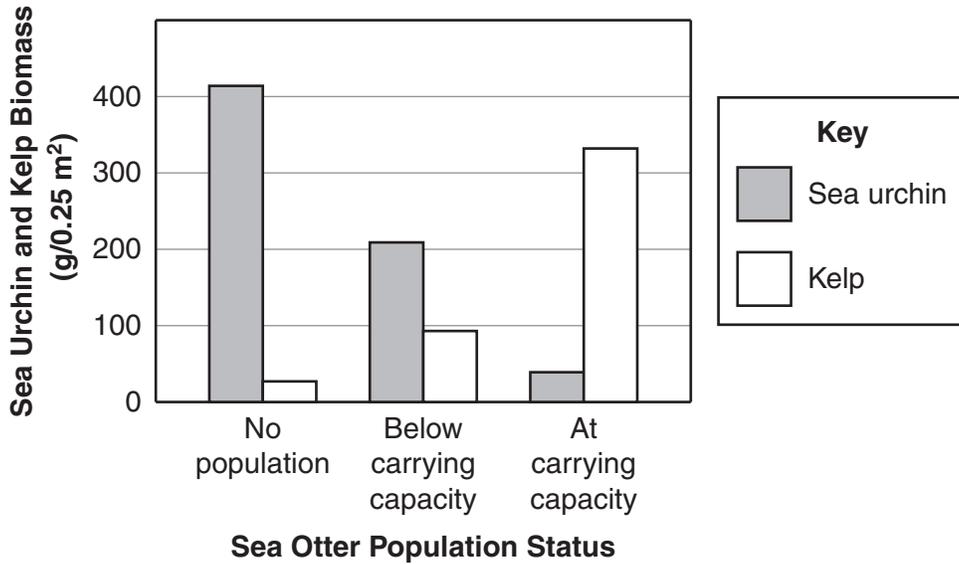
Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of how to accurately represent data in a graph. The response includes construction of an appropriate graph of the data presented in Table 2 using a key to identify sea urchin and kelp data.
2	The response demonstrates a general understanding of how to accurately represent data in a graph. The overall response is general.
1	The response demonstrates a limited understanding of how to accurately represent data in a graph. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

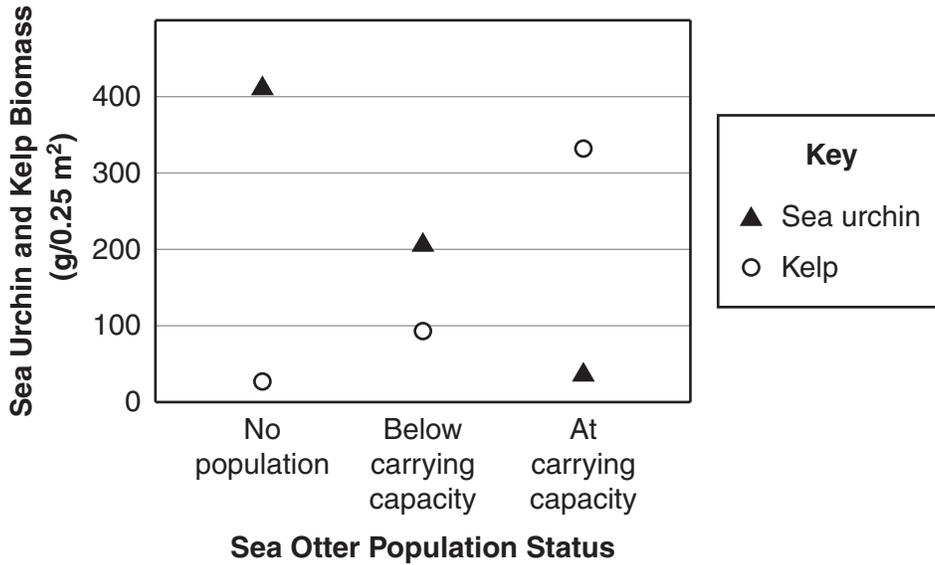
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A thorough understanding can be exemplified by one of the following sample responses:

