

Tennessee TCAP 2020 Grade 7 Science Practice

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Grade 7 Reference Sheet

Periodic Table of the Elements

Periodic Table of the Elements																					
1																	18				
1 H Hydrogen 1.01																	2 He Helium 4.00				
2																	13	14	15	16	17
3 Li Lithium 6.94	4 Be Beryllium 9.01											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18				
11 Na Sodium 22.99	12 Mg Magnesium 24.31	3	4	5	6	7	8	9	10	11	12	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.95				
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.63	33 As Arsenic 74.92	34 Se Selenium 78.97	35 Br Bromine 79.90	36 Kr Krypton 83.80				
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.95	43 Tc Technetium 98	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29				
55 Cs Cesium 132.91	56 Ba Barium 137.33	57 La Lanthanum 138.91	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.20	83 Bi Bismuth 208.98	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222				
87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	104 Rf Rutherfordium 261	105 Db Dubnium 262	106 Sg Seaborgium 266	107 Bh Bohrium 264	108 Hs Hassium 269	109 Mt Meitnerium 268	110 Ds Darmstadtium 271	111 Rg Roentgenium 272	112 Cn Copernicium 285	113 Nh Nihonium 284	114 Fl Flerovium 289	115 Mc Moscovium 288	116 Lv Livermorium 292	117 Ts Tennessine 294	118 Og Oganesson 294				
			58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium 145	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97					
			90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 262					

Tennessee Comprehensive Assessment Program TCAP

Science Grade 7 | Practice Test



Please PRINT all information in the box.

Student Name: _____

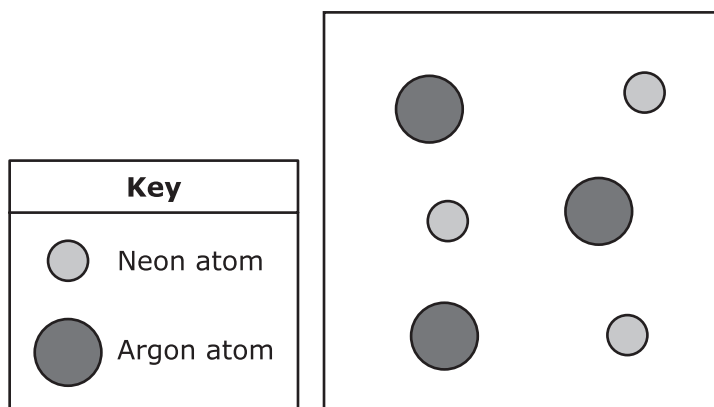
Teacher Name: _____

School: _____

District: _____

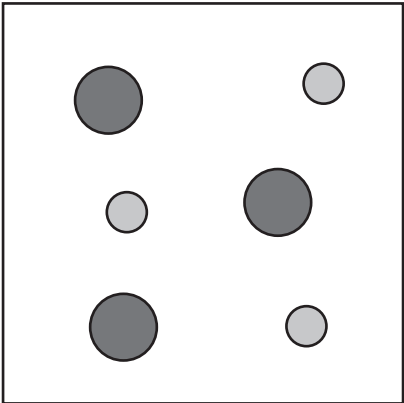
All practice test items represent the appropriate grade level/content standards—however, the practice test may contain item types that no longer appear on the operational assessment.

1. A mixture of two gases is in a rigid container at 25°C. The particle diagram shows a mixture of neon gas and argon gas.

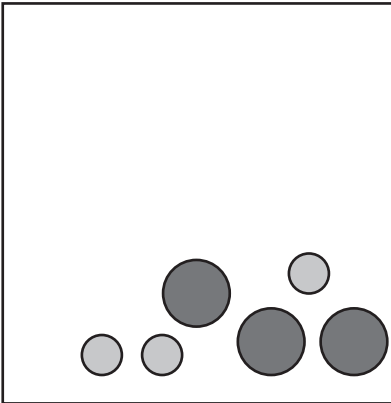


The temperature was decreased below the boiling point of each gas. Which diagram shows what would happen to the gas mixture?

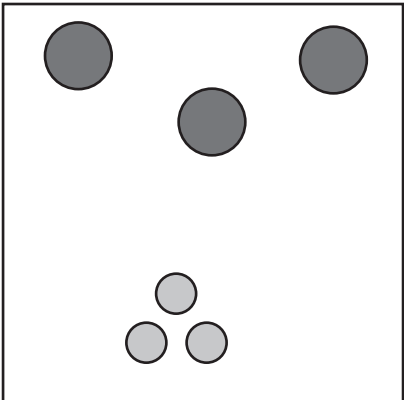
A.



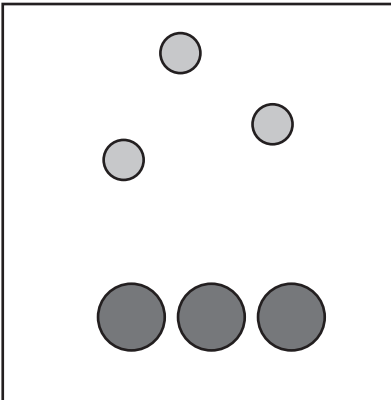
C.



B.



D.



2. Information about dairy products, lactose, and lactase are listed in the table shown.

Dairy Products and Lactose and Lactase in Humans

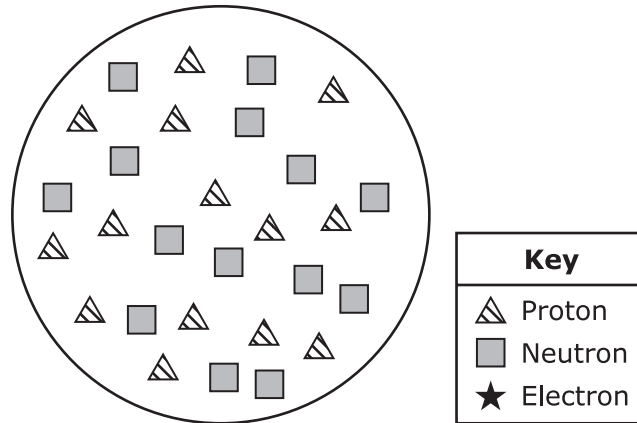
Dairy Products	Lactose and Lactase in Humans
Source of protein and minerals	An enzyme, lactase, breaks lactose down in the body.
	Some people do not produce enough lactase.
Contain lactose	Too little lactase causes abdominal pain when dairy is eaten.
	A gene controls lactase production.

Based on this information, which hypothesis best predicts how a change to the gene could affect people who do not produce enough lactase?

- M.** A change that causes the gene to increase the amount of lactase it produces will increase a person's ability to break down lactose.
- P.** A change that causes the gene to decrease the amount of lactase it produces will positively affect a person's body.
- R.** A change that causes the gene to increase the amount of lactase it produces will allow a person to consume large amounts of minerals.
- S.** A change that causes the gene to decrease the amount of lactase it produces will allow a person to digest more protein.

3. Students were studying the first 20 elements on the periodic table. One student found a diagram of a silicon nucleus. In the diagram the large circle represents the nucleus. The rest of the particles are represented as shown in the key.

Nucleus of a Silicon Atom



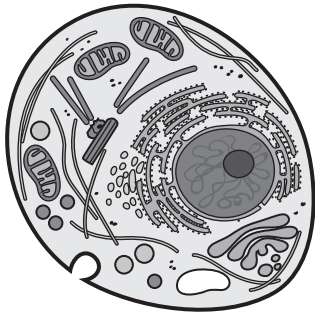
Based on the diagram and the periodic table, which three statements correctly describe a silicon atom?

- A. Electrons are not present in the nucleus of a silicon atom.
- B. There are 14 protons in the nucleus of a silicon atom.
- C. Silicon atoms have no electrons.
- D. A silicon atom should have 16 protons.
- E. There are equal numbers of protons and neutrons in a silicon atom with a mass number of 28.

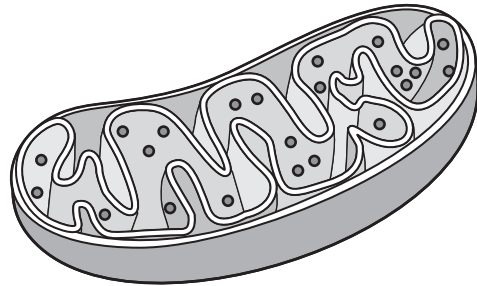
4. Students look at pictures of structures found in living organisms. Each picture represents a different level of complexity.

