Grade 11 NGSS Practice Test Answer Key

Item 1

Alignment: HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

- **SEP:** Planning and Carrying Out Investigations
- **DCI:** LS1.A: Structure and Function
- **CCC:** Stability and Change

Part A

Use the simulation to investigate the effects of eating on the levels of sugar and glucagon in normal, healthy adult test subjects.

In the simulation, subjects eat a normal meal at 12:00 p.m.

For each trial, select a Subject and a Measurement Time to take the subject's blood levels. Then click Start to collect data.

- Take measurements to identify reliable patterns in the relationships among feeling hungry, eating, sugar levels, and glucagon levels.
- You may take up to **ten** measurements.
- Be sure your data table contains only the data that will help you identify a reliable pattern in the relationships among feeling hungry, eating, sugar levels, and glucagon levels.
- If you need to change your selections, click the trash can icon next to a row to delete the data from the row.
- Sugar levels are measured in milligrams per deciliter (mg/dL) while glucagon levels are measured in picograms per milliliter (pg/mL).

Subject A

Measurement Time 8:30 a.m.

Start

Subject	Measurement Time	Sugar (mg/dL)	Glucagon (pg/mL)	Is Subject Hungry?

Answer: A correct output table will include measurements collected from all three samples at a consistent set of times that includes one immediately before the meal, one immediately after, and later after/earlier before the meal.

Subject	Measurement Time	Sugar (mg/dL)	Glucagon (pg/mL)	Is Subject Hungry?
A	11:30 a.m.	68	125	Yes
A	12:30 p.m.	122	60	No
A	1:30 p.m.	100	69	No
B	1:30 p.m.	119	70	No
B	12:30 p.m.	130	58	No
B	11:30 a.m.	69	132	Yes
C	11:30 a.m.	67	124	Yes
C	12:30 p.m.	121	55	No
C	1:30 p.m.	99	72	No
A	8:30 a.m.	81	90	No

Part B

Using the data collected in part A, calculate the average sugar concentration and average glucagon concentration when the subject is hungry and not hungry.

Complete the table to compare the average sugar and glucagon levels for all subjects who are hungry compared to those who are not hungry.

- Round your answers to the nearest whole number and enter them in the spaces provided.

	Average Sugar Concentration (mg/dL)	Average Glucagon Concentration (pg/mL)
The subject is hungry.		
The subject is not hungry.		

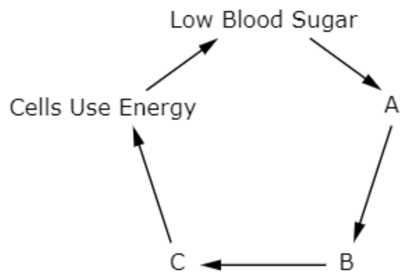
Answer: Varies, dependent on student input values in Part A.

Part C

Figure 1 shows a flow chart of feedback mechanisms that help regulate blood sugar levels.

In the table, select the boxes to match each letter with **one** event that will occur next on the flow chart.

Figure 1. Blood Sugar Regulation Flow Chart



	A	B	C
Eat a meal	☐	☐	☐
Cells store energy	☐	☐	☐
Sugar produced	☐	☐	☐
Glucagon released	☐	☐	☐
Glucagon absorbed	☐	☐	☐
Body feels hungry	☐	☐	☐
Decrease in saliva	☐	☐	☐

Answer:

	A	B	C
Eat a meal	☐	☐	☑
Cells store energy	☐	☐	☐
Sugar produced	☐	☐	☐
Glucagon released	☑	☐	☐
Glucagon absorbed	☐	☐	☐
Body feels hungry	☐	☑	☐
Decrease in saliva	☐	☐	☐

Part D

How does the feedback mechanism that controls feeling hungry help to maintain homeostasis?

Ⓐ This process keeps glucagon levels elevated.

Ⓑ This process keeps glucagon in a healthy range.

Ⓒ This process keeps blood sugar levels elevated.

Ⓓ This process keeps blood sugar in a healthy range.

Answer: D

Item 2

Alignment: HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

- **SEP**: Constructing Explanations and Designing Solutions
- **DCI**: PS1.A: Structure and Properties of Matter
- **CCC**: Patterns

Part A

Based on your observations in Animation 1 and Animation 2, select all of the properties that can be identified in the reactions of lithium and sodium with water.

