Washington Office of Superintendent of
PUBLIC INSTRUCTION

Washington Comprehensive Assessment of Science
Paper-Pencil Booklet

Grade 11

Training Test

This training test paper-pencil booklet is intended to provide students who are administered paper-pencil versions of the Washington Comprehensive Assessment of Science (WCAS) with the opportunity to become familiar with the format of the assessment.

Copyright © 2020 by the Office of Superintendent of Public Instruction, Olympia, Washington.

DO NOT WRITE ON THIS PAGE.

GO ON

Question 1

The following question has two parts. First, answer part A. Then, answer part B.

Part A

Hydrogen (H_2) is used as a fuel in some cars. The balanced chemical equation for a process that produces H_2 is shown in the Chemical Equation diagram.

Chemical Equation

$$CH_4 + H_2O \rightarrow CO + 3\ H_2$$

The Reaction Masses table shows the masses of some of the substances for one trial of the reaction.

Calculate the mass of H_2 produced. Complete the table by writing in the mass.

Reaction Masses

Substance	**Mass** (grams)
Reactant: H_2O	1802
Reactant: CH_4	1605
Product: CO	2801
Product: H_2	

Part B

Which statement supports the answer to part A?

Ⓐ The mass of H_2 is one-half the mass of CH_4.

Ⓑ The mass of H_2 is two-thirds the mass of H_2O.

Ⓒ The total mass of the products is twice the total mass of the reactants.

Ⓓ The total mass of the reactants is equal to the total mass of the products.

GO ON

Question 2

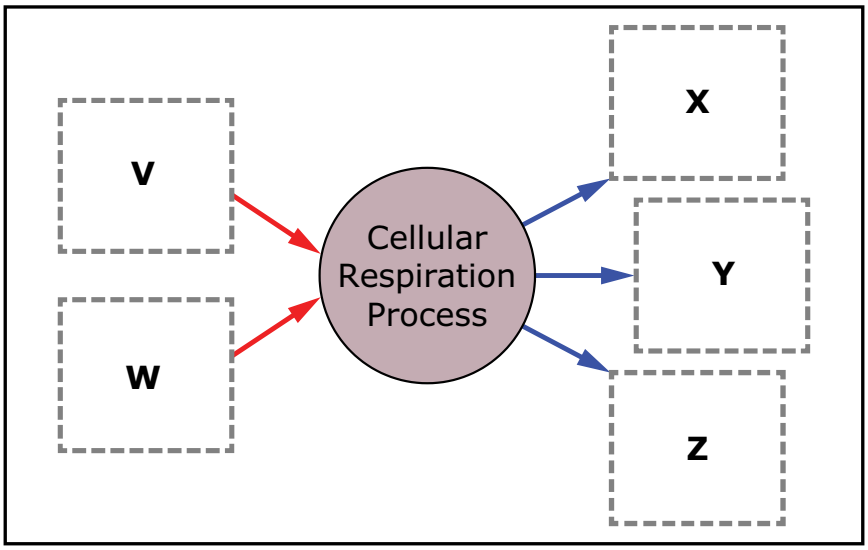
The following question has two parts. First, answer part A. Then, answer part B.

Part A

The Cellular Respiration model can be used to show the inputs and outputs of the cellular respiration process.

Fill in circles in the table to identify the input or output represented by each letter in the model. Fill in **one** circle for each letter.

Cellular Respiration



Letter	Sugar ($C_6H_{12}O_6$)	Water (H_2O)	Oxygen (O_2)	Energy	Carbon dioxide (CO_2)
V	○	○	○	○	○
W	○	○	○	○	○
X	○	○	○	○	○
Y	○	○	○	○	○
Z	○	○	○	○	○

GO ON

Part B

Which statement describes a reason that the output molecules of cellular respiration are different from the input molecules?

Ⓐ There is less energy stored in the input molecules than is stored in the output molecules.

Ⓑ The energy added to the input molecules is used to form new atoms in the output molecules.

Ⓒ There are different types of atoms in the input molecules than there are in the output molecules.

Ⓓ The bonds between atoms in the input molecules are broken and new bonds are formed to produce the output molecules.

DO NOT WRITE ON THIS PAGE.

