BRITISH COLUMBIA
The Best Place on Earth

Science 10
Examination Booklet
2011/12 Sample Exam
Exam B

DO NOT OPEN ANY EXAMINATION MATERIALS UNTIL INSTRUCTED TO DO SO.

Examination Instructions

1. On your Answer Sheet, fill in the bubble (Form A, B, C, D, E, F, G or H) that corresponds to the letter on this Examination Booklet.
2. Use a pencil to fill in bubbles when answering questions on your Answer Sheet.
3. When the examination begins, remove the data pages located in the centre of this booklet.
4. Read the Examination Rules on the back of this booklet.

Contents: 44 pages
80 multiple-choice questions

Examination: 2 hours
Additional Time Permitted: 60 minutes

Suggested Time: 120 minutes

INSTRUCTIONS: For each question, select the best answer and record your choice on the **Answer Sheet** provided. Using a pencil, completely fill in the bubble that has the letter corresponding to your answer.

You have **Examination Booklet Form B**. In the box above #1 on your **Answer Sheet**, fill in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	○	●	○	○	○	○	○	○

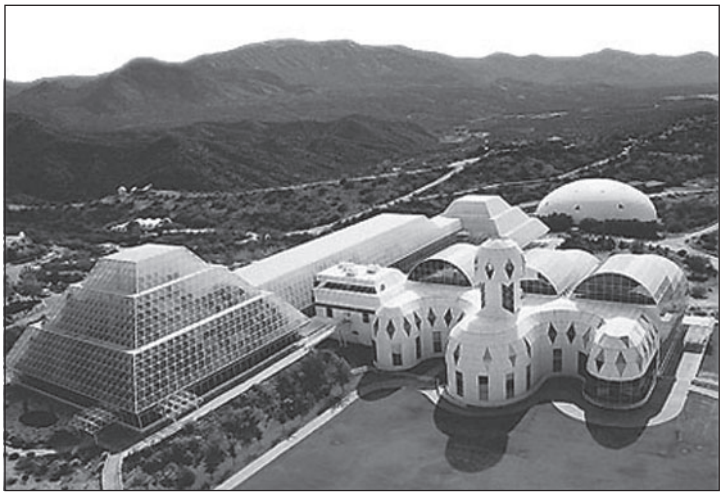
LIFE SCIENCE — SUSTAINABILITY OF ECOSYSTEMS

REFER TO DATA PAGES

For this section of the examination, refer to:

- **Names, Formulae and Charges of Some Polyatomic Ions on Data Page 5**
- **The Carbon Cycle on Data Page 8**
- **The Phosphorus Cycle on Data Page 9**
- **Biomes of the World on Data Page 10**
- **The Nitrogen Cycle on Data Page 11**

1. Biosphere II was built in Tucson, Arizona. This multi-million dollar experiment enclosed several mechanically maintained environments. These included a tropical rainforest, desert, grassland and a 4-million-litre tropical ocean.



www.bio2.com

The different environments in Biosphere II represent

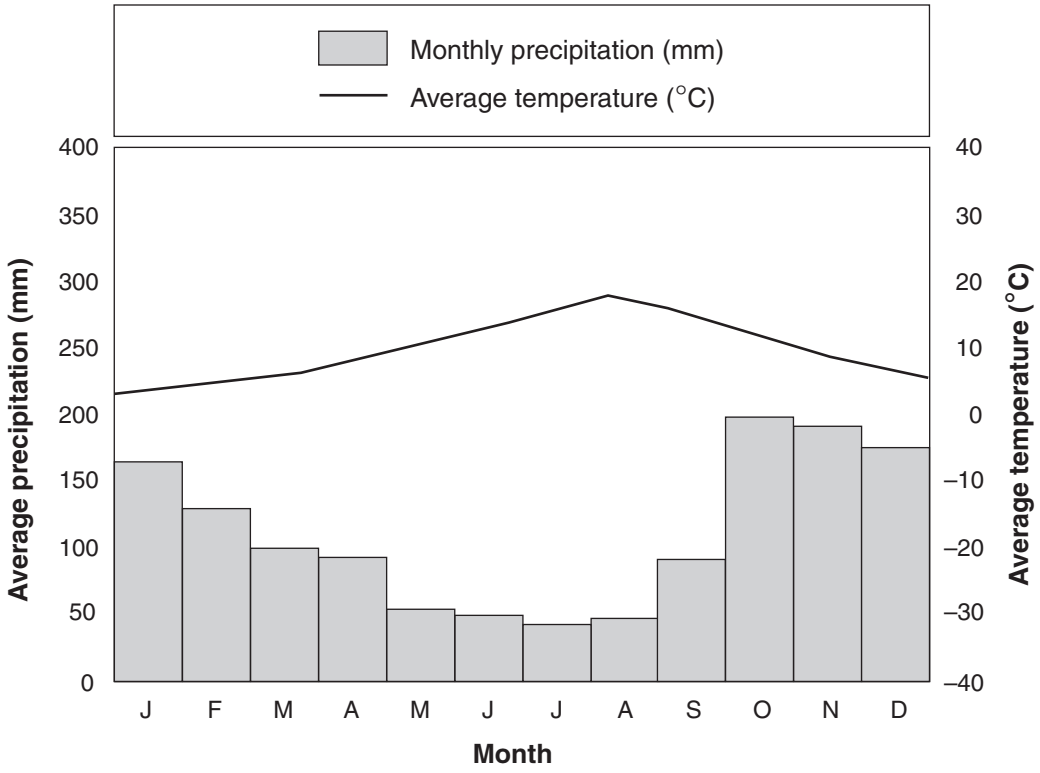
A. biomes.
B. food webs.
C. populations.
D. ecological succession.

2. Which of the following factors explains why there are very few tall trees in the grassland biome?

I	Low annual rainfall.
II	Summer temperatures only reach 10°C.
III	Frozen ground prevents root growth, allowing little drainage and little decomposition.

A. I only
B. I and II only
C. I and III only
D. II and III only

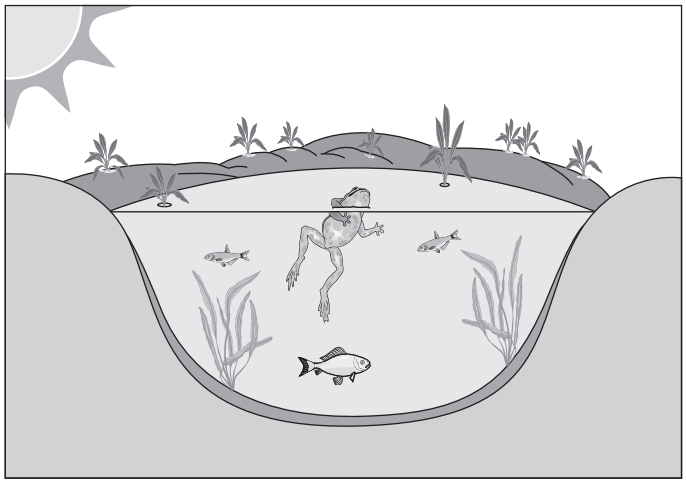
Use the following climatograph to answer question 3.



3. Which world biome is represented by the data in the climatograph?

A. desert
B. tundra
C. tropical rainforest
D. temperate rainforest

Use the following graphic of an aquatic ecosystem to answer questions 4 and 5.



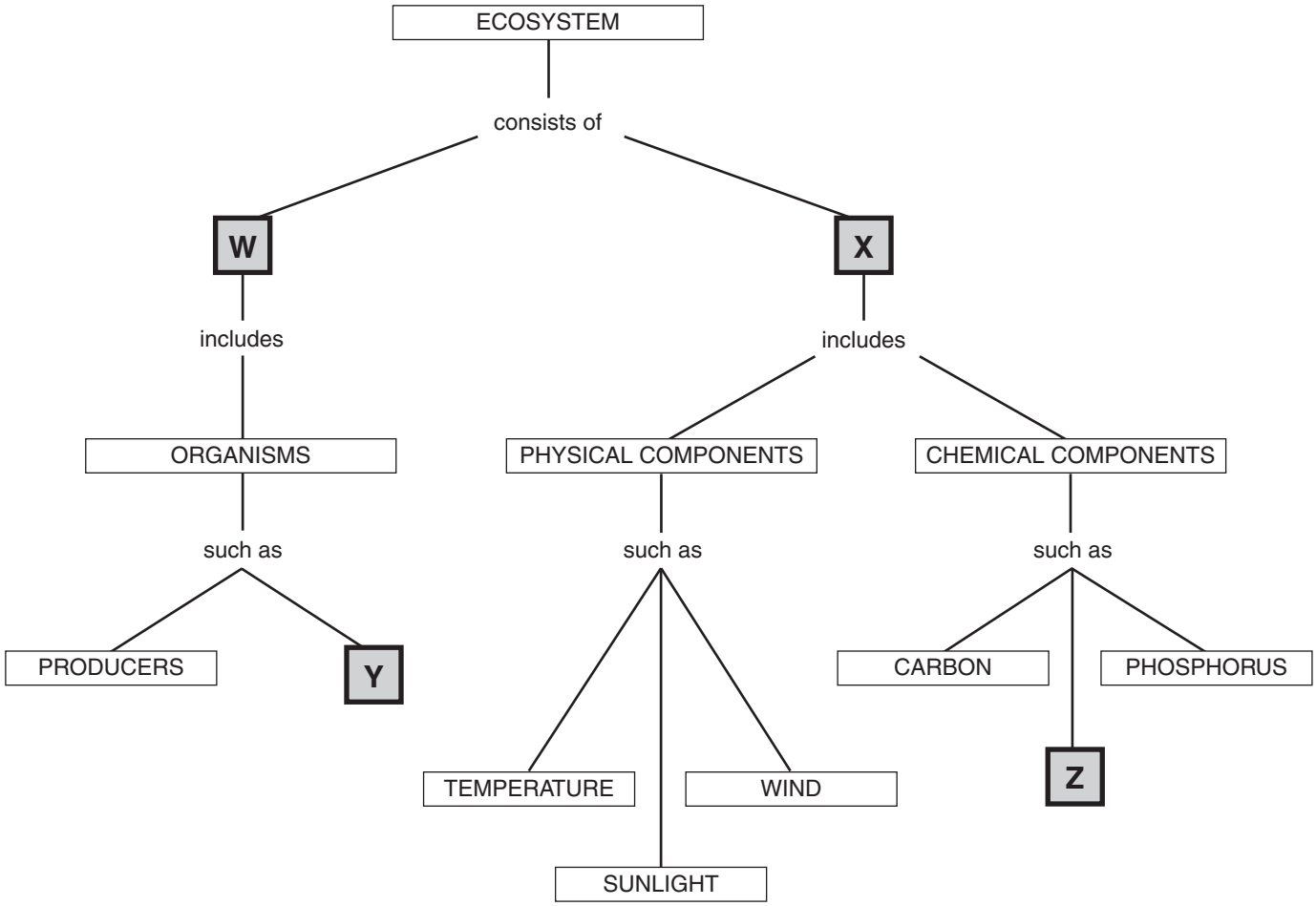
4. Which of the following factors is abiotic?

