STUDENT NAME _____
(please print)

Grade
11

New Jersey Student Learning Assessment–Science (NJSLA–S) Practice Test

FORM
A

Grade 11

Sample Items

This test booklet contains several different types of test questions. See the samples below, which will help you understand how to respond to each question type.

Record/mark your answers by circling the answer in the test booklet. If you need to change an answer, be sure to erase your first answer completely. **Only the answers you write in your test booklet will be scored.**

One of the questions will ask you to write a response. Write your response in the box provided in the test booklet. Be sure to keep your response within the provided space. Only responses written within the provided space will be scored.

Sample Item 1. Multiple-Choice (Select one answer.)

Which claim about the Sun is accurate?

A. The Sun appears smaller and brighter than other stars because it is the closest star to Earth.

B. The Sun appears larger and brighter than any other star because it is the closest star to Earth.

C. The Sun appears larger and less bright than other stars because it is the farthest star from Earth.

D. The Sun appears smaller and less bright than any other star because it is the farthest star from Earth.

Sample Item 2. Multi-Select (Select multiple answers.)

Select **two (2)** answers for this item. The risk of an earthquake happening is **higher**

A. in the South than in Alaska.

B. on the West Coast than in the Northeast.

C. on the East Coast than on the West Coast.

D. in Alaska than in the center of the country.

E. in the center of the country than on the West Coast.

Sample Item 3. Multi-Select Box Item (Select one answer for each box.)

A student claims that a soccer ball has less energy after it hits a wall. Select the correct word from each box to complete the statement that explains why this claim is true.

When a soccer ball hits the wall, [Y] of the soccer ball's energy is transferred to the air in the form of [Z].

[Y]

A. all

B. some

C. none

[Z]

A. light

B. sound

Sample Item 4. Constructed Response (Write out your answer.)

Many New Jersey towns have started programs to reduce the amount of traffic on roads as a means to help improve air quality. Give **two** examples of programs that would help reduce traffic and improve air quality.

Answers to Sample Questions

1. **A (B) C D**

2. **A (B) C (D) E**

3. **[Y]**
A (B) C

[Z]
A (B)

4. *Carpooling is one means to reduce the number of cars on the roads. Using public transit when available would also decrease the number of individual cars. Both of these measures would help improve air quality.*

STOP

Unit 1 Practice Test

Directions:

Today you will take Unit 1 of the Grade 11 New Jersey Student Learning Assessment–Science (NJSLA–S) Practice Test. You will be able to use a calculator and a periodic table.

Read each question. Then, follow the directions to answer each question. Circle the answer or answers you have chosen in your test booklet. If you need to change an answer, be sure to erase your first answer completely.

If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit **ONLY**. Do not go past the stop sign.

Use the information below to answer questions 1 and 2.

Higher concentrations of atmospheric carbon dioxide have led to increased biomass of many species, while biomass of coral reefs has decreased across the Great Barrier Reef in the hydrosphere.

Carbon is cycled through the atmosphere and hydrosphere by photosynthesis and cellular respiration, as shown in Figure 1.

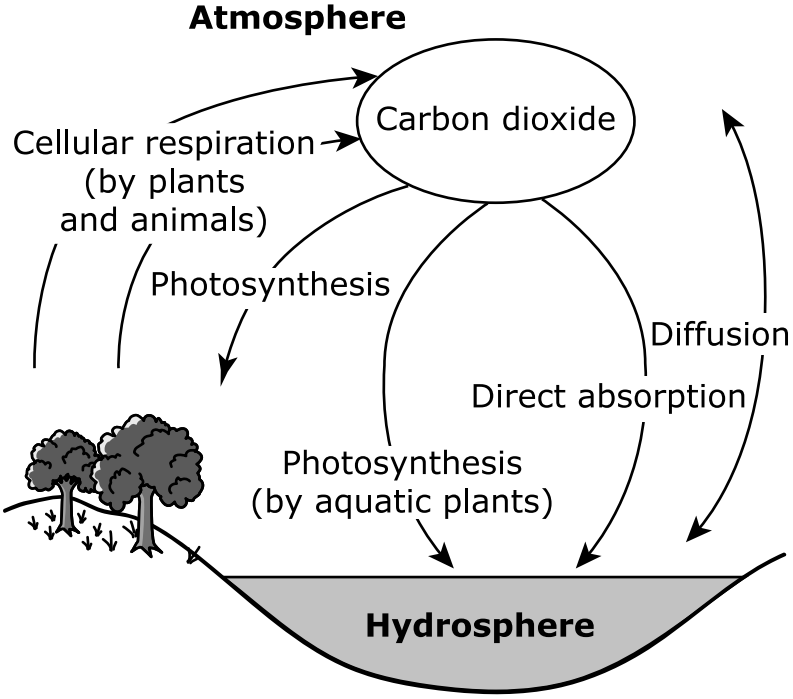


Figure 1. Carbon Cycle between Atmosphere and Hydrosphere

Figure 2 shows ocean acidity. Ocean acidity is expressed as a measure of the concentration of hydrogen ions present in a liter of ocean water, with higher concentrations indicating a higher acidity.

