

2012

Answer Key

Part I

1. The data table below shows apparent air temperature in degrees Fahrenheit (°F). Apparent air temperature is how hot the air feels at different air temperatures and different relative humidities.

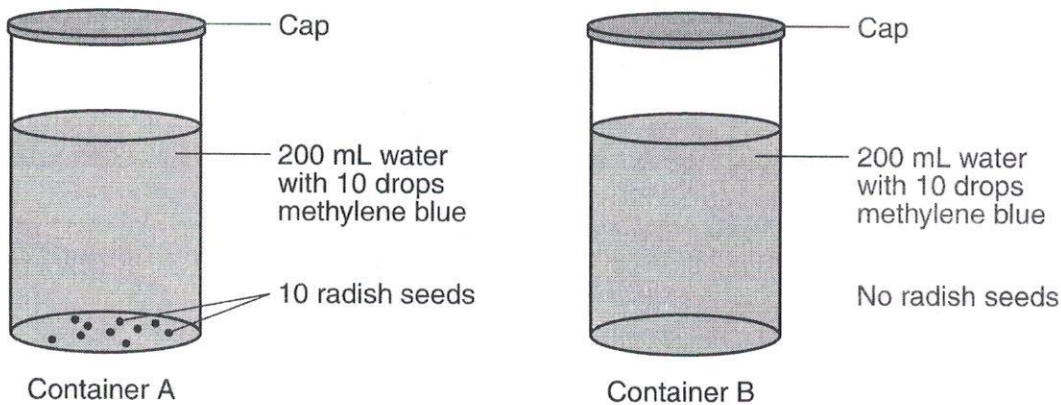
Apparent Air Temperature (°F)

Air Temperature (°F)	Relative Humidity									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
100	95	99	104	110	120	132	144			
95	90	93	96	101	107	114	124	136		
90	85	87	90	93	96	100	106	113	122	
85	80	82	84	86	88	90	93	97	102	108
80	75	77	78	79	81	82	85	86	88	91
75	70	72	73	74	75	76	77	78	79	80
70	65	66	67	68	69	70	70	71	71	72

If the air temperature is 90°F and the relative humidity is 70%, the apparent air temperature is

- (1) 20°F
- (2) 71°F
- (3) 106°F
- (4) 113°F

2. A student set up the experiment shown below to determine if radish seeds take in oxygen as they germinate. Methylene blue is a chemical that is blue when oxygen is present, but is colorless when oxygen is not present. Containers A and B each contained 200 mL of water and 10 drops of methylene blue. Ten radish seeds were added to container A. Container B had no radish seeds.



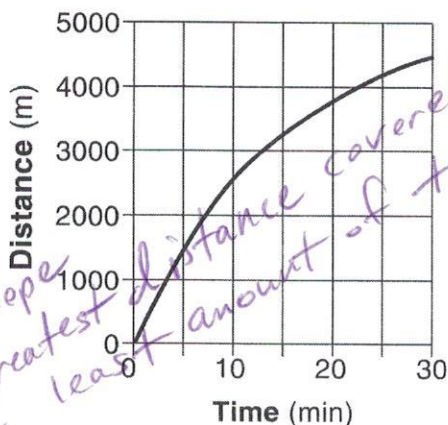
The purpose of container B in this experiment is to

- (1) serve as the control container
- (2) serve as the experimental container
- (3) show that seeds do not give off oxygen
- (4) show that seeds do not give off carbon dioxide

- 3 Which statement is an inference?
- (1) A thermometer shows that the air temperature is 56°F.
 - (2) A mineral sample of galena produced a gray-black streak when tested.
 - (3) Based on previous data, ten hurricanes may occur in the year 2013.
 - (4) A weather vane indicates the wind is coming from the west.

- 4 The graph below shows a runner's distance from the starting line during a 30-minute race. Distance was measured in meters (m). Time was measured in minutes (min).

Distance vs. Time



During which time interval was the runner moving at the greatest average speed?

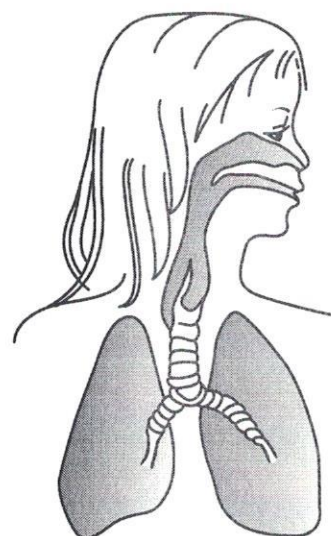
- (1) 0–5 minutes
 - (2) 10–15 minutes
 - (3) 15–20 minutes
 - (4) 25–30 minutes
- 5 Which human organ system produces most of the hormones that regulate body functions?
- (1) digestive
 - (2) nervous
 - (3) muscular
 - (4) endocrine
- 6 The fur of the snowshoe rabbit changes to a lighter color in the winter. This allows the rabbit to blend in with its surroundings. This change is an example of
- (1) extinction
 - (2) competition
 - (3) biological adaptation
 - (4) ecological succession

- 7 The label below shows the nutrition facts for a snack food.

Nutrition Facts	
Serving Size 1/2 cup (30g)	
Servings Per Container 9	
Amount Per Serving	
Calories 130	Calories from Fat 30
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0.5g	3%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 21g	7%
Dietary Fiber 1g	4%
Sugars 1g	
Protein 4g	

How many grams of fat would be consumed if a person ate the entire box of snack food?

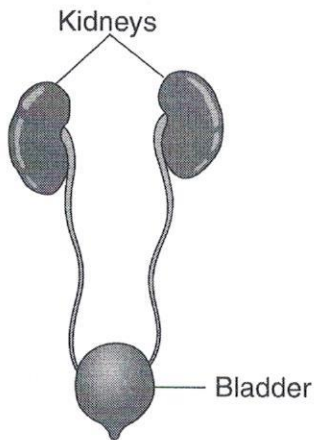
- (1) 3 g
 - (2) 27 g
 - (3) 30 g
 - (4) 65 g
- 8 The diagram below shows a human organ system.



Which human organ system is shown?

- (1) nervous
 - (2) digestive
 - (3) circulatory
 - (4) respiratory
- 9 In living things, traits are passed on from one generation to the next by the transfer of
- (1) blood
 - (2) minerals
 - (3) Calories
 - (4) DNA

- 10 The diagram below shows part of the human excretory system.



The structures shown are primarily involved in

- (1) transporting blood (3) removing wastes
 (2) producing sex cells (4) breaking down food
- 11 Which health condition is an infectious disease?
 (1) pneumonia caused by microorganisms
 (2) heart problem caused by a high-fat diet
 (3) lung cancer caused by smoking
 (4) eye damage caused by ultraviolet light
- 12 A structure that carries a single unit of hereditary information is a
 (1) gene (3) sex cell
 (2) tissue (4) pedigree chart
- 13 Which pair of terms describes the usual location for fertilization and the first stages of development in human reproduction?
 (1) external fertilization and external development
 (2) external fertilization and internal development
 (3) internal fertilization and external development
 (4) internal fertilization and internal development
- 14 Abnormal cell division in humans may result in
 (1) cancer
 (2) fertilization
 (3) asexual reproduction
 (4) dynamic equilibrium

- 15 Which process involves choosing certain organisms to reproduce with one another in order to pass on specific, desirable traits to their offspring?