- ☐ flammability
- ☐ boiling point
- ☐ reactivity with water
- ☐ electrical conductivity
- ☐ oxidation state
- ☐ electronegativity

Answers:

- Flammability
- Reactivity with water

Part B

Click on each blank box to select the word or phrase that **best** completes the statement.

All of the alkali metals have the same number of [▾], which suggests that they all have similar [▾]

The ionization energies of the alkali metals suggest that alkali metals [▾] reactivities when combined with water.

Options:

First dropdown:

- Protons
- Isotopes
- Atomic orbitals
- Valence electrons

Second dropdown:

- Boiling points
- Chemical properties
- Electron configurations

Third dropdown:

- All have similar
- All have different
- Have unpredictable

Answers:

All of the alkali metals have the same number of [valence electrons ▾], which suggests that they all have similar [chemical properties. ▾]

The ionization energies of the alkali metals suggest that alkali metals [all have different ▾] reactivities when combined with water.

Part C

Predict the reactivity of other alkali metals with water by ordering the following alkali metals from 1 (least reactive) to 5 (most reactive).

	1	2	3	4	5
Cesium	☐	☐	☐	☐	☐
Lithium	☐	☐	☐	☐	☐
Potassium	☐	☐	☐	☐	☐
Rubidium	☐	☐	☐	☐	☐
Sodium	☐	☐	☐	☐	☐

Answer:

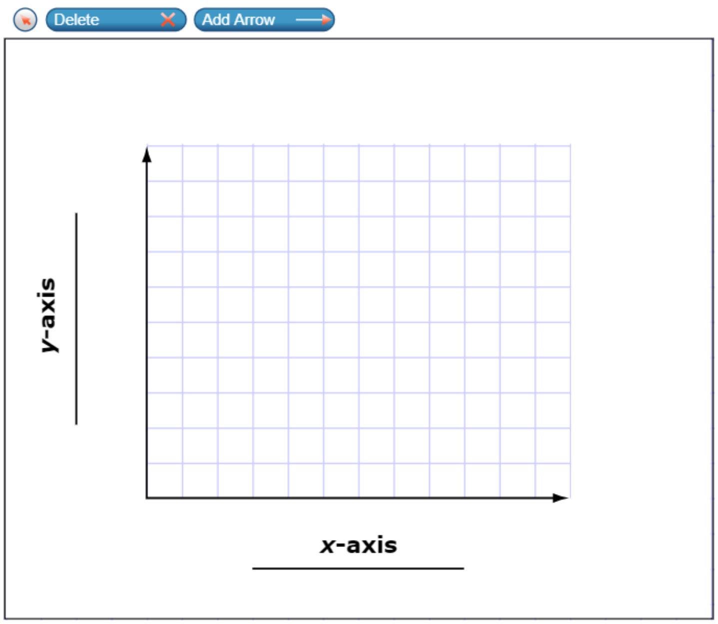
	1	2	3	4	5
Cesium	☐	☐	☐	☐	☑
Lithium	☑	☐	☐	☐	☐
Potassium	☐	☐	☑	☐	☐
Rubidium	☐	☐	☐	☑	☐
Sodium	☐	☑	☐	☐	☐

Part D

Using your response in part C, develop a graph that shows a pattern in the chemical reactivities of alkali metals. Choose the quantities that belong on the *x*- and *y*-axes and then use the Add Arrow tool to indicate the relationship.

The label for the *x*-axis should be [▾].

The label for the *y*-axis should be [▾].



Options:

X-axis label:

- Group 1 Alkali Metals (Lowest to Highest Atomic Number)
- Reactivity with Water (Least Reactive to Most Reactive)
- Conductivity (Least Conductive to Most Conductive)
- Density (Lowest to Highest)

