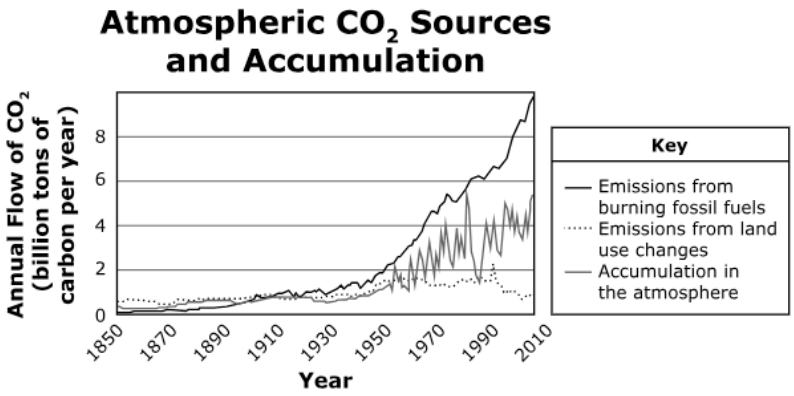
Tennessee Comprehensive Assessment Program (TCAP) Grade 7 Practice Items

The natural carbon cycle has changed because of human activity. The graph shows the annual flow of carbon dioxide from 1850 to 2010.



According to the graph, which human activity had the largest effect on carbon dioxide levels in the atmosphere?

- A. converting farmland to parking lots
- B. building more highways
- C. burning petroleum products
- D. constructing more office buildings

Skin cells are replaced throughout the lifetime of an organism. A student wants to create a model that demonstrates the skin cell replacement process.

Which **two** statements **best** describe what the skin cell replacement process model should show?

- [ ] A. one skin cell producing one identical skin daughter cell as the parent skin cell dies and flakes off
- [ ] B. two skin cells joining together to form a unique, large skin cell
- [ ] C. one skin cell dividing into four different skin daughter cells with a different number of chromosomes
- [ ] D. one skin cell dividing to produce two identical skin daughter cells
- [ ] E. one dead skin cell flaking off to reveal new skin cells with the same characteristics as the old skin cell

A student is making a chart to organize information about mitosis and meiosis. The X and Y represent numbers in the student's incomplete chart.

Mitosis and Meiosis

	Mitosis	**Meiosis**
Number of Divisions in Each Cycle	Cell goes through one division cycle.	Cell goes through two division cycles.
Number of Daughter Cells Produced in Each Cycle	X	Y

What numbers do X and Y represent?

- A. X = 2
  Y = 1
- B. X = 1
  Y = 2
- C. X = 4
  Y = 2
- D. X = 2
  Y = 4

Strawberry Farming – Part 1

Strawberry production has doubled since the 1990s in Tennessee. Strawberry farmers in Clarksville plant new crop fields based on the ability of strawberries to reproduce sexually and asexually. Sexual reproduction occurs through pollination. The result is a strawberry that has seeds that can be harvested and planted. Asexual reproduction occurs when the parent plant creates a new plant from a runner.

The data table shows sexual and asexual reproduction in strawberry plants.

Methods of Reproduction

Sexual Reproduction from a Seed	Asexual Reproduction from a Runner
	
Takes longer to reach maturity than a daughter plant produced from a runner	Reaches maturity faster than a plant produced from a seed

For a strawberry farmer, what is the main advantage of sexual reproduction in strawberry plants versus asexual reproduction?

- A. It creates daughter plants that are uniform in size.
- B. It produces plants with different genetic traits.
- C. It decreases the amount of fertilizer needed by the plants.
- D. It creates daughter plants that are genetically alike.

Which percentage of traits will be the same for two offspring produced from a plant asexually?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

Strawberry Farming – Part 2

A farmer in Unicoi, Tennessee, chooses two plants from which to produce seeds for new plants. Parent Plant 1 was grown from a runner and Parent Plant 2 was grown from a seed.

The data table shows the traits and genotypes of the two parent plants used to produce seeds.