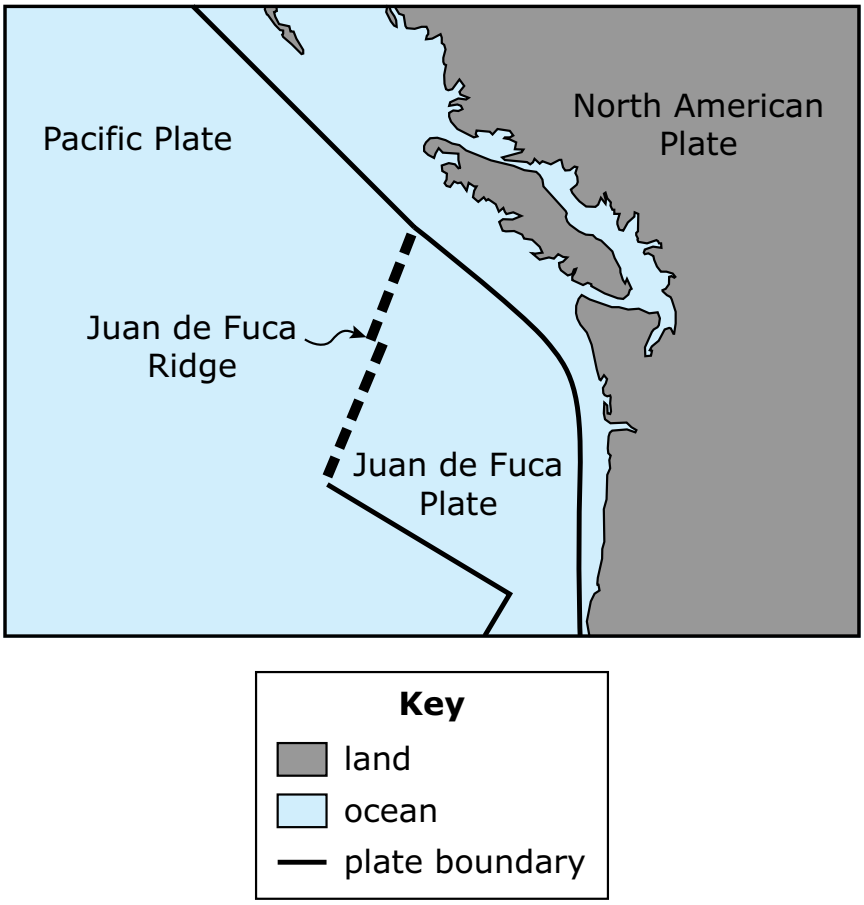
Question 3

The following question has two parts. First, answer part A. Then, answer part B.

Part A

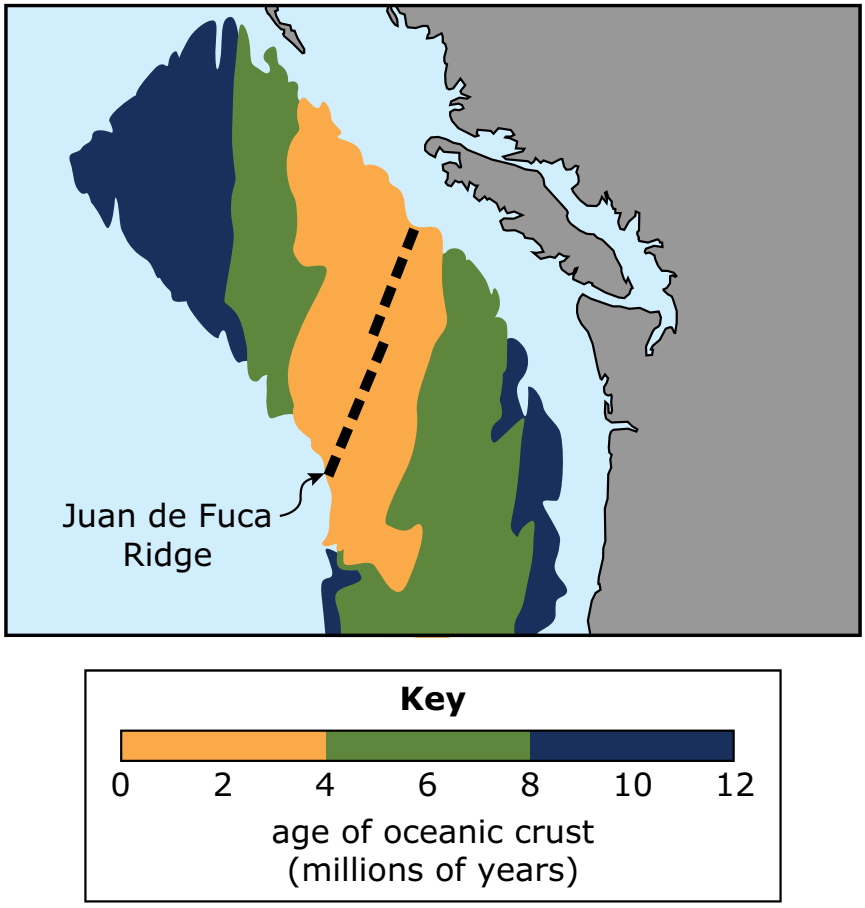
The Juan de Fuca Ridge separates the Pacific Plate and the Juan de Fuca Plate. The North American Plate borders the eastern side of the Juan de Fuca Plate. The Tectonic Plates diagram shows some of the features of these three plates.