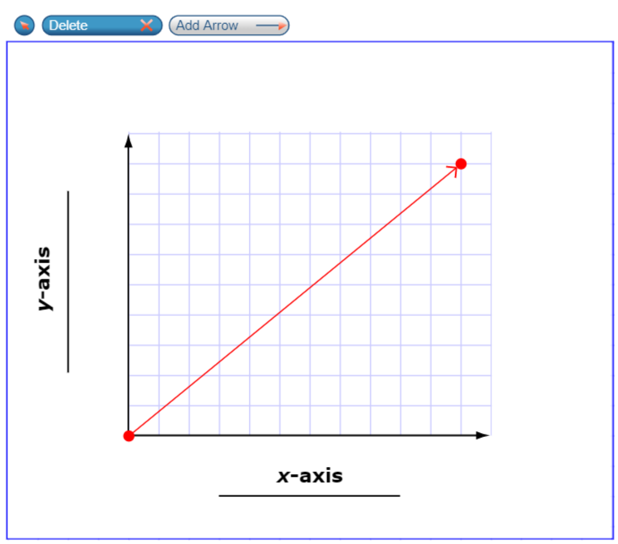
Y-axis lable:

- Group 1 Alkali Metals (Lowest to Highest Atomic Number)
- Reactivity with Water (Least Reactive to Most Reactive)
- Density (Lowest to Highest)

Answers:

The label for the *x*-axis should be Group 1 Alkali Metals (Lowest to Highest Atomic Number) ▾ .

The label for the *y*-axis should be Reactivity with Water (Least Reactive to Most Reactive) ▾ .



- The student earns a point for graphing a line with a positive slope.

Part E

Click on each blank box to describe the pattern in the alkali metals' that you graphed in Part D.

The [▾] of the alkali metals increases as their [▾]
[▾].

Options:

First dropdown:

- Atomic number
- Reactivity with water
- Conductivity
- Density

Second dropdown:

- Atomic number
- Reactivity with water
- Conductivity
- Density

Third dropdown:

- Increases
- Decreases

Answers:

Click on each blank box to describe the pattern in the alkali metals' that you graphed in Part D.

The [atomic number ▾] of the alkali metals increases as their [reactivity with water ▾]
[increases ▾].

Item 3

Alignment: HS-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

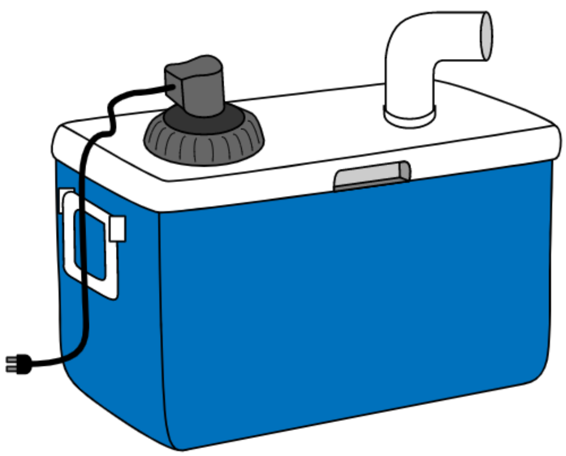
- **SEP**: Planning and Carrying out Investigations
- **DCI**: PS3.B Conservation of Energy and Energy Transfer
- **CCC**: Systems and System Models

A portable air conditioner can be made using an ice chest, a small electric fan, a flexible tube, and ice.

The ice is put inside the ice chest. The small electric fan will blow air into the ice chest through a hole in the lid. Air will come out of the flexible tube at the other end.

Figure 1 shows the portable air conditioner.

Figure 1. Portable Air Conditioner



Part A

The air conditioner from Figure 1 is plugged into an outlet in a room. The temperature of the room is higher than the temperature inside the air conditioner.

Which statement describes the transfer of energy between the room and the air conditioner?

Ⓐ Energy is transferred from the room to the air conditioner.

Ⓑ Energy is transferred from the air conditioner to the room.

Ⓒ Energy is first transferred from the air conditioner to the room, but then reverses direction.

Ⓓ Energy is first transferred from the room to the air conditioner, but then reverses direction.

Answer: A

Part B

Select **two** pieces of data that could provide evidence for the direction of thermal energy transfer identified in part A.

- ☐ the volume of ice in the cooler decreasing
- ☐ the temperature of air in the cooler decreasing
- ☐ the speed of the airflow due to the fan decreasing
- ☐ the mass of liquid water in the cooler decreasing
- ☐ the temperature of the air in the room decreasing

Answers:

The student selected two of the following three correct answers:

- The volume of ice in the cooler decreasing
- The temperature of air in the cooler decreasing
- The temperature of the air in the room decreasing

Item 4

Alignment: HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

- **SEP:** Constructing Explanations and Designing Solutions
- **DCI:** LS4.C: Adaptation
- **CCC:** Cause and Effect

Part A

Using Table 3, click on each blank box and first select a span of years. Then select a sentence that summarizes the data that will be **most** useful as you explain why seeds collected in 2004 flowered sooner than those collected in 1997.