**Sea Urchin and Kelp Biomass Estimates
Aleutian Island Marine Studies
1987–1988**



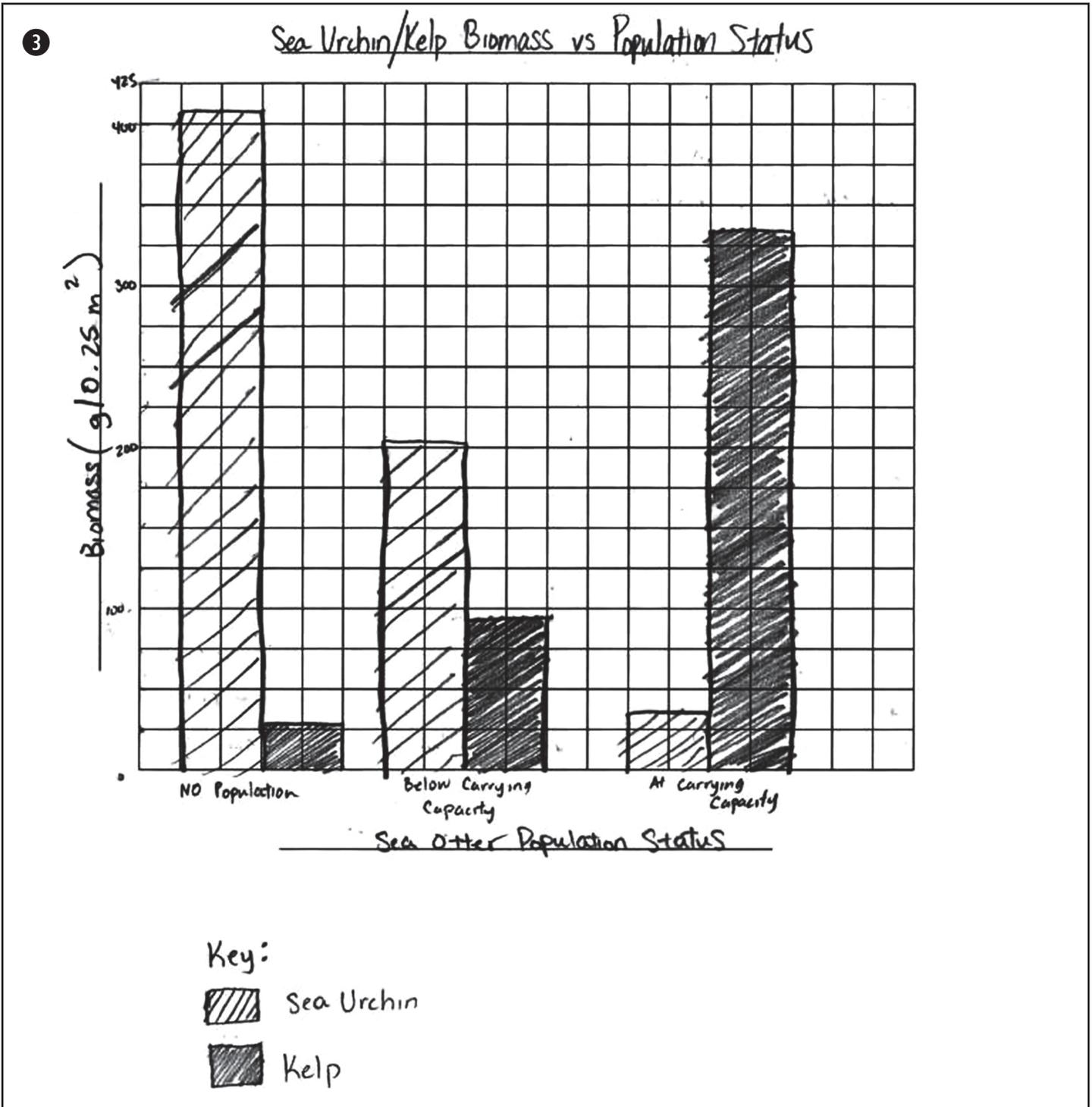
**Sea Urchin and Kelp Biomass Estimates
Aleutian Island Marine Studies
1987–1988**



Note: A general understanding may be demonstrated by presentation of another type of graph (not a bar or plot graph) containing data showing some of the necessary relationships.