Tectonic Plates



The Juan de Fuca Ridge diagram shows the ages of oceanic crust on both sides of the Juan de Fuca Ridge.

Juan de Fuca Ridge



Based on information from the Juan de Fuca Ridge diagram, choose a word in **each** box to complete the sentence.

As the distance from the Juan de Fuca Ridge

- ○ increases
- ○ decreases

, the age of the oceanic crust in the Juan de Fuca Plate

- ○ increases
- ○ decreases

.

GO ON

Part B

Select **two** statements that describe a reason for the answer to part A. Fill in **only** two circles.

- ○ The Juan de Fuca Ridge occurs at a convergent plate boundary.
- ○ Oceanic crust melts as the crust moves away from the Juan de Fuca Ridge.
- ○ Newly formed oceanic crust pushes existing oceanic crust away from the Juan de Fuca Ridge.
- ○ Convection currents beneath the crust cause ocean floor spreading at the Juan de Fuca Ridge.
- ○ Oceanic crust in the Juan de Fuca Plate moves in a different direction than the ocean waves above the crust.

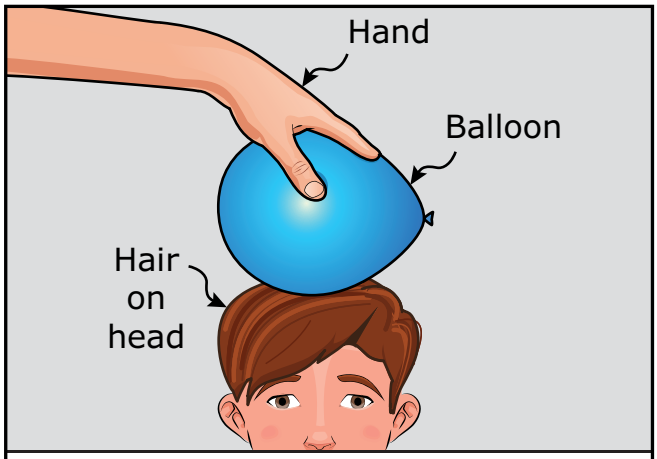
DO NOT WRITE ON THIS PAGE.

Competing Forces

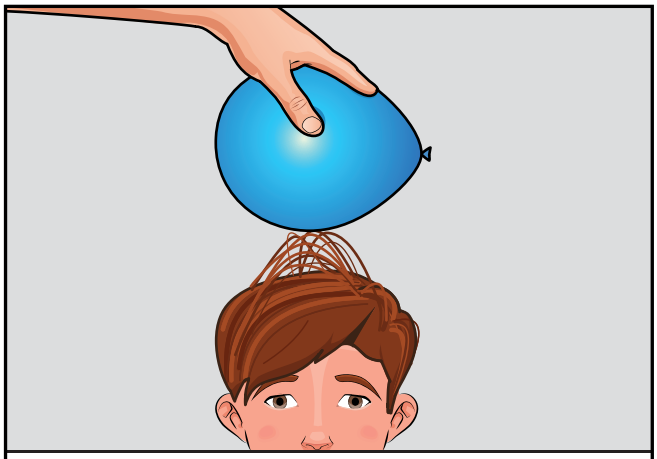
Read the information and answer the questions.

A balloon is rubbed against a student's hair. Then, the balloon is held over a piece of string lying on a table top. The interaction between the balloon and the string is shown in the Balloon and String Demonstration diagram.