Four Structures Found in Living Organisms

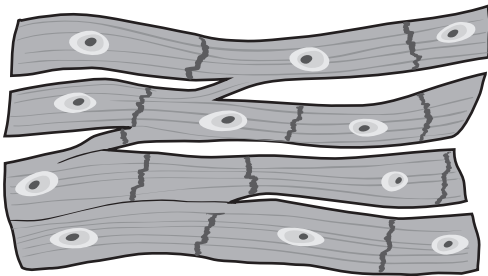
Structure 1



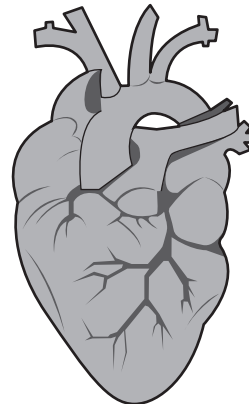
Structure 2



Structure 3



Structure 4

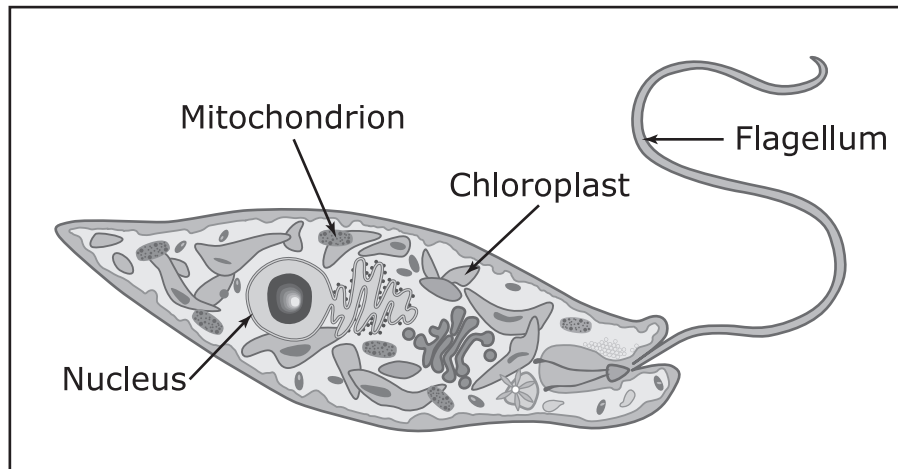


Which sequence places the structures in order from least complex to most complex?

- M. 1 → 2 → 4 → 3
- P. 1 → 3 → 2 → 4
- R. 2 → 1 → 3 → 4
- S. 2 → 1 → 4 → 3

5. **Protists are organisms that are classified in their own kingdom. Protists are not plants or animals, yet some protists have characteristics similar to those of either plants or animals or both. A protist like the protozoan shown in the picture has similarities to both plants and animals. This protozoan is similar to animals because it has the ability to move from place to place while obtaining nutrients. This protozoan also shares a similarity with plants.**

Protozoan



Which feature labeled on the protozoan is associated with organisms in the plant kingdom but not in other kingdoms except protists?

- A.** Mitochondrion
- B.** Chloroplast
- C.** Flagellum
- D.** Nucleus

6. A student investigates the process of passive transport by the cell membrane by creating a model. The student puts a starch solution in a dialysis tubing bag. The bag is then placed in a beaker that contains an iodine solution. The dialysis tubing bag is semipermeable. The student's observations are in the table.

Observations

Part of System	Observations Before Bag Was Added to Beaker	Observations After Bag Was Added to Beaker
Water and iodine solution in beaker	Light yellow	Light yellow
Starch solution in dialysis tubing bag	Cloudy, white	Blue-black

The student concludes that the iodine passes through the dialysis tubing material but the starch molecules cannot.

Which two statements provide evidence to support the student's conclusion?

- M.** The starch solution turned blue-black after the bag was placed in the beaker.
- P.** The iodine solution did not change color after the bag was placed in the beaker.
- R.** The iodine molecules passed through the bag because they are not the same size as the starch molecules.
- S.** The starch solution did not react with the iodine solution after the bag was placed in the beaker.
- T.** The change in color of the iodine solution was due to a student error in procedure.

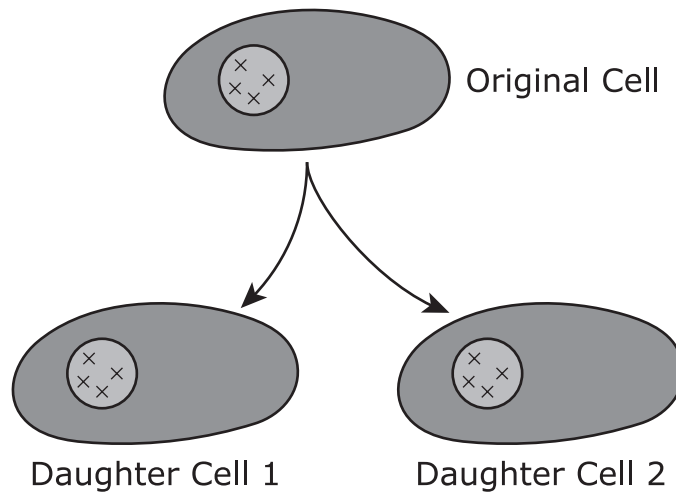
- 7. A student was reading about the gases in air. Ozone helps protect Earth from harmful ultraviolet rays that come from the sun. Certain types of pollution created by humans have caused a hole in the ozone layer. This hole is over the South Pole and could become larger if this type of pollution increases.**

Which question should the student ask to determine if ozone is an elemental molecule?

- A.** What is the color of the molecule?
- B.** What is the shape of the molecule?
- C.** What elements are present in the molecule?
- D.** How many atoms are present in the molecule?

8. The diagram represents a cellular process used by cells.

Cellular Process



In which situation would this process be beneficial to the cells?

- M.** growth and repair, because it produces identical types of cells
- P.** growth and repair, because it makes the cells of the organism larger
- R.** reproduction, because it creates more energy for the organism
- S.** reproduction, because it increases the number of chromosomes in the cells

9. The table shows the estimated percent concentrations of atmospheric gases. Trace gases are composed of small amounts of gases such as carbon dioxide, water vapor, and methane.

Types of Gas	Concentration of the Atmosphere
Nitrogen	78.08%
Oxygen	20.94%
Argon	0.93%
Trace Gases	0.05%

Which of these will most likely increase the amount of a trace gas in the atmosphere?

- A. A pine cone releases the protected seeds inside after it is exposed to intense heat.
- B. A hydroelectric dam increases the amount of water processed into energy after a flood.
- C. A company refining uranium ore is powered by natural gas.
- D. A bacterium releases oxygen gas during photosynthesis.

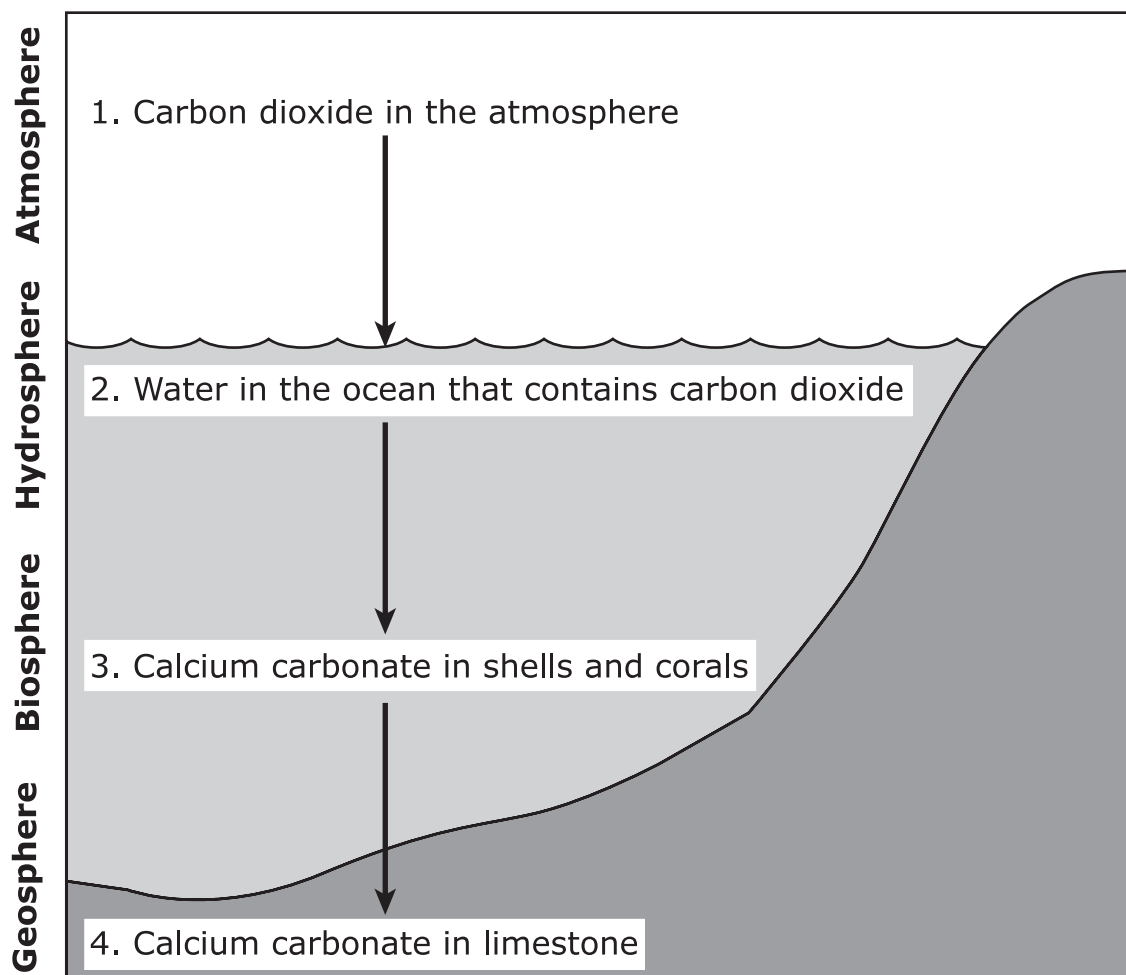
Questions 10 – 13 refer to the passage(s) and image(s) shown.

