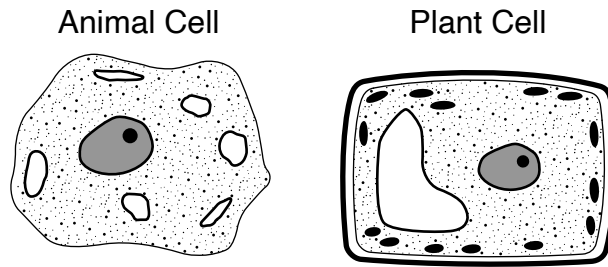


Part 1

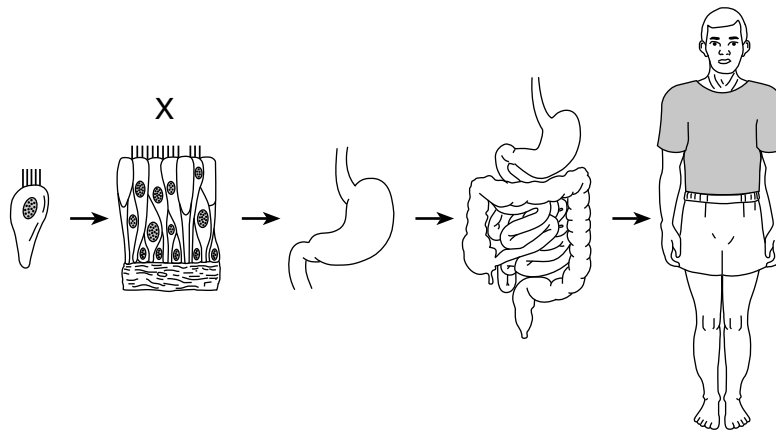
1 The diagrams below represent two types of cells, an animal cell and a plant cell.



Which type of cell uses energy to carry out life processes?

- (1) plant cell, only
- (2) animal cell, only
- (3) both a plant cell and an animal cell
- (4) neither a plant cell nor an animal cell

2 A diagram representing the levels of organization within an organism is shown below.

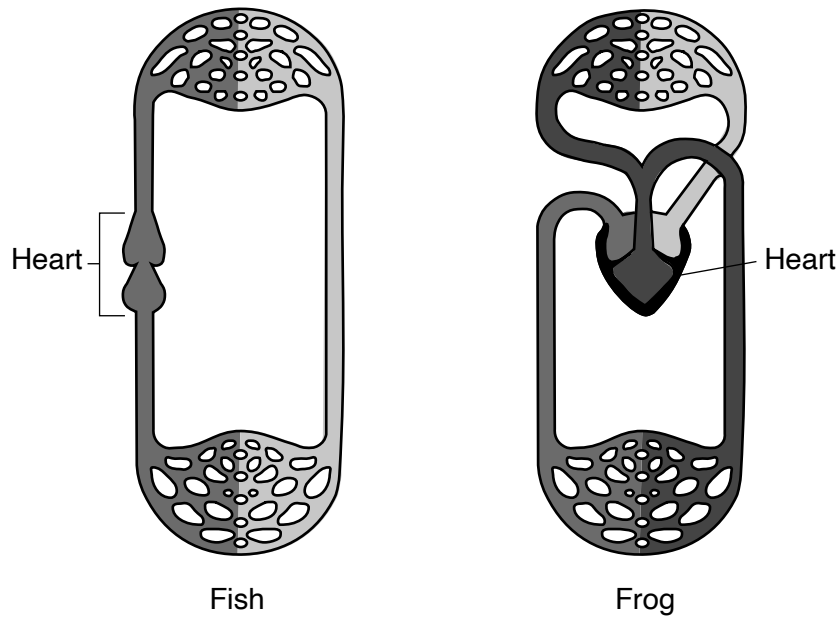


(Not drawn to scale)

Which level of organization is identified by X?