- (1) selective breeding
 (2) asexual reproduction
 (3) resource acquisition
 (4) natural selection

- 16 During which process do cells use oxygen to release stored energy?

- (1) photosynthesis (3) circulation
 (2) respiration (4) digestion

- 17 The basic life functions of an organism are carried on by

- (1) cells (3) atoms
 (2) nutrients (4) hormones

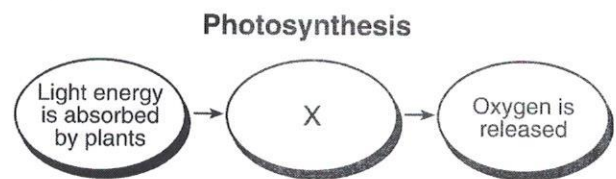
- 18 The sum of all chemical reactions that take place within an organism is known as

- (1) evolution (3) circulation
 (2) metabolism (4) reproduction

- 19 Which factor would most likely limit the number of mice living in an area?

- (1) plentiful resources (3) more predators
 (2) stable climate (4) less competition

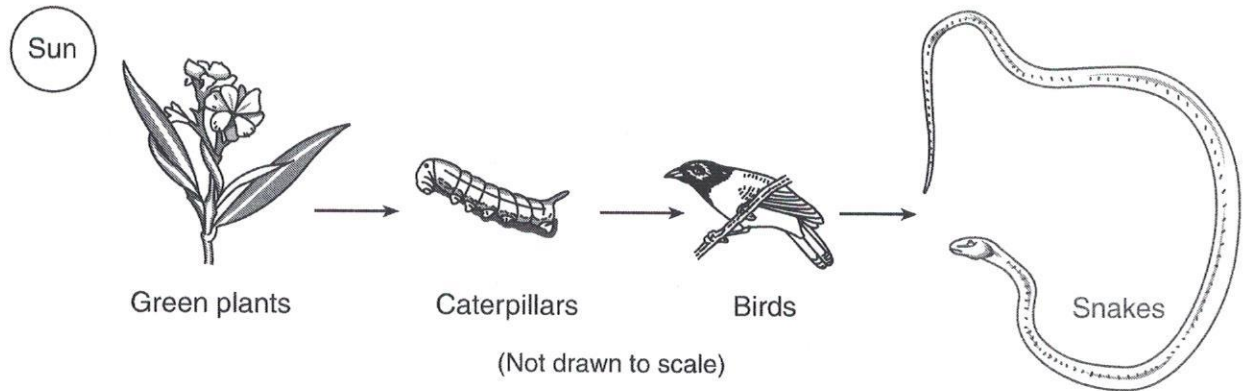
- 20 The flowchart below represents the process of photosynthesis. One step in the process is labeled X.



Which activity occurs at X?

- (1) Plants are eaten by animals for food.
 (2) Carbon dioxide and water are used to make sugar.
 (3) Plants release water into the soil.
 (4) Animals breathe out carbon dioxide.

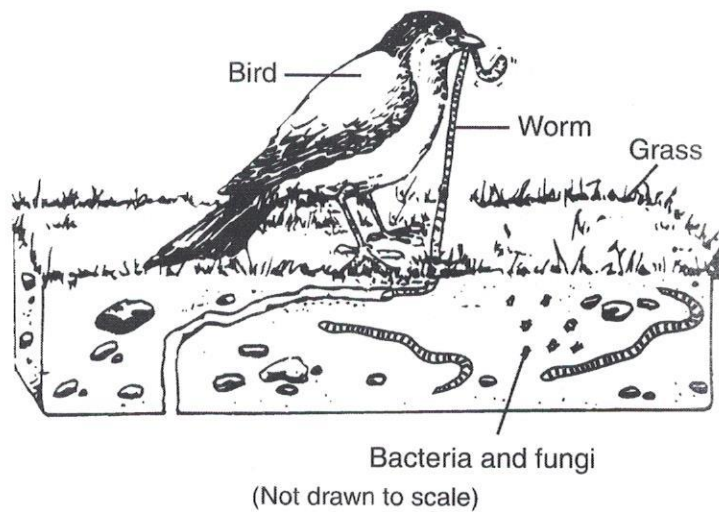
21 The diagram below shows a food chain.



Which organisms in this food chain are herbivores?

- (1) green plants
- (2) caterpillars
- (3) birds
- (4) snakes

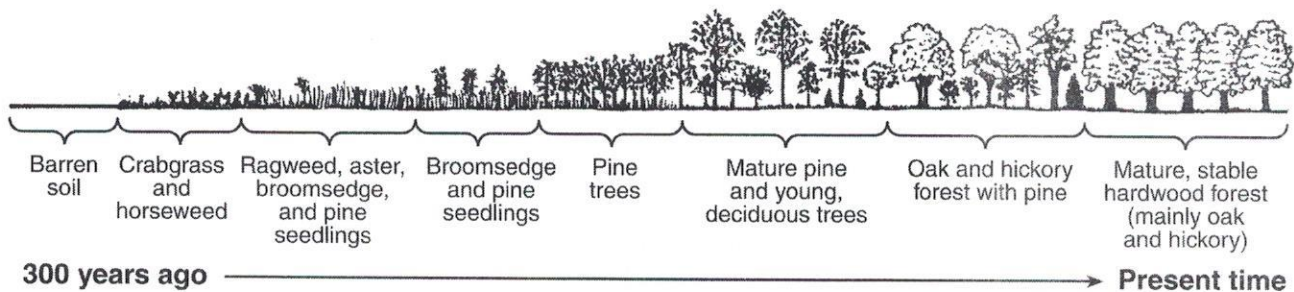
22 The diagram below shows several different organisms found in an area.