   A. fish
   B. frog
   C. plant
   D. water

5. What process is responsible for providing energy to the ecosystem?

   A. decomposition
   B. commensalism
   C. photosynthesis
   D. bioaccumulation

Use the following diagram to answer question 6.



6. Which of the following sets of terms correctly represent each of the shaded boxes shown above?

	Box W	Box X	Box Y	Box Z
A.	biotic	abiotic	biome	water
B.	biotic	abiotic	consumers	nitrogen
C.	abiotic	biotic	biome	water
D.	abiotic	biotic	consumers	nitrogen

Use the following information to answer questions 7 and 8.

A unique facility in northwestern Ontario is one of Canada's most innovative and successful freshwater research centres. This facility, the Experimental Lakes Area, or ELA, has served for more than thirty years as a natural laboratory. Scientists come here from around the world to study the lakes and streams, their watersheds and the effects of various pollutants on these living systems.

www.dfo-mpo.gc.ca

During the 1960s and early 1970s, rapid increases in algae growth caused deterioration of the water quality and the fisheries of Lake Erie and other lakes in North America and Europe. Laboratory studies suggested that several nutrients were responsible; primarily, high levels of phosphorus, nitrogen and carbon.

The ELA studied one lake by dividing it with a plastic curtain and adding various nutrients. The lower basin received additions of carbon, nitrogen and phosphorus; the upper basin received carbon and nitrogen only. The different colour in the lower basin as seen in the photo above is caused by algae growth.

7. What is the experimental variable in this study?

   A. carbon
   B. oxygen
   C. nitrogen
   D. phosphorus

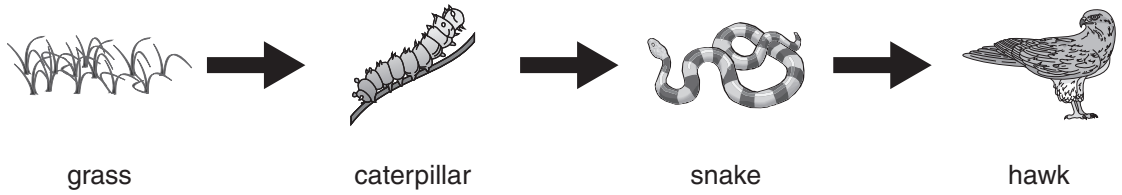
8. What would be an appropriate control for the experiment?

   A. the plastic curtain
   B. the amount of algae growth
   C. a similar lake where nutrient levels were not altered
   D. the amounts of phosphorus, nitrogen and carbon added to the lake

9. Which of the following species is most likely to occupy the second trophic level in an ecosystem?

   A. apple
   B. bird-eating cat
   C. insect-eating bird
   D. apple-eating insect

Use the following food chain to answer question 10.



10. If many hawks were killed, what would likely happen to the caterpillar population?

    A. It would increase.
    B. It would decrease.
    C. It would remain stable.
    D. It would increase, then level off.

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11. Which of the following scenarios is an example of parasitism?

    A. The red-billed oxpecker climbs over the skin of giraffes, searching for insects to eat. The giraffe is helped because the oxpecker takes away the irritating pests.

    B. The dodder is a plant that lives on other plants, getting nutrients from them. Dodders do not have any chlorophyll necessary for photosynthesis and do not make their own food.

    C. The remora fish has a suction disk on top of its head, which it uses to harmlessly attach itself to sharks. It is then protected by the shark and can pick up scraps of food the shark drops.

    D. Acacia ants protect the acacia tree in Costa Rica. They bite animals that try to eat parts of the tree. In return, the tree provides the ants with a safe place to nest inside its large thorns. The tree also produces a sweet substance for the ants to eat.

12. Which of the following situations best explains the limited amounts of nitrogen in agricultural land?

A. Denitrifying bacteria are scarce.
B. Decomposers remove nitrogen from the soil.
C. Bacteria that perform nitrogen fixation are rare.
D. Ammonium, nitrite and nitrate leach from the soil.

13. Which of the following activities will remove carbon dioxide from the atmosphere?

I	planting trees
II	burning a forest
III	cutting down trees
IV	maintaining a mature forest

A. I and IV only
B. II and III only
C. III and IV only
D. I, III and IV only

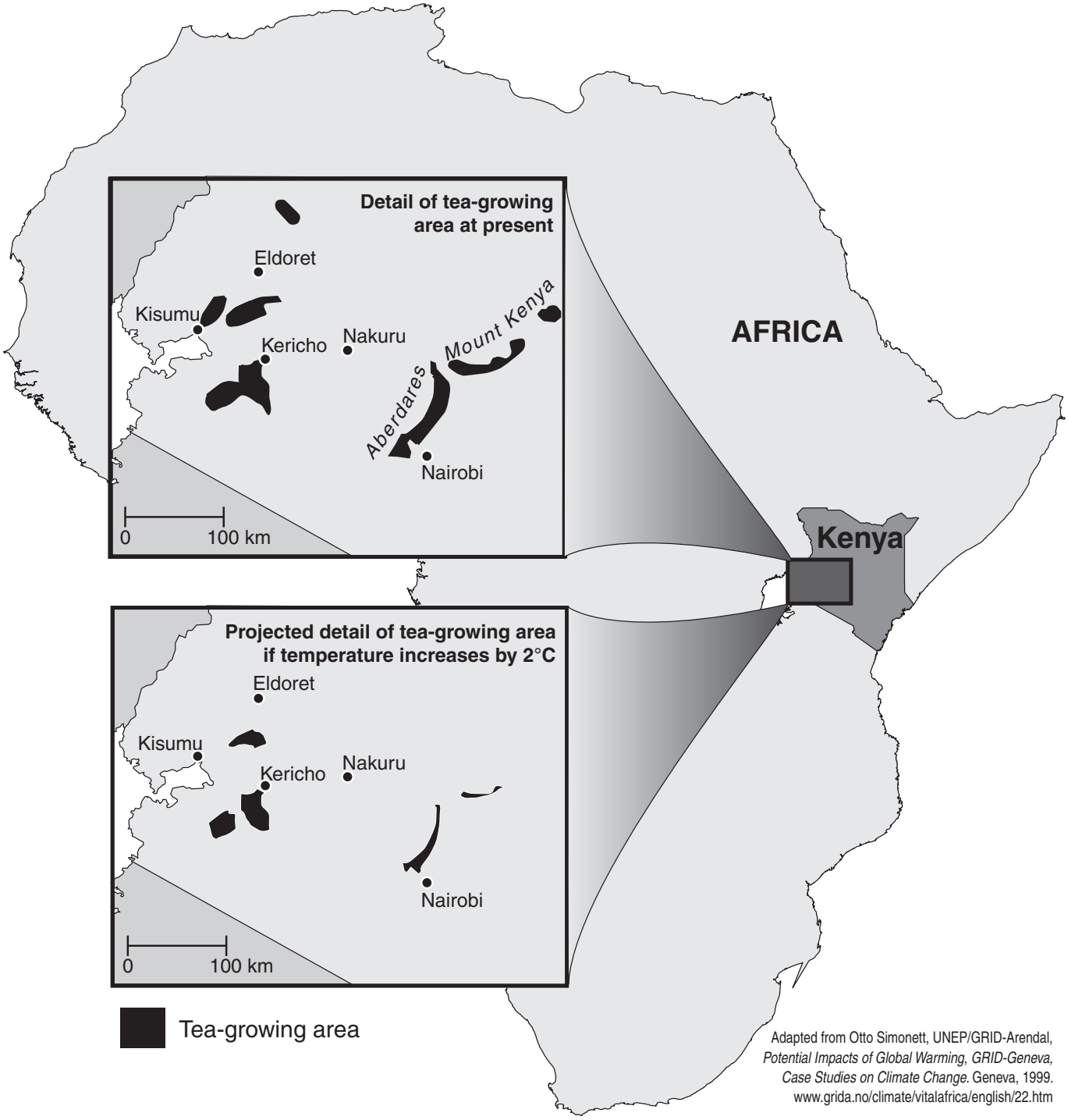
14. Which of the following processes describes how phosphorus is made available for plants to use?

A. Lightning fixes atmospheric phosphorous.
B. Weathering releases phosphorus from rock.
C. Volcanoes release phosphorus from the Earth.
D. Cellular respiration releases phosphorus to the atmosphere.

Use the following information to answer question 15.

Impact of rising temperatures on tea crops in Kenya

The following shows the current locations of tea-growing areas in Kenya, and how some of these areas are expected to become less suitable for tea-growing if there is an average annual temperature increase of 2°C.



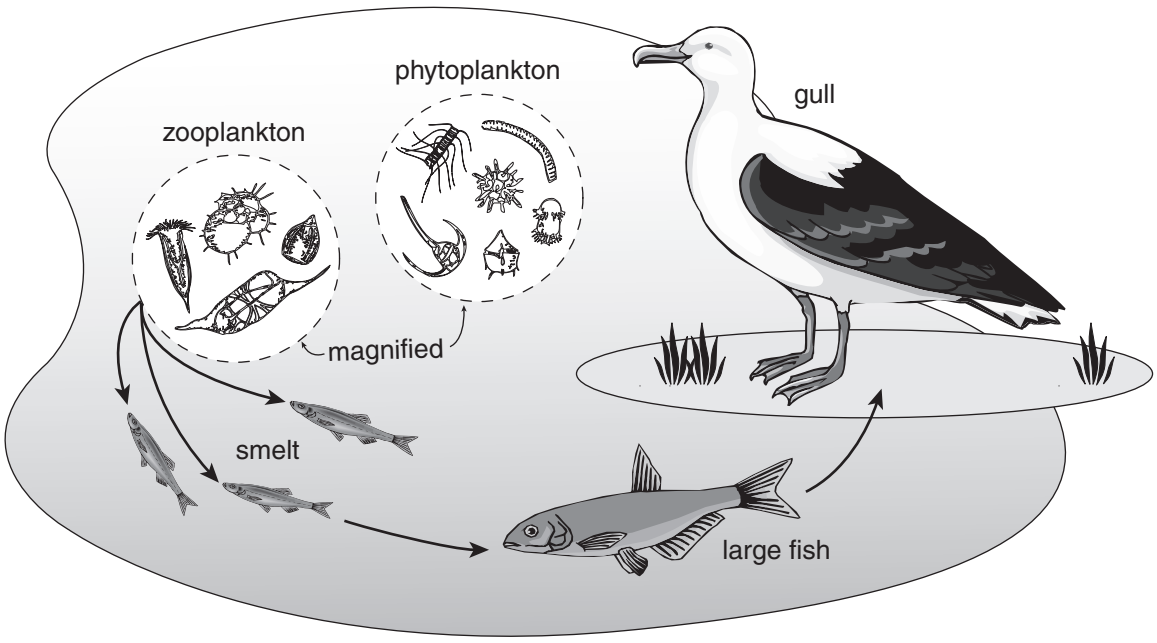
Adapted from Otto Simonett, UNEP/GRID-Arendal, *Potential Impacts of Global Warming, GRID-Geneva, Case Studies on Climate Change*. Geneva, 1999. www.grida.no/climate/vitalafrica/english/22.htm