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GRADE 11 SCIENCE

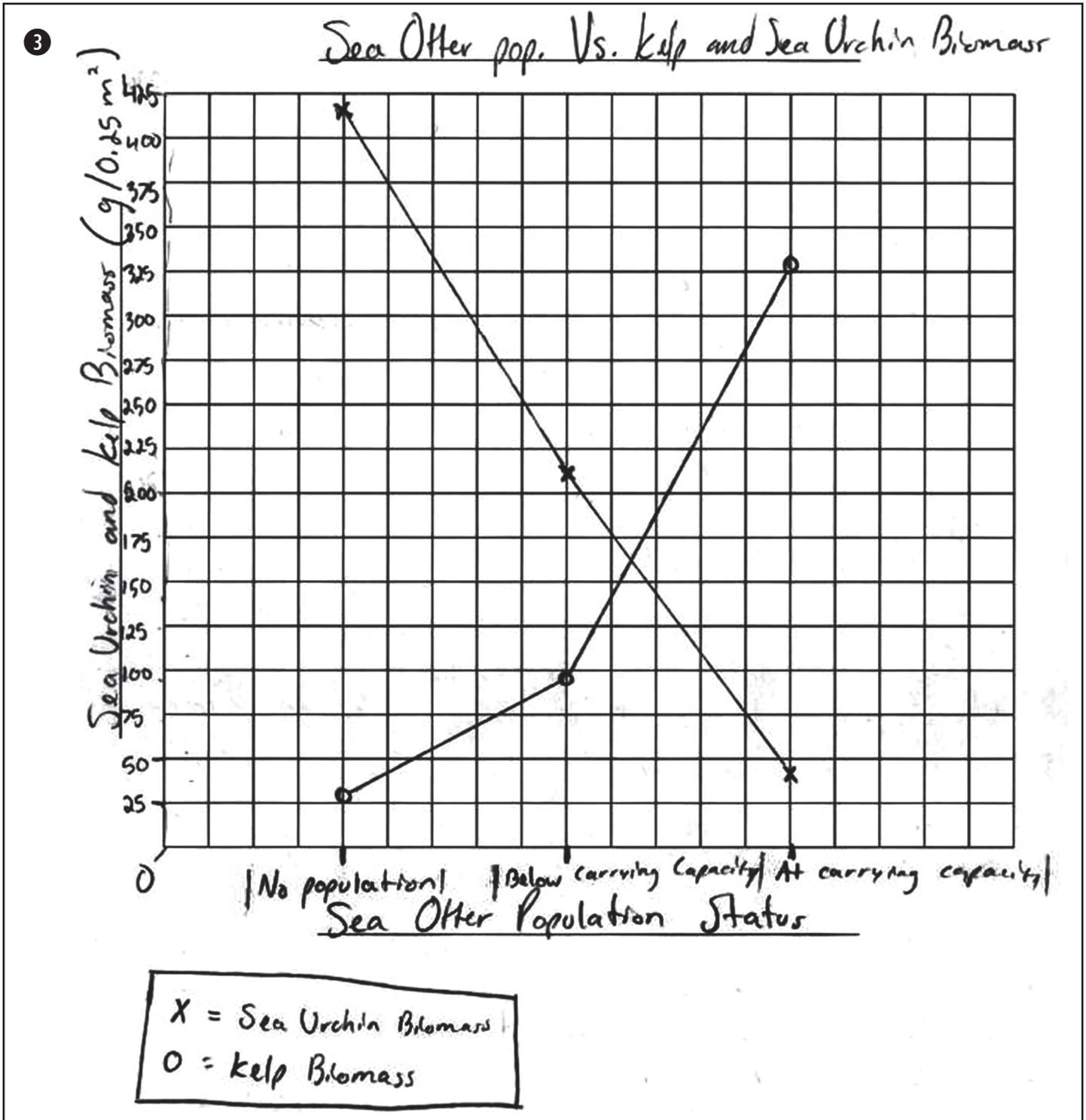
SCORE POINT 3



The response demonstrates a thorough understanding of how to accurately represent data in a graph. The response includes construction of an appropriate graph of the data presented in Table 2 using a key to identify sea urchin and kelp data.