Ocean Acidity

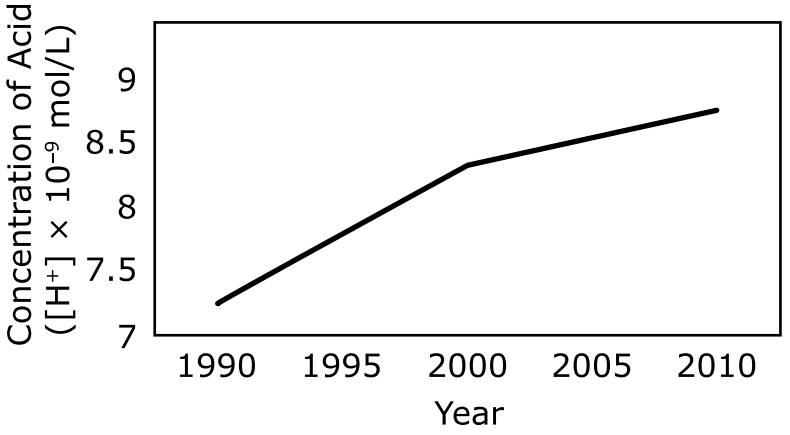


Figure 2.

GO ON →

Figure 3 shows the percentage of reef surface covered by live coral across the Great Barrier Reef from 1990 to 2010.

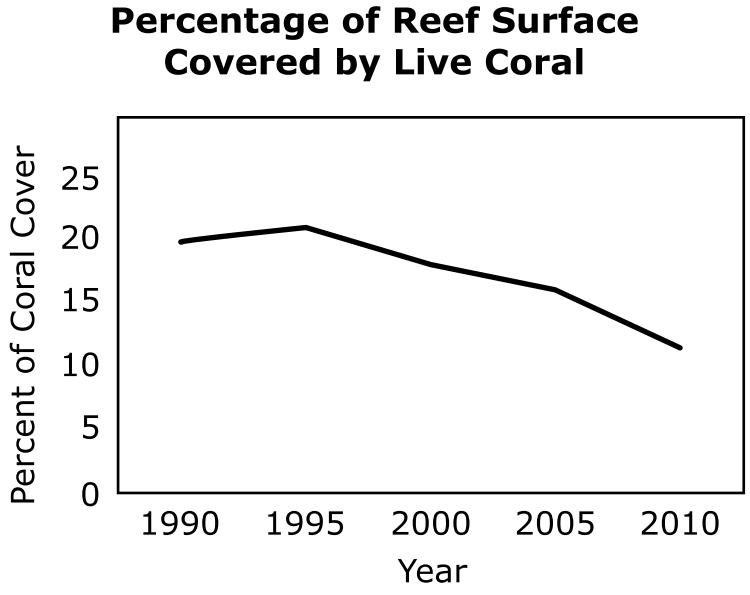


Figure 3.

Figure 4 shows the concentration of atmospheric carbon dioxide over the same span of time.

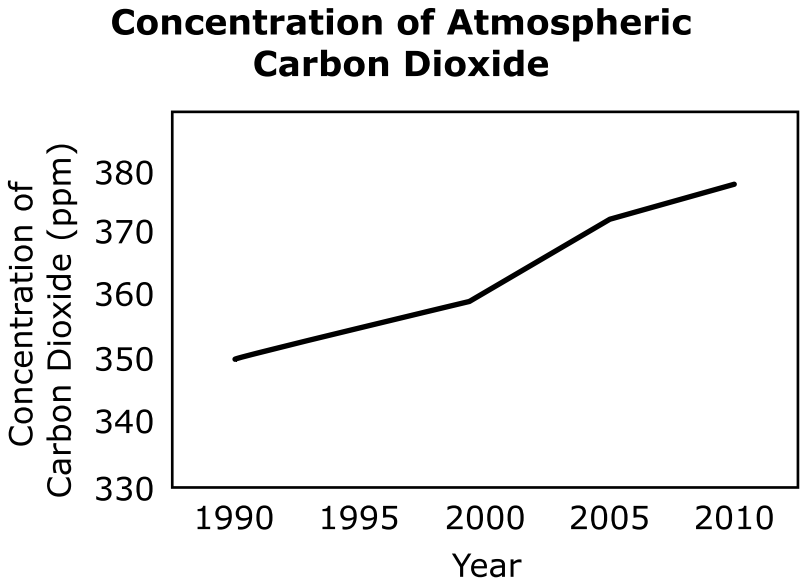


Figure 4.

GO ON →

1. Based on the data, which statement **best** describes the relationship causing the decreased biomass of the coral reef species in the hydrosphere?

A. Ocean acidity is increasing because atmospheric carbon dioxide and absorption in the hydrosphere are increasing.

B. Atmospheric carbon dioxide and absorption in the hydrosphere are increasing because ocean acidity is increasing.

C. Ocean acidity is decreasing because atmospheric carbon dioxide and absorption in the hydrosphere are increasing.

D. Atmospheric carbon dioxide and absorption in the hydrosphere are decreasing because ocean acidity is increasing.

2. Identify the relationships between Figure 2, Figure 3, and Figure 4.

A.

Figure 2 and Figure 3	Figure 2 and Figure 4	Figure 3 and Figure 4
Direct	Direct	Indirect

B.

Figure 2 and Figure 3	Figure 2 and Figure 4	Figure 3 and Figure 4
Indirect	Direct	Indirect

C.

Figure 2 and Figure 3	Figure 2 and Figure 4	Figure 3 and Figure 4
No Relationship	Direct	No Relationship

D.

Figure 2 and Figure 3	Figure 2 and Figure 4	Figure 3 and Figure 4
Indirect	Direct	No Relationship

GO ON TO NEXT PAGE

GO ON →

Use the information below to answer questions 3–5.

Changes in the concentration of carbon dioxide in the atmosphere impacts global sea level.

Rising carbon dioxide (CO_2) levels are correlated with rising atmospheric temperatures. Researchers collected data, shown in Figures 1 and 2, on atmospheric carbon dioxide and global sea level.