15. What factors might change, causing the tea-growing areas to shrink if the temperature increases?

I	elevation
II	type of pests
III	moisture levels
IV	type of diseases

A. I and II only
B. III and IV only
C. II, III and IV only
D. I, II, III and IV

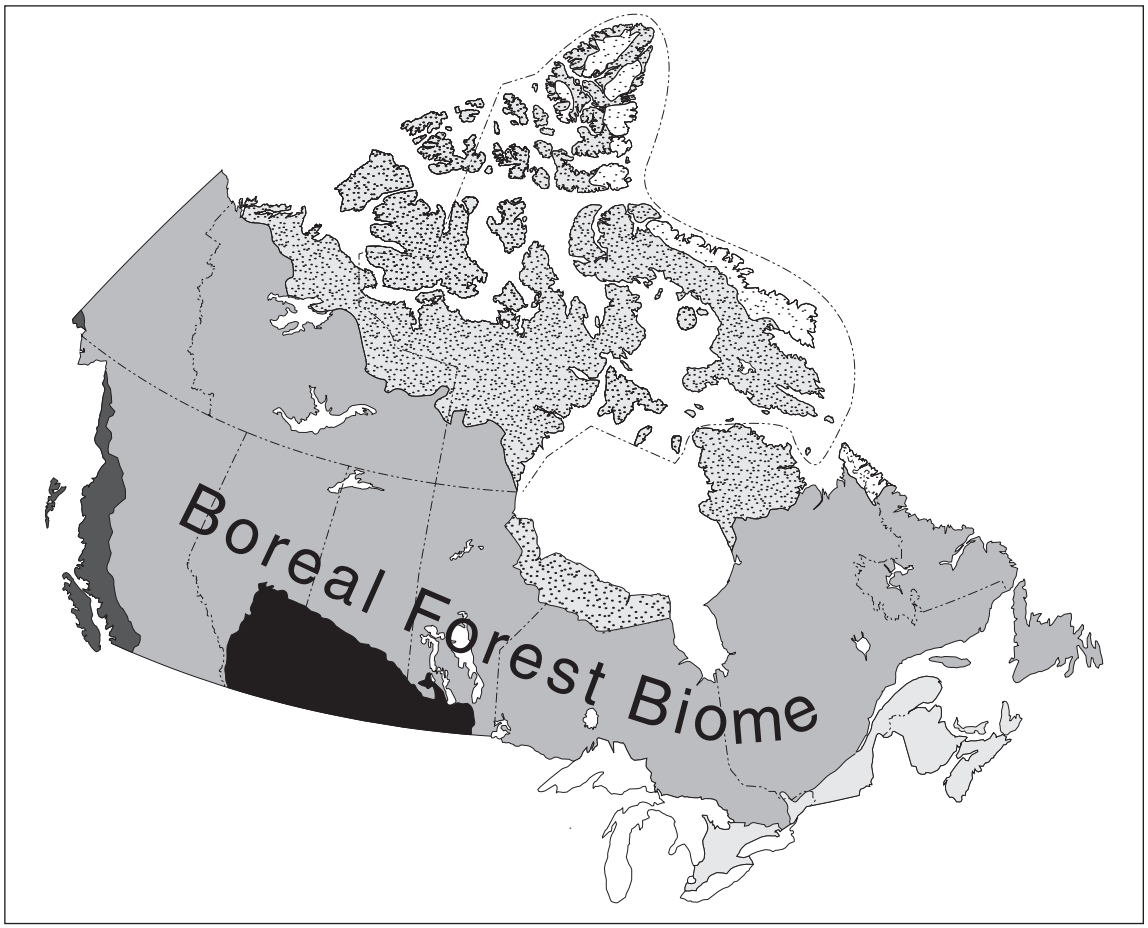
Use the following illustration of a marine ecosystem to answer question 16.



16. Which of the following organisms would most likely be eradicated by bioaccumulation?

A. the gull
B. the smelt
C. the large fish
D. the zooplankton

Use the following map of Canadian biomes to answer question 17.
Shading represents different biomes.

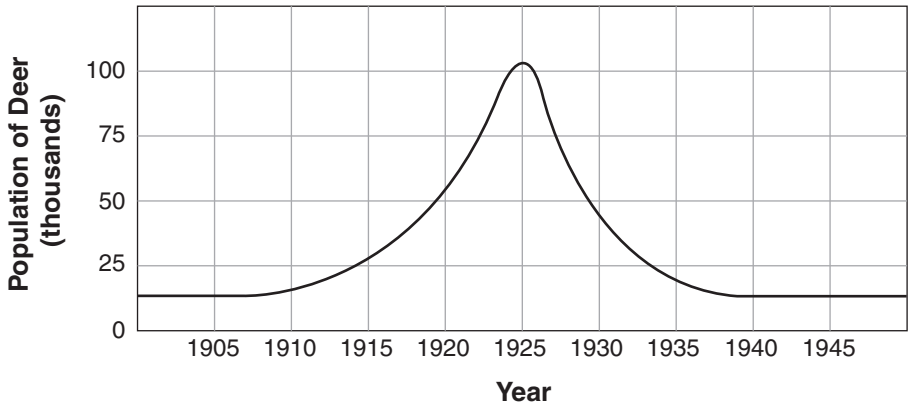


17. Which of the following abiotic factors would be similar within the boreal forest biome?

I	industrial pollution
II	average temperature
III	annual precipitation

A. I only
B. I and II only
C. I and III only
D. II and III only

Use the following graph of a deer population over time to answer question 18.



18. Which of the following statements is the most likely explanation for the change in the number of deer from 1925 to 1935?

    A. Food resources were depleted and starvation occurred.
    B. Drought caused a large number of deer to enter the area.
    C. Improved natural habitat provided additional protection from predators.
    D. A number of predatory species drove the local deer population to extinction.

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19. Which of the following terms refers to an increase in the numbers of individuals with a new adaptive trait, as a result of natural selection?

    A. predation
    B. succession
    C. proliferation
    D. biomagnification

Use the following information to answer question 20.

In the 1880s, Hawaiian sugar cane growers deliberately introduced the mongoose from India in an attempt to control the rat population. At the time, the rat population was increasing at an alarming rate and posed a serious threat to their crops. Unfortunately, the mongoose ate native birds and their eggs instead. The resulting tragedy was that many bird populations decreased almost to the point of extinction. Getting rid of the mongoose has proven nearly impossible. This foreign species became as much of a pest as the rats they were brought in to eliminate.

Adapted from: www.birding hawaii.co.uk

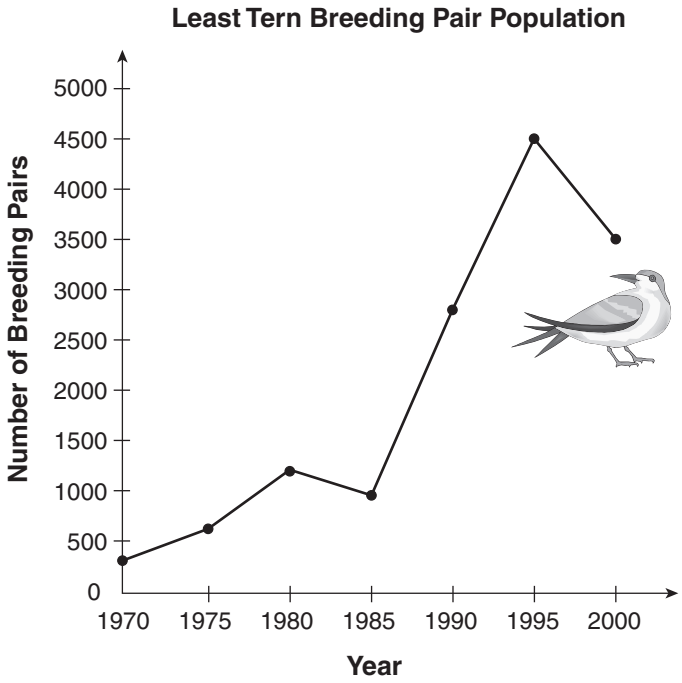
© Don Getty

20. If the mongoose had been introduced to Canada, this tragedy might not have occurred. Why was Hawaii particularly susceptible to the ecological disruption caused by the introduction of the mongoose?

I	Hawaii had no natural predators for the mongoose.
II	There were not enough rats to feed the mongoose.
III	The native Hawaiian bird species evolved in isolation and had no adaptations to escape the mongoose.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

21. The Least Tern is a recovering endangered bird species that occupies shorelines in North America. The number of breeding pairs was only 300 in 1970 and the number began to increase.