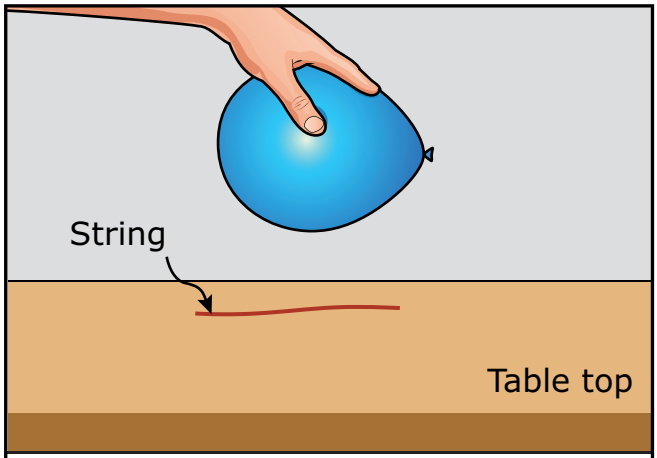
Balloon and String Demonstration



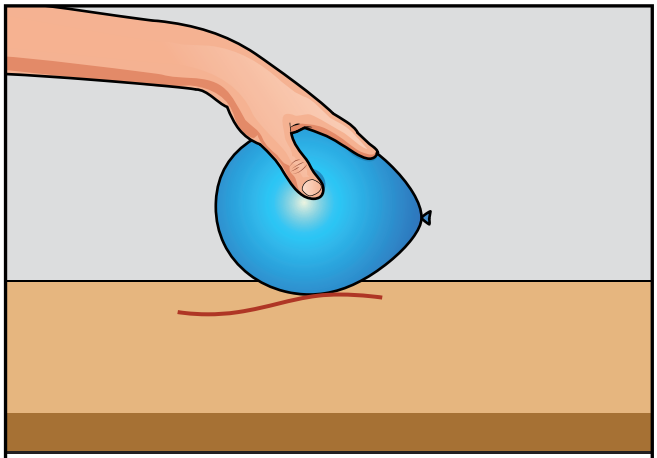
Step 1
A balloon is rubbed against a student's hair.



Step 2
The balloon is lifted and some of the student's hair sticks to the balloon.



Step 3
The balloon is held over a piece of string lying on a table top.



Step 4
When the balloon is close enough to the string, the string moves upward and sticks to the balloon.

GO ON

Students wondered what caused the interaction between the balloon and the string. They learned that the two forces involved in the interaction are the electrostatic force and the gravitational force. Information about the formulas that describe these two forces is shown in the Force Formulas table.

Force Formulas

Formula	Information
$F_e = k\frac{q_1 q_2}{d^2}$	F_e represents electrostatic force
	k represents Coulomb's constant
	q represents charge
	d represents distance
$F_g = -G\frac{m_1 m_2}{d^2}$	F_g represents gravitational force
	G represents the gravitational constant
	m represents mass
	d represents distance

Question 4

One student claims that the gravitational force is always attractive.

Which statement describes a mathematical reason that supports the student's claim?

Ⓐ The mass (m) of an object is always positive.

Ⓑ The gravitational force (F_g) always pulls towards Earth.

Ⓒ The distance (d) between two objects is always negative.

Ⓓ The gravitational force constant (G) always has a very small value.

THIS QUESTION WILL BE LOCKED AFTER COMPLETION.

You must answer this question before moving on to the next question.
After you move to the next question, you cannot change your answer to this question.

GO ON

DO NOT WRITE ON THIS PAGE.

Question 5

An electrostatic force can be either positive or negative because two charged objects can either attract or repel each other.

Fill in circles to describe an interaction between object 1 and object 2 that could result in the given sign of the electrostatic force. Fill in **one** circle in each cell.

Sign of Electrostatic Force (F_e)	Interaction between Objects 1 and 2	Charge of Object 1	Charge of Object 2
Negative	○ attract ○ repel	○ positive ○ negative	○ positive ○ negative
Positive	○ attract ○ repel	○ positive ○ negative	○ positive ○ negative

Question 6

The following question has two parts. First, answer part A. Then, answer part B.

Part A

Based on the electrostatic force formula, which statement predicts how the size of the electrostatic force changes when the distance between two charges becomes half as large?

Ⓐ The force becomes one-fourth as large.

Ⓑ The force becomes one-half as large.

Ⓒ The force becomes four times larger.

Ⓓ The force becomes twice as large.

Part B

Based on the gravitational force formula, which statement predicts how the size of the gravitational force changes when the distance between two masses doubles?

Ⓐ The force becomes one-fourth as large.

Ⓑ The force becomes one-half as large.

Ⓒ The force becomes four times larger.

Ⓓ The force becomes twice as large.

GO ON

Question 7

The following question has two parts. First, answer part A. Then, answer part B.

Part A

Which statement describes the reason the string moves toward the balloon in the Balloon and String Demonstration diagram?

Ⓐ The electrostatic force on the balloon is stronger than the gravitational force on the balloon.

Ⓑ The electrostatic force on the string is stronger than the gravitational force on the string.

Ⓒ The gravitational force on the balloon is less than the gravitational force on the string.