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GRADE 11 SCIENCE

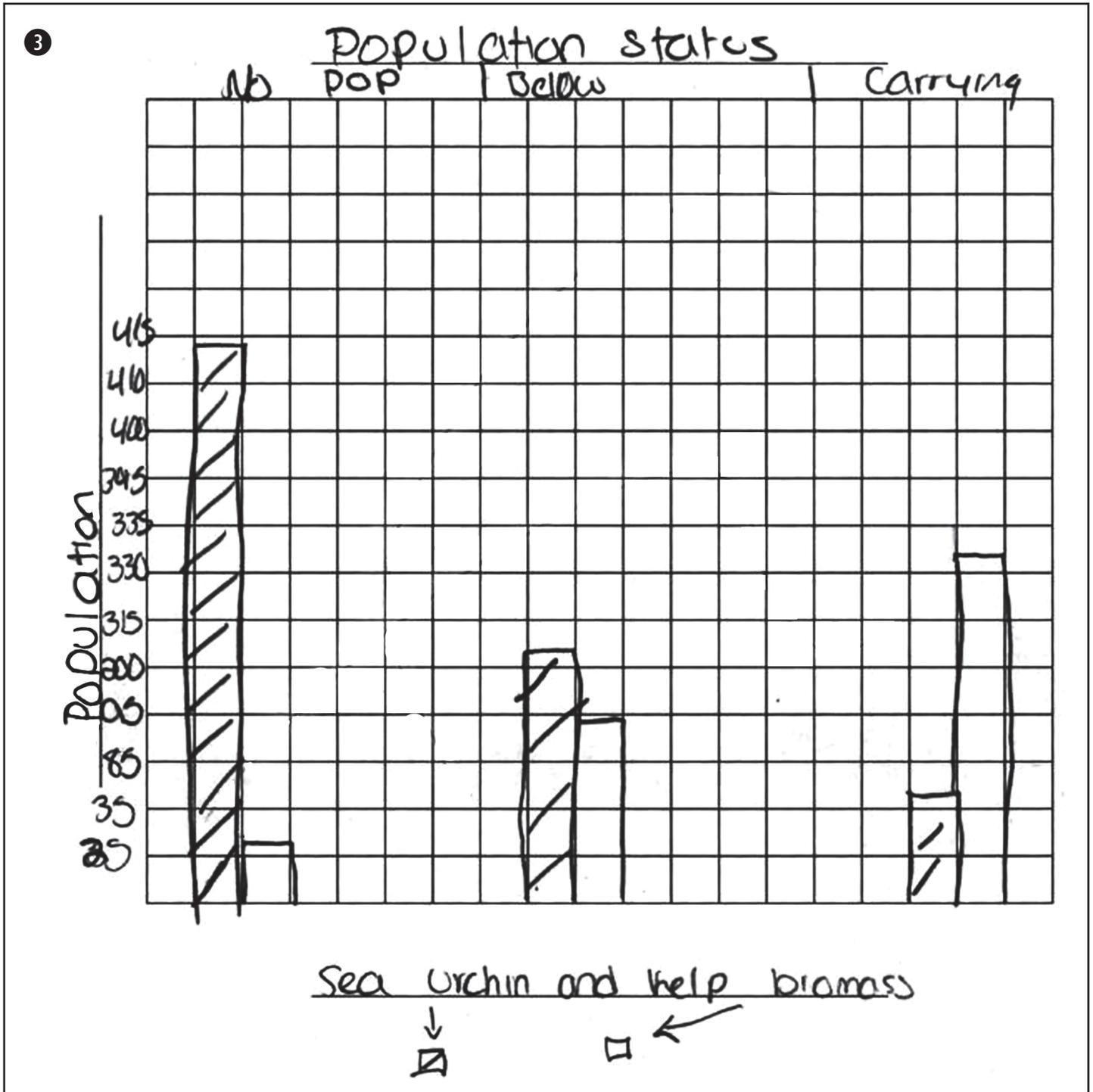
SCORE POINT 2



The response demonstrates a general understanding of how to accurately represent data in a graph. The graph is correctly labeled and plotted, but the data points are connected with lines, which is not appropriate for this data set.