Atmospheric Carbon Dioxide

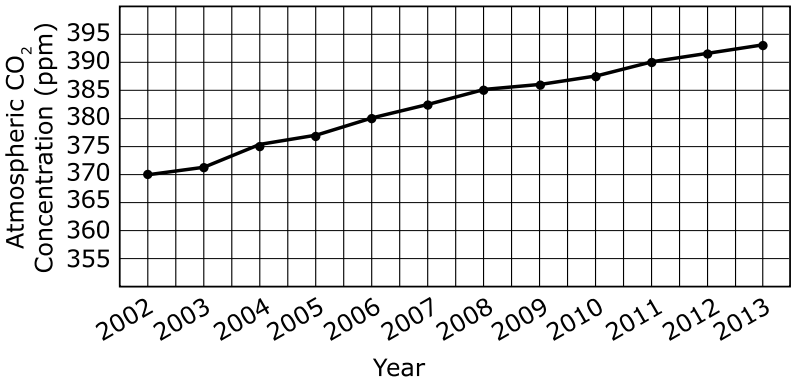


Figure 1.

Change of Global Sea Level

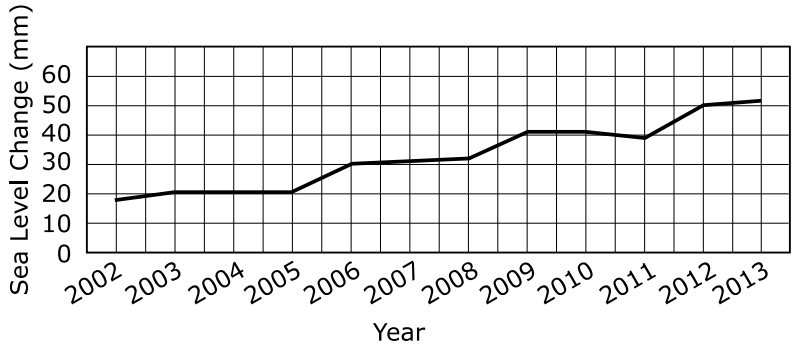


Figure 2.

Researchers also collected data on the Greenland ice sheet as shown in Figure 3. The Greenland ice sheet contains the second largest amount of land ice on the planet, after Antarctica. Together, these ice sheets hold more than 99% of the freshwater ice on Earth and have important impacts on global sea level and climate.

Change in Greenland Ice Sheet Mass

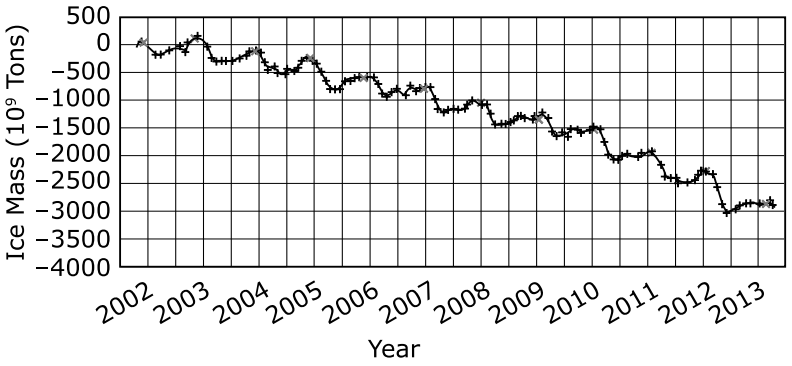


Figure 3.

GO ON

3. Which question is **best** addressed by analyzing the data?

A. What is the surface area of the Greenland ice sheet?

B. How does the Greenland ice sheet affect climate?

C. Why is the Greenland ice sheet made out of freshwater?

D. What is causing the Greenland ice sheet mass to decrease?

4. Which statements are **best** supported by the data?

Select **two** of the six statements.