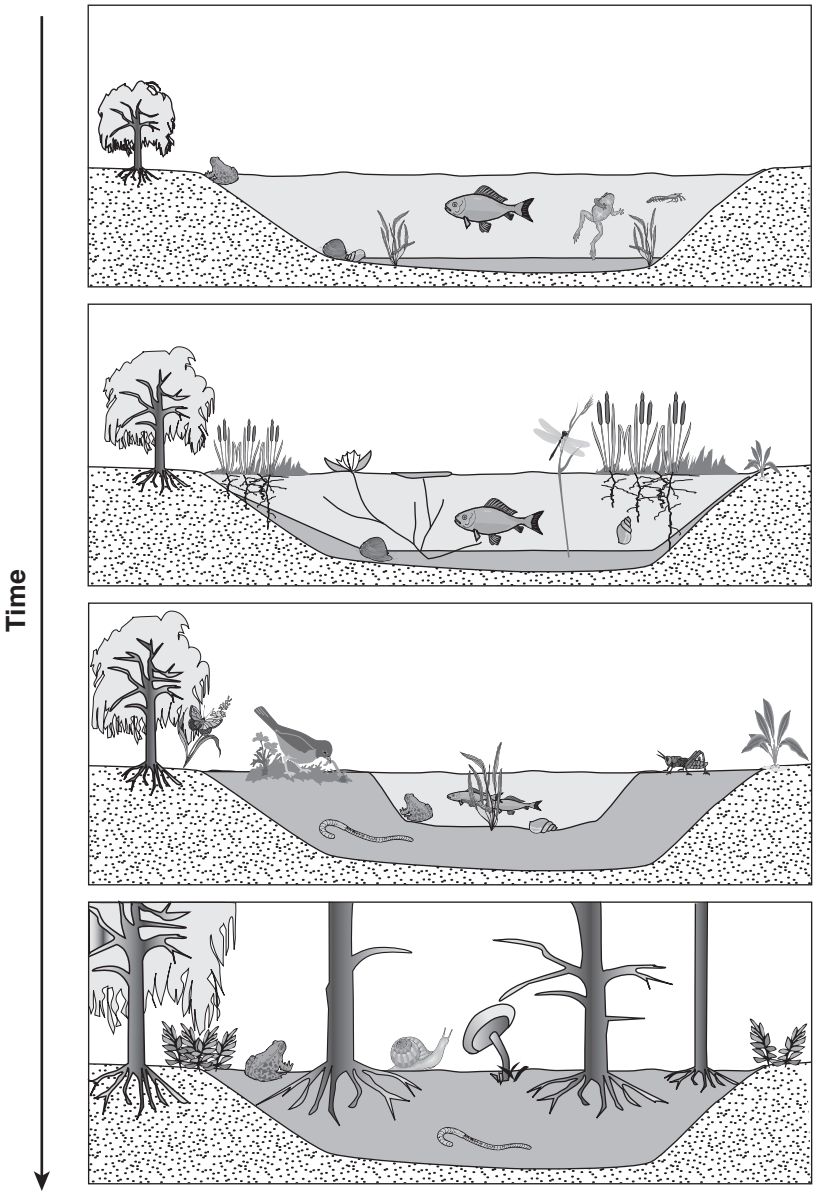


Year	Number of breeding pairs
1970	300
1975	600
1980	1264
1985	953
1990	2793
1995	4500
2000	3500

Which of the following management strategies is most likely responsible for the recovery of the Least Tern?

A. preservation of shoreline habitat
B. introduction of a competing species
C. introduction of 600 breeding pairs in 1975
D. development to improve predators access to nesting sites

Use the following sequence of diagrams showing change over time to answer question 22.

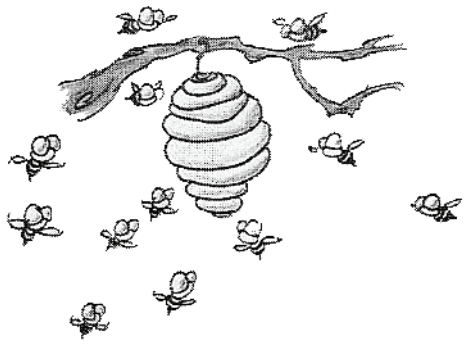


22. The diagram represents

    A. biodegradation.
    B. natural selection.
    C. adaptive radiation.
    D. ecological succession.

REFER TO DATA PAGES	For this section of the examination, refer to: • Periodic Table of the Elements on Data Page 2 • pH Scale on Data Page 3 • Alphabetical Listing of the Elements on Data Page 4 • Names, Formulae and Charges of Some Polyatomic Ions, Names and Formulae of Common Acids, and Prefixes on Data Page 5

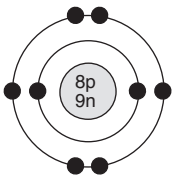
23. One atomic model represents an atom as a beehive surrounded by bees. What are represented by the beehive and the bees?



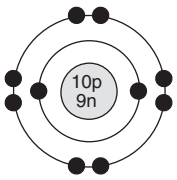
	Beehive	Bees
A.	nucleus	electrons
B.	nucleus	protons
C.	protons	neutrons
D.	electrons	protons

24. Which two of the following atomic models represents elements that can easily combine with each other to form a covalent compound?

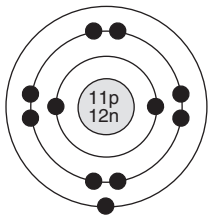
I



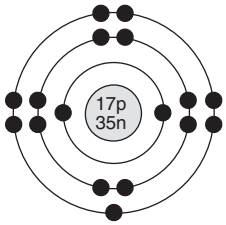
II



III



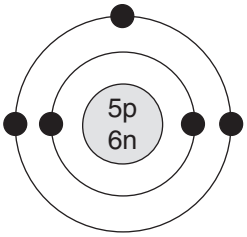
IV



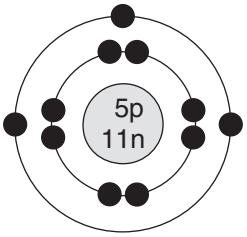
A. I and II
B. I and IV
C. II and III
D. III and IV

25. Which Bohr model represents boron, $^{11}_{5}B$?

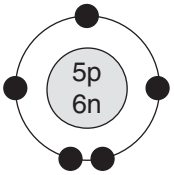
A.



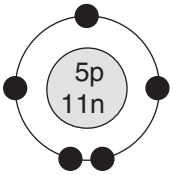
B.



C.



D.



26. Which of the following Lewis diagrams shows the valence electron arrangement for carbon?

A. 

B. 

C. 

D. 

Use the following Lewis diagrams of four unknown elements to answer question 27.

27. Which element will not combine with oxygen?

A. J
B. K
C. L
D. M

28. Which of the following Lewis diagrams represents the molecule formed in the reaction shown below?

A. 

B. 

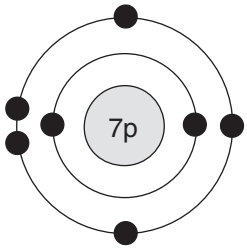
C. 

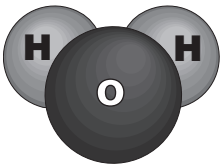
D. 

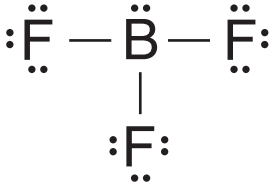
29. Which of the following terms is given to the scale on which each unit represents a 10-fold change in the hydrogen ion concentration?

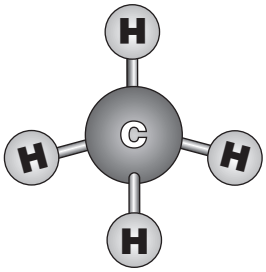
A. pH
B. indicator
C. acid/base
D. neutralization

30. Which of the following models represents an organic molecule?

A. 

B. 

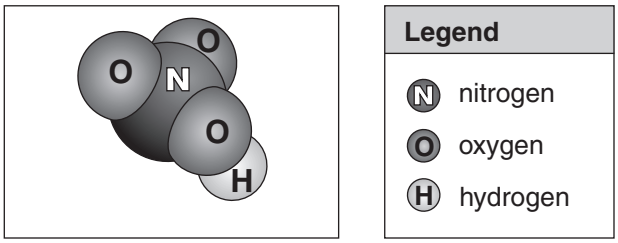
C. 

D. 

31. Which of the following sets of formulae correctly classifies each compound as an acid, base or salt?

	Acid	Base	Salt
A.	$Ca(OH)_2$	H_2CO_3	$MgCl_2$
B.	H_2CO_3	$Ca(OH)_2$	$MgCl_2$
C.	$MgCl_2$	H_2CO_3	$Ca(OH)_2$
D.	$Ca(OH)_2$	$MgCl_2$	H_2CO_3

Use the following diagram of a molecule to answer question 32.



32. What compound is represented by the illustrated molecule?

A. nitric acid
B. hydrogen nitride
C. nitrogen trioxide
D. nitrogen hydroxide

33. Identify the formula for iron(II) oxide.

A. FeO
B. Fe_2O
C. Fe_2O_2
D. Fe_2O_3

34. If a hydrocarbon reacts with oxygen, what type of reaction has occurred?

A. synthesis
B. combustion
C. neutralization
D. single replacement

35. Which of the following elements is more reactive than sodium?

A. neon
B. lithium
C. potassium
D. magnesium

36. Which of the following characteristics are typical of metals?

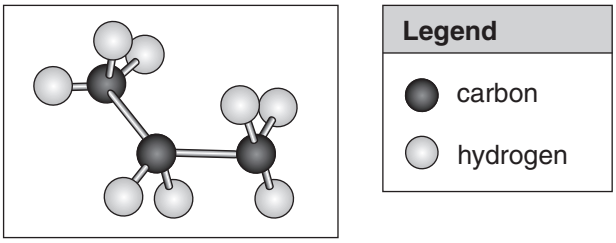
I	They have a positive ion charge.
II	They lose electrons when forming ions.
III	They are found on the left-hand side of the Periodic Table.

A. I only
B. I and III only
C. II and III only
D. I, II and III only

37. Which of the following compounds will form an acidic solution when dissolved in water?

A. NO_2
B. CaO
C. CuO
D. Na_2O

Use the following illustration to answer question 38.

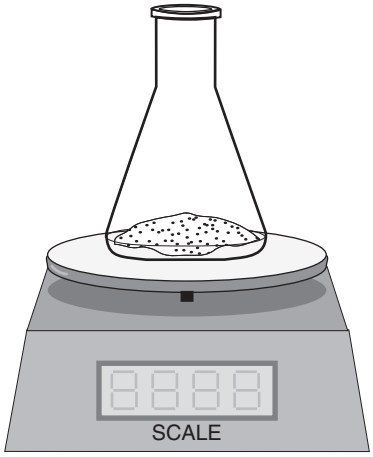


38. Which formula is represented by the illustration?

A. C_3H_7
B. $3CH_3$
C. CH_3COOH
D. $CH_3CH_2CH_3$

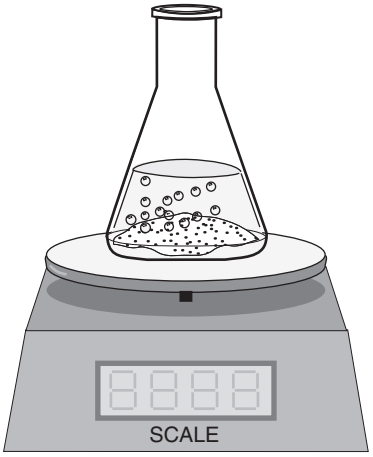
39. Which of the following experiments would provide the best data to support the Law of Conservation of Mass?

A.