Carbon Cycle – Part 1

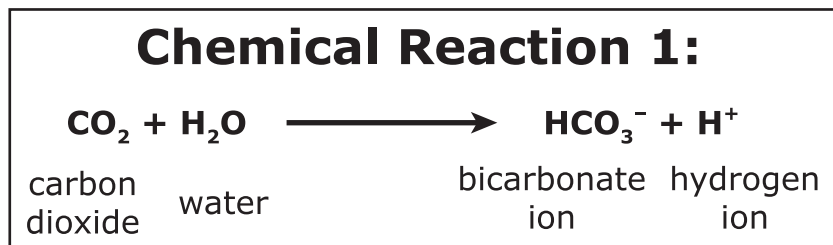
A Tennessee student studying the carbon cycle learned that carbon moves through all four spheres of Earth: the atmosphere, the hydrosphere, the biosphere, and the geosphere. The student wanted to understand how carbon cycles through both the abiotic and biotic parts of the planet.

The student knew that limestone, the official state rock of Tennessee, contains carbon because it is made of calcium carbonate (CaCO_3).

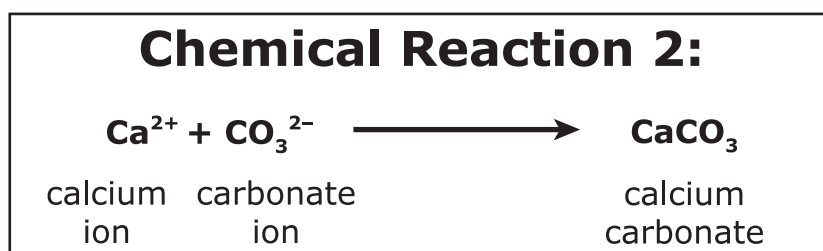
Limestone Formation



The student learned that the water (H_2O) in the ocean absorbs carbon dioxide (CO_2) from the atmosphere. This produces carbonic acid (H_2CO_3), which easily splits apart into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-), which are both charged particles. The chemical reaction for this process is shown.

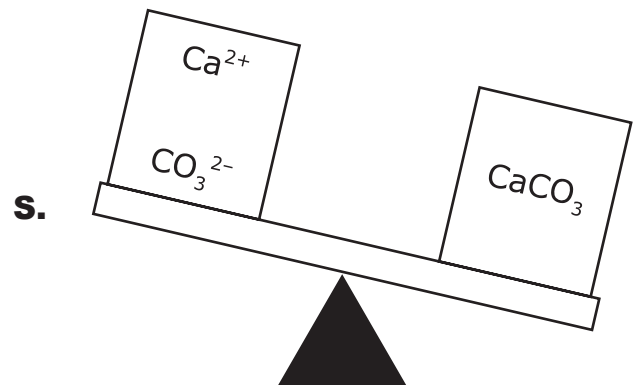
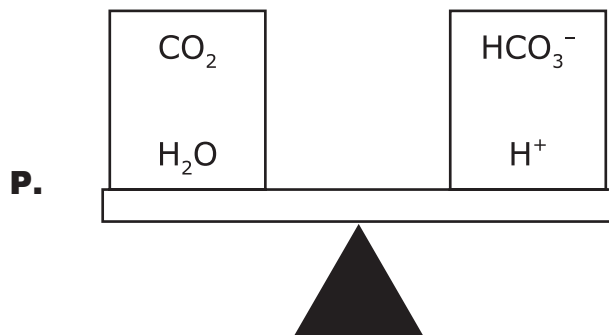
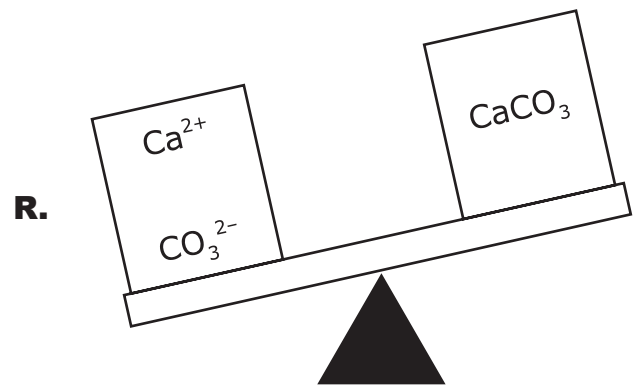
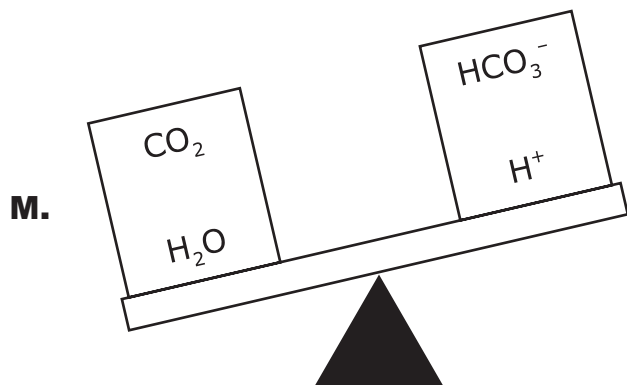


The bicarbonate ions (HCO_3^-) split into more hydrogen ions (H^+) and carbonate ions (CO_3^{2-}). Corals and mollusks pull in seawater that contains the carbonate ions and calcium ions (Ca^{2+}) and pump out any hydrogen ions. The organisms use the carbonate and calcium ions to make calcium carbonate (CaCO_3) for their skeletons and shells. The chemical reaction for this process is shown.



When the corals and mollusks die, layers of their skeletons and shells form on the ocean floor. As the layers are buried by sediments, they compact and cement to form limestone, which is a sedimentary rock made of calcium carbonate (CaCO_3).

10. Which diagram correctly represents the mass of one of the chemical reactions?



11. Which step in the formation of limestone includes biotic parts of the system?

- A. 1. Carbon dioxide in the atmosphere
- B. 2. Water in the ocean that contains carbon dioxide
- C. 3. Calcium carbonate in shells and corals
- D. 4. Calcium carbonate in limestone

12. Which statement correctly describes how matter is conserved in Chemical Reaction 1?

- M.** There are three oxygen atoms in the reactants for every three oxygen atoms in the products.
- P.** There is one hydrogen atom in the reactants for every two hydrogen atoms in the products.
- R.** There is one carbon atom and one hydrogen atom in the reactants for every three carbon atoms and three hydrogen atoms in the products.
- S.** There are two carbon atoms and two oxygen atoms in the reactants for every three carbon atoms and three oxygen atoms in the products.

13. Which statement correctly describes how matter is conserved in Chemical Reaction 2?

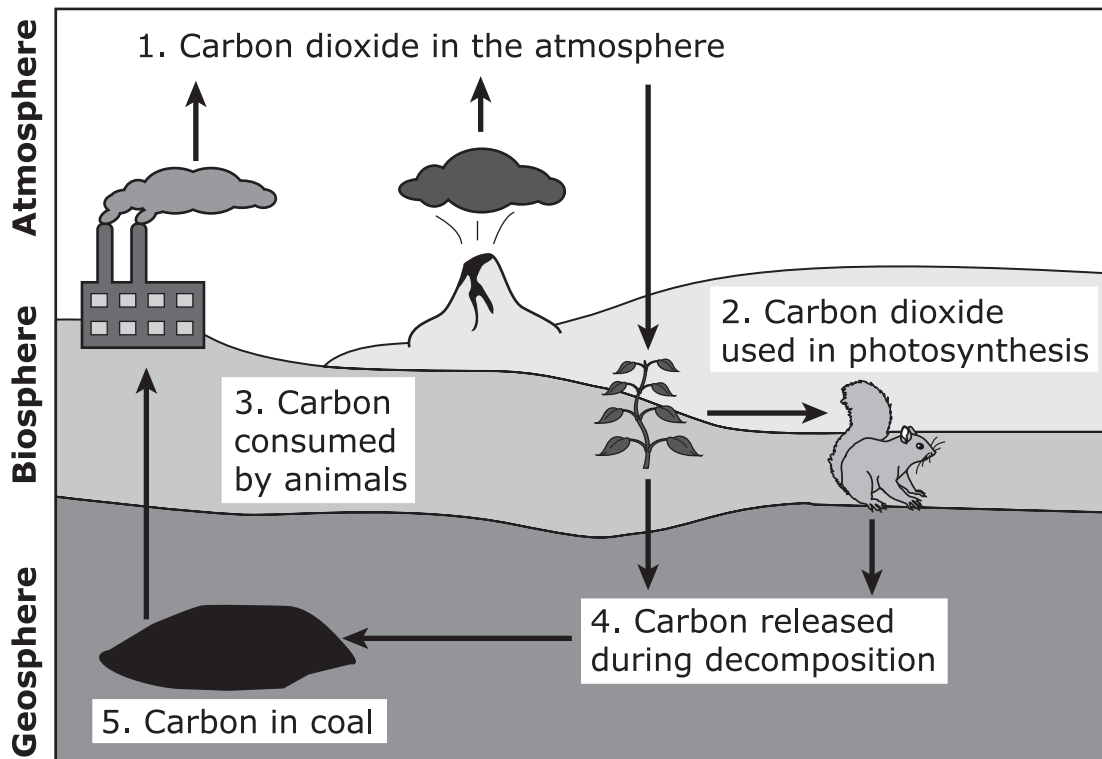
- A.** There are six oxygen atoms in the reactants for every three oxygen atoms in the product.
- B.** There are two calcium ions in the reactants for every one calcium ion in the product.
- C.** There are more atoms in the reactants than there are in the product.
- D.** There is one carbonate ion in the reactants for every one in the product.

Questions 14 – 16 refer to the passage(s) and image(s) shown.