- (1) cell
- (2) tissue
- (3) organ
- (4) organ system

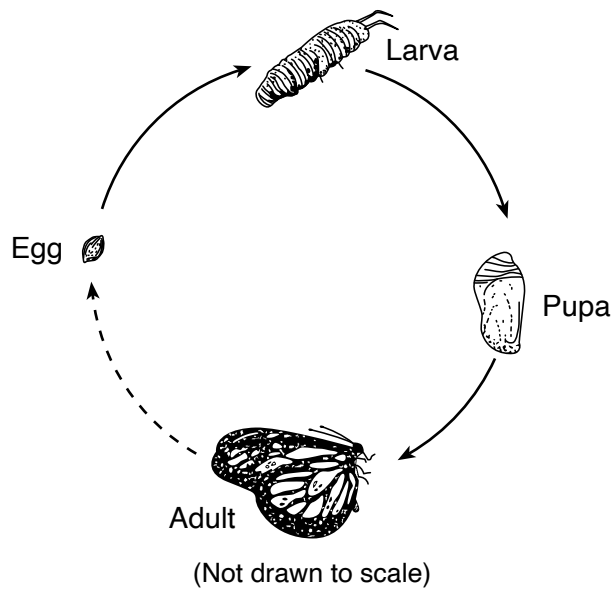
3 The diagrams below show models of the circulatory systems of a fish and frog.



A student compared these diagrams. The student found that each of these organisms had a heart to pump blood. Which statement is supported by the student's findings?

- (1) Some organisms are composed of one cell, while others are multicellular.
- (2) Many multicellular animals have similar organs and specialized systems.
- (3) The circulatory system in most organisms removes solid wastes from their bodies.
- (4) All animals have identical circulatory systems.

4 The diagram below represents the life cycle of a butterfly.



This life cycle represents the process of

- (1) separation from parent
- (2) asexual reproduction
- (3) metamorphosis
- (4) extinction

5 water and carbon dioxide are waste products released as a direct result of

- (1) asexual reproduction
- (2) mechanical digestion
- (3) natural selection
- (4) cellular respiration

6 The primary function of a plant's roots is to

- (1) absorb water
- (2) perform photosynthesis
- (3) produce seeds
- (4) exchange gases

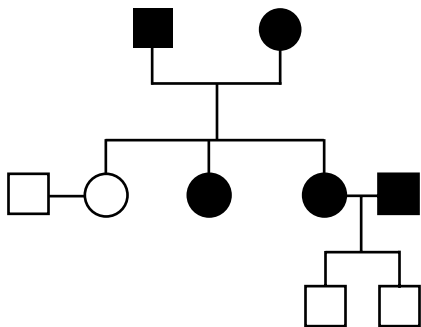
7 Genes are a part of a

- (1) cell wall
- (2) chromosome
- (3) hormone
- (4) vitamin

8 Compared to the amount of genetic information contained in a normal human body cell, the amount contained in a normal human sperm cell is

- (1) the same
- (2) twice as much
- (3) one-half as much
- (4) one-fourth as much

9 The diagram below represents a pedigree chart.



Which type of information is organized by this chart?

- (1) energy flow in an ecosystem
- (2) population growth for pea plants
- (3) the number of chromosomes in an organism
- (4) the passing of a trait from one generation to another

10 A change in an animal's DNA, leading to a variation in a species, is called

- (1) a mutation
- (2) an infection
- (3) selective breeding
- (4) sexual reproduction

11 Which set of terms describes natural fertilization and development in humans before birth?

- (1) external fertilization, external development
- (2) external fertilization, internal development
- (3) internal fertilization, external development
- (4) internal fertilization, internal development

12 A plant growing toward a light source is an example of an organism

- (1) attracting a mate
- (2) destroying infectious germs
- (3) responding to external stimuli
- (4) obtaining moisture from the air

13 A cactus plant, a snake, and a hawk can be members of the same

- (1) community
- (2) kingdom
- (3) population
- (4) species

14 Which substance in green plants needs to absorb sunlight during photosynthesis?

- (1) chlorophyll
- (2) cytoplasm
- (3) oxygen
- (4) water

15 In 1865, a pond was surrounded by open fields. Today, the same area is swampy and surrounded by a forest. Which process is responsible for this change?