The worms in the diagram represent

- (1) a community
- (2) an ecosystem
- (3) a habitat
- (4) a population

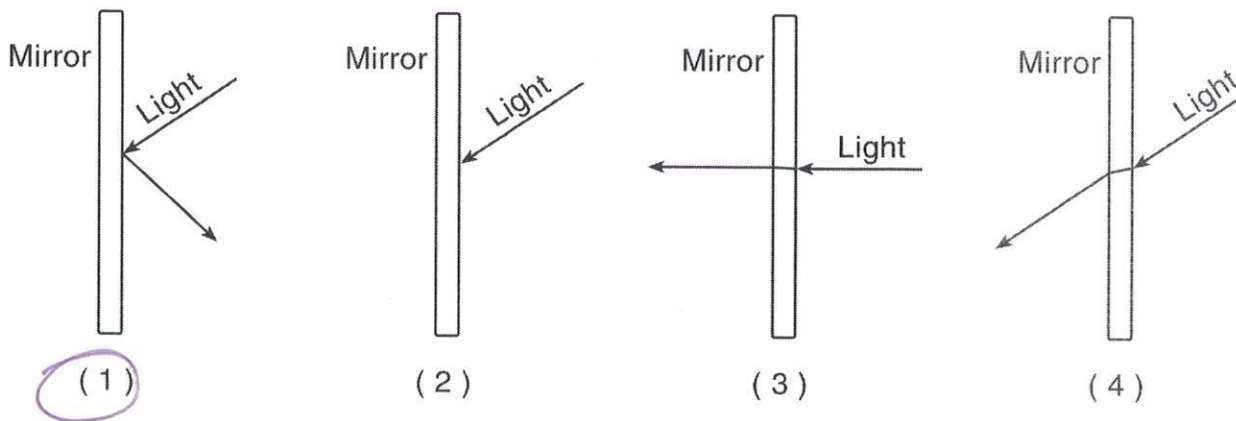
23 The diagram below shows how a plant community changed over 300 years.



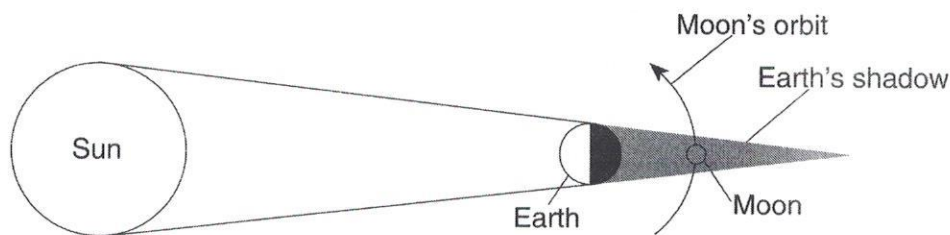
Which process caused the gradual changes shown in this plant community?

- (1) urban growth
- (2) global warming
- (3) environmental pollution
- (4) ecological succession

24 Which diagram best represents light being reflected after striking the flat surface of a mirror?



25 The diagram below shows the positions of the Sun, Earth, and the Moon as seen from space.



(Not drawn to scale)

Which event is caused by the Moon passing through Earth's shadow?

- (1) a meteor shower
- (2) a change of seasons
- (3) an eclipse
- (4) an earthquake

26 A bright object with a long tail of glowing gases is in orbit around the Sun. This object is most likely

- (1) a planet
- (2) a star
- (3) an asteroid
- (4) a comet

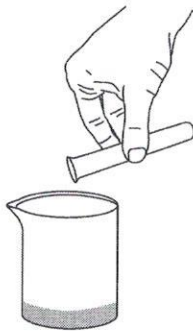
27 The thin layer of rock on Earth's surface is the

- (1) atmosphere
- (2) hemisphere
- (3) hydrosphere
- (4) lithosphere

28 Under which conditions would a sugar cube dissolve most quickly when placed in a liter of water at room temperature?

- (1) A whole sugar cube is added and the water is stirred.
- (2) A whole sugar cube is added and the water is not stirred.
- (3) A crushed sugar cube is added and the water is stirred.
- (4) A crushed sugar cube is added and the water is not stirred.

29 All of the liquid from a test tube is poured into a beaker, as shown in the diagram below.



Compared to the liquid that was in the test tube, the liquid in the beaker has

- (1) a different volume, but the same shape
- (2) a different volume and a different shape
- (3) the same volume, but a different shape
- (4) the same volume and the same shape

30 Rocks are classified as sedimentary, metamorphic, or igneous on the basis of the

- (1) age of the rocks
- (2) way the rocks were formed
- (3) types of fossils the rocks contain
- (4) number of minerals found in the rocks

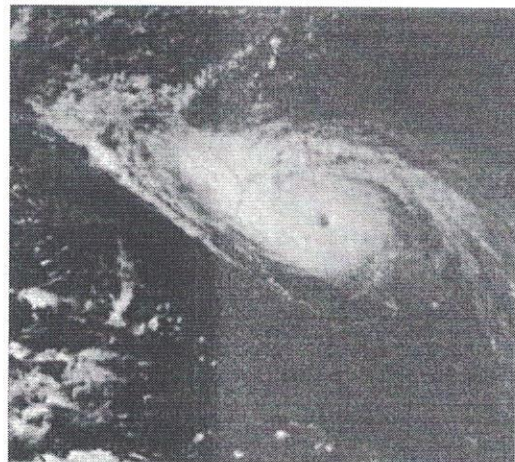
31 Which temperature and moisture conditions describe an air mass that originates over the Atlantic Ocean near the equator?

- (1) warm and dry
- (2) warm and humid
- (3) cool and dry
- (4) cool and humid

32 Which property of a substance indicates whether the substance is a liquid or a solid at room temperature?

- (1) melting point
- (2) electrical conductivity
- (3) flexibility
- (4) solubility

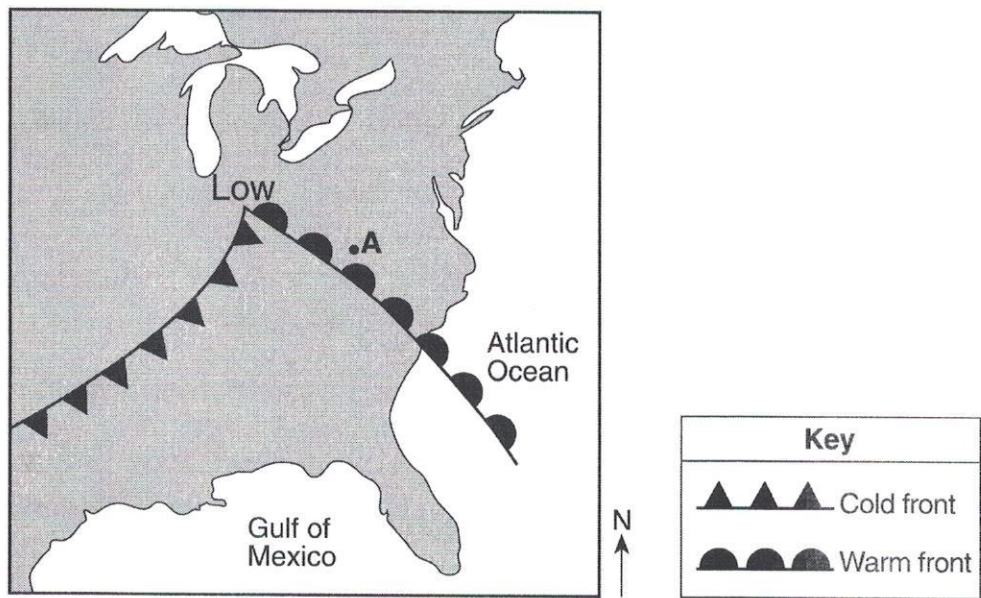
33 The photograph below shows a satellite image of a hurricane.