Traits and Genotypes

Trait	Parent Plant 1	Parent Plant 2
Runner Production B – many runners b – no runners	Bb	BB
Fruit Production E – year-round e – summer only	ee	ee
Fruit Size Q – large q – small	Qq	qq
Resistance to Gray Mold Fungus R – resistant r – not resistant	rr	Rr

Red stele is a fungal disease that kills strawberry plants by rotting their roots. Genetic variability may result in offspring that can survive the disease.

Which method of reproduction will increase genetic variability the **most**?

- A. asexual reproduction using the runners of Parent Plant 1
- B. sexual reproduction by self-pollinating Parent Plants 1 and 2
- C. asexual reproduction using the runners of Parent Plant 2
- D. sexual reproduction by cross-pollinating Parent Plants 1 and 2

What is a benefit of producing daughter plants using the runners of Parent Plant 2 instead of runners of Parent Plant 1?

- A. The new plants will produce few runners.
- B. The new plants will produce fruit year-round.
- C. The new plants will be resistant to gray mold fungus.
- D. The new plants will produce large fruit.

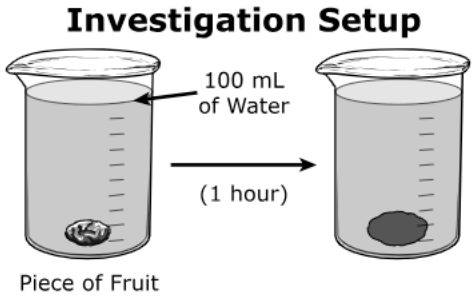
Which trait will be present in 100% of the offspring between Parent Plant 1 and Parent Plant 2?

- A. production of fruit year-round
- B. production of many runners
- C. large fruit size
- D. resistance to gray mold fungus

A student designs an investigation to model how water moves across a cell membrane through diffusion. The student uses a piece of dried fruit to represent the cell membrane and follows the steps in the investigation process.

Student's Investigation Process

- Measure the mass of the dried fruit.
- Measure the mass of 100 milliliters (mL) of water in a beaker.
- Place the dried fruit in the beaker of water.
- Leave the setup for one hour.
- Remove the dried fruit from the beaker.
- Measure the mass of the dried fruit.
- Measure the mass of the beaker with water.



The student concludes that water moved into the dried fruit through diffusion. Which piece of evidence would **best** support the student's claim that diffusion moved water into the dried fruit?

A. The mass of the fruit increased.

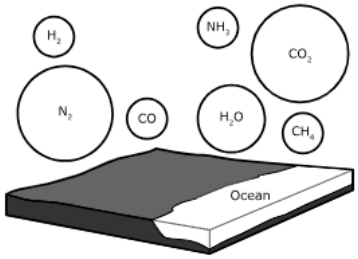
B. The mass of the fruit stayed the same.

C. The mass of the water in the beaker increased.

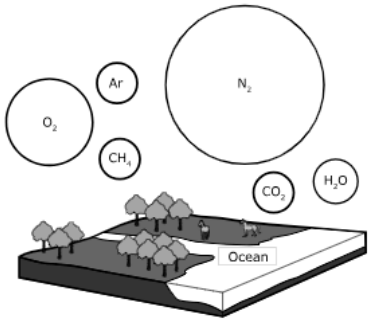
D. The mass of the water in the beaker stayed the same.

Earth's atmosphere has changed over time. Some of the changes are shown in the diagrams.

Earth's Early Atmosphere



Earth's Modern Atmosphere



If the same processes that changed the atmosphere continue, which **three** gases will increase in concentration in the future?

- [ ] A. nitrogen, N_2
- [ ] B. argon, Ar
- [ ] C. carbon monoxide, CO
- [ ] D. water, H_2O
- [ ] E. oxygen, O_2

A person has a condition in which his cells cannot detect the temperature of his surroundings. His cells do not respond correctly to the environment.

Which statement explains how two body systems are involved in the person's condition?

A. The nervous system is not sending any messages to the excretory system because of the temperature of the environment.

B. The digestive system is inactive because of an increase in temperature of the environment and is not sending any oxygen to the respiratory system.

C. The integumentary system is receiving incorrect information to forward to the nervous system regarding the temperature of the environment.

D. The circulatory system is not transferring oxygen and carbon dioxide, so the musculoskeletal system is unable to work because of the environment.