- (1) metamorphosis
- (2) conservation
- (3) ecological succession
- (4) crustal plate movement

Base your answers to questions 16 and 17 on the food label below and on your knowledge of science. The food label lists nutritional facts about a serving of cereal alone and cereal with a $\frac{1}{2}$ cup of fat-free milk.

Nutrition Facts		
Serving Size	51 Biscuits (55g/1.9 oz.)	
Servings Per Container	About 8	
Amount Per Serving		
	Cereal	Cereal with 1/2 Cup Fat-free Milk
Calories	190	230
Calories from Fat	10	10
% Daily Value		
Total Fat 1g	2%	2%
Saturated Fat 0g	0%	0%
<i>Trans</i> Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 0g		
Cholesterol 0mg	0%	0%
Sodium 0mg	0%	3%
Potassium 200mg	6%	11%
Total Carbohydrate 46g	15%	17%
Dietary Fiber 6g	23%	23%
Sugars 12g		
Other Carbohydrate 28g		
Protein 5g		
Vitamin A	0%	4%
Vitamin C	0%	0%
Calcium	0%	15%
Iron	90%	90%
Thiamin	25%	30%
Riboflavin	25%	35%
Niacin	25%	25%
Vitamin B ₆	25%	25%
Folic Acid	25%	25%
Vitamin B ₁₂	25%	35%
Phosphorus	15%	25%
Magnesium	10%	15%
Zinc	10%	15%

16 How much total energy is contained in a single serving of this cereal with a $\frac{1}{2}$ cup of fat-free milk?

- (1) 10 Calories (3) 190 Calories
 (2) 40 Calories (4) 230 Calories

17 One nutrient that is obtained only when milk is added to the cereal is

- (1) niacin (3) sodium
 (2) cholesterol (4) phosphorus

18 The fur on an arctic polar bear appears white all year. The color of the fur is an example of

- (1) an adaptation helping an organism to survive
 (2) an organism exchanging materials with its environment
 (3) an organism responding to internal stimuli
 (4) metabolism regulating an organism's activities

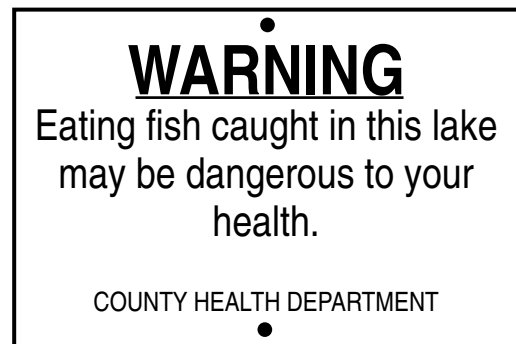
19 Urban growth and uncontrolled waste disposal by humans most likely results in

- (1) conservation of fossil fuels
 (2) environmental degradation
 (3) improved soil composition
 (4) a balanced ecosystem

20 Cell division occurs as part of which process?

- (1) Energy in food is released.
 (2) A cut on a person's finger heals.
 (3) A disinfectant destroys microbes.
 (4) The body eliminates wastes.

21 The sign below was posted near a lake.



Which environmental problem is most likely indicated by the sign?

- (1) toxic waste (3) ozone depletion
 (2) global warming (4) species extinction

22 Which human activity would help reduce the amount of carbon dioxide in the atmosphere?

- (1) decrease the burning of fossil fuels
 (2) decrease the number of recycling programs
 (3) increase the human population
 (4) increase the number of cars being driven

23 The data table below shows data for four planets in our solar system.

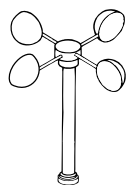
Data Table

Planet	Distance from Sun (millions of km)	Period of Revolution (in Earth time)	Period of Rotation (in Earth time)
Mercury	57.9	88 days	59 days
Venus	108.2	225 days	243 days
Earth	149.6	365 days	24 hours
Mars	227.9	687 days	25 hours

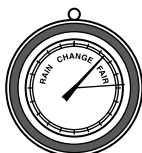
For which planet is the length of the planet's day longer than the planet's year?