A satellite image of a hurricane helps weather forecasters to

- (1) warn residents of hazardous weather conditions
- (2) explain the effects of global warming on the ocean currents
- (3) predict the times of high tide and low tide
- (4) predict the total number of storms to occur in one year

Base your answers to questions 34 through 36 on the weather map below and on your knowledge of science. The center of a storm system (**LOW**) over part of the United States and the frontal boundaries associated with this system are shown. Point A represents a location on the map.



- 34 The word **LOW** on the map refers to
- (1) air temperature
 - (2) air pressure
 - (3) relative humidity
 - (4) amount of cloud coverage
- 35 Precipitation is most likely occurring at A because it is located
- (1) on a cold ocean surface
 - (2) on a warm land surface
 - (3) near the cold front
 - (4) near the warm front
- 36 In which compass direction will the storm center (**LOW**) most likely move over the next few days if it follows a typical storm track?
- (1) northeast
 - (2) southeast
 - (3) northwest
 - (4) southwest

Because of coriolis effect (earth spinning) weather gets deflected to the east,

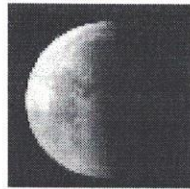
37 The photograph below shows a phase of the Moon as seen by an observer in New York State.



Which phase is closest to what will be seen by the observer in New York State 1 month later?



(1)



(2)



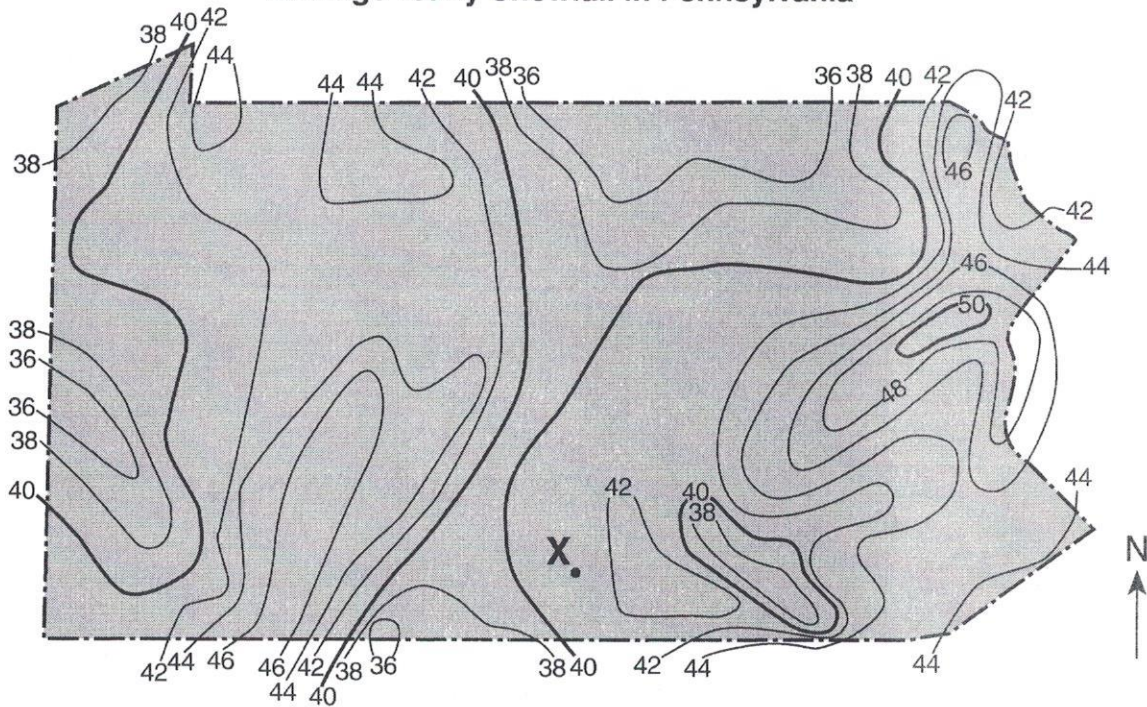
(3)



(4)

Base your answers to questions 38 and 39 on the field map below, which shows average yearly snowfall in the state of Pennsylvania. The solid lines represent amounts of snowfall in inches. Point X represents a location on the map.

Average Yearly Snowfall in Pennsylvania



38 Approximately how much snow falls in an average year at location X?

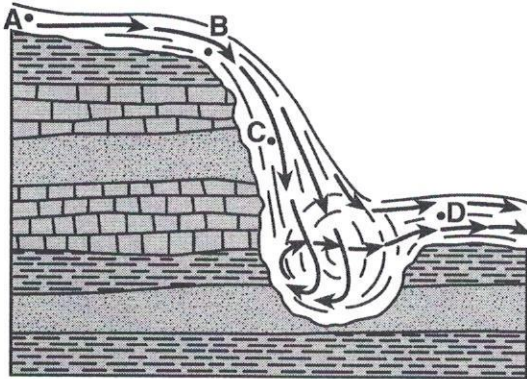
- (1) 39 inches
- (2) 40 inches
- (3) 41 inches
- (4) 42 inches

39 Which part of Pennsylvania has the greatest average yearly snowfall?

- (1) northern
- (2) eastern
- (3) southern
- (4) western

- 40 Fossil fuels are considered *nonrenewable* because they
- (1) produce pollution
 - (2) are no longer used by humans
 - (3) often contain microscopic animals
 - (4) take millions of years to form

- 41 The diagram below shows a cross section of a waterfall. Points A, B, C, and D represent locations in the stream.



At which location does the water have the greatest kinetic energy?

- (1) A
- (2) B
- (3) C
- (4) D

Note that question 42 has only three choices.

- 42 If the force used to push a shopping cart increases, the cart's acceleration will
- (1) decrease
 - (2) increase
 - (3) remain the same

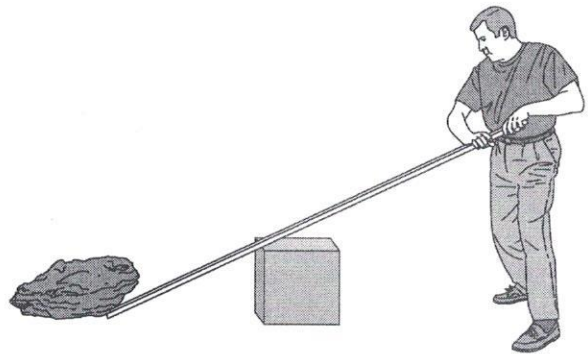
- 43 Sound waves are *not* able to travel through
- (1) a cloud
 - (2) a vacuum
 - (3) metal
 - (4) water

- 44 The diagram below shows two magnets.