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GRADE 11 SCIENCE

SCORE POINT 1

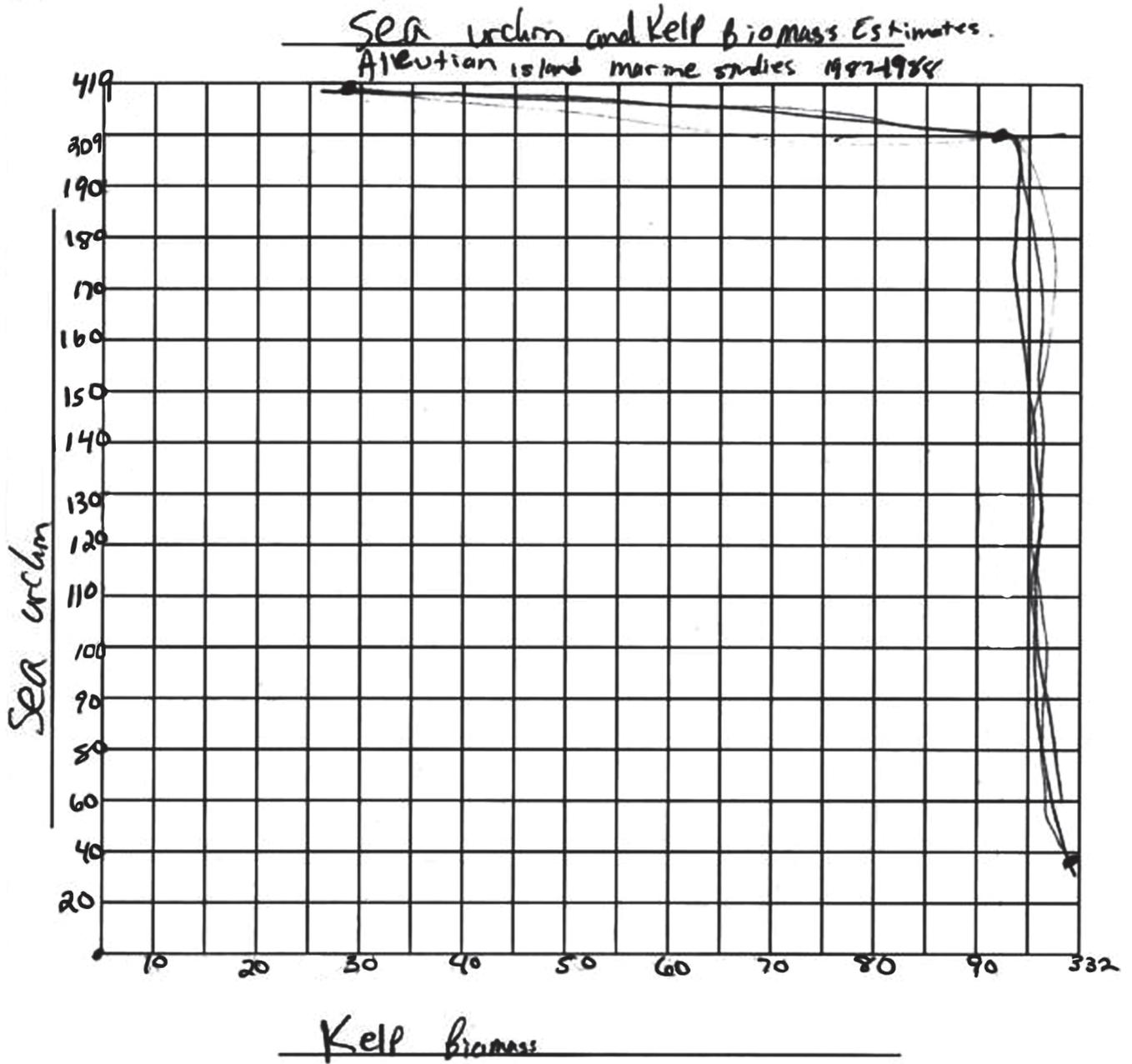


The response demonstrates a limited understanding of how to accurately represent data in a graph. The response attempts to create a bar graph, but the x-axis is not labeled, and the y-axis scale is not appropriate.