- (1) Mercury (2) Venus (3) Earth (4) Mars

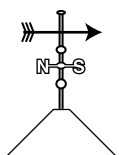
24 Which weather instrument is used to measure wind speed?



Anemometer
(1)



Barometer
(2)



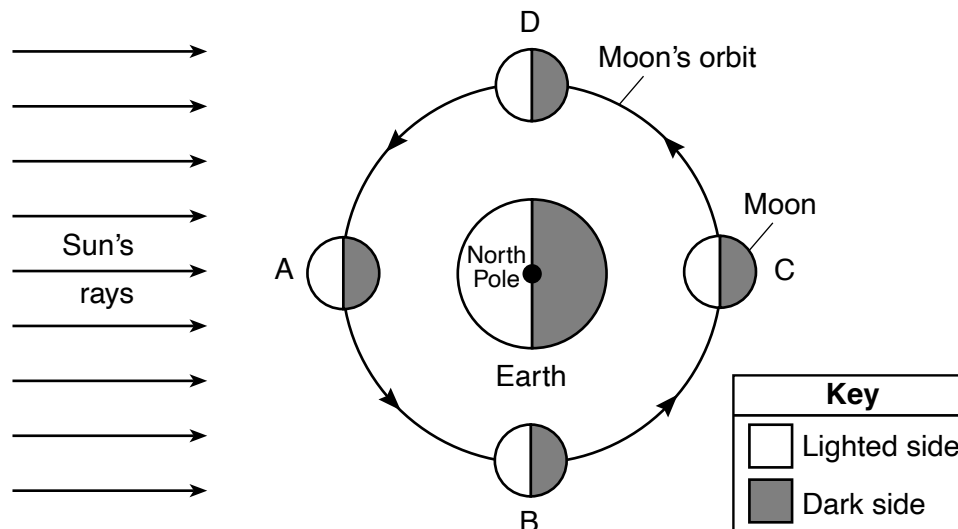
Weather vane
(3)



Rain gauge
(4)

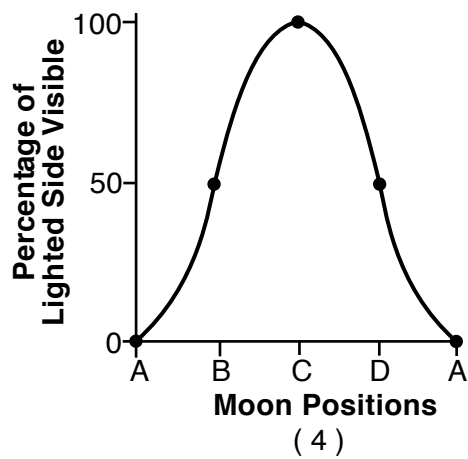
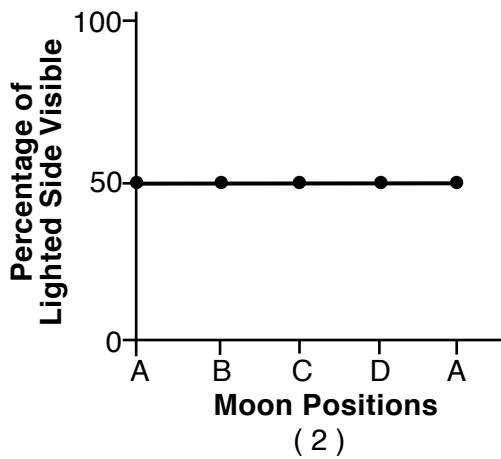
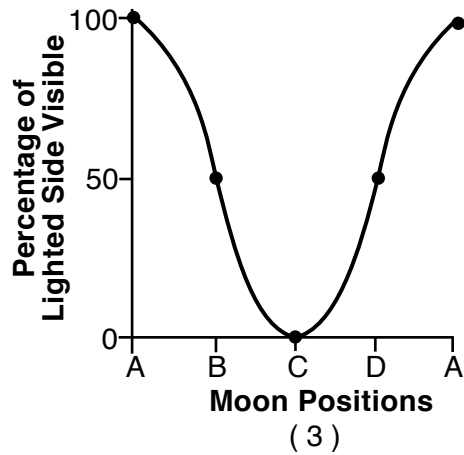
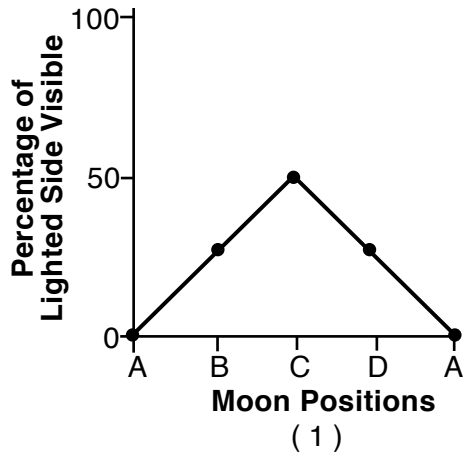
(Not drawn to scale)