Carbon Cycle – Part 2

After learning about limestone formation in a marine environment, the student was still curious about the cycling of carbon through the biotic and abiotic parts of the planet in a terrestrial environment. The student found a diagram on the website that shows another way that carbon in the atmosphere is absorbed into another part of the planet. This diagram shows the carbon moving directly into the biosphere.

Part of the Carbon Cycle on Land



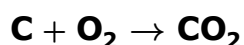
The student learned that plants absorb carbon dioxide from the atmosphere and use it for photosynthesis. During photosynthesis, plants make sugars that are used by the plant for growth and that are stored for energy. Animals eat the plants for food and absorb the carbon in the sugar. The chemical reaction for photosynthesis is shown.

Chemical Reaction 3:



When the plants and animals die, their bodies decay, releasing carbon into the soil. Under the right conditions, decaying plants can turn into coal, which is almost pure carbon. Eastern Tennessee has several coal mines that produce tons of coal each year. This coal is burned for energy, which releases carbon dioxide back into the atmosphere.

- 14. Coal is mostly carbon. When coal is burned, it reacts with oxygen. The carbon dioxide produced is released into the atmosphere. The chemical reaction for coal burning is shown.**



Based on the model shown, which statement correctly describes what may happen to the carbon dioxide in the atmosphere?

- M.** Carbon dioxide becomes solid and falls to the ground.
- P.** Carbon dioxide burns in the atmosphere.
- R.** Carbon dioxide is used by plants in photosynthesis.
- S.** Carbon dioxide is breathed in by animals and humans.

- 15. The student learns that carbon dioxide is stored in Earth's mantle. Which part of the carbon cycle diagram shows the carbon dioxide from the mantle being cycled to another sphere of Earth?**
- A.** the arrow pointing from the volcano, which is part of the geosphere, to the atmosphere
 - B.** the arrow pointing from the plant, which is part of the biosphere, to the soil, which is part of the geosphere
 - C.** the arrow pointing from the plant, which is part of the biosphere, to the animal, which is also part of the biosphere
 - D.** the arrow pointing from the coal, which is part of the geosphere, to the factory, which releases emissions into the atmosphere
- 16. Which statement correctly describes how matter is conserved in Chemical Reaction 3?**
- M.** Water is a reactant and a product.
 - P.** There are six carbon atoms in the reactants for every one carbon atom in the products.
 - R.** The total combined number of atoms in both the reactants and the products is the same.
 - S.** There are more hydrogen atoms in the products than there are in the reactants.

17. A student conducted an investigation by following the steps shown.

- Place three raw eggs in a beaker filled with vinegar.
- Wait for the vinegar to dissolve the hard outer eggshells. The inside of each egg will be surrounded by a thin membrane.
- Measure and record the initial mass of each egg without its shell.
- Fill one beaker with distilled water, one with a sugar-water solution, and one with a saltwater solution. Place one of the eggs in each beaker and soak for 24 hours.
- Measure and record the final mass of each egg that has been soaking in its liquid.
- Compare the initial and final mass measurements for each egg.

The table shows some data from the student's investigation.

Investigation Data

Initial Mass of Egg Without Its Shell (g)	Liquid in Which Egg Was Soaked	Final Mass of Egg Soaking in Liquid (g)
80.3	Distilled water	82.5
80.0	Sugar-water solution	77.5
80.6	Saltwater solution	75.3

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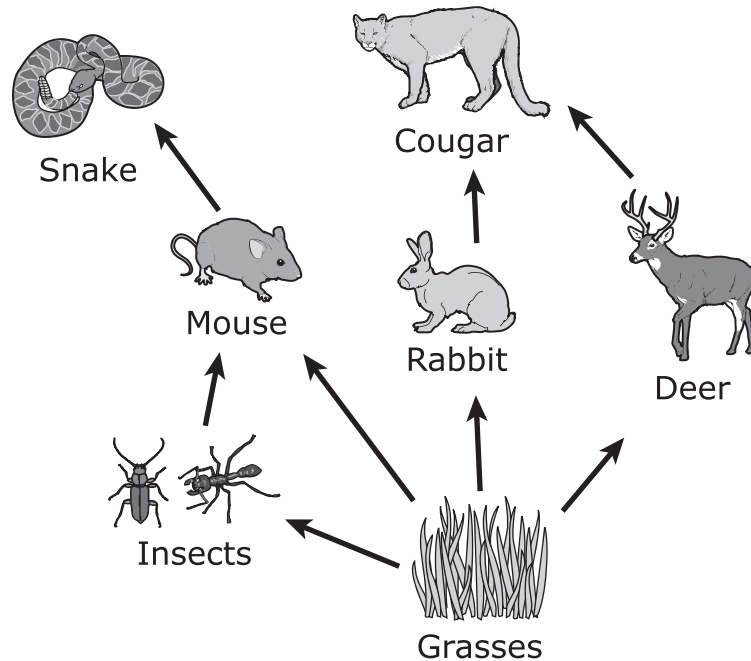
(Item 17, continued from the previous page)

Which of these statements best explains why the eggs that were soaked in sugar-water and saltwater solutions both decreased in mass?

- A.** Because these eggs were placed in solutions that had higher concentrations of dissolved materials than were inside the eggs, water diffused from inside the egg into the liquid.
- B.** Because these eggs were placed in solutions that had lower concentrations of dissolved materials than were inside the eggs, water diffused from inside the egg into the liquid.
- C.** Because these eggs were placed in solutions that had higher concentrations of dissolved materials than were inside the eggs, water diffused from the liquid into the egg.
- D.** Because these eggs were placed in solutions that had lower concentrations of dissolved materials than were inside the eggs, water diffused from the liquid into the egg.

18. A partial food web shows the movement of matter and energy in a land ecosystem.

Partial Food Web



Deer need producers and oxygen to provide energy and matter for their cells. What is the primary source of oxygen for the deer in this ecosystem?

- M.** The oxygen is a product of photosynthesis by the insects.
- P.** The oxygen is a product of photosynthesis by the grasses.
- R.** The oxygen is a product of cellular respiration by the cougar.
- S.** The oxygen is a product of cellular respiration by the grasses.

- 19. White-tailed deer are mammals. Mammals have a reproductive strategy that is not found in all animals.**

Which two statements provide a cause and effect of the reproductive strategy of white-tailed deer that helps them survive?

- A.** It requires two parents.
- B.** It requires only one parent.
- C.** It causes very fast growth and development.
- D.** It produces genetic variation within a population.
- E.** It results in individuals being identical to one parent.

20. A student has been learning about atoms. He wrote a small paragraph describing one.

How an Atom Looks

An atom looks similar to a racetrack. There are small particles that move like cars on a racetrack. These particles move in a circle around the center of the track and do not easily move away from the center.

The student describes particles on the edge of the atom. Which statement supports the student's claim that the particles on the edge of the atom do not move away from the center?

- M.** The particles are connected to the center by an object similar to a rope.
- P.** The particles are attracted to the center because they have a charge opposite to the center's charge.
- R.** The particles are held in place because atoms are a solid structure.
- S.** The particles are pushed toward the center by the nuclear charges of other atoms.

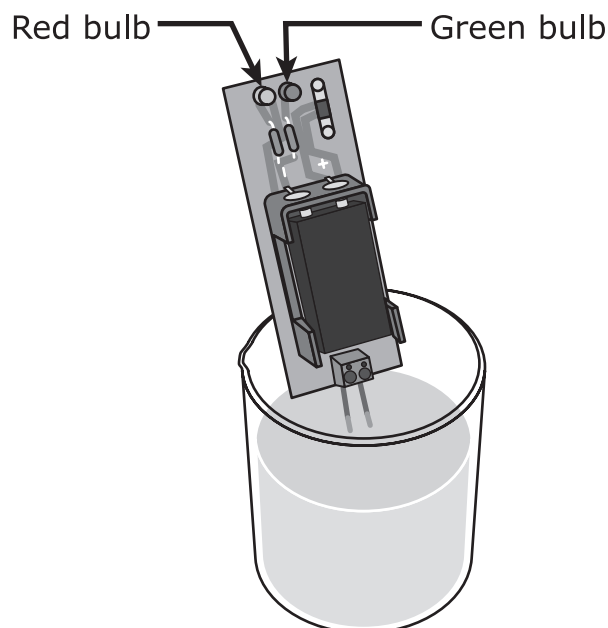
- 21. A person riding a bicycle wants to move the bicycle forward. She moves her legs up and down on the bicycle's pedals. Then the rider wants to stop the bicycle. She stops pedaling and the bicycle slows. She takes one of her feet off a pedal and puts her foot on the ground to stop the bicycle and stay upright.**

Which of these best identifies a pathway of systems in the rider's body, as described in this scenario?

- A.** nervous system → musculoskeletal system → circulatory system → nervous system
- B.** nervous system → musculoskeletal system → nervous system → musculoskeletal system
- C.** musculoskeletal system → nervous system → circulatory system → musculoskeletal system
- D.** musculoskeletal system → circulatory system → musculoskeletal system → nervous system

22. Several students were studying five compounds. They wanted to see if the compounds would conduct electricity when dissolved in water. A small sample of each compound was placed in a beaker, and 100 mL of pure water was added. Each sample dissolved in the water. A conductivity tester was placed in each beaker. A glowing green bulb meant the sample was a conductor. A glowing red bulb meant the sample was not a conductor.

A Conductivity Tester



The students recorded the results in a data table.