Ⓓ The electrostatic force on the balloon is less than the electrostatic force on the string.

Part B

Which mathematical relationship represents the net force on the string when the string moves toward the balloon in the Balloon and String Demonstration diagram?

Ⓐ $F_e + F_g = 0$

Ⓑ $F_e - F_g = 0$

Ⓒ $F_e < F_g$

Ⓓ $F_e > F_g$

Coral Bleaching—Section 1

Read the information and answer the questions.

A coral reef is made up of organisms called corals. Corals are marine animals whose skeletons form the structure of the reef. The bright colors of coral reefs are caused by algae that live inside the skeletons of the corals and provide the corals with energy.

Coral reefs provide homes for about 25% of all marine species. The Coral Reef Ecosystem diagram shows some of the organisms found in a coral reef ecosystem.

Coral Reef Ecosystem

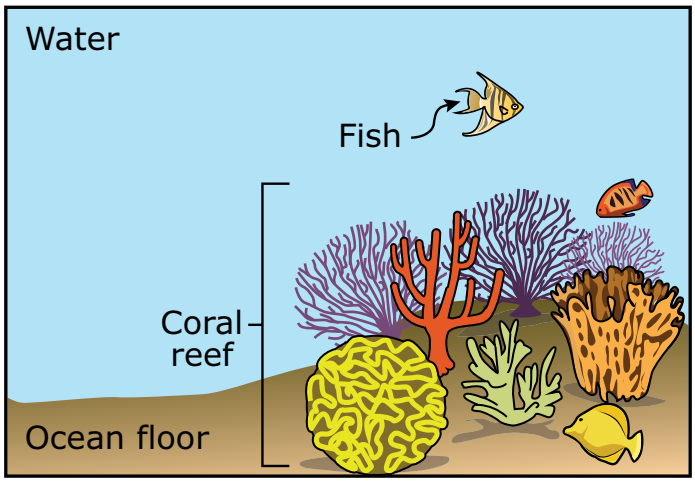


Diagram not to scale

When stressed, corals expel the algae, lose their bright colors, and become white. This is known as a coral bleaching event. If the stress lasts for only a short time, the corals can recover. But if the stress lasts for a long time, the corals can starve.

Question 8

A student claims that coral reef ecosystems are stable because they can recover after a bleaching event.

Which evidence should be collected to evaluate the student's claim?

Ⓐ the number of algae in a coral reef ecosystem during a bleaching event

Ⓑ the size of predators in a coral reef ecosystem that survive a bleaching event

Ⓒ the temperature of the ocean in a coral reef ecosystem before and after a bleaching event

Ⓓ the number and type of organisms in a coral reef ecosystem before and after a bleaching event

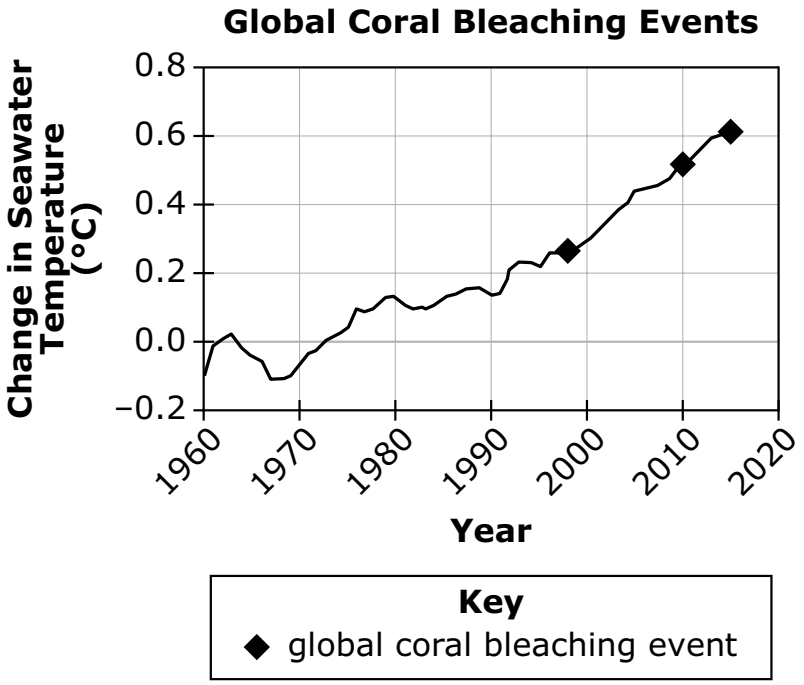
THIS QUESTION WILL BE LOCKED AFTER COMPLETION.