Base your answers to questions 25 and 26 on the diagram below and on your knowledge of science. The diagram represents the Moon at positions A, B, C, and D, in its orbit around Earth.



(Not drawn to scale)

25 Which graph best represents the percentage of the lighted side of the Moon that can be seen by an observer in the northern hemisphere when the Moon is at the positions shown?



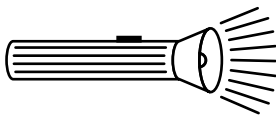
26 Approximately how long does it take for an observer on Earth to view a complete cycle of Moon phases?

- (1) 12 hours
- (2) 24 hours
- (3) 1 month
- (4) 1 year

- 27 The motions of comets and asteroids in our solar system are predictable because they are
- (1) smaller than planets
 - (2) nearly spherical in shape
 - (3) in orbit around the Sun
 - (4) controlled by Earth's gravity

- 28 Which two gases, when released into the atmosphere, are believed to contribute most to global warming?
- (1) nitrogen and oxygen
 - (2) nitrogen and carbon dioxide
 - (3) methane and oxygen
 - (4) methane and carbon dioxide

- 29 The diagram below represents a flashlight that has been turned on.



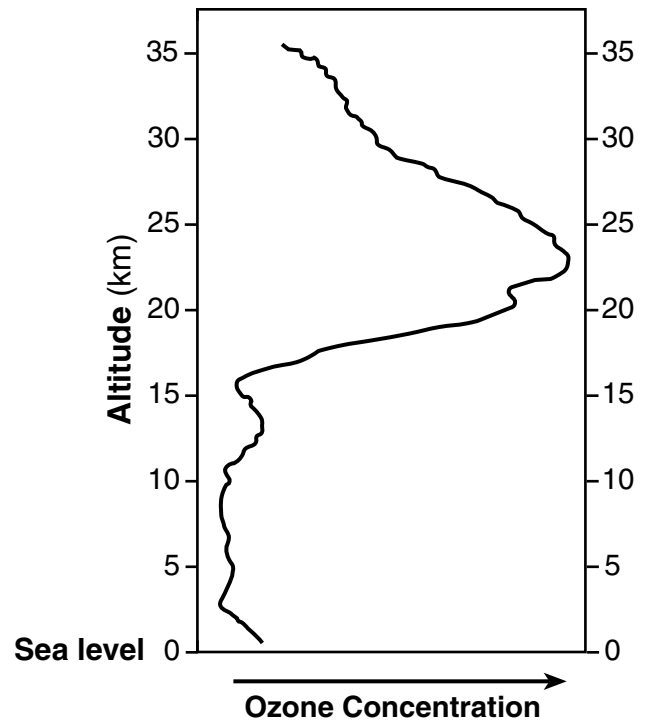
Which form of energy is being converted to electrical energy by the batteries in the flashlight?