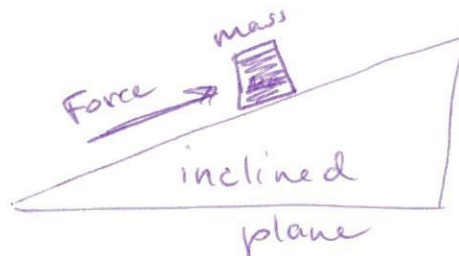
If the magnets are brought closer together, they will

- (1) attract each other with a stronger force
 - (2) attract each other with a weaker force
 - (3) repel each other with a stronger force
 - (4) repel each other with a weaker force
- 45 The diagram below shows a person using a simple machine to move a rock.



Which simple machine is the person using?

- (1) pulley
- (2) inclined plane
- (3) wheel and axle
- (4) lever



Part II

Directions (46–83): Record your answers in the space provided below each question.

Base your answers to questions 46 and 47 on the passage below and on your knowledge of science.

A student wondered if different types of plants would produce different amounts of oxygen. A pea plant, a fern, and a cactus were growing in equal-sized containers with equal amounts of soil. The student measured the amount of oxygen produced by each.

46 State *one* possible hypothesis for this experiment. [1]

Different plants will produce different
amounts of O_2 .

47 Identify *two* conditions, other than the size of container and the amount of soil, that should be held constant in this experiment. [1]

- (1) sunlight, air temp., soil type
- (2) plant size, water quantity - - -

Base your answers to questions 48 through 50 on the data table below and on your knowledge of science. The data table shows the number of Calories used per hour by a small dog while running at different speeds. Average running speed was recorded in kilometers per hour (km/h).

Calories Used by a Small Dog While Running

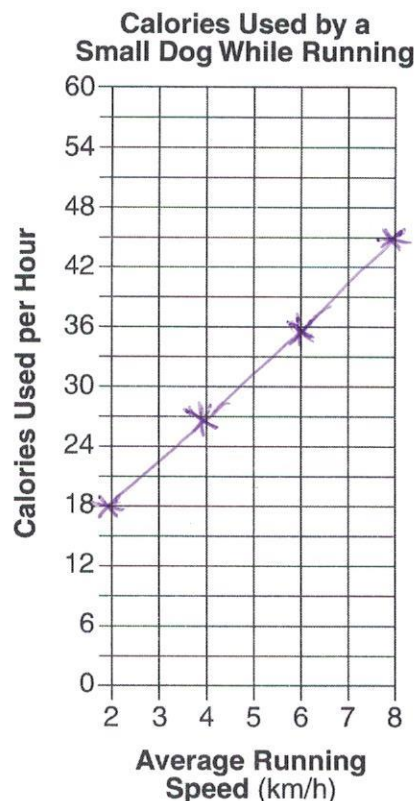
Average Running Speed (km/h)	Calories Used per Hour
2	18
4	27
6	36
8	45

+9
+9
+9

48 If the trend shown in the data table continues, how many Calories per hour will be used by the dog when running at an average speed of 10 km/h? [1]

54 Calories

49 Construct a line graph on the grid below. Use an **X** to plot the number of Calories per hour used by the dog for *each* average running speed recorded in the data table. Connect the **X**s with a line. [1]



50 Describe the relationship between the dog's average running speed and the number of Calories used per hour. [1]

The faster the dog runs, the more calories it uses.

Base your answers to questions 51 and 52 on the data table below and on your knowledge of science. The table shows some properties of five different minerals.

Data Table

Mineral	Properties				
	Surface Color	Luster	Streak	Hardness	Density (g/cm ³)
kaolinite	white	nonmetallic	white	soft	2.6
galena	silver to gray	metallic	gray black	soft	7.6
graphite	silver to gray	metallic	black	soft	2.3
magnetite	silver to black	metallic	black	hard	5.2
olivine	green	nonmetallic	white	hard	3.4

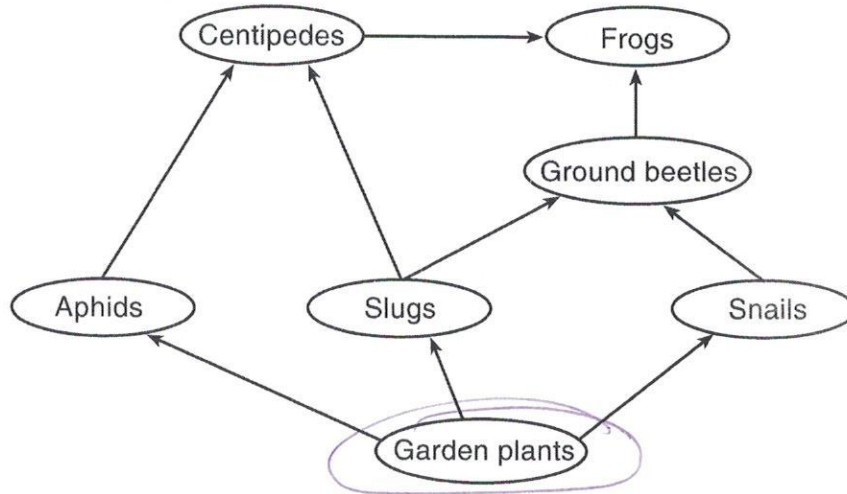
51 Identify the mineral that has the greatest difference between the color of its powder and the color of its outside surface. [1]

Olivine

52 Explain why a sample of magnetite will scratch a sample of galena. [1]

Magnetite is harder than galena

Base your answers to questions 53 and 54 on the food web below and on your knowledge of science.



53 Which organism labeled in this food web provides energy, either directly or indirectly, to all of the other organisms? [1]

plants

54 Explain why the amount of food available to the slug population might increase if the aphid population decreased. [1]

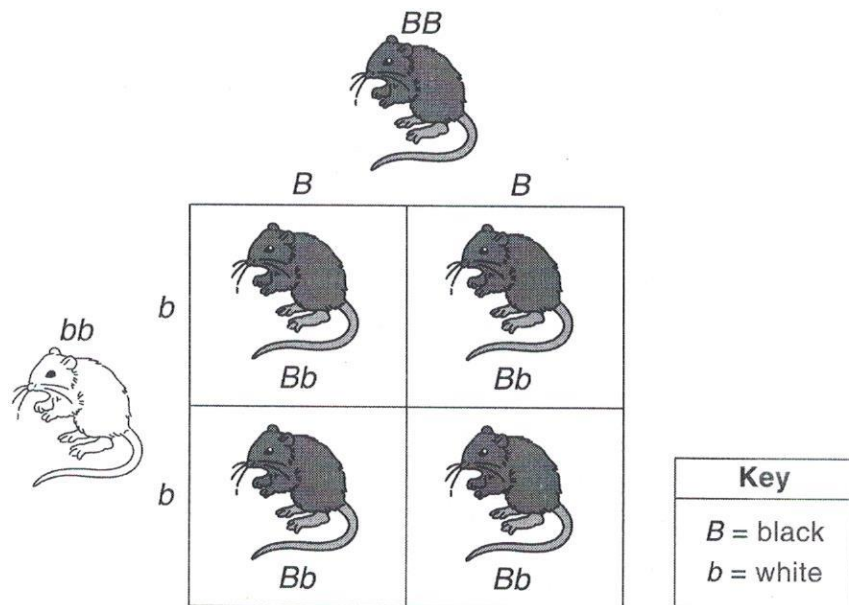
Less competition with aphids for food

55 Use the terms below to complete the sequence of the levels of organization in a multicellular organism. [1]

organs
organ systems
tissues

cells → tissues → organs → organ system → organism

Base your answers to questions 56 and 57 on the Punnett square below and on your knowledge of science. The Punnett square shows a cross between a mouse with black fur whose genetic makeup was BB , and a mouse with white fur whose genetic makeup was bb .