A. As ice sheet mass increases, sea level rises.

B. As atmospheric carbon dioxide increases, sea level rises.

C. As sea level rises, atmospheric carbon dioxide decreases.

D. As atmospheric carbon dioxide decreases, ice sheet mass decreases.

E. As atmospheric carbon dioxide increases, ice sheet mass decreases.

F. As ice sheet mass decreases, atmospheric carbon dioxide decreases.

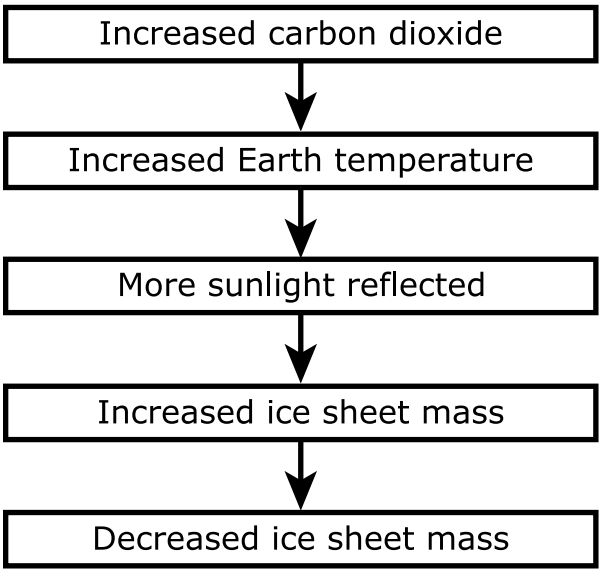
GO ON TO NEXT PAGE

GO ON →

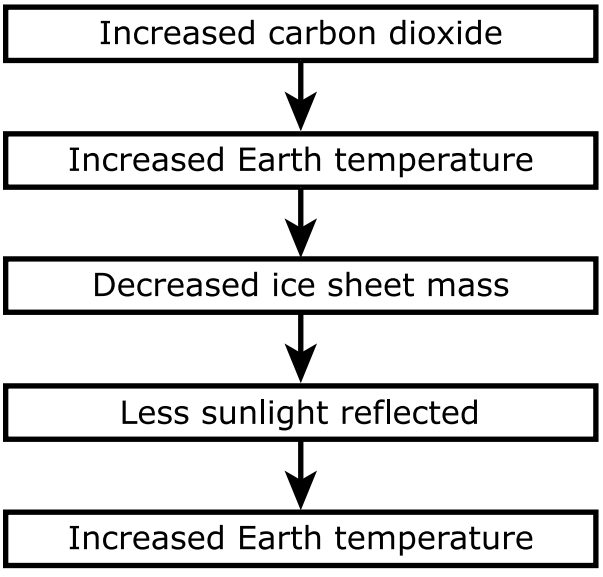
5. The ice sheets reflect energy from sunlight back into space and allow the Earth to stay cooler. If the ice sheets melt, the amount of energy reflected will change, and thus the temperature of the Earth can change.

Based on the data, complete the model to show how a change in the ice sheets leads to changes in other Earth systems.

A.

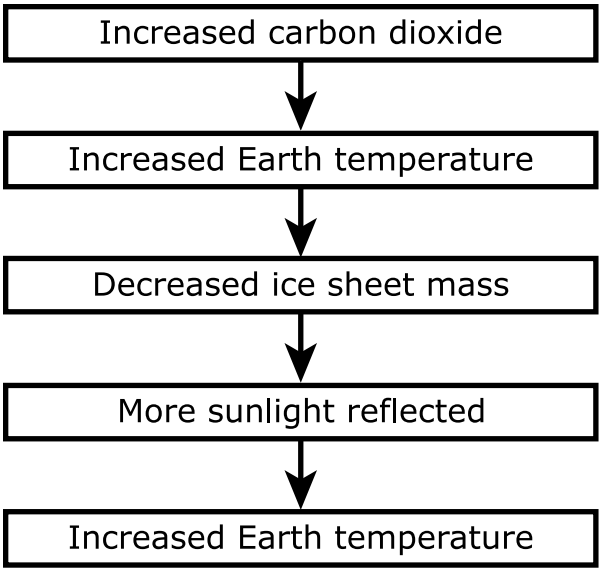


B.

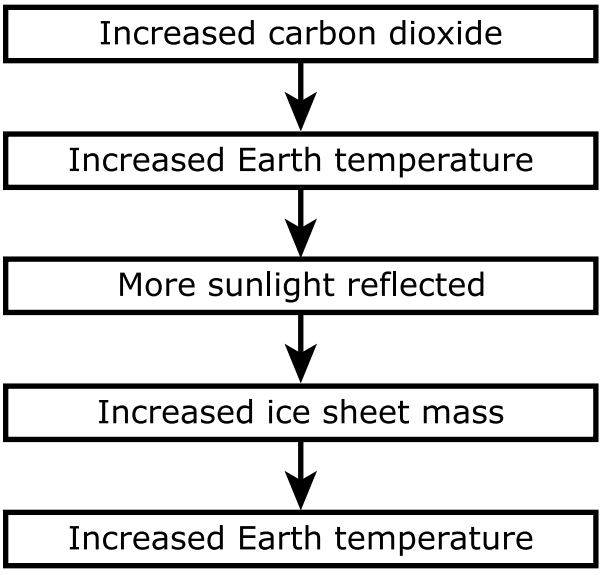


(Item 5 continued)

C.



D.



Use the information below to answer questions 6 and 7.

Peppered moths, *Biston betularia*, exhibit light- and dark-color variations. Over the years 1950–2000, changes to the trees inhabited by a population of peppered moths were observed.

In 1950, trees were primarily dark and covered in soot, as shown in Figure 1A. In 2000, trees in the same areas were primarily light and covered in lichen, as shown in 1B. Light- and dark-colored moths are shown on each tree.

Figure 1A

Figure 1B

Figure 1. Dark Soot-Covered Oak Tree and Light Lichen-Covered Oak Tree

Table 1 shows percentages of dark and light moths in the population from 1950 to 2000.

Table 1. Dark and Light Moths in the Population

Year	Dark (%)	Light (%)
1950	98.5	1.5
1960	95.9	3.1
1970	78.1	21.9
1980	64.7	35.3
1990	42.3	57.7
2000	19.0	81.0

Table 2 shows the survival percentages of dark and light moths in different environments.

Table 2. Survival Percentages of Dark and Light Peppered Moths in Different Environments

	Survival Percentage of Each Color Variation	
Environment	**Dark (%)**	**Light (%)**
Darker	5.7	1.5
Lighter	4.7	13.7

6. Which correlation between the peppered moth population and its environment is **best** supported by the data provided?

A. When dark-colored moths migrated out of the population, tree color changed from mostly dark to mostly light.

B. Dark-colored moths turned into light-colored moths when tree color changed from mostly dark to mostly light.

C. When light-colored moths outcompeted dark-colored moths, tree color changed from mostly dark to mostly light.

D. Light-colored moths became more common than dark-colored moths when tree color changed from mostly dark to mostly light.

7. The environmental change that occurred was due to the enactment of pollution-control laws. These laws significantly reduced the amount of smoke being released into the environment by some industries.

Based on the data in Table 1, during which decade were these laws **most likely** first enacted?

A. 1950

B. 1960

C. 1970

D. 1980

E. 1990

F. 2000

Use the information below to answer questions 8–10.

A clear marble made of a type of absorbent polymer (a type of plastic) is easily visible when held, but seems to disappear when placed in a glass of water.