- (1) chemical
- (2) nuclear
- (3) solar
- (4) sound

- 30 Which set of Earth components is arranged in order from solid to liquid to gas?
- (1) hydrosphere, atmosphere, lithosphere
 - (2) hydrosphere, lithosphere, atmosphere
 - (3) lithosphere, atmosphere, hydrosphere
 - (4) lithosphere, hydrosphere, atmosphere

- 31 The graph below shows the change in ozone concentration with altitude in Earth's atmosphere. The data table below shows the average height range above sea level, in kilometers (km), for the different layers of Earth's atmosphere.

Ozone Concentration vs. Altitude in Earth's Atmosphere



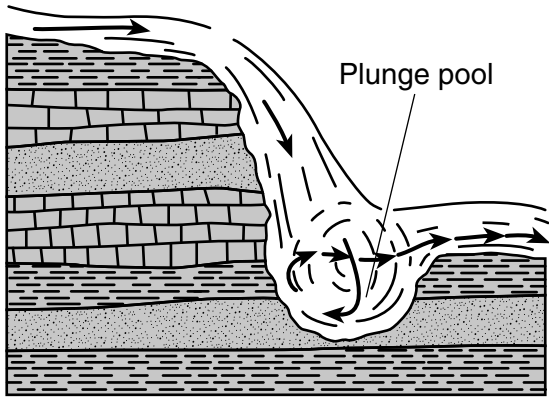
Data Table

Layer of Earth's Atmosphere	Range in Altitude Above Sea Level (km)
middle stratosphere	21 to 35
lower stratosphere	8 to 20
upper troposphere	4 to 7
lower troposphere	0 to 3

Which layer of Earth's atmosphere contains the highest concentration of ozone?

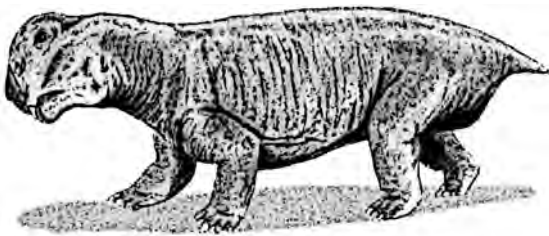
- (1) middle stratosphere
- (2) lower stratosphere
- (3) upper troposphere
- (4) lower troposphere

- 32 The cross section below represents a plunge pool that formed at the bottom of a waterfall.



The plunge pool at the bottom of the waterfall was formed mainly by

- (1) deposition (2) evaporation (3) precipitation (4) erosion
- 33 What is the main source of energy for the water cycle?
- (1) the Moon (2) the Sun (3) winds (4) oceans
- 34 The diagram below represents a *Lystrosaurus*. *Lystrosaurus* was an herbivore that lived on land about 250 million years ago. Fossils of this dinosaur have been discovered on the widely separated continents of Africa and South America.



Which statement best explains why *Lystrosaurus* fossils are found on these two continents?

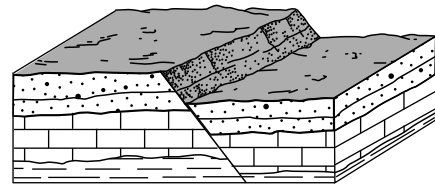
- (1) This dinosaur could fly to distant locations.
 (2) Both continents were once joined together.
 (3) Predators transported the remains of this dinosaur between continents.
 (4) Glaciers transported the fossils to the two continents.

- 35 A student correctly determined the density of two rocks. If the volumes of the two rocks are equal, the rock with the greater density has a
- (1) rounder shape (2) smoother surface (3) greater mass (4) smaller size

- 36 Which terms best describe the properties of a gas?
- (1) definite volume and a definite shape
 (2) definite volume and no definite shape
 (3) no definite volume and a definite shape
 (4) no definite volume and no definite shape

- 37 Low-pressure systems generally move across the United States from
- (1) north to south (2) east to west (3) west to east (4) south to north

- 38 The block diagram below represents a displaced rock structure.