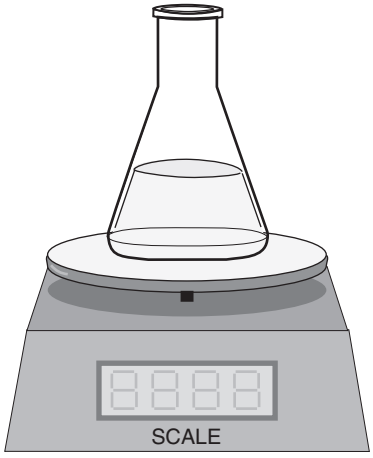
sodium bicarbonate
solid only

B.



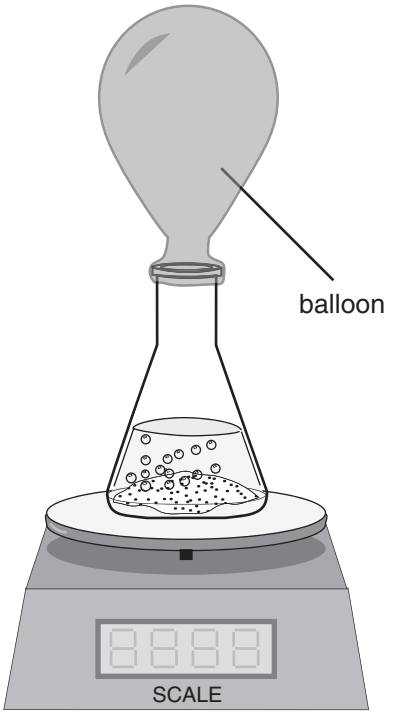
sodium bicarbonate with
acetic acid

C.



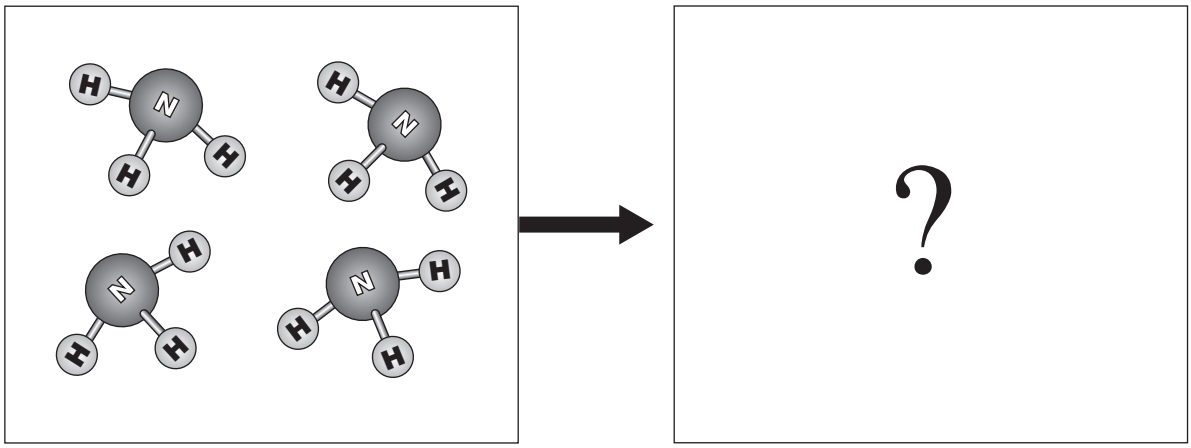
acetic acid only

D.



sodium bicarbonate with
acetic acid

Use the following illustration of four reactant molecules of ammonia to answer question 40.



40. If four molecules of ammonia undergo decomposition, how many molecules of nitrogen and hydrogen will form?

	Nitrogen molecules	Hydrogen molecules
A.	2	2
B.	2	6
C.	4	4
D.	4	12

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41. Which set of ordered coefficients correctly balances the following equation?

$$\_\_\_\ K_3PO_4 + \_\_\_\ ZnSO_4 \rightarrow \_\_\_\ K_2SO_4 + \_\_\_\ Zn_3\left(PO_4\right)_2$$

A. 1, 2, 3, 2
B. 2, 1, 3, 2
C. 2, 2, 1, 3
D. 2, 3, 3, 1

Use the following information to answer question 42.

$$CH_4 + 2O_2 \rightarrow \_\_\_\_ + 2H_2O$$

42. Which of the following products would balance the reaction?

A. CO
B. CO_2
C. 2CO
D. $2CO_2$

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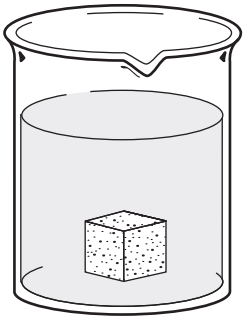
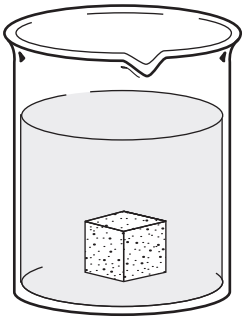
43. When calcium metal is added to water, it reacts to produce calcium hydroxide and hydrogen gas. Which one of the following reactions would progress at the greatest rate?

A.



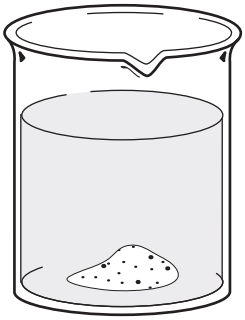
5°C
Cube of calcium

B.



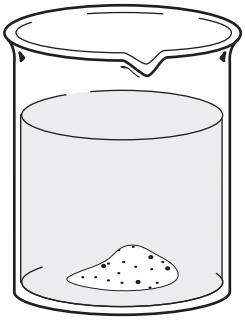
40°C
Cube of calcium

C.



5°C
Crushed calcium

D.



40°C
Crushed calcium

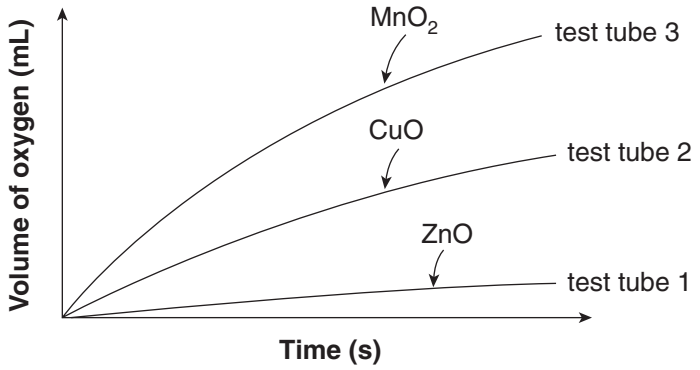
Use the following information from a student's experiment to answer question 44.

A student used three different catalysts to increase the rate at which H_2O_2 decomposes into O_2 and water. He filled in the Observation Chart below.

Observation Chart		
Test Tube	**Catalyst**	**Observation**
control	no catalyst	no bubbles
1	MnO_2	bubbles form rapidly
2	CuO	bubbles form slowly
3	ZnO	bubbles form very slowly

He also measured the volume of O_2 produced during each reaction with different catalysts and recorded the information on the graph below.

Graph of Test Tubes 1 to 3



44. Which conclusion is supported by the observations?

A. MnO_2 is the most effective catalyst.
B. Catalysts have no effect on reaction rate.
C. The reaction occurs most quickly if ZnO is added.
D. All three catalysts cause O_2 to be produced at the same rate.

REFER TO DATA PAGES	For this section of the examination, refer to: • Periodic Table of the Elements on Data Page 2 • Alphabetical Listing of the Elements on Data Page 4 • Common Isotope Pairs Chart and Radioactivity Symbols on Data Page 12

45. What isotope has 25 protons and 29 neutrons?

A. copper-25
B. copper-54
C. manganese-29
D. manganese-54

46. What particle is released when seaborgium-263 decays to rutherfordium-259?

A. a proton
B. a neutron
C. a beta particle
D. an alpha particle

47. A fossil is removed from a bedrock layer and is found to contain $\frac{1}{4}$ of the original amount of carbon-14. What conclusion can be made about the age of the fossil?

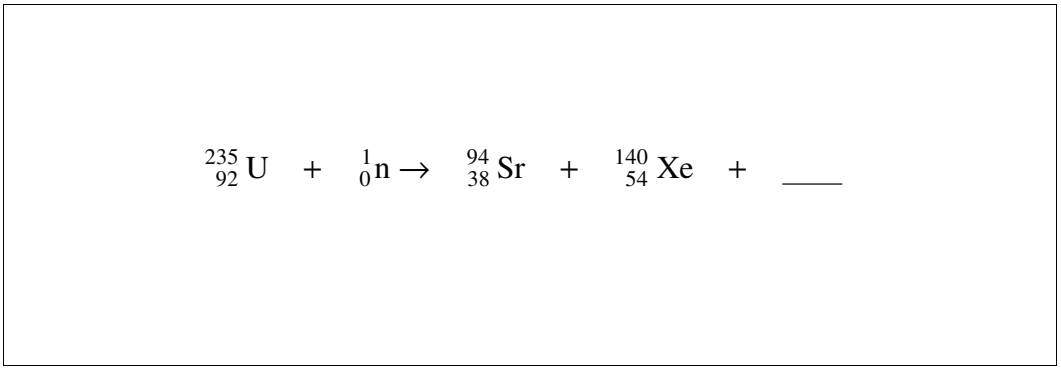
A. It is 1 433 years old.
B. It is 5 730 years old.
C. It is 11 460 years old.
D. It is 22 920 years old.

48. Which of the following statements describe nuclear fusion?

I	Mass is converted into energy.
II	The reaction occurs in hydrogen bombs and in the Sun.
III	The process divides a nucleus into two or more fragments, releasing neutrons and energy.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

49. Which of the following subatomic particles completes the nuclear reaction shown?



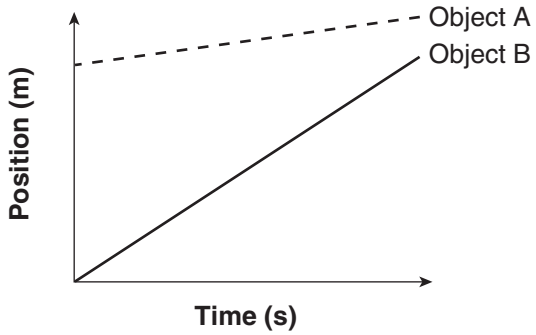
A. one proton
B. two protons
C. one neutron
D. two neutrons

REFER TO DATA PAGES	For this section of the examination, refer to: • Units and Abbreviations and Equations of Motion on Data Page 12

50. Which of the following symbols represents a change in quantity?

A. α
B. β
C. γ
D. Δ

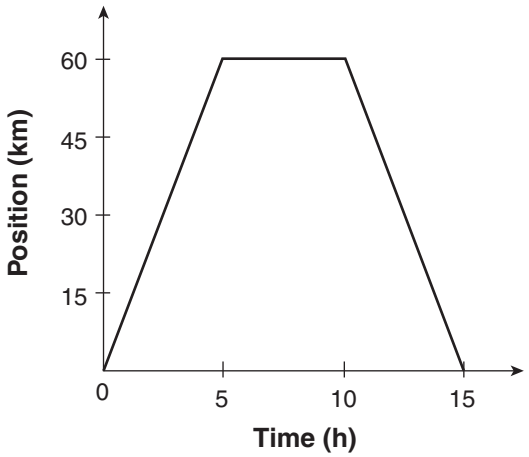
Use the following position vs. time graph to answer question 51.