56 Explain why all of the offspring have black fur, even though each of them has a gene for white fur. [1]

Black is the dominant gene
White fur is recessive

57 A second cross was done using a different pair of mice. One parent was a mouse with white fur (bb). The other parent was a mouse with black fur. Some of the offspring produced from this cross had white fur. What genetic makeup did this parent with black fur have in order to produce some offspring with white fur? [1]

Genetic makeup: Bb heterozygous

58 The chart below shows the major function of three different human organ systems. For *each* major function listed, identify the human organ system that performs the function. [2]

Major Function	Human Organ System
moves substances to and from all cells of the body	<u>Cardiovascular</u> system
creates sex cells and offspring	<u>reproductive</u> system
breaks down food	<u>digestive</u> system

59 The data table below shows five hamster species and the number of chromosomes found in their body cells.

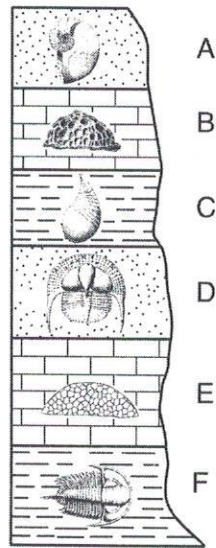
Number of Chromosomes in the Body Cells of Five Hamster Species

Hamster Species	Number of Chromosomes
Syrian hamster	44
dwarf Campbell's Russian hamster	28
dwarf winter white Russian hamster	28
Chinese hamster	22
Roborovski hamster	34

These species all reproduce sexually. How many chromosomes would be in a sex cell of a Syrian hamster? [1]

22 chromosomes

Base your answers to questions 60 and 61 on the diagram below and on your knowledge of science. The diagram represents a cross section of several layers of sedimentary rock that have *not* been overturned. Each layer contains fossils.



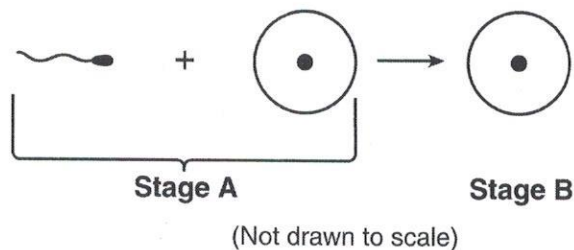
60 Explain why the fossils in rock layer A are more likely to resemble life-forms that exist today. [1]

The fossils in layer A are the youngest

61 State *one* conclusion that many scientists have made about Earth's past by studying fossils. [1]

Different geology in the past, different organisms existed then & life has evolved.

Base your answers to questions 62 and 63 on the diagram below and on your knowledge of science. The diagram represents a model of sexual reproduction in humans. Two stages are labeled A and B.



62 Identify each of the *two* cells represented at stage A. [1]

male sex cell (sperm)

female sex cell (egg)

63 Describe *one* difference between sexual reproduction and asexual reproduction. [1]

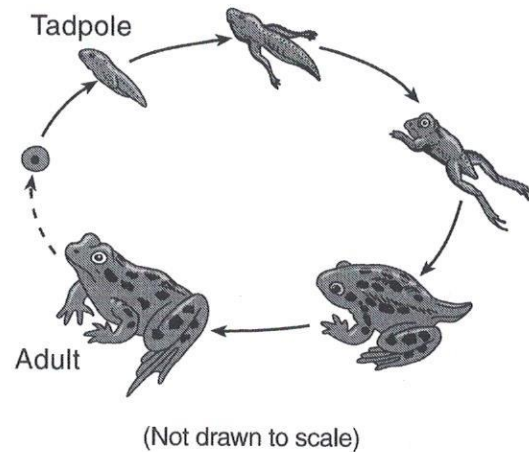
Haploid sex cells from both ♂ & ♀ required for sexual. Asexual requires only (1) parent

64 Producers, consumers, and decomposers are three types of organisms that obtain nutrients in different ways. In the chart below, identify *each* organism as a producer, consumer, or decomposer based on its source of nutrients. [1]

Organism	Source of Nutrients	Type of Organism
mushroom	breaks down dead tree roots	decomposer
algae	makes its own food	producer
cow	eats plants	consumer

Base your answers to questions 65 and 66 on the information and diagram below and on your knowledge of science. The diagram represents the life cycle of a frog.

Frogs live most of their lives in and around water. During the tadpole stage, they live entirely underwater and get oxygen through their gills. As adults, frogs can live on land and breathe air.



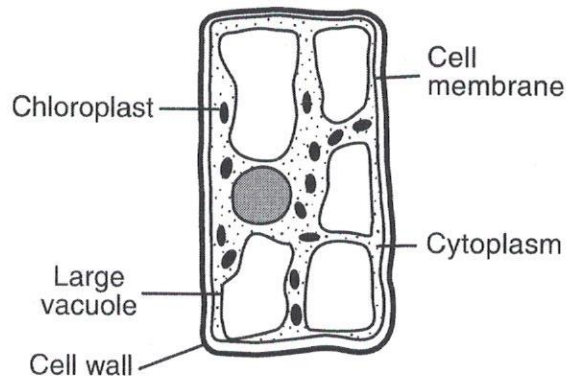
65 Identify *one* structural change to this organism's body that occurs during its life cycle. [1]

Metamorphosis - gills become lungs
tail is lost & legs grow

66 An environmental change causes a *decrease* in the amount of oxygen that is dissolved in the pond water. Explain why this change would have a greater effect on the frog during the tadpole stage than during the adult stage. [1]

Tadpole get oxygen from water with gills.
Adult frog can get O₂ from the air.

Base your answers to questions 67 and 68 on the diagram below and on your knowledge of science. The diagram represents an enlarged view of a plant cell. Several cell structures have been labeled.



67 Identify *two* labeled structures that identify this cell as a plant cell rather than an animal cell. [1]

(1) cell wall

(2) chloroplast

68 Identify *one* other structure that could be found in this plant cell that is *not* labeled in the diagram. [1]

nucleus, chromosome, mitochondria

Base your answers to questions 69 and 70 on the information below and on your knowledge of science.