Conductivity Test of Five Compounds

Compound	Observation
NaI	Green bulb glowed.
$C_6H_{12}O_6$	Red bulb glowed.
$Zn(NO_3)_2$	Green bulb glowed.
Li_2SO_4	Green bulb glowed.
CH_3OH	Red bulb glowed.

(This item continues on the next page.)

(**Item 22**, continued from the previous page)

Using the data table and a periodic table, which three of these compounds are most likely to be conductors of electricity?

M. NaCl

P. K_2SO_4

R. $\text{C}_{12}\text{H}_{24}\text{O}_{12}$

S. $\text{C}_2\text{H}_5\text{OH}$

T. $\text{Sr}(\text{NO}_3)_2$

23. The photograph shows a two-toed sloth. These slow-moving organisms cannot outrun or outclimb predators, so they spend most of their time hanging from branches in trees. The sloths eat the leaves and flowers from these trees. Two-toed sloths often have a greenish tint on their fur because algae grow on their bodies.

Two-Toed Sloth



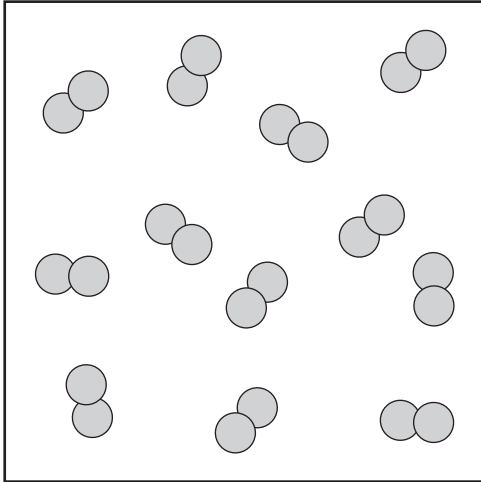
Which of these is the most likely reason the algae are able to help two-toed sloths survive?

- A. by allowing the sloths to blend in with the trees to hide from predators
- B. by providing sloths with easy access to another food source
- C. by making sloths more attractive to other sloths to encourage mating
- D. by helping to keep the body temperatures of sloths cooler during hot weather

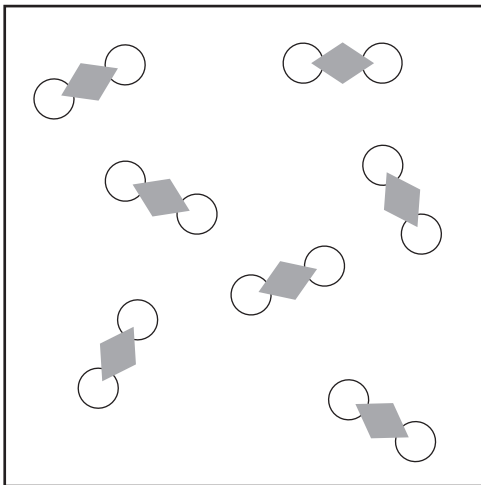
24. Students have been studying air quality. The teacher provides them with particle diagrams of the components of five air samples.

Which three diagrams contain compound molecules?

M.



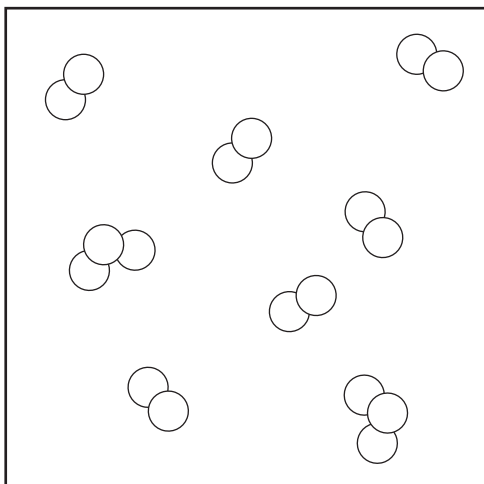
P.



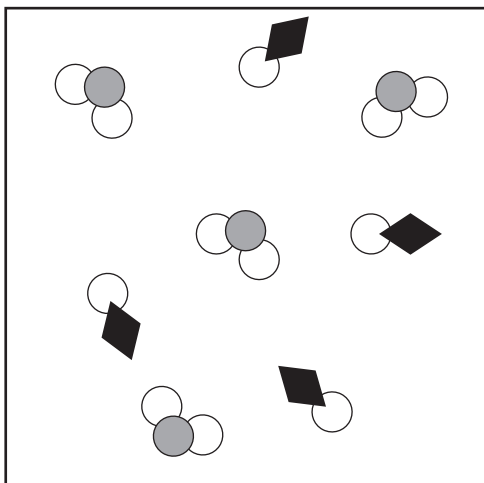
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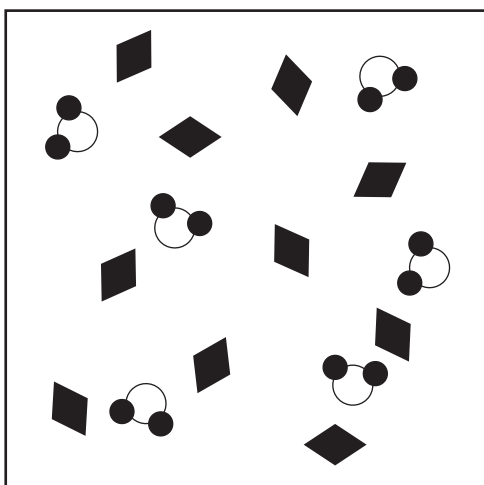
R.



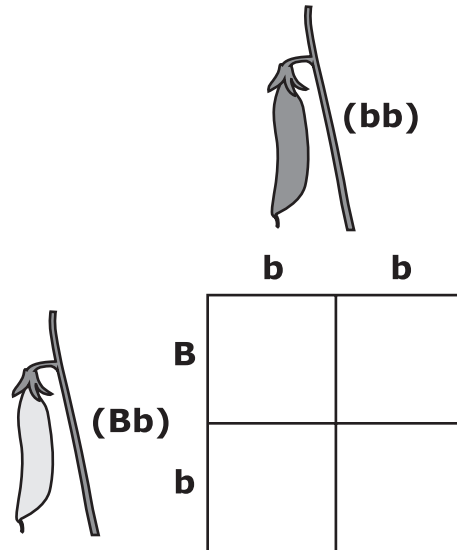
S.



T.



25. In a type of bean plant, the trait for yellow pods (B) is dominant to the trait for green pods (b). A plant that is heterozygous for yellow pods is crossed with a plant that has green pods. An incomplete Punnett square of the cross is shown.



Which statement correctly describes the probability that offspring of this cross will display certain traits?

- A. 75% yellow pods and 25% green pods
- B. 50% yellow pods and 50% green pods
- C. 100% yellow pods
- D. 100% green pods

- 26. A student uses a microscope to observe a single-celled organism that can move. The organism contains a nucleus and many chloroplasts. Based on the observations, the student claims the organism is not a bacterium. Which observation best supports the student's claim?**
- M.** The organism is unicellular.
 - P.** The organism is able to move.
 - R.** The organism has a nucleus.
 - S.** The organism performs photosynthesis.

Questions 27 – 29 refer to the passage(s) and image(s) shown.

Tennessee Air Quality — Part 1

Air pollution in Tennessee cities is an increasing problem. Table 1 shows the different Air Quality Index (AQI) categories.

Table 1: Air Quality Index Categories

Color Category	AQI Value	Level of Health Concern
Green	0 – 50	Good
Yellow	51 – 100	Moderate
Orange	101 – 150	Unhealthy for sensitive groups
Red	151 – 200	Unhealthy
Purple	201 – 300	Very unhealthy
Maroon	301 – 500	Hazardous

The orange category is unhealthy for sensitive groups such as children, older adults, and those with heart or lung disease. Table 2 lists four cities in Tennessee that had six or more orange days in 2017.

Table 2: Tennessee Cities With Six or More Orange Days in 2017

City	County	Population	Number of Orange Days
Chattanooga	Hamilton	179,139	6
Knoxville	Knox	187,347	9
Memphis	Shelby	652,236	11
Nashville	Davidson	667,560	8

A known cause of air pollution is emissions from cars. The average household in the state has two cars. In Tennessee 855 electric cars were registered in 2016 and 791 in 2017. Electric cars produce fewer emissions. They also release zero tailpipe emissions. Because electric cars are charged by power grids that burn fossil fuels, they are not necessarily zero-carbon. This means that the extent of the carbon footprint of an electric car depends on where the power to charge the vehicle comes from. Driving an electric car is the equivalent of driving a gasoline-powered car that gets 80 miles per gallon.

27. Students make lists of characteristics that describe an isotope of carbon (C). Which list is correct?

A.

- It is a pure substance.
- All the atoms have the same number of protons.
- All the atoms have the same properties.

B.

- It is a pure substance.
- All the atoms have different numbers of protons.
- All the atoms have different properties.

C.

- It is a mixture.
- All the atoms have the same number of protons.
- All the atoms have the same properties.

D.

- It is a mixture.
- All the atoms have different numbers of protons.
- All the atoms have different properties.

28. Which statement best classifies air?

- M.** Air is a pure substance because it is composed of pure substances.
- P.** Air is a pure substance because its properties rarely change.
- R.** Air is a mixture because it has the same properties at all times.
- S.** Air is a mixture because its composition varies.

29. Which statement does not describe a problem that causes some smaller cities to have poorer air quality than some larger cities?