51. Which of the following statements describes the situation shown above?

A. Object B has a lower velocity.
B. Object B has a higher velocity.
C. Both objects travelled the same distance.
D. Both objects started at the same location.

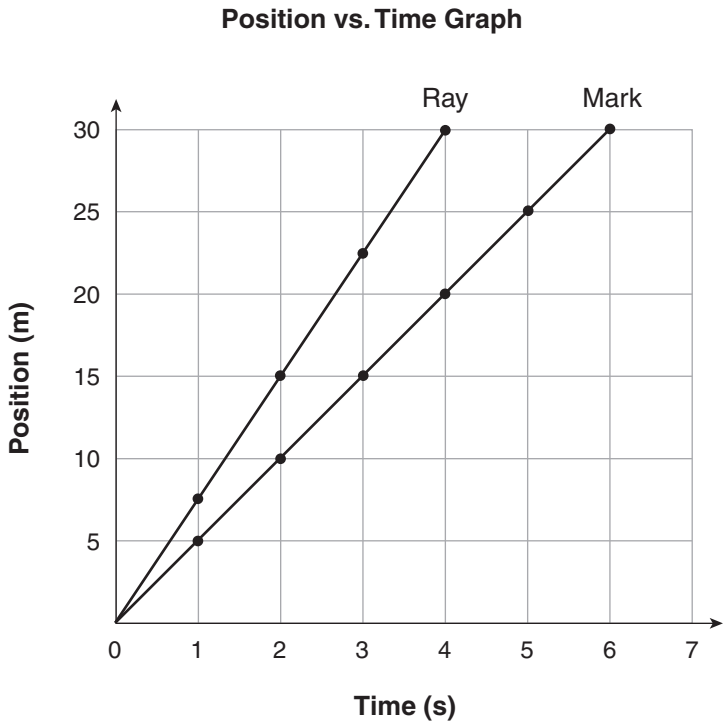
Use the following position vs. time graph to answer question 52.



52. What distance is travelled in the first 15 hours?

A. 0 km
B. 60 km
C. 120 km
D. 180 km

Use the following position vs. time graph to answer question 53.

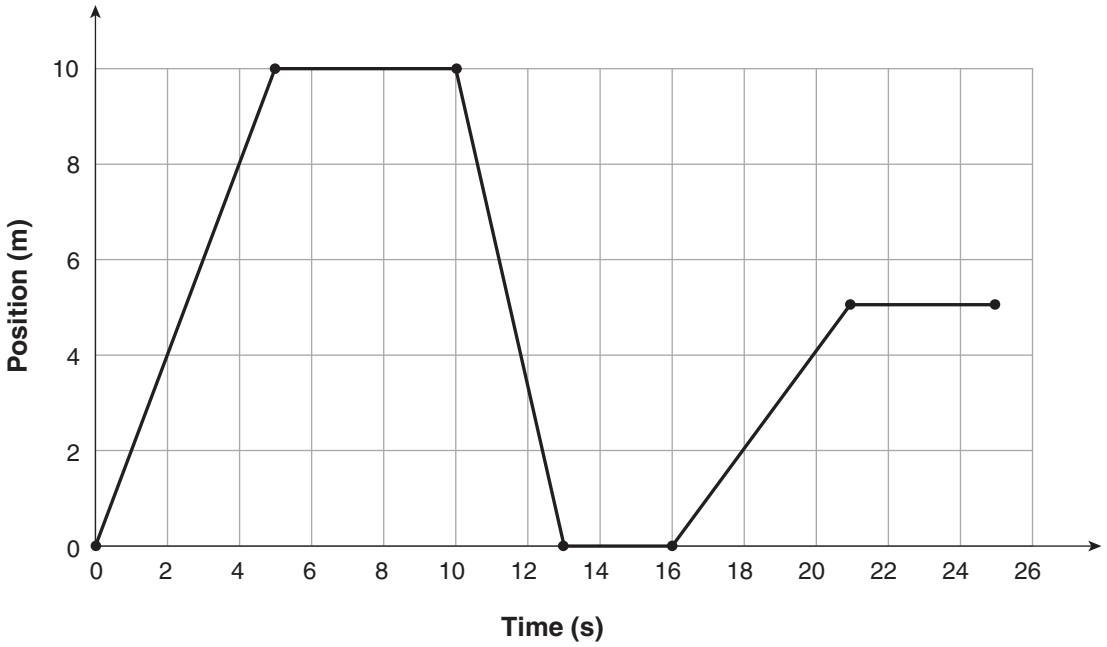


53. Ray and Mark are running on a track and a sample of their progress is plotted on a graph. Which of the following statements are supported by the graph?

I	Ray is running faster than Mark.
II	Mark runs farther than Ray during the same time interval.
III	Ray has a greater displacement during each time interval than Mark.

A. I only
B. III only
C. I and II only
D. I and III only

Use the following position vs. time graph to answer question 54.



54. The graph shows the displacement of a skateboarder on a sidewalk. What is the average velocity of the skateboarder in the interval between 2 and 4 seconds?

A. 0.5 m/s
B. 2 m/s
C. 4 m/s
D. 8 m/s

---

55. The Eurotunnel connects Great Britain and France, passing under the English Channel. A train leaves France with an average speed of 110 km/h and travels 37 km in the tunnel.

How long is the train in the tunnel?

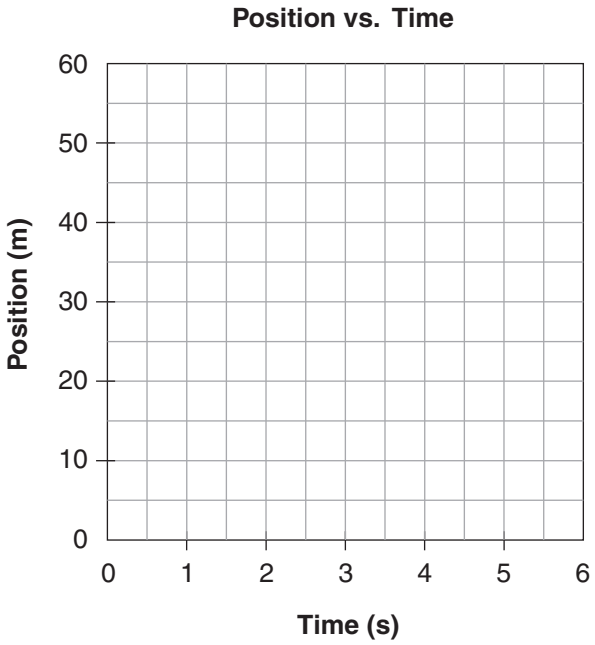
A. 20 min
B. 68 min
C. 244 min
D. 4070 min

56. If a car moves from +7 m to −21 m in 2 s, what is the car's average velocity?

A. −14 m/s
B. −7 m/s
C. +7 m/s
D. +14 m/s

Plot the data given in the table onto the grid to answer question 57.

Time (s)	Position (m)
0	0
1	10
2	20
3	30
4	40



57. If the object continues to travel uniformly, what will the displacement be after 5 s?

A. 5 m
B. 10 m
C. 50 m
D. 250 m

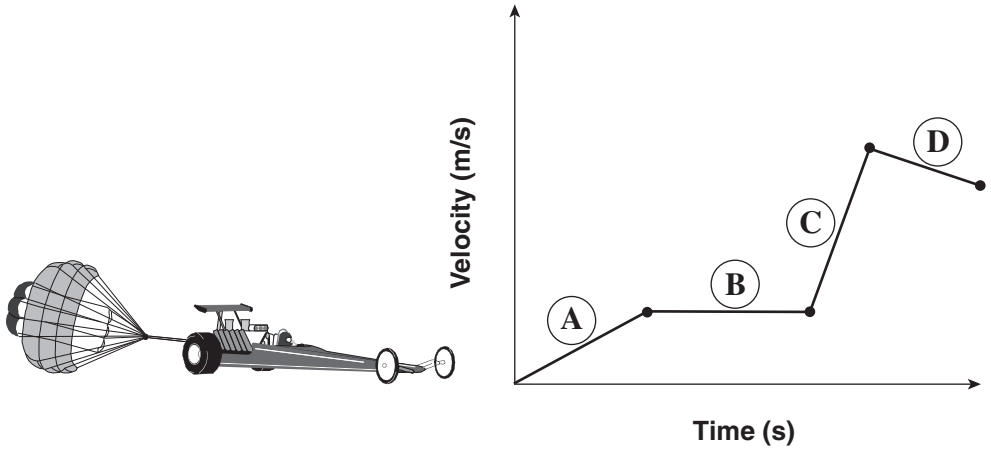
58. The rate of change of velocity is represented by which of the following units?

A. s
B. m
C. m/s
D. m/s^2

59. A ball accelerates downwards at $9.8\ m/s^2$ in free fall. Which of the following comparisons correctly describes the motion of the ball as it is falling?

	Velocity	Acceleration
A.	constant	constant
B.	constant	decreasing
C.	increasing	constant
D.	increasing	increasing

Use the following velocity vs. time graph to answer question 60.



60. The graph above shows the motion of a dragster. During which interval does the dragster have the greatest acceleration?

A. (A)
B. (B)
C. (C)
D. (D)

61. A NASA space shuttle accelerates from rest to a velocity of $+50\ \text{m/s}$ in 4 s.
What calculation must be used to determine the shuttle's acceleration?