Light with a frequency of 5.60×10^{14} Hz (Hertz) is used to test the behavior of light through the different substances. The velocity of light (v) is measured as the product of frequency (f) and wavelength (λ):

$$v = f\lambda$$

Figure 1 shows a polymer marble before and after it is dropped into a glass of distilled water. As indicated, the light changes velocity when it passes through each substance.

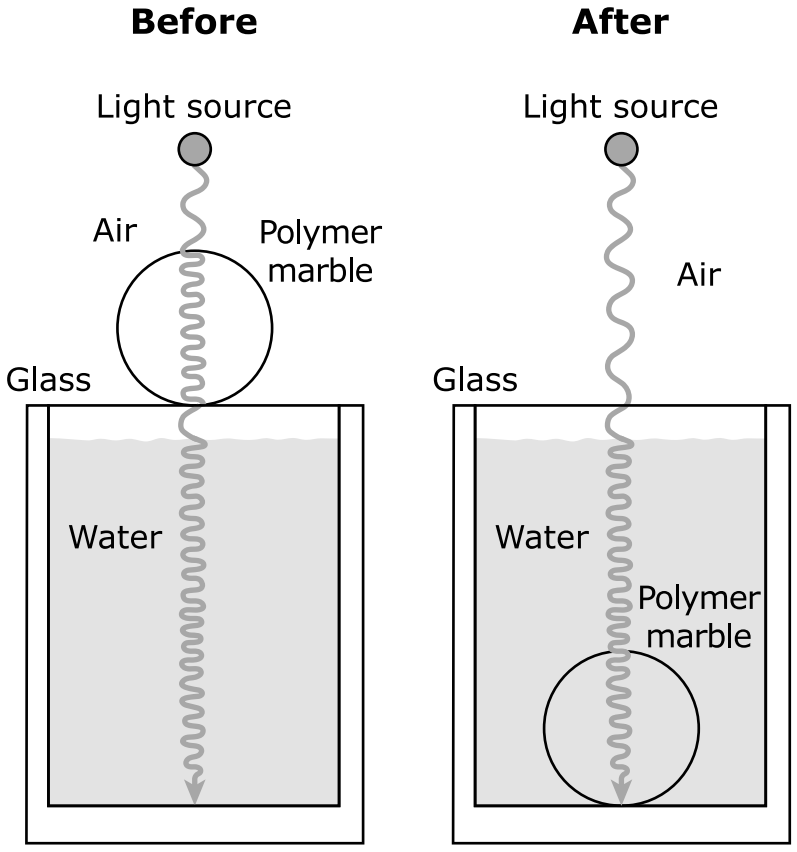


Figure 1. Model of Polymer Marble Before and After Being Placed Into a Glass of Clear Water (Not to Scale)

Table 1 shows light velocity data, in meters per second (m/s), for various substances.

Table 1. Velocity of Light through Different Substances

	Air	Water	Polymer	Glass
Velocity ($\times 10^8$ m/s)	3.00	2.25	2.25	2.00

GO ON →

8. Which wavelength (λ) of the light results as it passes from water into the polymer ball?

A. 3.57×10^{-7} m

B. 4.02×10^{-7} m

C. 5.35×10^{-7} m

D. 7.12×10^{-7} m

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GO ON →

9. The polymer marble is placed in a glass full of water. A beam of light passes through the different materials, as shown in Figure 2.

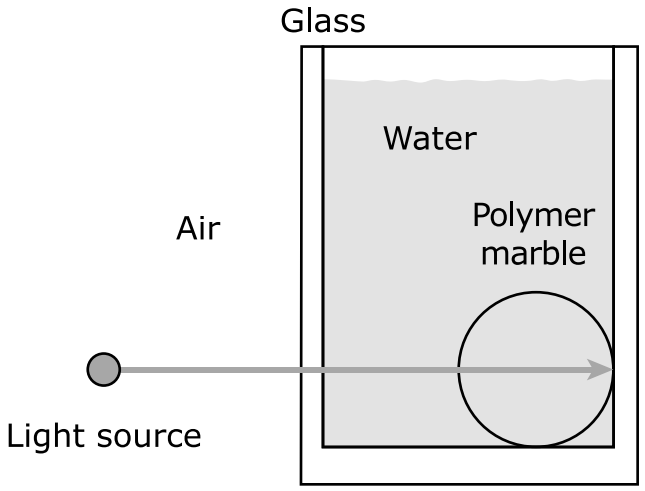

Figure 2. Light Beam Passing Through a Water Glass

Select the correct word or phrase from each box to complete the statements that describe the behavior of light as it passes through the different materials.

As the light passes from the air into the glass, the velocity of light [X]. As the light passes from the glass to the water, the wavelength [Y]. As the light passes from the water into the polymer marble, the velocity of light [Z].

Box X

A. increases

B. decreases

C. stays the same

Box Y

A. increases

B. decreases

C. stays the same

(Item 9 continued)

Box Z

A. increases

B. decreases

C. stays the same

10. Which observations are consistent with the given information and diagrams, and could help explain why the polymer ball is visible in air but invisible in water?

A. The speed of light is the same in the polymer and air, but different in water.

B. The speed of light is the same in the polymer and water, but different in air.

C. The frequency of light is the same in the polymer and water, but different in air.

D. The wavelength of light is the same in the polymer and air, but different in the water.

Use the information below to answer questions 11 and 12.

There are over one million more solar power installations than fossil fuel plants in America. However, fossil fuels generate the most electricity, and solar power contributes the least.

Construction and use of electrical power plants produce carbon dioxide, which is a greenhouse gas (GHG). Building new power plants that maximize power production but minimize GHG emission is a current engineering challenge. One approach used in the United States is to construct power plants that use renewable energy.