Table 3. Summary of Average Annual Precipitation

Years	Average Annual Precipitation
1995–[▾]	[▾]
[▾]–2004	[▾]

Options:

- 1995-
  - 1996
  - 1997
  - 2000
  - 2001
  - 2002
  - 2003
- -2004
  - 1996
  - 1997
  - 2000
  - 2001
  - 2002
  - 2003
- Average annual precipitation
  - Precipitation was consistently above average in Days 1-50
  - Precipitation was consistently above average in Days 51-100
  - Precipitation was consistently below average in Days 1-50
  - Precipitation was consistently below average in Days 51-100

Answer:

- 1995-
  - 1997
  - Precipitation was consistently above average in Days 51-100
- -2004
  - 2000
  - Precipitation was consistently below average in Days 51-100

Part B

What is a short-term effect of the drought on the mustard plants?

Ⓐ Drier conditions cause the mustard plants to slowly mature during Days 51–100.

Ⓑ Several of the mustard plants started to release seeds that will germinate during Days 1–50.

Ⓒ Mustard plants that flower in Days 51–100 are less likely to produce surviving offspring.

Ⓓ Mustard plants produced fewer seeds during Days 1–50 in response to the drier conditions.

Answer: C

Part C

Select a piece of evidence from the text to support your inference made in part B.

Answer:

- Flowering mustard plants and their young offspring plants need plenty of water to grow.
- Table 1. Difference in Precipitation Compared to the Long-Term Seasonal Averages.
- Table 1 shows the difference in average seasonal precipitation in the first and last 50 days of a typical growing season.

Part D

Click each box and select a phrase to complete the sentence and make an inference about the mustard plants in the wet location.

The drought caused a change in ______, which led to a change in the ______.

Options:

- Box 1
    - Seed dispersal
    - Maturation rate
    - Plant flowering time
    - Absorption of precipitation by soil
- Box 2
    - Time of germination
    - Individual plant genes
    - Wider area covered by plants
    - Distribution of genes in the population

Answer:

- Box 1
    - Plant flowering time
- Box 2
    - Distribution of genes in the population

Part E

Which statement explains the change in the flowering time of the mustard plants?

Ⓐ The population of mustard plants was more affected by the changes in the precipitation because of the dry, sandy soil.

Ⓑ Mustard plants that adapted to drier conditions were more likely to survive and reproduce in the drought.

Ⓒ There were similar species of plants in the same area in 2004 with which the mustard plants could crossbreed.

Ⓓ Genetic drift occurred in the population of mustard plants from the 1997 sample but not in the population from the 2004 sample.

Answer: B

Part F

Evaluate the provided data to determine whether more information is needed to support the inference you selected in part E.

Select all of the relevant conclusions.

- ☐ sufficient evidence is provided
- ☐ the average amount of precipitation between the years of 1997 and 2004
- ☐ a comparison of the rate of survival to reproduction for the 1997 and 2004 plants
- ☐ genetic sequencing data that looks for genes from other plant species in the 2004 mustard plants
- ☐ genetic sequencing data to determine whether the changes to the flowering time are caused by genes

Answer: sufficient evidence is provided

Item 5

Alignment: HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

- **SEP:** Engaging in Argument from Evidence
- **DCI:** LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- **CCC:** Stability and Change

Select the **three** characteristics that provide evidence that the mountain ecosystem has changed.

- ☐ density of shrubs
- ☐ amount of farmland
- ☐ livestock habitat size
- ☐ total number of livestock
- ☐ ratio of forest to farmland

Answer: livestock habitat size AND density of shrubs AND total number of livestock

Item 6

Alignment: HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

- **SEP**: Developing and Using Models
- **DCI**: ESS1.A: The Universe and Its Stars
- **CCC**: Scale, Proportion, and Quantity

Part A

Using Figure 1, complete the table to compare the distance and approximate ERT of the minimum and maximum boundaries of the sun's current habitable zone. Enter the values in the table.