- A.** Smaller cities have less funding to spend fighting pollution.
- B.** Smaller cities have fewer charging stations for electric cars.
- C.** Smaller cities have shorter commutes to work.
- D.** Smaller cities have less access to public transportation.

Questions 30 – 33 refer to the passage(s) and image(s) shown.

Tennessee Air Quality — Part 2

Photochemical smog is a type of air pollution produced by the emissions of gasoline-powered cars and trucks and can hover over cities as a brown haze. Smog is a mixture of ozone (O_3), nitrogen dioxide (NO_2), nitric oxide (NO), and sulfur dioxide (SO_2). NO_2 gas forms in the cylinders of engines when the oxygen gas (O) and nitrogen gas (N) are compressed at hot temperatures.

The molecules that are monitored for the Air Quality Index are O_3 , NO_2 , and SO_2 . Table 3 contains physical property data about these three compounds.

Table 3: Physical Properties of Ozone, Nitrogen Dioxide, and Sulfur Dioxide

Compound	Appearance at Room Temperature (22°C)	Boiling Point (°C)
O_3	Colorless	-112
NO_2	Reddish-brown	21.0
SO_2	Colorless	-10.0

Table 4 shows the physical properties of three elements.

Table 4: Physical Properties of Nitrogen, Sulfur, and Oxygen

Material	Appearance at Room Temperature (22°C)	Boiling Point (°C)
N	Colorless	-195.8
S	Yellow	444.6
O	Colorless	-183.0

30. Which question about photochemical smog could not be experimentally determined by scientists?

- M.** In what year will the amount of sulfur in the air start to decrease?
- P.** How many different types of hydrocarbons are found in gasoline?
- R.** What concentration of gas molecules causes a visible brown haze in the air?
- S.** What temperature is the car engine when it begins to produce nitric oxide in the cylinder?

31. One of the components contained in gasoline is octane (C_8H_{18}). Which statement best describes C_8H_{18} ?

- A.** It is a mixture containing a combination of the properties of hydrogen and carbon.
- B.** It is a pure substance containing a combination of the properties of hydrogen and carbon.
- C.** It is a mixture containing properties different from those of hydrogen and carbon.
- D.** It is a pure substance containing properties different from those of hydrogen and carbon.

- 32. Students compare the properties of the substances in Table 3 with the properties of the elements in Table 4.**

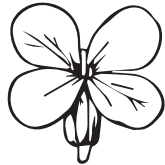
Which conclusion is best supported by the information?

- M.** Pure substances in the air reacted to form mixtures of themselves.
 - P.** Nitrogen dioxide is a pure substance while both ozone and sulfur dioxide are mixtures.
 - R.** Nitrogen dioxide is a mixture while both ozone and sulfur dioxide are pure substances.
 - S.** Pure substances in the air reacted to produce other pure substances.
- 33. Students learn that impurities in hydrocarbons release sulfur into the air, which contributes to smog. Which recommendation will least likely reduce the amount of sulfur released into the air?**
- A.** driving a smaller car that gets better gas mileage
 - B.** filling the vehicle up with gas at the same gas station each time
 - C.** treating the fuel to remove the impurities
 - D.** riding with neighbors to go to school and work

- 34. Almonds are edible seeds that grow on trees. Wild almonds typically have a bitter taste caused by a chemical in the almond. If an organism eats wild almonds, a chemical reaction occurs that releases the bitter taste. However, a genetic mutation in the almond tree can occur that prevents wild almonds from producing the bitter taste. Which statement describes how this type of mutation could affect these wild almond trees?**
- M.** This mutation could increase the population of wild almond trees.
 - P.** This mutation could increase the life span of wild almond trees.
 - R.** This mutation could decrease the size of wild almond trees.
 - S.** This mutation could decrease the rate of reproduction for wild almond trees.

35. Students collected the seeds from a red flower and planted them. After a few months, the plants bloomed. Students saw that not all of the flowers were the same color. They collected and recorded data about the flowers. They also sketched one of the flowers. The students plan to harvest seeds from these flowers and plant them to see what color flowers will be produced.

Flower Data

Number of Plants	Petal Color	Drawing of Flower
6	Red	
2	White	

Based on the data collected, which statement is the best prediction of what the colors of the flowers will be on the new plants?

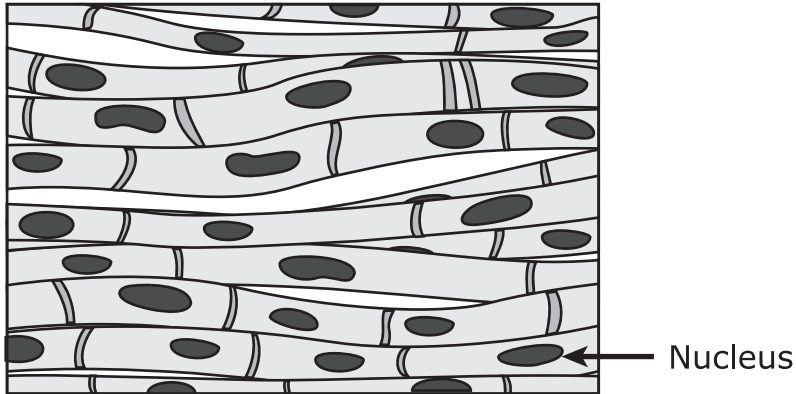
- A.** There will be more red flowers than white flowers, because the red color is dominant over white.
- B.** There will be more white flowers than red flowers, because the white color is dominant over red.
- C.** There will be fewer red flowers than white flowers, because the red flower color is a recessive trait.
- D.** There will be fewer white flowers than red flowers, because the white flower color is a dominant trait.

36. There are advantages to both sexual and asexual reproduction. Which of these describes the most likely advantage of sexual reproduction?

- M.** Sexual reproduction results in more variation among offspring, which may help them adapt better to changing environments.
- P.** Sexual reproduction ensures that all of the parents' genes are passed on to the next generation.
- R.** Sexual reproduction is able to produce large numbers of offspring in a short amount of time.
- S.** Sexual reproduction increases the chance that an offspring will receive a harmless mutation from its parents.

37. A scientist used a microscope to observe a prepared sample on a slide. The scientist's observations are shown.

Smooth Muscle



The drawing illustrates which two levels of biological organization?

- A. cell
- B. tissue
- C. organ
- D. organism
- E. organ system

- 38. When an athlete began running, both her breathing and heart rates increased.**

The athlete's breathing and heart rates increased as she was running because the athlete needed to

- M.** exhale more oxygen from her lungs.
- P.** decrease the temperature of her skin.
- R.** increase the amount of carbon dioxide in her blood.
- S.** transport more oxygenated blood to her muscles.

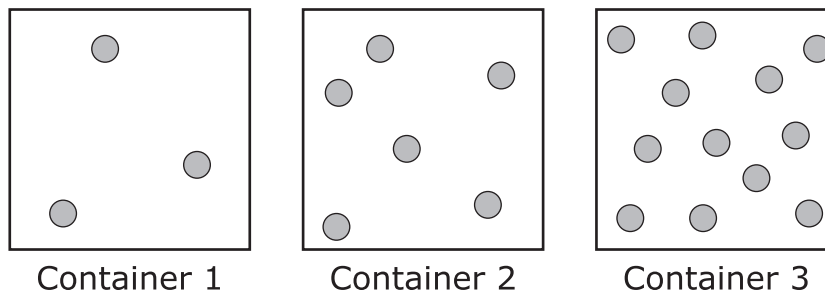
39. Damaged cells can release chemicals known as growth factors. Some of these growth factors can cause nearby cells to divide.

Which pair identifies the process used by the nearby cells to divide and the result of that process?

- Process:** meiosis
Result: new cells that are genetically different from the parent cell, allowing the new cells to carry out their function better than other new cells
- A.**
- Process:** meiosis
Result: new cells that are genetically the same as the parent cell, allowing the new cells to develop and specialize into different types of cells
- B.**
- Process:** mitosis
Result: new cells that are genetically identical, allowing them to perform the same functions as the parent cell
- C.**
- Process:** mitosis
Result: new cells that are genetically different from the parent cell, allowing the new cells to carry out different functions
- D.**

40. Students are studying the behavior of matter as a gas. Each sample is at the same temperature and in different 1.0-liter rigid containers. The number of particles shown in the diagram is proportional to the number of particles in each sample.

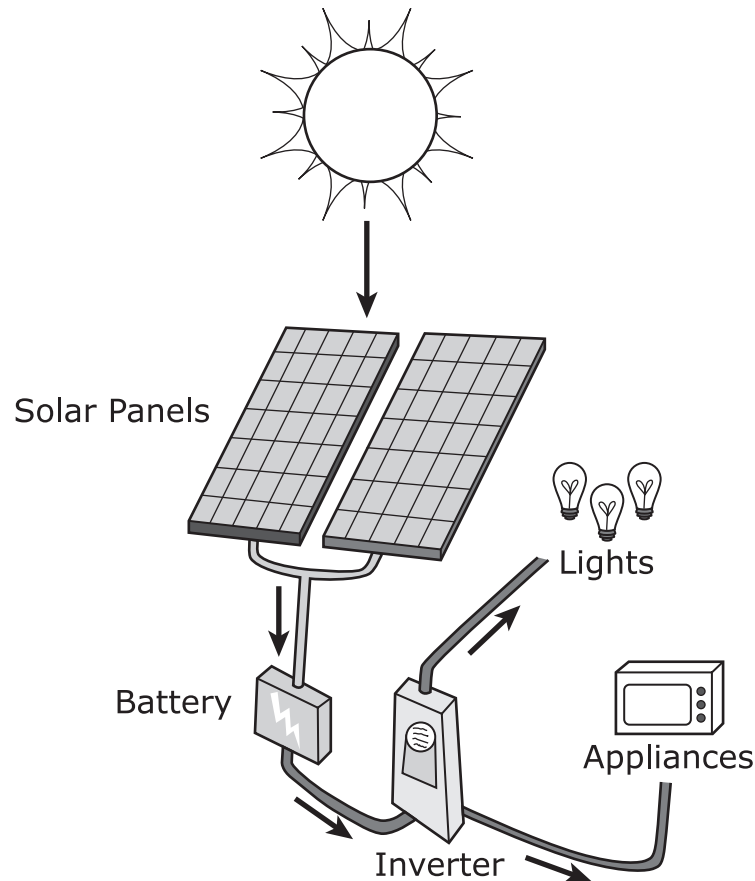
Three Samples of a Gas



Which three statements about the gas in the containers are true?