Characteristics of electrical plants that use certain renewable or nonrenewable sources of energy are listed in Table 1.

Table 1. Energy Sources and Characteristics

Energy Sources	Renewable			Nonrenewable	
	Solar Power	Wind Power	Hydropower	Nuclear	Fossil Fuels
GHG Emissions Intensity (grams of CO_2 per kilowatt hour produced)	97	30	27	30	506
Cost (cents per kilowatt hour produced)	6	6	2	9.5	≤7.5
Number of Facilities (installations, turbines, or plants)	1.5 million	52,343	1,440	62	3,288
Electricity Generated in 2016	0.9%	5.6%	6.5%	20%	65%

11. Which statement correctly answers the question of whether electrical plants that use wind power instead of fossil fuels would maximize power production and minimize GHG emissions?

A. No, using wind power costs more than using fossil fuels.

B. Yes, using wind power costs less than using fossil fuels.

C. No, using wind power creates a higher GHG emission intensity than using fossil fuels.

D. Yes, using wind power produces a lower GHG emission intensity than using fossil fuels.

12. Choose the option that shows the energy sources that have been arranged from the **greatest** (top) to the **least** (bottom) amount of electricity produced per facility.

A. nuclear energy
hydropower
wind power
solar power
fossil fuels

B. nuclear energy
fossil fuels
hydropower
wind power
solar power

C. fossil fuels
nuclear energy
wind power
hydropower
solar power

D. fossil fuels
nuclear energy
solar power
wind power
hydropower

Use the information below to answer questions 13–15.

Even though bison generally require large, open areas with dense grass coverage to survive, they are sometimes observed living in small areas with sparse grass coverage.

Scientists studied four areas in Canada's Banff National Park to determine habitat suitability for bison.

Table 1. Characteristics of Bison Areas

Area	Size (km^2)	Amount of Grassland (km^2)	Total Grass Available (millions of kg)	Average Snow Depth (cm)
1	435	130	6.53	110
2	424	148	7.42	80
3	286	57	2.86	100
4	245	74	3.68	60

Table 2 provides data for the different classes of bison. Bison individually consume an average of 2,300 kilograms of grass and require an average of 0.05 square kilometers of grassland during the entire winter period.

Table 2. Bison Data

Age Group	Average Body Mass (kg)	Average Rate of Grass Consumption (kg/day)	Proportion of Herd Population
Adult male	800	20.0	0.3
Adult female	440	12.1	0.5
Juvenile	220	6.60	0.2

13. Based on the estimates of total grass available in the study areas and average grass consumption of an individual bison, which study areas could support a herd of 2,000 bison over the winter?

A. 1 or 2

B. 2 or 3

C. 3 or 4

D. 1 or 4

14. Scientists plan to introduce a 100-bison herd into a potential habitat area. Which estimate for how much grass all of the juvenile bison in the herd will eat over a period of 30 days is supported by Table 2?

A. 132 kg

B. 198 kg

C. 3,960 kg

D. 19,800 kg

15. After introducing bison herds into the park, the scientists observed that the bison prefer to occupy study areas 4, 2, 3, and 1, in that order. Based on the data in Table 1, select the correct word or phrase from each box to complete the statements explaining the bisons' preference.

In Banff National Park, bison preference is based on [Y]. Higher carrying capacity [Z] a factor in bison preference for the study areas

Box Y

A. habitat size

B. amount of grassland

C. total grass available

D. average snow depth

Box Z

A. is

B. is not

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GO ON →

Use the information below to answer questions 16–18.

Tectonic plates interact in different ways, but most interactions result in some type of mountain formation.

Figure 1 models conditions at plate boundaries that create various types of surface features. Each separate plate is marked with a letter, with arrows showing the plates' directions of movement: moving toward or away from each other, or sliding past each other.

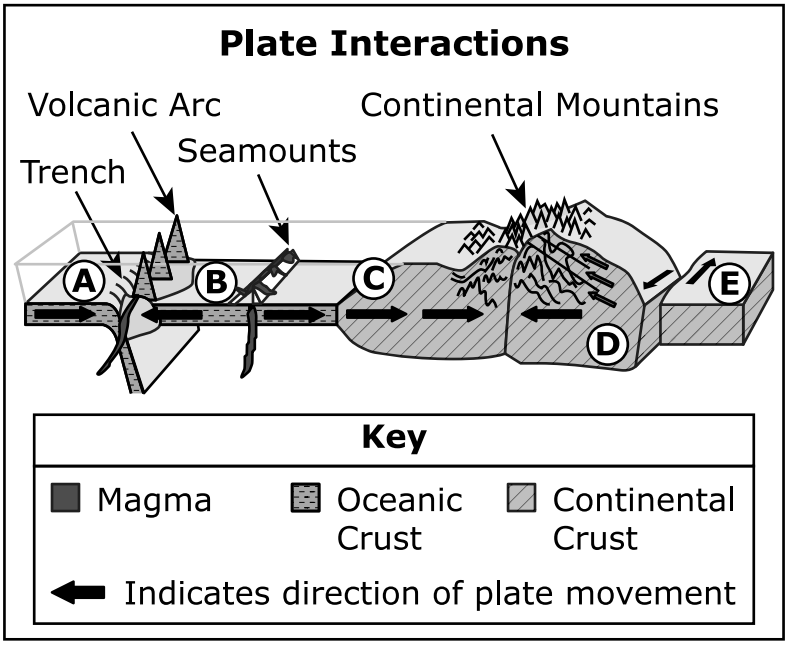

Figure 1.

Table 1 describes types of plate boundaries and the interactions between them.