You must answer this question before moving on to the next question.
After you move to the next question, you cannot change your answer to this question.

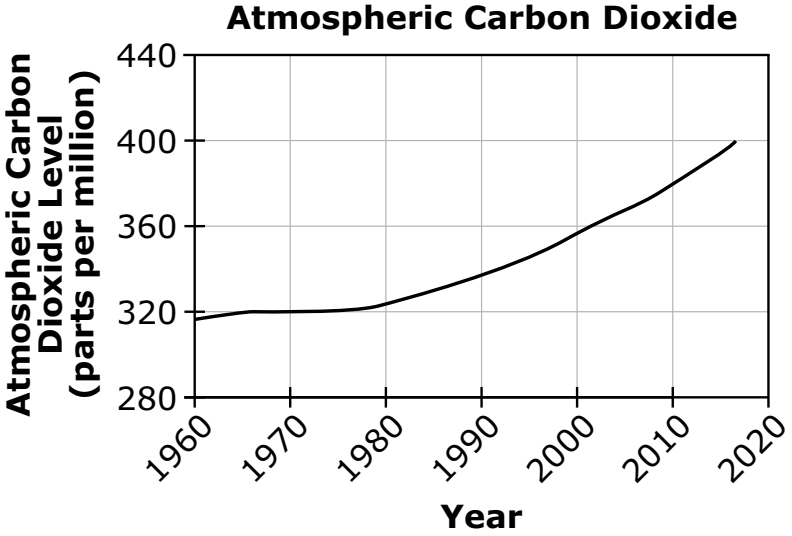
GO ON

Coral Bleaching—Section 2

An increase in the temperature of seawater is one possible cause of coral bleaching. The Global Coral Bleaching Events graph shows the relationship between the change in seawater temperature and three global coral bleaching events.



The change in seawater temperature is correlated with the amount of carbon dioxide in the atmosphere. The Atmospheric Carbon Dioxide graph shows how the amount of carbon dioxide in the atmosphere has changed since 1960.



Question 9

Scientists claim that an increase in carbon dioxide in the atmosphere destabilizes coral reef ecosystems. Which evidence from the Global Coral Bleaching Events and Atmospheric Carbon Dioxide graphs supports the claim?

Ⓐ The increase in the frequency of coral bleaching events correlates with the increase in atmospheric carbon dioxide levels.

Ⓑ The increase in seawater temperature correlates with the decrease in atmospheric carbon dioxide levels.

Ⓒ The atmospheric carbon dioxide level and change in seawater temperature fluctuate at regular intervals.

Ⓓ The atmospheric carbon dioxide level was highest before the first coral bleaching event occurred.

THIS QUESTION WILL BE LOCKED AFTER COMPLETION.

You must answer this question before moving on to the next question.
After you move to the next question, you cannot change your answer to this question.

GO ON

DO NOT WRITE ON THIS PAGE.

Question 10

The following question has two parts. First, answer part A. Then, answer part B.