Waste Management – Part 1

Students are returning to school from a field trip. Some of them notice they are passing an area of land where a large pile of trash is being buried under soil. The teacher tells them, "What you are seeing is a landfill. More than 50% of the solid trash humans generate is buried in landfills and it is becoming a big problem." The next day, students are asked to research how the trash (or waste) is processed in a landfill. The teacher tells the students to search for information using the website of the Tennessee Department of Environment and Conservation.

Table 1: Common Compounds Produced from the Anaerobic Digestion of Food Waste

	Compound	Melting Point (degrees Celsius, °C)	Boiling Point (degrees Celsius, °C)
Compounds that have C atoms	CH_4	–183	–161
	CH_3COOH	17	118
	CH_3CH_2COOH	–21	141
Compounds that do not have C atoms	H_2	–259	–253
	H_2S	–86	–60
	NH_3	–78	–33

Students focus their research on food waste. During their research, they discover that the state of Tennessee will process food waste using anaerobic digestion as part of a 10-year waste management plan. Anaerobic digestion can minimize the release of greenhouse gases from the decomposition of food waste. It can also be used to produce biofuels. The most common compounds made by the anaerobic digestion of food waste are listed in Table 1. This table lists some of the properties of these compounds.

Based on the data shown in Table 1, which statement identifies a trend in the data?

A. For compounds that have carbon (C) atoms, the more total atoms there are in the compound, the higher the boiling point.

B. For compounds that have carbon (C) atoms, the more C atoms there are in the compound, the higher the melting point.

C. For compounds that do not have carbon (C) atoms, the more hydrogen (H) atoms there are in the compound, the lower the melting point.

D. For compounds that do not have carbon (C) atoms, the less hydrogen (H) atoms there are in the compound, the higher the boiling point.

A chemist analyzes the products of the anaerobic digestion of food waste. One of the products is a liquid at –10°C.

Based on the data in Table 1, this substance is

A. CH_3CH_2COOH.

B. CH_3COOH.

C. NH_3.

D. H_2S.

The biofuel produced from the anaerobic digestion of food waste is a mixture of methane (CH_4) and carbon dioxide (CO_2). Solid CO_2 transforms into CO_2 gas at –78.5°C under normal atmospheric pressure at sea level.

Based on Table 1 and the information provided, when the biofuel is collected at 25°C and normal atmospheric pressure it will be a mixture of

A. liquid CH_4 and CO_2 gas.

B. CH_4 gas and liquid CO_2.

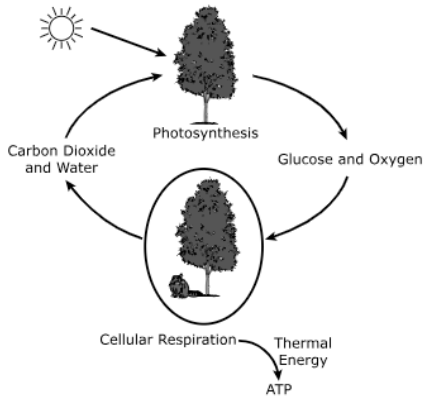
C. CH_4 gas and CO_2 gas.

D. liquid CH_4 and liquid CO_2.

Waste Management – Part 2

Students wonder how much waste can be dumped in a landfill. The teacher explains that landfills are closed once they reach a certain capacity of waste. Students research what happens to landfills when they are finally closed. They learn that some states have converted their closed landfills to open recreational areas. The students want to know how plant and animal life can thrive in what used to be a landfill. They drew this diagram to determine how a closed landfill can sustain living organisms.

Photosynthesis and Cellular Respiration



These chemical equations represent the overall changes that take place as a result of photosynthesis and cellular respiration.

Reaction 1: Photosynthesis

$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

Reaction 2: Cellular Respiration

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

What is the **best** evidence the students can provide for the conservation of matter in an ecosystem?

A. Plants produce $C_6H_{12}O_6$ and use it to grow and produce CO_2.

B. Plants use carbon atoms in CO_2 to produce $C_6H_{12}O_6$ that other organisms use to release carbon atoms in the form of CO_2.