- M.** The gas particles in Container 1 will be the easiest to compress.
- P.** The gas particles in Container 3 will be the hardest to compress.
- R.** The gas particles in Container 2 will move faster than the gas particles in Container 1.
- S.** The gas particles in Container 3 will move slower than the gas particles in Container 1.
- T.** If the temperature is decreased in each container, the pressure will decrease in each container.

41. The diagram represents solar panels collecting energy from sunlight and then converting that energy to electrical energy. The electrical energy can be stored as chemical energy in batteries. Then, this chemical energy can be converted back to electrical energy to power lights and appliances.



Which of these best describes a similarity between photosynthesis and the changes in energy represented by the diagram?

- A. During photosynthesis, a plant's leaves change solar energy into chemical energy, and then the chemical energy is used for the plant's life functions.
- B. During photosynthesis, a plant's roots absorb and store water until the plant needs the energy stored in the water for the plant's life functions.
- C. During photosynthesis, a plant's leaves change chemical energy into solar energy, and then the solar energy is used for the plant's life functions.
- D. During photosynthesis, a plant's roots absorb water and then transform the water into chemical energy that is used for the plant's life functions.

42. Which of these describes a behavioral adaptation that will increase the probability that a species will survive?

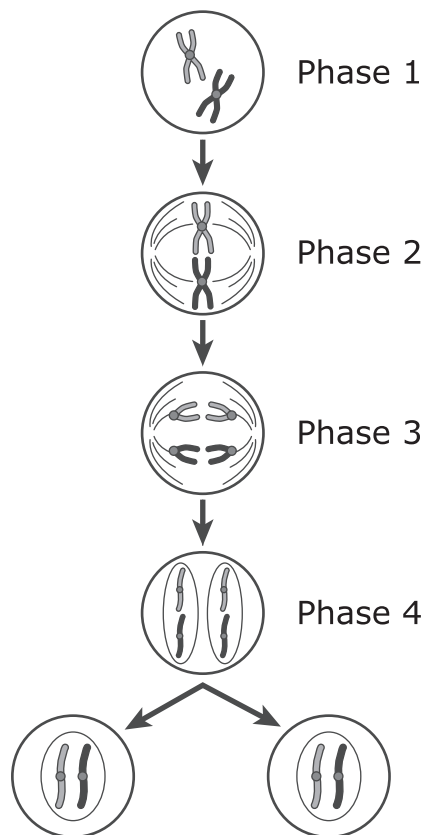
- M.** A bird has brown feathers that help it blend with the ground where its nest is located.
- P.** A giraffe has long legs that help it reach leaves growing at the tops of acacia trees.
- R.** A moth has large dark spots on its wings that resemble eyes and scare away predators.
- S.** A mother bear stays with her cubs for a year and a half until they learn skills to live on their own.

Questions 43 – 45 refer to the passage(s) and image(s) shown.

Cellular Division – Part 1

All human life begins from a single cell. This cell then divides into many more cells. Cells in the human body divide through two main processes called mitosis and meiosis. The process of mitosis allows the human body to heal itself. New cells originate mostly from newer cell layers of a particular tissue. However, after an injury, older cells are pushed to an area to gradually fill in the damaged space. This complex process automatically stops once an injury is healed. The healing process is not just for injuries; the process also repairs normal wear and tear of the body. Skin, mouth, intestine, and blood cells that are damaged or dead are replaced daily.

Figure 1: Mitotic Cell Division



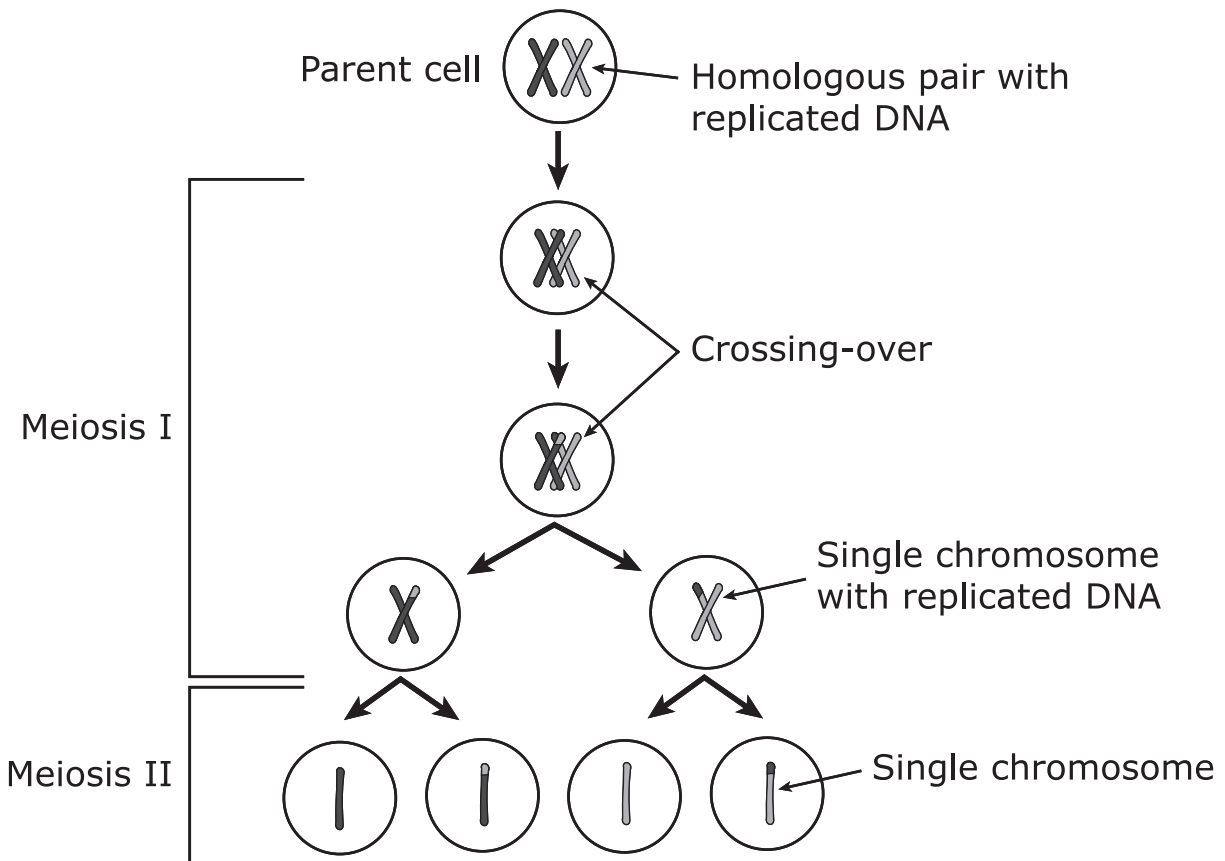
- 43. Which organelle begins to form in Phase 4 of the process in Figure 1?**
- A.** mitochondrion
 - B.** nucleus
 - C.** ribosome
 - D.** lysosome
- 44. If a student were to discuss Figure 1 with a classmate, which description would be correct?**
- M.** The student says Phase 2 of Figure 1 shows prophase, with the chromosomes moving toward the far ends of the cell.
 - P.** The student says Phase 3 of Figure 1 shows telophase, where the chromosomes have duplicated.
 - R.** The student says Phase 4 of Figure 1 shows anaphase, where the chromosomes have lined up in the middle of the cell.
 - S.** The student says the bottom part of Figure 1 shows the daughter cells, with each having the same chromosomes as the parent cell.
- 45. Mitosis occurs in the organelle that controls cell activities. Which organelle should be added to the model in Figure 1 to show where this process is occurring?**
- A.** vacuole
 - B.** chloroplast
 - C.** mitochondrion
 - D.** nucleus

Questions 46 – 49 refer to the passage(s) and image(s) shown.

Cellular Division – Part 2

Meiosis is a special type of cell division that reduces the number of chromosomes by half. Four haploid cells known as sex cells are created during this process. Meiosis occurs in all sexually reproducing organisms including animals, plants, and fungi. Sex cells are produced for the purpose of creating new offspring. Not all organisms reproduce sexually, but those that do experience increased genetic diversity in their populations.