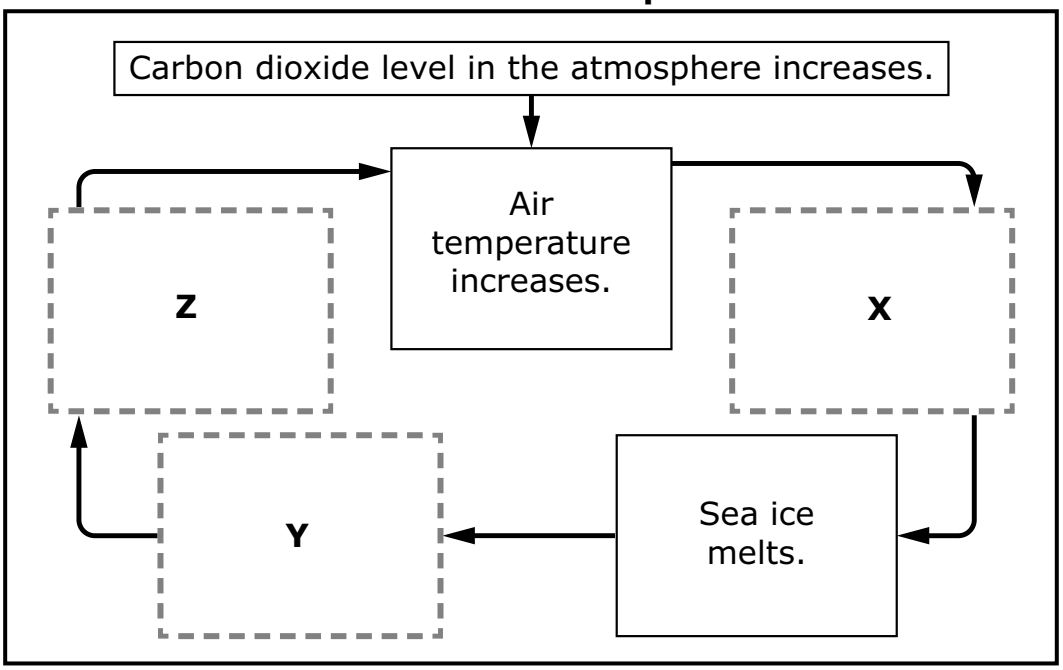
Part A

Atmospheric carbon dioxide is a greenhouse gas that absorbs thermal energy, resulting in an increase in air temperature. An increase in the amount of carbon dioxide in the atmosphere causes a feedback loop that stresses coral reef ecosystems by causing seawater temperature to increase.

The Feedback Loop model can be used to show a feedback loop that could stress coral reef ecosystems.

Fill in circles in the table to identify the statement represented by each letter in the model. Fill in **one** circle for each row.

Feedback Loop



Statement	X	Y	Z
The amount of thermal energy transferred to the atmosphere increases.	○	○	○
Seawater temperature increases.	○	○	○
The amount of solar radiation absorbed increases.	○	○	○

Part B

Choose a word or phrase in **each** box to describe the answer to part A.

The model represents

- ○ positive
- ○ negative

feedback, because as the air temperature increases over time, the amount of sea ice melting will

- ○ increase
- ○ decrease
- ○ become constant

over time, causing the ecosystem to

- ○ stabilize
- ○ destabilize

.

THIS QUESTION WILL BE LOCKED AFTER COMPLETION.

You must answer this question before moving on to the next question.
After you move to the next question, you cannot change your answer to this question.

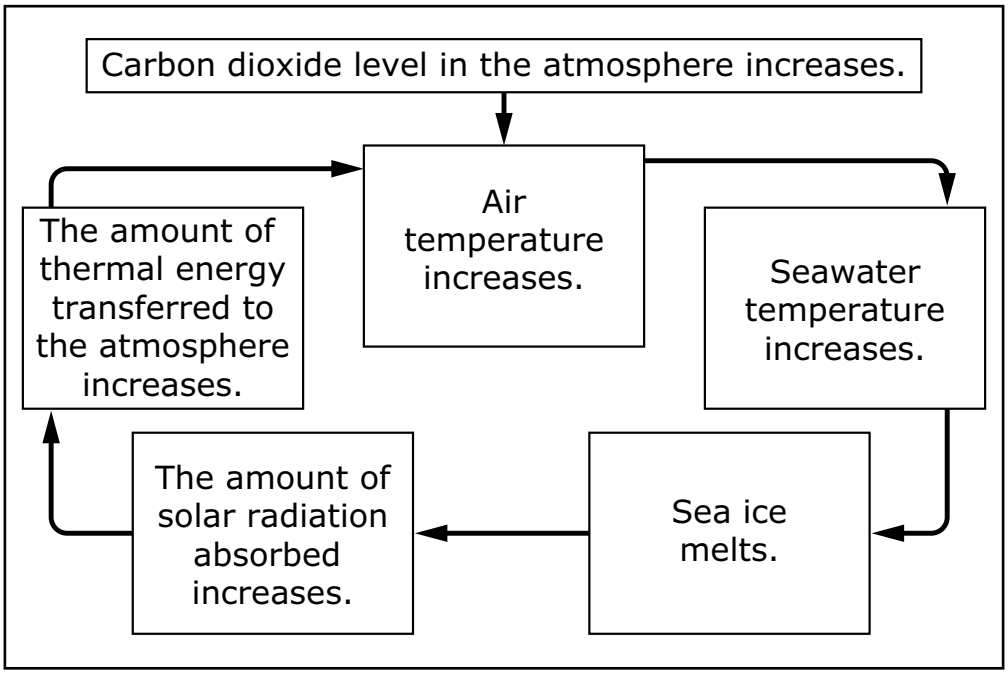
GO ON

DO NOT WRITE ON THIS PAGE.

Question 11

One student made the Positive Feedback Model to describe a feedback loop that could destabilize coral reef ecosystems.

Positive Feedback Model



Fill in a circle to identify whether each human activity would speed up or slow down the rate of change in the feedback loop. Fill in **one** circle for each row.