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GRADE 11 SCIENCE

SCORE POINT 0

3



The response does not show understanding of how to represent the information in a graph.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 10:	Conducting Investigations Summarize results based on data.
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- 4 Based on the data the students collected, identify the ecological relationships among the sea otters, sea urchins, and kelp. Explain what these relationships indicate about the flow of energy in the marine ecosystem of the Aleutian Islands.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to summarize results based on data. The response identifies the ecological relationships among the sea otters, sea urchins, and kelp based on data the students collected, and explains what these relationships indicate about the flow of energy in the marine ecosystem of the Aleutian Islands.
1	The response demonstrates a limited understanding of how to summarize results based on data. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by the following sample response:

Sea otters consume sea urchins but not kelp. Sea urchins consume kelp but are preyed upon by sea otters. Kelp are fed upon by sea urchins. These relationships show that energy flows from kelp to sea urchins and from sea urchins to sea otters.

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SCORE POINT 2

- 4 When there are more sea otters there are less sea urchins and more kelp. This shows that energy flows from the kelp to the sea urchins to the otters and each population is dependent on the ones below it and is regulated by the consumers above it.

The response demonstrates a general understanding of how to summarize results based on data. The response shows general understanding of how the energy flows from the kelp to the sea urchins to the otters, and how the otter population impacts the sea urchin and kelp populations.

NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE

SCORE POINT 1

- 4 The relationship between sea otters and sea urchins and kelp is that sea otters consume sea urchins which eat kelp.
So when there's less kelp that means there is more sea urchins, which provides food for sea otters.

The response demonstrates a limited understanding of how to summarize results based on data. The response shows understanding of the data and the ecological relationships, but does not discuss the flow of energy in the marine ecosystem of the Aleutian Islands.

SCORE POINT 0

- 4 The ecological relationships among the sea otters, sea urchins, and kelp is there's food for all of them to eat.

The response is irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 11:	Developing and Evaluating Explanations Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous.
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- 5 Use the data the students collected to explain how the energy flow through the food web to orcas shown in Diagram 1 has shifted from pre-1900 to the present. Use data from the students' research findings to support the shift in energy flow in your explanation.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response uses data the students collected to explain how the energy flow through the food web to orcas as shown in Diagram 1 has shifted from pre-1900 to the present, and uses data from the students' research findings to support the shift in energy flow in the explanation.
1	The response demonstrates a limited understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by the following sample response:

Pre-1900, much more energy flowed to orcas through great whales, seals, and sea lions. This is shown in Table 3 by the much greater biomass of these orcas' prey types. In the present, much less energy is available to orcas from these types of prey because their biomass is much less in Table 3. Diagram 1 shows that another source of energy for orcas is sea otters. So orcas may be getting more of their energy from sea otter prey than in the past. Cody's research study results summary states that orcas have changed to a diet of more sea otters.

Note: Either quantitative or qualitative data references are acceptable as support for the explanation.

NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE

SCORE POINT 2A

5 The energy flow through the food web to orcas has shifted greatly since the pre 1900's. During the mid twentieth century great whales were hunted, which shifted the diet of the orcas - the orcas began to feed on sea otters which directly affected the kelp and sea urchin population. Pre 1900's the great whale population was 3740 and now the present population is 520. In the 1900's the seals and sea lions population was 130 and now it's 80. The shifting of the orcas prey directly affects the energy flow through the food chain.

The response demonstrates a general understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response uses quantitative data to show understanding of the shift in the energy flow once the orcas switched to seals/sea lions, and then otters, as their main food source.

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SCORE POINT 2B

- 5 When the great whales were being hunted to near extinction, Orcas had to turn to the seals and sea lions for sustenance because these were a limited number of great whales. However, with more of a focus on the seals and sea lions, the population of these animals began to decline. With now a limited number of seals, sea lions, and great whales, the energy shifted towards sea otters. Because they were the next best thing to replace seals and sea lions.

The response demonstrates a general understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response shows general understanding of how the orca's diet has shifted over time by using qualitative information from the study results as support.

SCORE POINT 1

- 5 When the orca's food supply became almost non-existent they started to look for other species to eat. This led to the orcas eating the otters which made their population decline rapidly.

The response demonstrates a limited understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response shows some understanding of how the orcas changed their diet to include otters due to scarcity, but the supporting details from the students' research findings are limited.