A student performed an experiment in which 10 mL of a strong acid was placed on a sample of limestone. Bubbles formed where the acid touched the limestone. After 20 minutes, the bubbling stopped and the surface of the limestone appeared unchanged.

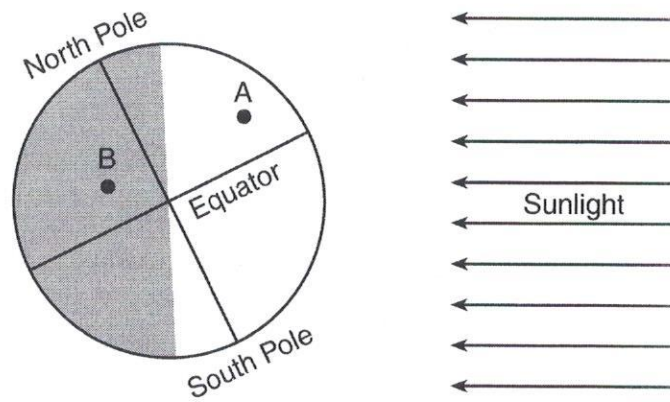
69 Identify *one* observation that shows a chemical reaction occurred between the acid and the limestone. [1]

bubbles formed - gas formed

70 Explain why limestone buildings are weathered by acid rain even though the limestone sample in this experiment did *not* appear to be changed by the strong acid. [1]

Acid rain damage can take years not minutes
and cumulative over time.

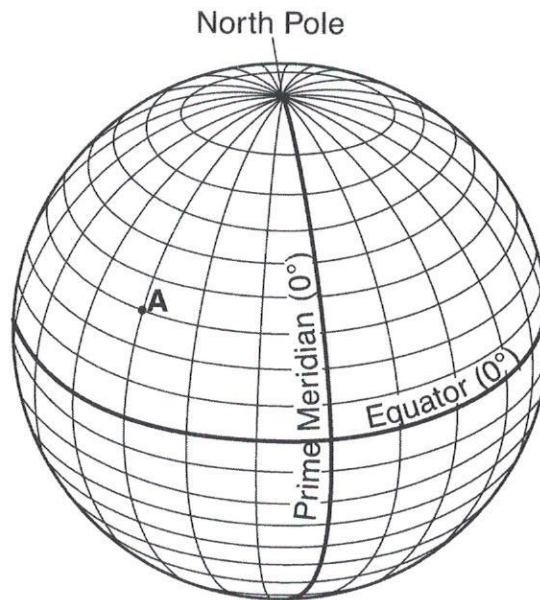
- 71 The diagram below represents one position of Earth in its orbit. Points *A* and *B* represent locations on Earth's surface. Location *A* is experiencing daylight while location *B* is experiencing darkness.



What Earth motion will bring location *B* into daylight in the next few hours? [1]

Rotation

- 72 The model below shows latitude and longitude lines on Earth. Point *A* represents a location on Earth. The latitude lines shown are spaced 10° apart and the longitude lines are spaced 15° apart.



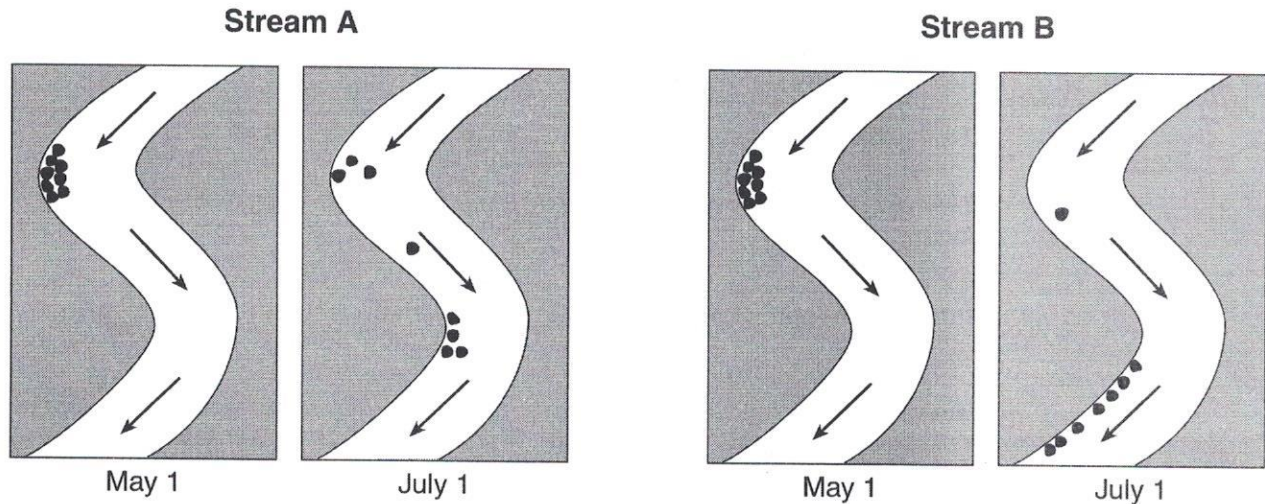
Determine the latitude and longitude of location *A*. [1]

Latitude: 30 $^\circ$ N

Longitude: 45 $^\circ$ W

Base your answers to questions 73 and 74 on the four maps below and on your knowledge of science. The maps show two streams, A and B, on two different dates. The arrows represent the direction of the streams' flow.

Students studying erosion painted several rocks of similar size, shape, and density. On May 1, they put half of the rocks in stream A and half of the rocks in stream B. On July 1, the students recorded the locations of the painted rocks in each stream. The results are shown in the diagram below.



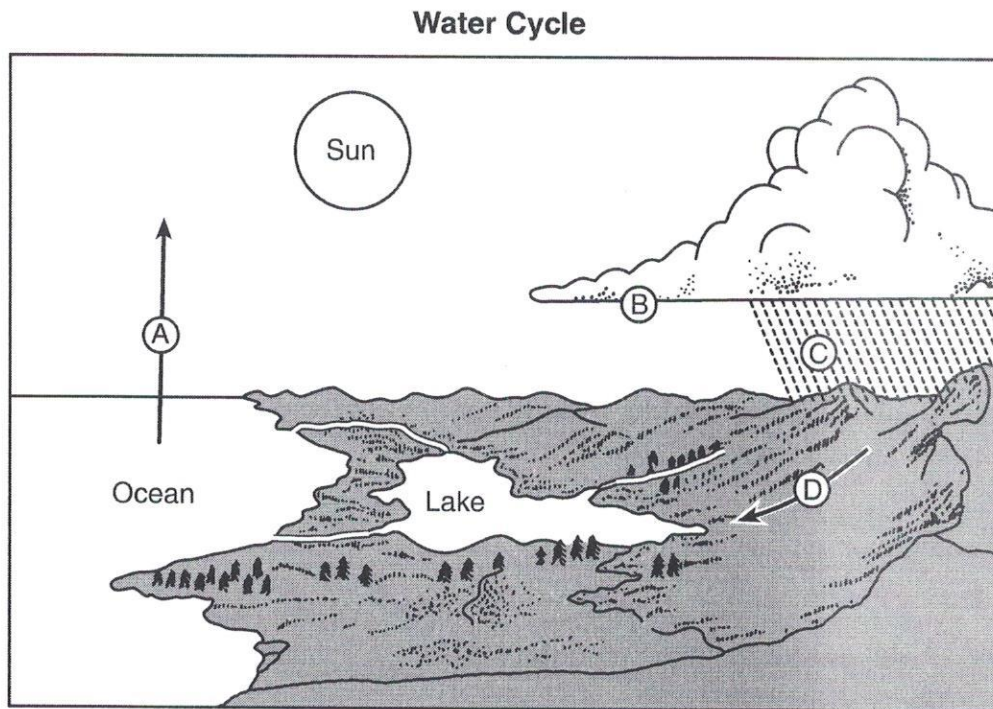
73 Explain how this experiment demonstrated erosion. [1]

Erosion occurred when water moved the rock material.