Sun's Current Habitable Zone	Distance (AU)	Approximate ERT (K)
Minimum Boundary		
Maximum Boundary		

Answer:

- Distance (AU) at minimum boundary: 0.95
- Distance (AU) at maximum boundary: 1.68
- Approximate ERT (K) at minimum boundary: between 290 and 310
- Approximate ERT (K) at maximum boundary: between 190 and 210

Part B

Using Table 3, select the boxes to identify how each of the sun's characteristics might change as it ages.

Sun Characteristic	Increases	Decreases	Remains the Same
Radius	☐	☐	☐
Surface Temperature	☐	☐	☐
Luminosity	☐	☐	☐

Answer:

Using Table 3, select the boxes to identify how each of the sun's characteristics might change as it ages.

Sun Characteristic	Increases	Decreases	Remains the Same
Radius	☑	☐	☐
Surface Temperature	☐	☑	☐
Luminosity	☑	☐	☐

Part C

Click on the box to select the characteristic that **best** completes the statement.

The stellar characteristic most correlated to a star's effective radiation temperature (ERT) is the star's [▾]

Options:
- Radius
- Surface temperature
- Luminosity

Answer:
- Luminosity

Part D

Which bright star **most likely** has an ERT similar to the sun's predicted ERT at 10 billion years old?

Ⓐ Aldebaran

Ⓑ Arcturus

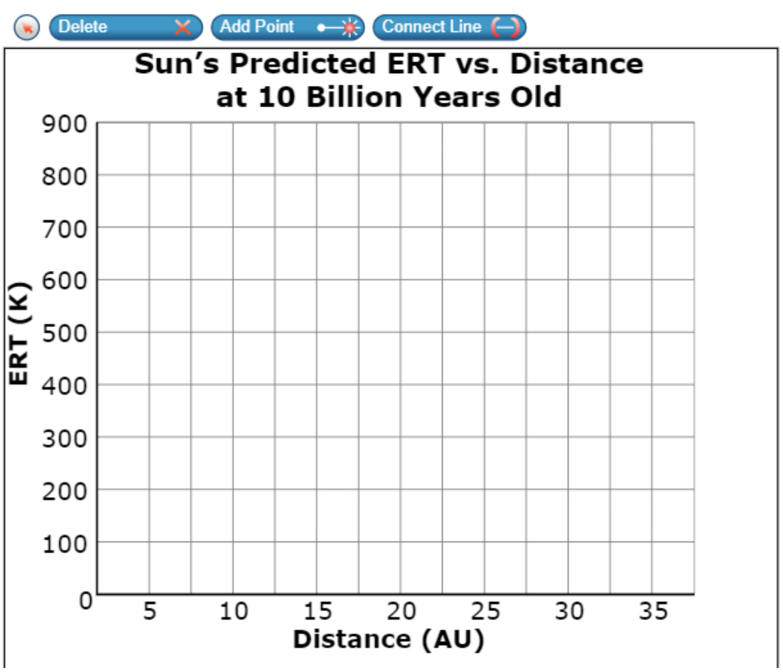
Ⓒ Procyon

Ⓓ Rigel

Answer: A

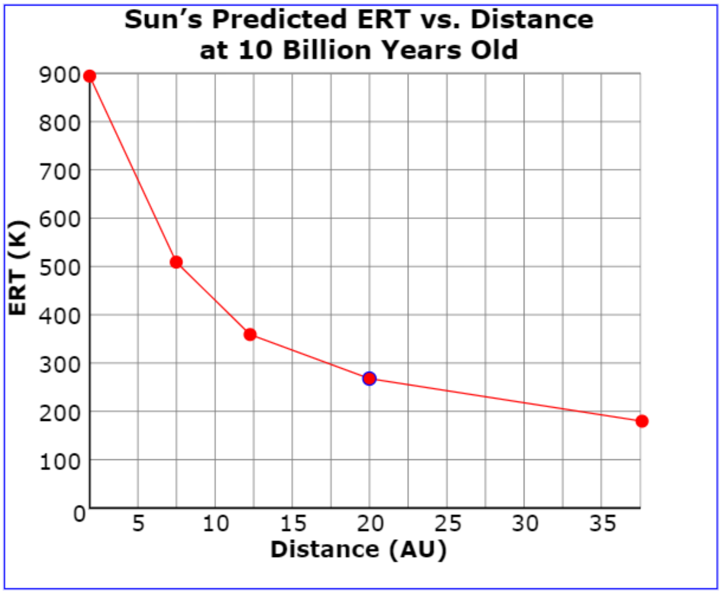
Part E

Use the Connect Line tool to construct a graphical model of the effective radiation temperature (ERT) over distance for the sun at 10 billion years old.