Table 1. Plate Boundaries

Boundary Type	Tectonic Process	Resulting Surface Feature
Convergent with no subduction[1]	Compression and uplift	Mountain
Convergent with subduction	Volcanism, compression, and uplift	Mountain and/or volcano
Divergent	Volcanism, rifting, and sea floor spreading	Seamount
Transform	Side-to-side motion	None

[1]subduction—the process of one plate being forced beneath another plate

GO ON →

16. Describe the formation of seamounts.

Complete the sentence by choosing the correct answers from each box.

Seamounts form where [X] plates [Y] each other and magma [Z] between them.

Box X

A. continental

B. oceanic

Box Y

A. collide into

B. separate from

C. slip past

Box Z

A. rises

B. descends

17. Figure 2 shows tectonic plate boundaries on Earth, with areas labeled W, X, Y, and Z.

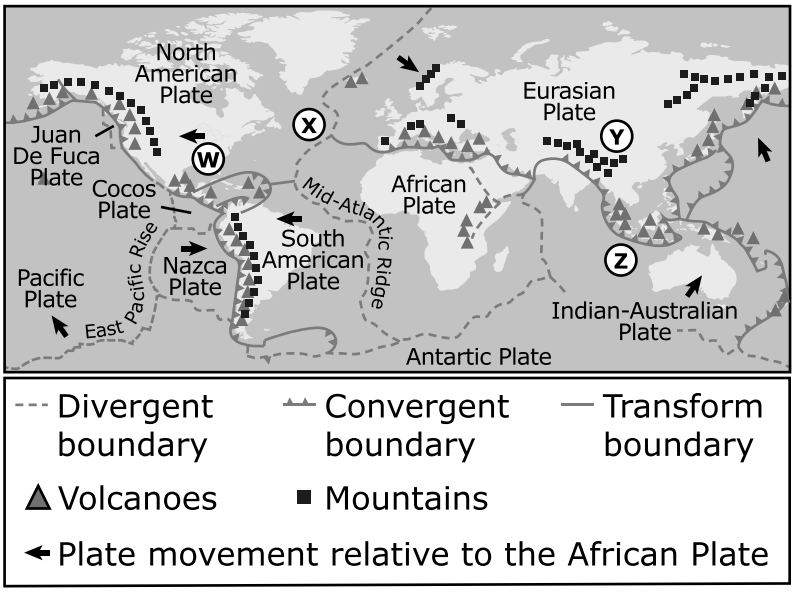

Figure 2. Tectonic Plate Boundaries

Identify the location in Figure 2 that best represents the boundary between plates C and D in Figure 1.

Select the correct location from the four options.

A. Area W

B. Area X

C. Area Y

D. Area Z

18. Based on Figure 1, describe where trenches are found.

Complete the sentences by choosing the correct answers from from each box.

A trench is a feature that is associated with a [Y] plate boundary. It is created when one plate [Z] another plate.

Box Y

A. transform

B. convergent

C. divergent

Box Z

A. moves laterally against

B. is forced underneath

C. moves away from

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GO ON →

Use the information below to answer questions 19–23.

A single hard disk drive can contain all the information from many libraries. When putting the information onto the disk, the disk does not change in size or composition.

Hard disk drives were first introduced in 1954 and remained a dominant technology for over 50 years.

An electromagnetic wave is generated when the direction of current is repeatedly reversed. This wave creates an alternating magnetic field. Hard disk drives use a part called a write head to store information as bits. When current goes through the write head, it becomes magnetic, which magnetizes the grains. This magnetic interaction allows information to be stored in the magnetized grains of the disk as either a "0" or a "1," with each 0 or 1 being considered a single bit. This system of using zeros and ones to store information is known as binary code. Bits are shown as downward- or upward-pointing arrows in Figure 1.