A. $a = 4\ \text{s} \times +50\ \text{m/s}$

B. $a = \dfrac{4\ \text{s}}{+50\ \text{m/s}}$

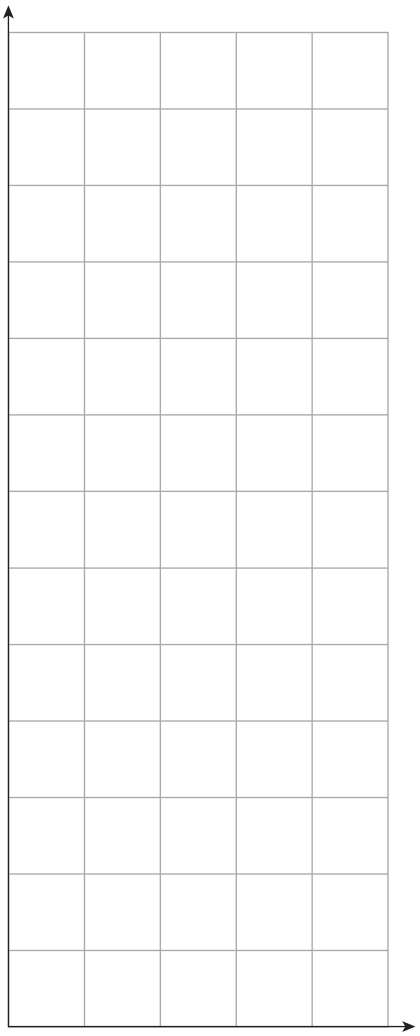
C. $a = \dfrac{+50\ \text{m/s}}{4\ \text{s}}$

D. $a = \left(\dfrac{+50\ \text{m/s}}{4\ \text{s}}\right)^2$

Use the data given in the table and the grid provided to answer question 62.

The data represents the motion of a powerboat.
Use the grid provided to determine the acceleration of the boat.

Time (s)	Velocity of Boat (m/s) [E]
0.0	1.9
1.0	4.1
2.0	6.0
3.0	8.2
4.0	9.9
5.0	12.2



62. What is the acceleration of the boat?

A. $1\ \text{m/s}^2\,[\text{E}]$

B. $2\ \text{m/s}^2\,[\text{E}]$

C. $3\ \text{m/s}^2\,[\text{E}]$

D. $4\ \text{m/s}^2\,[\text{E}]$

63. A ball is thrown straight up into the air, leaving the student's hand at $+20\ \text{m/s}$.
Gravity accelerates the ball at $-9.8\ \text{m/s}^2$.

How long does it take for the ball to come to rest at its highest point before it begins to fall back to Earth?

A. 0.49 s
B. 2.0 s
C. 9.8 s
D. 196.0 s

64. A car travelling at $+16\ \text{m/s}$ accelerates at $-6\ \text{m/s}^2$ for 2 s. What is its final velocity?

A. +4 m/s
B. +10 m/s
C. +22 m/s
D. +28 m/s

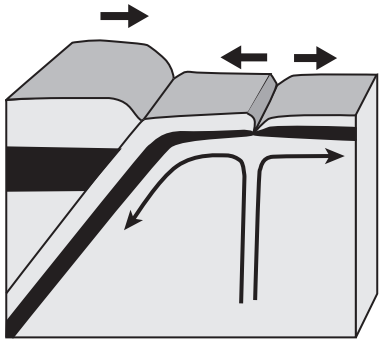
REFER TO DATA PAGES	For this section of the examination, refer to: • Periodic Table of the Elements on Data Page 2 • Alphabetical Listing of the Elements on Data Page 4 • Names, Formulae and Charges of Some Polyatomic Ions, Names and Formulae of Common Acids, and Prefixes on Data Page 5 • Map of the Pacific Coast of North America on Data Page 6 • World Tectonic Plate Boundaries Map on Data Page 7 • Units and Abbreviations and Equations of Motion on Data Page 12

65. What is a tectonic plate boundary?

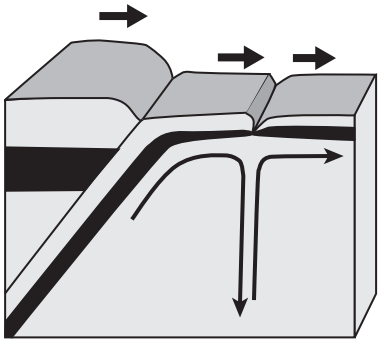
A. the plastic layer upon which tectonic plates move
B. the region that marks the bottom of the Earth's crust
C. the region between tectonic plates and the asthenosphere
D. the region where tectonic plates move toward, apart or horizontally past one another

66. Which of the following models correctly illustrates plate movement and mantle convection?

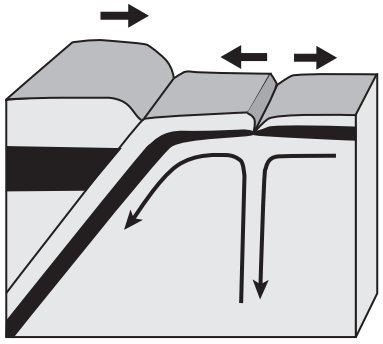
A.



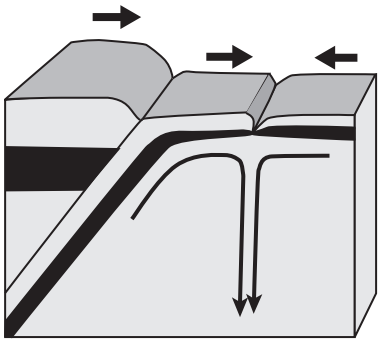
B.



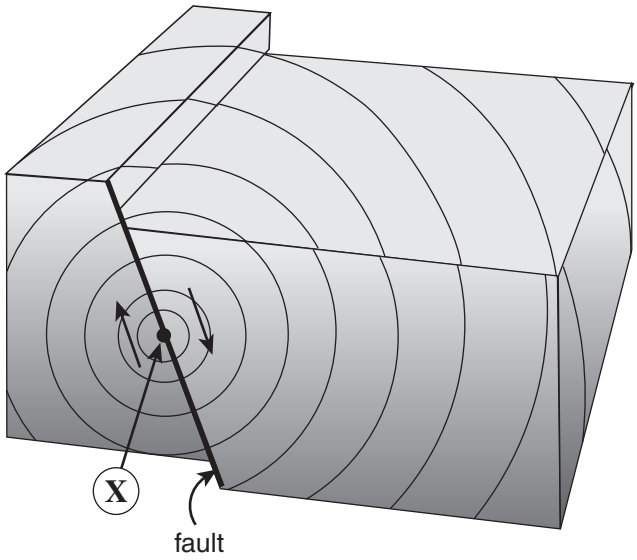
C.



D.



Use the following earthquake diagram to answer question 67.



67. What does X point to?

A. a focus
B. a rift valley
C. an epicentre
D. a surface wave

---

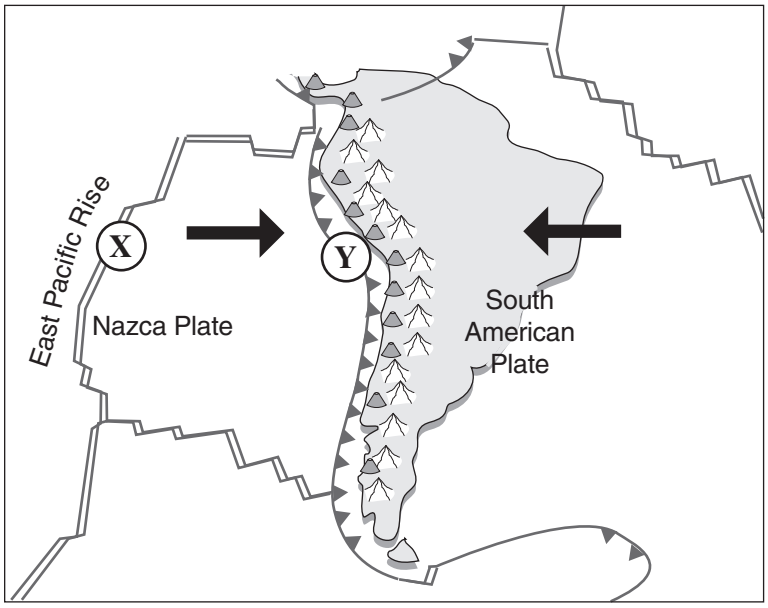
68. Identify a characteristic feature at a divergent plate boundary and a convergent plate boundary.

	Divergent Plate Boundary	Convergent Plate Boundary
A.	mid-ocean ridge	rift valley
B.	continental mountain chain	deep sea trench
C.	rift valley	continental mountain chain
D.	volcanic island arc	mid-ocean ridge

69. There are no volcanoes along the Denali fault that runs through Alaska and the Yukon because

A. it is a subduction zone.
B. it is an inactive hotspot.
C. there is no magma source.
D. it is a convergent plate boundary.

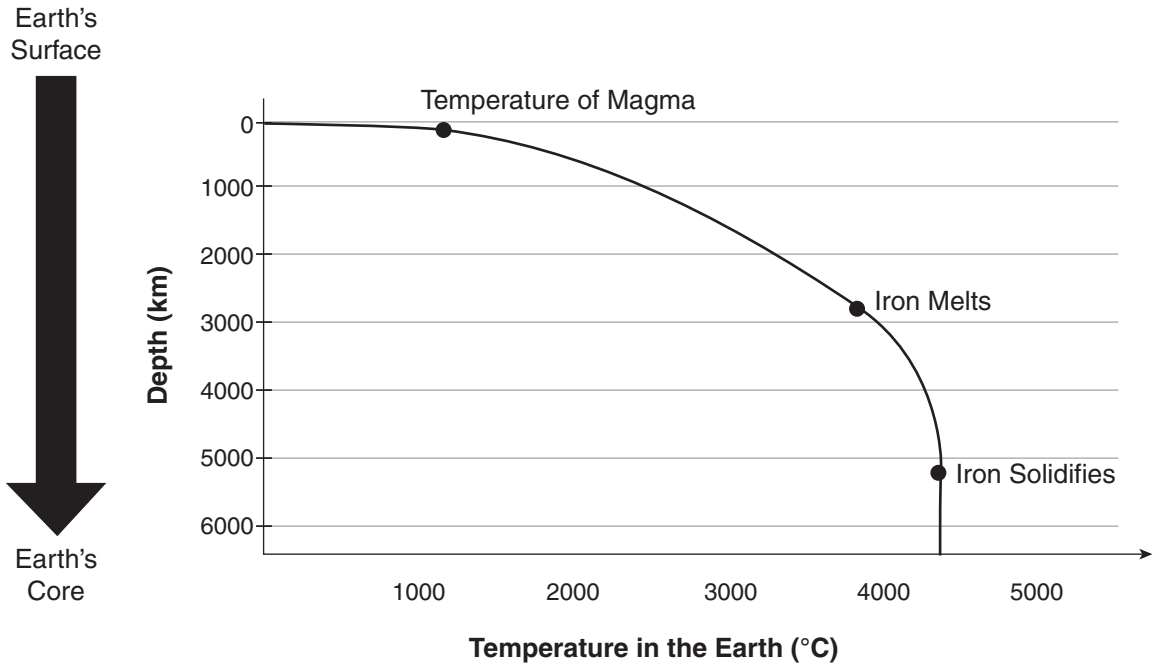
Use the following map to answer question 70.