Which process was responsible for the displacement of the horizontal rock layers?

- (1) folding (2) faulting (3) tilting (4) weathering
- 39 Which event is an example of a physical change?
- (1) iron rusting (2) fireworks exploding (3) eggs cooking (4) ice melting

Note that question 40 has only three choices.

40 The diagram below represents a portion of the Periodic Table of the Elements.

Portion of the Periodic Table of the Elements

KEY

1	H	approximate atomic mass
	H	symbol
	Hydrogen	name
1		atomic number

Groups

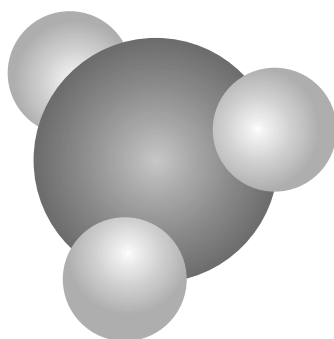
		13	14	15	16	17	18
11	12	13	14	15	16	17	18
64	65	70	73	75	79	80	84
29	30	31	32	33	34	35	36
108	112	115	119	122	128	127	131
47	48	49	50	51	52	53	54

Based on its position in the Periodic Table, at room temperature, cadmium is most likely a

- (1) noble gas
- (2) nonmetal
- (3) metal

41 The model below represents a molecule of ammonia gas.

Model of a Molecule of Ammonia Gas

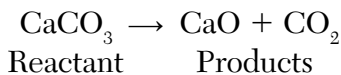


Key	
Nitrogen atom	
Hydrogen atom	

Ammonia gas would be classified as

- (1) a compound
- (2) a mixture
- (3) an element
- (4) an atom

42 When calcium carbonate (CaCO_3) is heated, it decomposes to form calcium oxide (CaO) and carbon dioxide (CO_2). The equation below shows this reaction.



In this reaction, the mass of CaCO_3

- (1) is less than the mass of CaO plus the mass of CO_2
- (2) is greater than the mass of CaO plus the mass of CO_2
- (3) equals the mass of CaO plus the mass of CO_2
- (4) equals the mass of CaO minus the mass of CO_2

43 The chart below shows the wind-chill temperatures caused by wind speeds at different surface air temperatures.

		Surface Air Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind Speed (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	

What is the wind-chill temperature when the surface air temperature is 10°F and the wind speed is 20 mph?

- (1) -41°F
- (2) -9°F
- (3) 9°F
- (4) 4°F

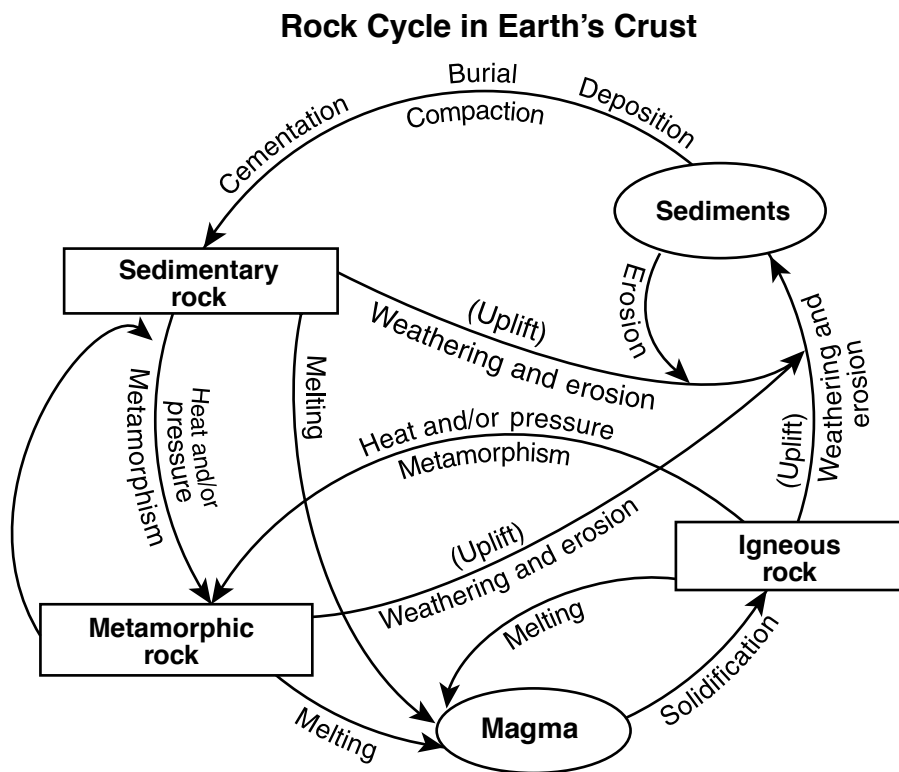
44 The diagram below represents a person using a wheelbarrow to move a heavy load of soil.