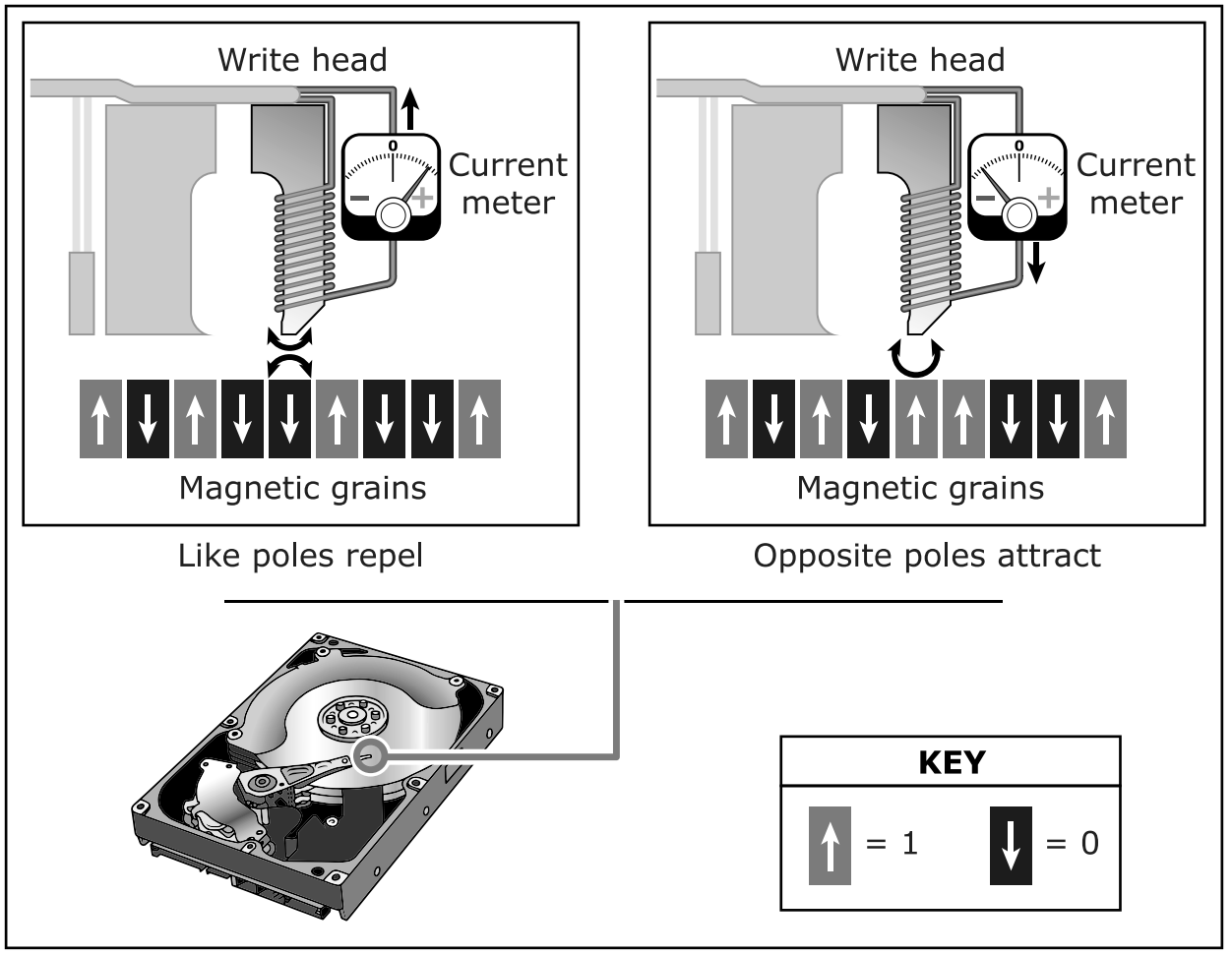

Figure 1. Hard Disk Drives Store Information

Information is stored in larger groups of bits, as shown in Table 1.

Table 1. The Number of Bits in Larger Units

Unit	Value
1 bit	one "0" **OR** one "1"
1 byte	8 bits
1 kB	1,000 bytes
1 MB	1,000,000 bytes
1 GB	1,000,000,000 bytes

19. What is **most** important to the process of storing information on a hard disk drive?

Select **two** of the five statements.

A. the sign of the current

B. the size of the hard disk drive

C. how fast the write head moves

D. the different magnetic field directions

E. how many previously written bits there are

20. How many bits are required to store an image of 1 MB?

A. 1

B. 8

C. 1,000,000

D. 8,000,000

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GO ON →

21. The letter "Z" is written as "01011010" in binary code.

Select the option that shows the correct combination of signs on the current meter to write the letter "Z."

A.

Bit Number	Sign on the Current Meter	
	Positive	Negative
Bit #1		X
Bit #2	X	
Bit #3		X
Bit #4	X	
Bit #5	X	
Bit #6		X
Bit #7	X	
Bit #8		X

B.

Bit Number	Sign on the Current Meter	
	Positive	Negative
Bit #1	X	
Bit #2		X
Bit #3	X	
Bit #4		X
Bit #5		X
Bit #6	X	
Bit #7		X
Bit #8	X	

(Item 21 continued)

C.

Bit Number	Sign on the Current Meter	
	Positive	Negative
Bit #1	X	
Bit #2		X
Bit #3		X
Bit #4	X	
Bit #5		X
Bit #6	X	
Bit #7		X
Bit #8	X	

D.

Bit Number	Sign on the Current Meter	
	Positive	Negative
Bit #1		X
Bit #2	X	
Bit #3	X	
Bit #4		X
Bit #5	X	
Bit #6		X
Bit #7	X	
Bit #8		X

22. Each capital English letter is represented by a one-byte string that contains eight bits, as shown in the table. Each byte is read from left to right.

Table 2. 8-Bit Strings Representing English Capital Letters

Letter	Bit String
A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100

(Item 22 continued)

The following bit string was recovered from a corrupted hard disk drive by measuring the magnetic interactions stored by the magnetic grains.

Bit Number	Magnetic Interaction
Bit 1	repulsive
Bit 2	attractive
Bit 3	repulsive
Bit 4	repulsive
Bit 5	attractive
Bit 6	repulsive
Bit 7	attractive
Bit 8	repulsive

Which capital letter was recovered?

A. H

B. I

C. J

D. K

E. L

23. Each capital English letter is stored by a sequence of magnetic interactions between the write head and the magnetic grains, as shown in the table. A bit string is obtained by writing bits 1–8 from left to right.

Table 3. 8-Bit Strings Representing Two English Capital Letters

Bit Number	Magnetic Interaction Sequence	
	Letter "O"	**Letter "R"**
1	repulsive	repulsive
2	attractive	attractive
3	repulsive	repulsive
4	repulsive	attractive
5	attractive	repulsive
6	attractive	repulsive
7	attractive	attractive
8	attractive	repulsive

Construct an explanation about how wave interactions store information on a hard disk drive.

Enter your response in your answer document. Support your answer with evidence from the information in Figure 1.

Use an English letter from Table 3 to construct an explanation about how the sequence of the magnetic interactions between the write head and the magnetic grains are used to store information.

Enter your response in your answer document. Support your answer with evidence from the information in Figure 1.

(Item 23 continued)

Make a claim about:

- the type of magnetic interaction that is produced when a current is applied to the write head;
- why this magnetic interaction is produced, and
- the bit that results from this interaction.

Enter your response in your answer document. Support your answer with evidence from the information in Figure 1.

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You have reached the end of Unit 1 of the test.

- **Review your answers from Unit 1.**