70. Which of the following comparisons correctly identifies the processes occurring at X and Y?

	X	Y
A.	slab pull	ridge push
B.	slab pull	slab pull
C.	ridge push	slab pull
D.	ridge push	ridge push

Use the following geothermal model of the Earth to answer questions 71 and 72.



The geothermal model was constructed using seismic evidence and laboratory experiments of the properties of rock at different temperatures and pressures.

71. Using the geothermal model, identify the depth of the upper boundary of the Earth's outer core.

A. 200 km
B. 2700 km
C. 5200 km
D. 6400 km

72. Why does melted iron become solid again at a depth of 5200 km?

A. Pressure increases.
B. Magnetism increases.
C. Temperature decreases.
D. Force of gravity decreases.

73. Which of the following factors is responsible for the movement of tectonic plates?

I	gravity
II	mantle convection
III	heat from radioactive decay

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

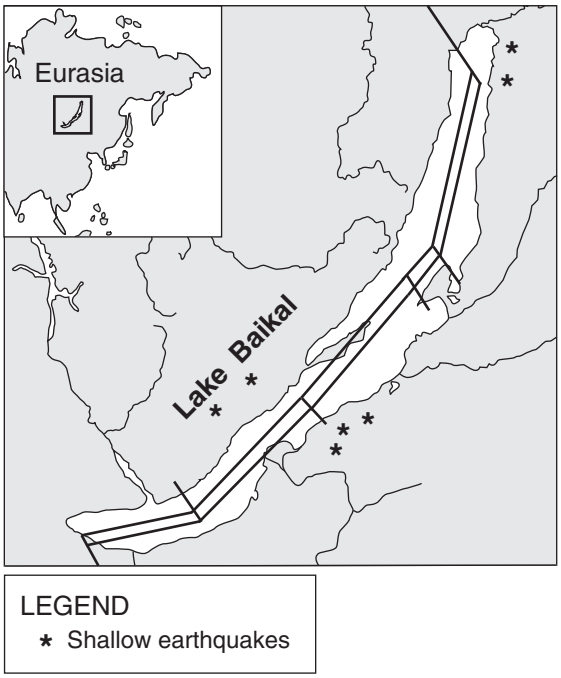
74. Consider the following descriptions of the movement of continental crust:

- Continents plow through the oceanic crust.
- Continents slide over the oceanic crust.

These statements are associated with

A. mantle convection.
B. seafloor spreading.
C. Continental Drift Theory.
D. Theory of Plate Tectonics.

Use the following location map, plate boundary map and photograph to answer question 75.



Lake Baikal, the deepest lake in the world.

75. What type of tectonic feature is responsible for the formation of Lake Baikal?

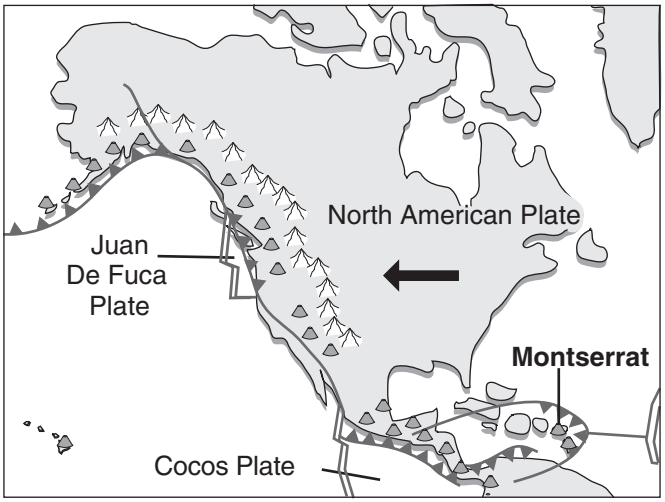
A. a trench
B. a transform fault
C. a diverging plate
D. a converging plate

Use the following article to answer questions 76 to 79.

Drifting Volcanic Plume Snapped by Climate Satellite

A volcanic plume that travelled halfway around the world is visible in the first image released from NASA's CALIPSO satellite. CALIPSO took its first measurements in June 2006 and spied a wispy plume of sulfur dioxide at an altitude of 20 kilometres above Indonesia. The plume originated 17 000 kilometres away on the Caribbean island of Montserrat in May, when a plug of viscous lava that had been rising from the Soufrière Hills volcano, like toothpaste from a tube, collapsed, sending ash flying 17 kilometres into the atmosphere.

"It wasn't one of those big eruptions. It was just a puff that went up high," said a CALIPSO project scientist. The fact that CALIPSO could see the plume 18 days after the eruption illustrates the satellite's sensitivity. The plume appears to be made up mainly of sulfuric acid droplets. CALIPSO's main task is to measure aerosols — fine particles from dust, smoke, volcanic activity or combustion. Aerosols can absorb, scatter and reflect sunlight and infrared radiation. Ultimately, scientists hope to use CALIPSO to help understand the relationship between aerosols and climate change.



Adapted by Kelly Young from *New Scientist.com News Service,* 25 July 2006.

76. Which of the following features is responsible for the volcanic activity on Montserrat?

A. a hot spot
B. subduction of an oceanic plate
C. formation of a mid-ocean ridge
D. divergence of two oceanic plates

77. A scientist on Montserrat tested the rainwater falling in the area during the days following the eruption. Both bromthymol blue and methyl orange indicators were yellow. What was the approximate pH of the rain sample?

A. 2
B. 5
C. 8
D. 11

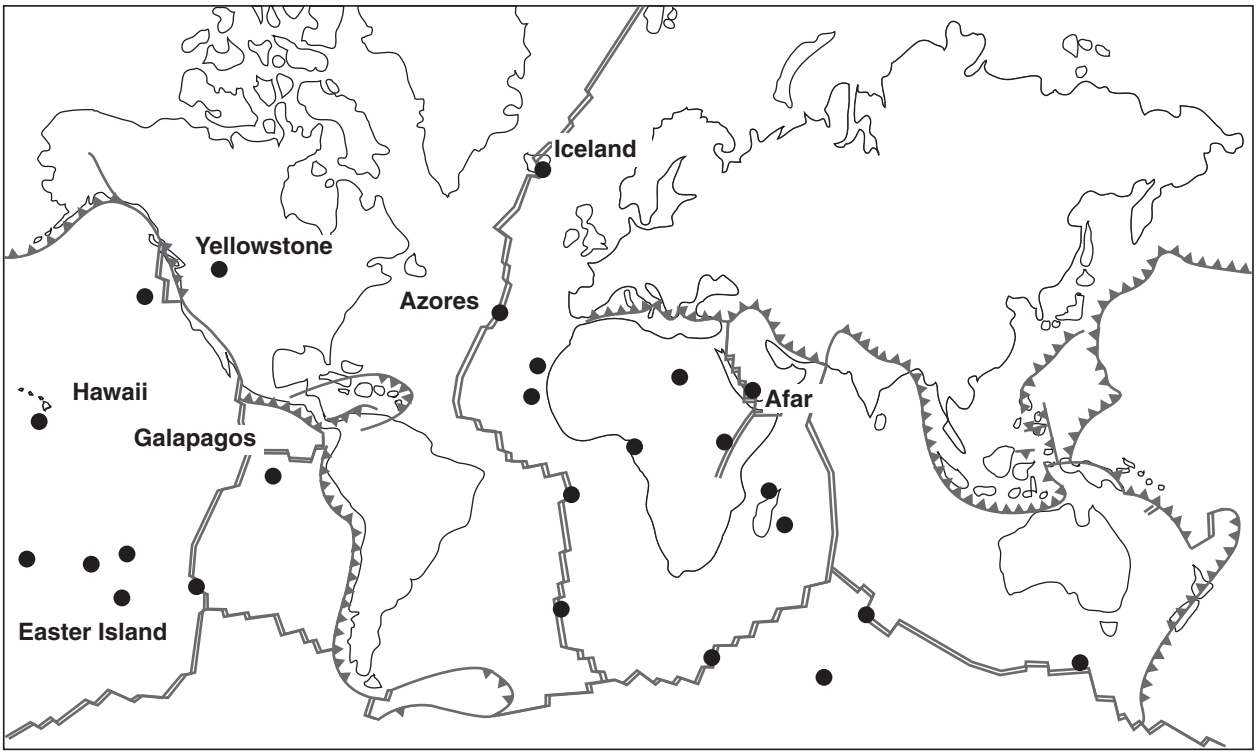
78. Which of the following pairs of chemical formulas identify the sulfur dioxide and sulfuric acid resulting from the eruption?

	Sulfur Dioxide	Sulfuric Acid
A.	SO	HSO_4
B.	SO	H_2SO_4
C.	SO_2	HSO_4
D.	SO_2	H_2SO_4

79. What was the average velocity of the volcanic plume as it travelled from Montserrat to Indonesia?

A. 39 km/h
B. 708 km/h
C. 944 km/h
D. 22 667 km/h

Use the following world map to answer question 80.



80. What do the black dots represent?

A. hot spots
B. deep earthquakes
C. subduction zones
D. divergent plate boundaries

You have **Examination Booklet Form B**. In the box above #1 on your **Answer Sheet**, ensure you filled in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	○	●	○	○	○	○	○	○

END OF EXAMINATION

Examination Rules

1. The time allotted for this examination is two hours.
   You may, however, take up to 60 minutes of additional time to finish.

2. Answers entered in the Examination Booklet will not be marked.

3. Cheating on an examination will result in a mark of zero. The Ministry of Education considers cheating to have occurred if students break any of the following rules:

   - Students must not be in possession of or have used any secure examination materials prior to the examination session.
   - Students must not communicate with other students during the examination.
   - Students must not give or receive assistance of any kind in answering an examination question during an examination, including allowing one's paper to be viewed by others or copying answers from another student's paper.
   - Students must not possess any book, paper or item that might assist in writing an examination, including a dictionary or piece of electronic equipment, that is not specifically authorized for the examination by ministry policy.
   - Students must not copy, plagiarize or present as one's own, work done by any other person.
   - Students must immediately follow the invigilator's order to stop writing at the end of the examination time and must not alter an Examination Booklet, Response Booklet or Answer Sheet after the invigilator has asked students to hand in examination papers.
   - Students must not remove any piece of the examination materials from the examination room, including work pages.

4. The use of inappropriate language or content may result in a mark of zero being awarded.

5. Upon completion of the examination, return all examination materials to the supervising invigilator.