74 State *one* possible reason why more rocks moved farther downstream in stream B than in stream A. [1]

The water in stream B was moving faster.

75 The diagram below shows part of the water cycle. Some processes in the water cycle are represented by A, B, C, and D.



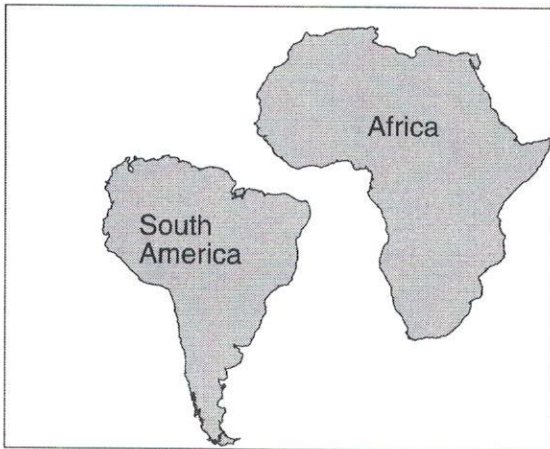
Complete the chart below by identifying the water cycle process represented by *each* letter in the diagram. [2]

Water Cycle

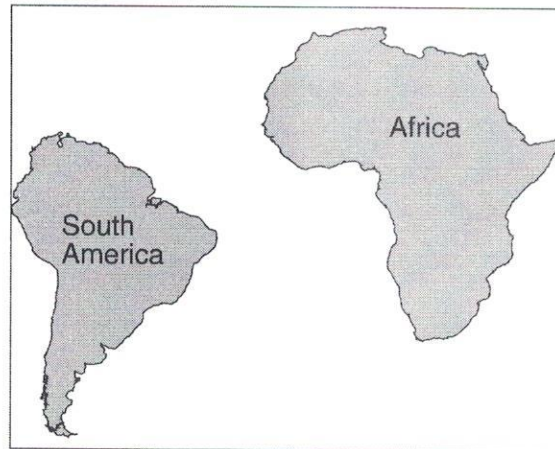
Letter	Process
A	evaporation
B	condensation
C	precipitation
D	runoff

Base your answers to questions 76 and 77 on the maps below and on your knowledge of science. The maps show the change in the positions of South America and Africa over the last 65 million years.

**Location of South America and Africa
65 Million Years Ago**



**Location of South America and Africa
Today**



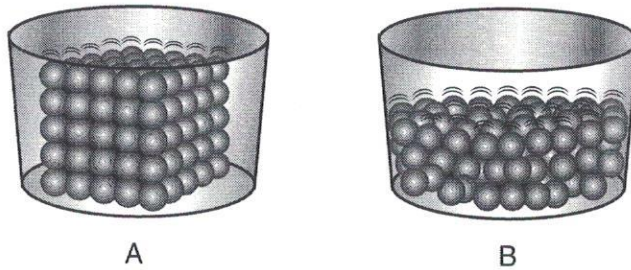
- 76 Describe the process that most likely caused the change in the positions of South America and Africa over the last 65 million years. [1]

Continental drift due to sea floor spreading

- 77 State *one* piece of evidence to support the theory that South America and Africa were once connected. [1]

Matching rock layers & fossils along both these continents shores.

- 78 Diagrams A and B show models of how the molecules of the same substance are arranged in two different phases of matter.



(Not drawn to scale)

Which phases of matter are represented by diagrams A and B? [1]

Diagram A: Solid Diagram B: liquid

- 79 When a balloon is rubbed on a wool sweater, the balloon builds up a negative electrical charge. When a glass rod is rubbed on silk, the rod builds up a positive electrical charge. Explain why the charged balloon will be attracted to the charged glass rod. [1]

Oppositely charged objects are
attracted to one another.

80 The diagram below shows a portion of the Periodic Table of the Elements.

Portion of the Periodic Table of the Elements

KEY

28	— approximate atomic mass
Si	— symbol
Silicon	— name
14	— atomic number

Groups

	13	14	15	16	17	18
11	12	14	16	19	20	
B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10	
27	28	31	32	35	40	
Al Aluminum 13	Si Silicon 14	P Phosphorus 15	S Sulfur 16	Cl Chlorine 17	Ar Argon 18	
70	73	75	79	80	84	
Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35	Kr Krypton 36	
115	119	122	128	127	131	
In Indium 49	Sn Tin 50	Sb Antimony 51	Te Tellurium 52	I Iodine 53	Xe Xenon 54	
81	82	83	84	85	86	
Tl Thallium 204.4	Pb Lead 207.2	Bi Bismuth 209.0	Po Polonium (209)	At Astatine (210)	Rn Radon (222)	

Identify one element that has chemical properties similar to the chemical properties of fluorine. [1]

Cl, Br, I, At ← any of these

81 The diagram below shows the arrangement of atoms and the chemical composition of a water molecule. The table shows common elements and their chemical symbols.

Water Molecule (H₂O)

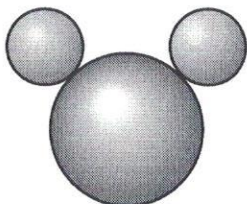


Table of Common Elements

Element	Chemical Symbol
helium	He
calcium	Ca
oxygen	O
carbon	C
chlorine	Cl
hydrogen	H
sulfur	S

What *two* elements make up the water molecule? [1]

hydrogen and oxygen

Base your answers to questions 82 and 83 on the diagram below and on your knowledge of science. The diagram shows an aluminum can before and after it was crushed.



82 Explain why crushing the aluminum can is an example of a physical change and *not* a chemical change. [1]

The aluminum still has all the same
chemical properties, change is merely

physical.

83 Making cans from newly mined aluminum ore uses a large amount of energy. Therefore, old aluminum cans are often recycled to make new ones. State *one* positive effect recycling aluminum has on the environment. [1]

Recycling allows us to reduced foot print
on the environment. Fewer landfills less
pollution, conservation of energy.