C. Some organisms use the CO_2 produced by plants and release $C_6H_{12}O_6$ for the plant to grow.

D. Some organisms use the ATP produced from the oxygen atoms in CO_2 and hydrogen atoms in H_2O.

Which statement **best** explains why plants are essential to the development of a new ecosystem in a closed landfill?

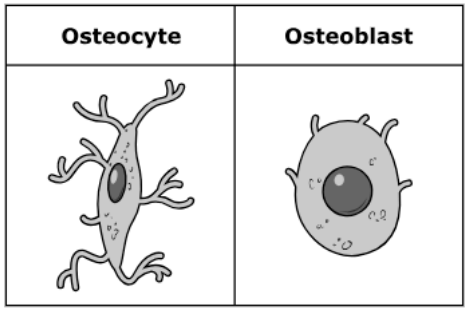
A. Plants use oxygen (O_2), glucose ($C_6H_{12}O_6$), and energy from the sun to produce carbon dioxide (CO_2) that animals need for survival.

B. Plants use energy from the sun to convert carbon dioxide (CO_2) and water (H_2O) to glucose ($C_6H_{12}O_6$) and oxygen (O_2) that animals need for survival.

C. Plants use the reaction between glucose ($C_6H_{12}O_6$) and oxygen (O_2) to produce water (H_2O), carbon dioxide (CO_2), and thermal energy for the rest of the ecosystem.

D. Plants use the reaction between water (H_2O) and carbon dioxide (CO_2) to produce oxygen (O_2), glucose ($C_6H_{12}O_6$), and thermal energy for the rest of the ecosystem.

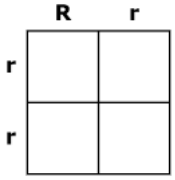
The diagram shows two types of bone cells. Osteocytes are responsible for maintaining the health of the bone tissue by exchanging nutrients and waste. Osteoblasts are responsible for building the bone tissue.



When a bone fractures, these two groups of cells work together to

- A. build new pathways to connect the tissues of the bone to the muscular system.
- B. reduce pain experienced by the organism by removing old bone tissue pieces.
- C. create new cells for other types of bone tissues.
- D. repair bone tissues within the skeletal system.

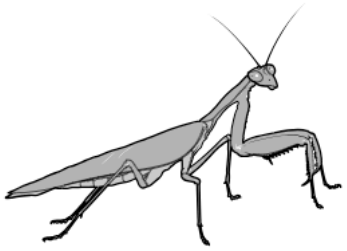
In pea plants, the allele for purple flowers is dominant to the allele for white flowers. A pea plant with purple flowers (Rr) is crossed with a pea plant with white flowers (rr). A Punnett square of the cross of the two pea plants is shown.



Which correctly predicts the ratio of offspring with purple flowers to offspring with white flowers?

- A. 1:3
- B. 2:2
- C. 3:1
- D. 4:0

A praying mantis is an insect that uses camouflage to blend into its habitat.



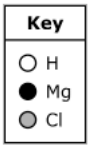
A student claims that camouflage is an adaptation that increases the survival of the praying mantis. Which **two** statements **best** support the student's claim?

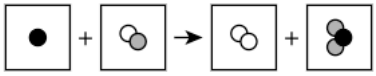
- [ ] A. Prey avoid the praying mantis because they recognize its unique body.
- [ ] B. Predators walk past the praying mantis because the mantis resembles a plant leaf.
- [ ] C. Predators are discouraged when the praying mantis stands on its front legs.
- [ ] D. Predators recognize the praying mantis because of the loud noises it makes.
- [ ] E. Prey are caught by the praying mantis because the prey cannot see the mantis.

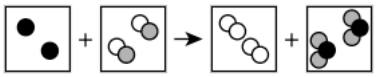
A group of students is asked to draw the reactants and products of this chemical equation.

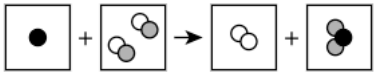
$$\mathrm{Mg} + 2\mathrm{HCl} \rightarrow \mathrm{H_2} + \mathrm{MgCl_2}$$

Which drawing represents the law of conservation of mass in this reaction?



A. 

B. 

C. 

D.