Figure 2: Meiotic Cell Division



- 46. The parent cell in Figure 2 already contains double the amount of original genetic material. Which event must have occurred before the parent cell in Figure 2?**
- M.** mitosis
 - P.** DNA replication
 - R.** cellular respiration
 - S.** germination
- 47. During meiosis, an organelle breaks down to allow chromosomes to separate. This part then redevelops during the last phase of the cycle. Which part of the cell should be added to Figure 2 to make the diagram more accurate?**
- A.** vacuole
 - B.** mitochondrion
 - C.** cell membrane
 - D.** nucleus

- 48. In male organisms, the process shown in Figure 2 results in cells that each have a special organelle that helps the cell move. Which organelle has this function?**
- M.** flagella
 - P.** ribosome
 - R.** endoplasmic reticulum
 - S.** Golgi apparatus
- 49. Figure 2 illustrates genetic diversity between all four daughter cells, with no two being the same. Which component in the model helps account for creating this diversity?**
- A.** Crossing-over
 - B.** Parent cell
 - C.** Homologous pair
 - D.** Meiosis II

50. Students were looking at coins during lunch. One of them noticed that older pennies looked and felt different from new pennies. The students decided to investigate whether all pennies are made of the same materials. The students measured the mass and the volume of 10 pennies and then divided the mass by the volume to determine the density. The measurements were recorded in a data table.

Student Data Table

Penny	Mass (grams, g)	Volume (cubic centimeters, cm ³)
1	2.5	0.35
2	2.5	0.35
3	2.6	0.35
4	2.4	0.35
5	2.4	0.35
6	3.1	0.35
7	3.1	0.35
8	3.2	0.35
9	3.0	0.35
10	3.1	0.35

The teacher told the students that newer pennies contain copper and zinc. Copper has a density of 8.96 g/cm^3 . Zinc has a density of 7.1 g/cm^3 .

Which statement is best supported by the data and information from the teacher?

- M.** All pennies are pure copper.
- P.** All pennies have the same amount of copper since their volume is the same.
- R.** Pennies 1 through 5 are mostly copper because the mass of copper is less than the mass of zinc.
- S.** Pennies 6 through 10 are mostly copper because their density is closer to copper's density.

51. Some processes add carbon dioxide to the atmosphere. There are other processes that absorb carbon dioxide from the atmosphere. The global carbon cycle is a complicated interaction between processes that take place on the land and processes that take place in the ocean.

Global Carbon Cycle Data

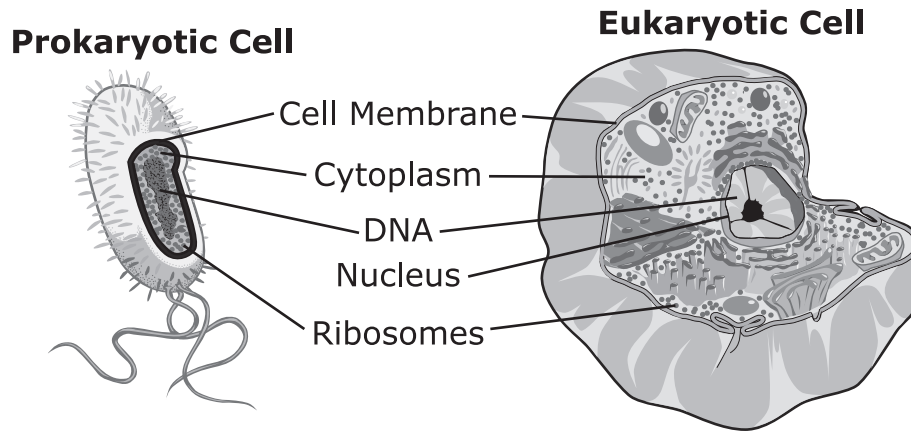
Process	Result in Atmosphere	Change in Amount of Carbon (billions of tons)
Burning of fossil fuels	Adds carbon dioxide	+5.3
Agriculture	Adds carbon dioxide	+2.0
Photosynthesis	Removes carbon dioxide	-120.0
Plant respiration	Adds carbon dioxide	+50.0
Decomposition	Adds carbon dioxide	+60.0
Ocean sink	Removes carbon dioxide	-110.0

Which change in the carbon cycle would have the greatest effect on the amount of carbon dioxide in the atmosphere?

- A. a 10% decrease in the burning of fossil fuels
- B. a 20% decrease in the number of photosynthetic organisms
- C. a 10% increase in the amount of decomposing organic matter
- D. a 20% increase in land used for agriculture

52. Two types of cells are shown. Organelles found in both cells are labeled.

Two Types of Cells



Which two claims about cell function are supported by the evidence in the diagram?

- M.** Both types of cells are unable to produce energy.
- P.** Both types of cells produce proteins.
- R.** Both types of cells can store excess water.
- S.** Both types of cells can maintain a rigid shape.
- T.** Both types of cells can control what enters and exits the cell.

53. Students are learning about the functions of different parts in cells. The students model a cell part with a screen that sorts large objects from small objects. When objects of different sizes are placed on the screen, the screen allows the smaller objects to pass through it but not the larger objects.

Students Using a Sifting Screen



Which of these cell functions is most likely being modeled?

- A. energy production by the mitochondria
- B. passive transport across the cell membrane
- C. photosynthesis inside the chloroplast
- D. mitosis in the nucleus



This is the end of the Grade 7 Science test.

1. ☐ A ☐ B ☒ ☐ D
2. ☒ ☐ P ☐ R ☐ S
3. ☒ ☒ ☐ C ☐ D ☒ (select **three**)
4. ☐ M ☐ P ☒ ☐ S
5. ☐ A ☒ ☐ C ☐ D
6. ☒ ☒ ☐ R ☐ S ☐ T (select **two**)
7. ☐ A ☐ B ☒ ☐ D
8. ☒ ☐ P ☐ R ☐ S
9. ☐ A ☐ B ☒ ☐ D
10. ☐ M ☒ ☐ R ☐ S
11. ☐ A ☐ B ☒ ☐ D
12. ☒ ☐ P ☐ R ☐ S
13. ☐ A ☐ B ☐ C ☒ ☐ D
14. ☐ M ☐ P ☒ ☐ S
15. ☒ ☐ B ☐ C ☐ D
16. ☐ M ☐ P ☒ ☐ S
17. ☒ ☐ B ☐ C ☐ D
18. ☐ M ☒ ☐ R ☐ S
19. ☒ ☐ B ☐ C ☒ ☐ E (select **two**)
20. ☐ M ☒ ☐ R ☐ S
21. ☐ A ☒ ☐ C ☐ D
22. ☒ ☒ ☐ R ☐ S ☒ (select **three**)
23. ☒ ☐ B ☐ C ☐ D
24. ☐ M ☒ ☐ R ☒ ☒ (select **three**)
25. ☐ A ☒ ☐ C ☐ D
26. ☐ M ☐ P ☒ ☐ S

27. ☒ (B) (C) (D)
28. (M) (P) (R) ☒
29. (A) (B) ☒ (D)
30. ☒ (P) (R) (S)
31. (A) (B) (C) ☒
32. (M) (P) (R) ☒
33. (A) ☒ (C) (D)
34. (M) (P) (R) ☒
35. ☒ (B) (C) (D)
36. ☒ (P) (R) (S)
37. ☒ ☒ (C) (D) (E) (select **two**)
38. (M) (P) (R) ☒
39. (A) (B) ☒ (D)
40. ☒ ☒ (R) (S) ☒ (select **three**)
41. ☒ (B) (C) (D)
42. (M) (P) (R) ☒
43. (A) ☒ (C) (D)
44. (M) (P) (R) ☒
45. (A) (B) (C) ☒
46. (M) ☒ (R) (S)
47. (A) (B) (C) ☒
48. ☒ (P) (R) (S)
49. ☒ (B) (C) (D)
50. (M) (P) (R) ☒
51. (A) ☒ (C) (D)
52. (M) ☒ (R) (S) ☒ (select **two**)
53. (A) ☒ (C) (D)

TCAP Practice Test Standards Alignment and Key - Grade 7 Science

Question No.	Key	Standard
1	C	7.PS1.6
2	M	7.LS3.1
3	A, B, E	7.PS1.1
4	R	7.LS1.4
5	B	7.LS1.3
6	M, P	7.LS1.2
7	C	7.PS1.2
8	M	7.LS1.8
9	C	7.ESS3.1
10	P	7.PS1.4
11	C	7.LS2.1
12	M	7.PS1.4
13	D	7.PS1.4
14	R	7.LS2.1
15	A	7.LS2.1
16	R	7.PS1.4
17	A	7.LS1.2
18	P	7.LS1.9
19	A, D	7.LS1.7
20	P	7.PS1.1
21	B	7.LS1.5
22	M, P, T	7.PS1.5
23	A	7.LS1.6
24	P, S, T	7.PS1.2
25	B	7.LS3.3
26	R	7.LS1.3
27	A	7.PS1.3
28	S	7.PS1.3
29	C	7.ESS3.2
30	M	7.ESS3.2
31	D	7.PS1.3

Question No.	Key	Standard
32	S	7.PS1.3
33	B	7.ESS3.2
34	S	7.LS3.1
35	A	7.LS3.3
36	M	7.LS1.7
37	A, B	7.LS1.4
38	S	7.LS1.5
39	C	7.LS1.8
40	M, P, T	7.PS1.6
41	A	7.LS1.9
42	S	7.LS1.6
43	B	7.LS1.1
44	S	7.LS3.2
45	D	7.LS1.1
46	P	7.LS3.2
47	D	7.LS1.1
48	M	7.LS1.1
49	A	7.LS3.2
50	S	7.PS1.5
51	B	7.ESS3.1
52	P, T	7.LS1.3
53	B	7.LS1.2