Which two simple machines are parts of the wheelbarrow?

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

45 The diagram below represents the rock cycle.



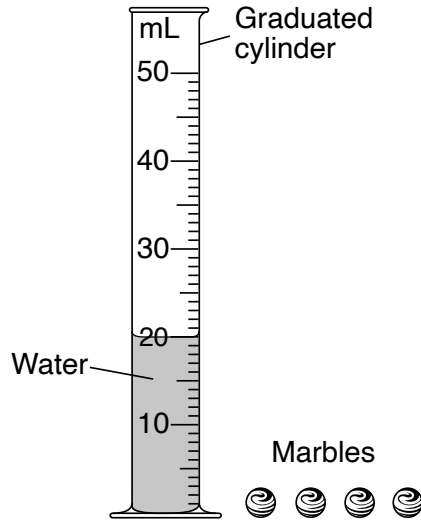
According to this diagram, metamorphic rock is formed by

- (1) melting and solidification
- (2) burial and compaction
- (3) weathering and erosion
- (4) heat and/or pressure

part II

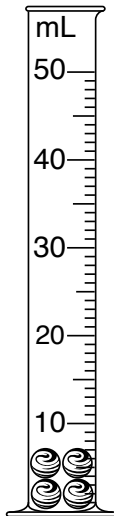
Directions (46–85): Record your answers in the spaces provided below each question.

- 46 The diagram below represents a graduated cylinder containing 20 mL of water. Four identical marbles are next to the cylinder.

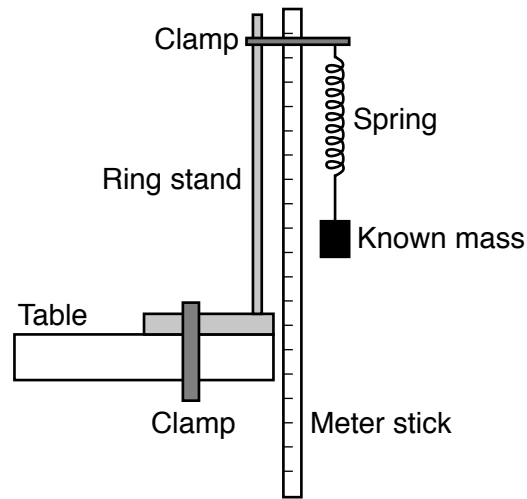


After two of the marbles are added to the cylinder, the water level reads 24 mL.

Shade in the graduated cylinder below to show what the water level would be after the *other* two marbles are added. [1]



Base your answers to questions 47 through 50 on the diagram and data table below and on your knowledge of science. The diagram shows a laboratory set-up used to investigate the relationship between the force on the spring and the length it will stretch. Increasing masses were attached to the spring. The length the spring stretched for each mass was measured using a meter stick. The data table shows the results of the investigation.



(Not drawn to scale)

Data Table

Mass (g)	Extension of Spring (cm)
0	0
100	0.5
200	0.6
300	0.8
400	1.5
500	2.5