Human Activity	Speed Up	Slow Down
Planting a new forest	○	○
Walking to school instead of driving to school	○	○
Increasing the number of trucks driving on roads	○	○
Replacing a coal power plant with a solar power plant	○	○

Question 12

Describe what could happen to a healthy coral reef ecosystem if atmospheric carbon dioxide levels continue to increase.

In your description, be sure to:

- Describe **one** way a healthy coral reef ecosystem could change if atmospheric carbon dioxide levels continue to increase.
- Describe how **that** change to a coral reef ecosystem could affect other organisms in the coral reef ecosystem.

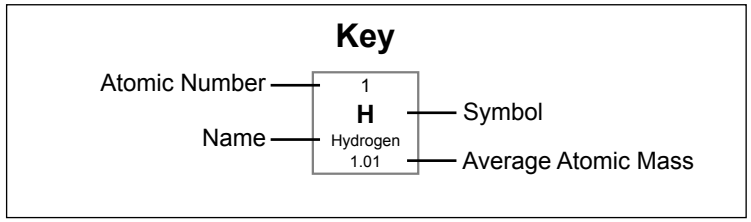
GO ON

DO NOT WRITE ON THIS PAGE.

You have reached the end of the test.

PERIODIC TABLE

This periodic table is a state approved non-embedded universal tool for students in grades 8 and 11 taking the paper-pencil science assessment, only.
Use of other periodic tables is prohibited. TAs must collect and account for this sheet when provided during state testing.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 **H** Hydrogen 1.01																	2 **He** Helium 4.00
2	3 **Li** Lithium 6.94	4 **Be** Beryllium 9.01											5 **B** Boron 10.81	6 **C** Carbon 12.01	7 **N** Nitrogen 14.01	8 **O** Oxygen 16.00	9 **F** Fluorine 19.00	10 **Ne** Neon 20.18
3	11 **Na** Sodium 22.99	12 **Mg** Magnesium 24.30											13 **Al** Aluminum 26.98	14 **Si** Silicon 28.09	15 **P** Phosphorus 30.97	16 **S** Sulfur 32.06	17 **Cl** Chlorine 35.45	18 **Ar** Argon 39.95
4	19 **K** Potassium 39.10	20 **Ca** Calcium 40.08	21 **Sc** Scandium 44.96	22 **Ti** Titanium 47.87	23 **V** Vanadium 50.94	24 **Cr** Chromium 52.00	25 **Mn** Manganese 54.94	26 **Fe** Iron 55.85	27 **Co** Cobalt 58.93	28 **Ni** Nickel 58.69	29 **Cu** Copper 63.55	30 **Zn** Zinc 65.38	31 **Ga** Gallium 69.72	32 **Ge** Germanium 72.63	33 **As** Arsenic 74.92	34 **Se** Selenium 78.97	35 **Br** Bromine 79.90	36 **Kr** Krypton 83.80
5	37 **Rb** Rubidium 85.47	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.91	40 **Zr** Zirconium 91.22	41 **Nb** Niobium 92.91	42 **Mo** Molybdenum 95.95	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.91	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.87	48 **Cd** Cadmium 112.41	49 **In** Indium 114.82	50 **Sn** Tin 118.71	51 **Sb** Antimony 121.76	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90	54 **Xe** Xenon 131.29
6	55 **Cs** Cesium 132.91	56 **Ba** Barium 137.33	57–71	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.95	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.21	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.22	78 **Pt** Platinum 195.08	79 **Au** Gold 196.97	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.38	82 **Pb** Lead 207.21	83 **Bi** Bismuth 208.98	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
7	87 **Fr** Francium (223)	88 **Ra** Radium (226)	89–103	104 **Rf** Rutherfordium (267)	105 **Db** Dubnium (268)	106 **Sg** Seaborgium (269)	107 **Bh** Bohrium (270)	108 **Hs** Hassium (269)	109 **Mt** Meitnerium (278)	110 **Ds** Darmstadtium (281)	111 **Rg** Roentgenium (282)	112 **Cn** Copernicium (285)	113 **Nh** Nihonium (286)	114 **Fl** Flerovium (289)	115 **Mc** Moscovium (289)	116 **Lv** Livermorium (293)	117 **Ts** Tennessine (294)	118 **Og** Oganesson (294)

57 **La** Lanthanum 138.91	58 **Ce** Cerium 140.12	59 **Pr** Praseodymium 140.91	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.96	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.93	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93	70 **Yb** Ytterbium 173.05	71 **Lu** Lutetium 174.97
89 **Ac** Actinium (227)	90 **Th** Thorium 232.04	91 **Pa** Protactinium 231.04	92 **U** Uranium 238.03	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (266)