Answer:
Answers may vary depending on the start chosen in part D.

For Alderbaran, an example of a full credit graph is shown below:



Part F

Using the evidence and mathematical models, predict the size of the habitable zone of our solar system when the sun is 10 billion years old. Enter the values in the table.

	Approximate Lower Limit (AU)	Approximate Upper Limit (AU)
Future Habitable Zone		

Answer:
- Lower limit: 20-22 AU
- Upper limit: 39-41 AU

Part G

Select the boxes to identify the planet or planets included in the habitable zone of our solar system when the sun is 10 billion years old.

Select "No Planets" if none of the planets are included in the new habitable zone.

Planets	Included in New Habitable Zone
Mercury	☐
Venus	☐
Earth	☐
Mars	☐
Jupiter	☐
Saturn	☐
Uranus	☐
Neptune	☐
No Planets	☐

Answer: Neptune, or an answer appropriate for star chosen in part D

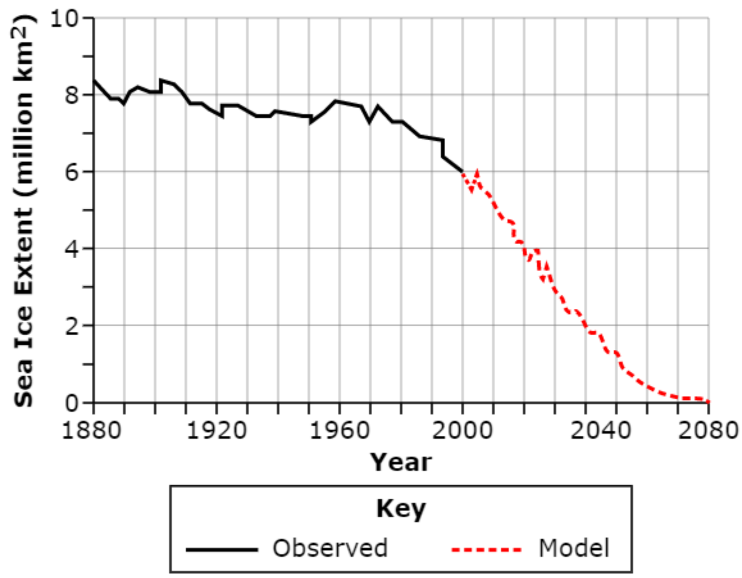
Item 7

Alignment: HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

- **SEP**: Analyzing and Interpreting Data
- **DCI**: ESS3.D: Global Climate Change
- **CCC**: Stability and Change

The amount of water covered by ice (sea ice extent) in the Arctic is changing. Figure 1 shows the observed sea ice extent in the Arctic from 1880 to 2000 and the modeled sea ice extent from 2000 to 2080. The sea ice extent is measured in millions of square kilometers (km^2).

Figure 1. Arctic Sea Ice Extent



Source: National Climate Assessment, GlobalChange.gov

Complete Table 1 by doing the following:

- Based on the data in Figure 1, calculate the change in observed sea ice extent from 1880 to 2000.
- Then, calculate the change in sea ice extent predicted by the model between 2000 and 2080.
- Round your answers to the nearest whole number.
- Enter your answers in the first two blank boxes in the table.
- Then, based on the data in Figure 1, click on the third blank box and select a prediction.

Table 1. Change in Observed and Modeled Sea Ice Extent

Change in Observed Sea Ice Extent, 1880–2000	million km^2
Change in Modeled Sea Ice Extent, 2000–2080	million km^2
Prediction	▾

Options:

- Average global temperatures will decrease.
- The concentration of greenhouse gases will decrease.

- The temperature of the ocean in the Arctic will increase.
- The volume of ice in other parts of the world will increase.

Answer:

- Change in Observed Sea Ice Extent, 1880 – 2000: 2 million km^2
- Change in Modeled Sea Ice Extent, 2000 – 2080: 6 million km^2
- Prediction: The temperature of the ocean in the Arctic will increase.