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SCORE POINT 0

5 Orcas are the top of the food web and are the dominant predator in their ecosystem.

The response is totally irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 12:	Developing and Evaluating Explanations Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.
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- 6 Based on all the data from the students’ research, explain whether the evidence **supports or refutes** your prediction. Include one specific example from the data to support your reasoning. If the data the students compiled does not provide enough data to evaluate your prediction, explain why the data does not support or refute your prediction.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response explains whether the evidence supports or refutes the student’s prediction in question 1 and includes one specific example from the data to support the reasoning. If the data does not provide enough evidence to evaluate the prediction, an explanation of why the data does not support or refute is given.
1	The response demonstrates a limited understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by one of the following sample responses:

Evidence supports

(Prediction: Reduction in sea urchins will reduce energy flow from kelp to sea urchins.) The prediction is supported because the data in Table 2 shows that sea otter predation on sea urchins reduced sea urchin biomass. This caused kelp biomass to increase because urchins were not consuming nearly as much kelp.

Evidence refutes

(Prediction: Reduction in sea urchins will decrease energy flow to sea otters.) The prediction is refuted because Table 2 showed that sea urchin biomass was low when otter populations were at carrying capacity. If energy flow decreased to sea otters when sea urchin biomass was lower, there should be fewer sea otters, not more.

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Evidence does not support or refute

(Prediction: Reduction in sea urchins and increase in kelp will increase energy flow to fishes but reduce energy flow to sea otters.) The prediction is not supported or refuted by the data. No data for fishes is given, so the energy flow to fishes is unknown. Also data from Tables 1 and 2 and the research study summary shows that energy flow from sea urchins to otters is controlled more by predation on sea otters than by sea urchin biomass. More study would need to be done to know whether the prediction is supported or not.

Note: Support for a prediction need not be inclusive of all the research so long as it includes the data relevant to the prediction.

SCORE POINT 2

① With more kelp, there will be more sea urchins, or the sea urchins that are there will be healthy which will feed fish and sea otters will keep the Harbor seal, the Steller sea lion and the orca fed, and their species going strong

⑥ The student's data refutes my hypothesis of more kelp would cause higher population of everything else. Instead, the problem starts at the top. With loss of food for the orcas, they turned to other prey. When they started eating sea-otters they the otters population declined and the sea urchin population rose. Since there was more sea urchin, there was less kelp due to the consumption of the sea urchin.

The response demonstrates a general understanding of how to use evidence to explain how the hypothesis is refuted. The response explains how the evidence refutes the student's prediction in question 1, and includes specific details from the data to support the reasoning.

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SCORE POINT 1

① As the kelp and sea urchin populations decline, so will the fish and sea otter populations, which would decrease the seal and sea lion populations, decreasing the killer whale population.

⑥ My prediction was primarily wrong. According to the data, the population shifts were due to a decrease in the Great Whale populations and Orca hunting patterns.

The response demonstrates a limited understanding of how to use evidence to explain how the hypothesis is refuted. The explanation and data support are limited.

SCORE POINT 0

① There was a change in the biomass and the kelp biomass.

⑥ The data supports my prediction. The ecosystems are getting ruined because humans are killing and hurting it.

The response is incorrect or irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 4:	Planning and Critiquing Investigations Identify information/evidence that needs to be collected in order to answer the question, hypothesis, prediction.
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- 7 A scientist wants to test this hypothesis: orca predation caused the sea otter population to decline. Describe what new data the scientist could collect to further test the hypothesis. Explain how the **new** data could support this hypothesis.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to identify the types of evidence that should be gathered to answer the hypothesis. The response describes what additional data scientists could gather to investigate the hypothesis that orca predation caused the sea otter population decline and explains how the data from this new investigation could support this hypothesis.
1	The response demonstrates a limited understanding of how to identify the types of evidence that should be gathered to answer the hypothesis. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding can be exemplified by the following sample response:

The scientist can gather more data about the orca diet. They could watch the orcas to see what they eat or look at orca waste to find out what they have been eating. If these data show that otters are being eaten by the orcas, it would support the hypothesis.

Note: New data may include comparisons of populations or biomasses relative to the orca-otter relationship.

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SCORE POINT 2

- 7 The scientist could collect data on the possible food choices that the orca could feed on and survive on. The scientist could also observe the populations of the orcas and sea otters, and then he could notice the increasing population of orcas but the decreasing population of sea otters. This "new" data would help the scientist's hypothesis in a positive way because he would discover that the orca predation has caused the sea otter population to decline.

The response demonstrates a general understanding of how to identify the types of evidence that should be gathered to answer the hypothesis. The response addresses both how scientists could observe what specifically orcas eat, as well as the population figures of the varied prey of the orcas, and explains how the new data could support the hypothesis.

SCORE POINT 1

- 7 The scientist could study the hunting habits of orca whales and monitor the population of the orcas and their prey.

The response demonstrates a limited understanding of how to identify the types of evidence that should be gathered to answer the hypothesis. The response mentions studying orca hunting habits and checking the population of their prey, but does not provide an explanation for how the new data could support the hypothesis.

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GRADE 11 SCIENCE

SCORE POINT 0

7 it caused this because the orca's eat sea otters so it would make sense to say they are causing the sea otter population to decline.

The response is incorrect or irrelevant to the skill or concept being measured. The response does not address any new data, just validates the hypothesis as plausible.

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GRADE 11 SCIENCE**

Broad Area of Inquiry: Inquiry Construct 12:	Developing and Evaluating Explanations Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.
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8 Use the predator-prey relationships among organisms, as shown in the data gathered by the class, to justify only **one** of the students’ interpretations of the data:

- Mark:

“I think the main cause is orcas because their behavior directly caused the decrease in sea otter populations.”

or

- Amelia:

“I think the main cause is human hunting of great whales because this started a chain reaction that ended with the kelp being eaten.”

Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response uses the predator-prey relationships among organisms, as shown in the data gathered by the class, to justify either Mark’s interpretation of the data or Amelia’s interpretation.
2	The response demonstrates a general understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is general.
1	The response demonstrates a limited understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

**NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE**

A thorough understanding can be exemplified by the following sample response:

Amelia's interpretation is better supported by the data. As great whale prey became less available due to whaling, as shown in Table 3, orcas had to find other prey. Table 3 shows that seals and sea lions were also suffering a population decline. This would cause orcas to seek more otters as prey. This was the conclusion of the orca study summary. If a reduction in otters increased the sea urchin population, this would cause a decrease in the kelp biomass, as shown in Table 2.

Note: Correct response may instead justify Mark's interpretation with data support such as

- Table 3 shows that orcas had to find new sources of food (prey).
- The food web in Diagram 1 shows that orcas changing their diet (prey) could cause them to get more energy from sea otters, reducing the sea otter population.
- Table 2 shows that kelp forest biomass was greatly reduced (by sea urchins) when there were fewer sea otters.

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GRADE 11 SCIENCE

SCORE POINT 3

- 8 I think that Amelia's statement is correct because the numerous hunting of great whales is what caused the orcas to change their behavior initially and therefore caused the sea lions + seals to decrease from 130 in the 1400s to 80 billion kg today. In correspondence with this change, the sea otter population also decreased meaning there was nothing to limit the population of sea urchins. The sea urchins then thrived and increased in population, meaning the kelp population decreased since sea urchins eat kelp.

The response demonstrates a thorough understanding of how to use evidence to support and justify interpretations and conclusions. The response shows thorough understanding of the chain of events, and uses specific data in support of Amelia's statement.

SCORE POINT 2

- 8 Amelia is right. because since the whales were hunted, the Orcas needed to find a new source of food, so the otters were eaten, so they couldn't eat the urchins, so the urchins ate all the kelp.

The response demonstrates a general understanding of how to use evidence to support and justify interpretations and conclusions. The response shows a general understanding of the chain of events that occurred due to whale hunting. The explanation is considered general, not thorough.

NECAP 2015 RELEASED INQUIRY TASK
GRADE 11 SCIENCE

SCORE POINT 1

8 mark is right because the orcas decided to change its food source and is killing of the sea otter population

The response demonstrates a limited understanding of how to use evidence to support and justify interpretations and conclusions. The response identifies one reason Mark is correct (orcas had to change food source to otters), but the overall response is limited.

SCORE POINT 0A

8 They both have a valid point but I believe marks answers is better. Because if the orcas are acting weird and not behaving correctly they going to change if there not eating as much or to much that could throw the whole ecosystems flow off

The reasoning in the response does not show any understanding.

8 Orcas eat otters
because the otters
are part of the orcas
diet.

The response is totally irrelevant.