Atoms on the Move

Read how particle models explain properties and chemical change.

8.6 "Matter and energy. The student understands that matter can be classified according to its properties and matter is conserved in chemical changes that occur within closed systems..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline every chemical formula. Then number 1, 2, and 3 beside the three sentences that connect a water property to an observable event.

A Lab of Matter Models

1. At a school materials lab, students sort four samples by what their particles show. A copper wire is an element because it contains only copper atoms, Cu. Table sugar, $C_{12}H_{22}O_{11}$, is a compound because carbon, hydrogen, and oxygen atoms are chemically bonded in a fixed ratio. Clear saltwater is a homogeneous mixture because its salt is spread evenly. Trail mix is a heterogeneous mixture because raisins, nuts, and seeds remain visibly different parts. Classification depends on composition and how evenly substances are mixed.

2. Water's unusual behavior comes from attractions among its molecules and with other materials. Cohesion, attraction between water molecules, helps water form rounded droplets. Adhesion, attraction between water and another surface, helps water move upward through narrow plant tubes. At the water's surface, cohesion creates surface tension, a tight surface layer that can support some insects. Acids have pH values below 7, neutral water has pH 7, and bases have pH values above 7. These pH values compare substances to water.

3. A chemical equation is a model of atoms before and after a reaction. In photosynthesis, $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$, carbon dioxide and water become glucose and oxygen when light energy is available. The periodic table identifies C, H, and O as carbon, hydrogen, and oxygen. Each side has 6 carbon, 12 hydrogen, and 18 oxygen atoms. In a closed system, no matter enters or leaves, so total mass stays the same as atoms rearrange into new substances.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do saltwater and trail mix differ in classification? Give the observation that supports each classification.

2. How do cohesion and adhesion cause two different observable events involving water?

3. Compare the pH of an acid and a base to the pH of neutral water.

4. In the photosynthesis equation, how do the atom counts show that mass is conserved in a closed system?

3 YOUR TURN

Your own words

Make a two-panel particle model of $2H_2 + O_2 \rightarrow 2H_2O$. Draw the reactant molecules in Panel 1 and the product molecules in Panel 2, label H and O atoms, then write one sentence explaining how the model shows conservation of mass.

ANSWER KEY

Atoms on the Move

GRADE 8 · TEKS 8.6

PART 1 · READ AND MARK

Underline every chemical formula. Then number 1, 2, and 3 beside the three sentences that connect a water property to an observable event. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do saltwater and trail mix differ in classification? Give the observation that supports each classification.	**Saltwater is a homogeneous mixture because the salt is spread evenly. Trail mix is a heterogeneous mixture because its raisins, nuts, and seeds remain visibly different.**
2	How do cohesion and adhesion cause two different observable events involving water?	**Cohesion helps water form rounded droplets. Adhesion helps water move upward through narrow plant tubes.**
3	Compare the pH of an acid and a base to the pH of neutral water.	**An acid has a pH below 7, neutral water has pH 7, and a base has a pH above 7.**
4	In the photosynthesis equation, how do the atom counts show that mass is conserved in a closed system?	**Both sides have 6 carbon atoms, 12 hydrogen atoms, and 18 oxygen atoms. The atoms rearrange into new substances, but no atoms are lost or gained, so mass stays the same.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Draw two H_2 molecules and one O_2 molecule, showing four H atoms and two O atoms. Panel 2: Draw two H_2O molecules, showing four H atoms and two O atoms. The atoms are rearranged, but the same numbers of H and O atoms are present, so mass is conserved.

Accept equivalent wording that distinguishes even mixing from visibly different parts and correctly relates each water property to its event. For the particle model, accept any clear representation with four H atoms and two O atoms in both panels and a correct conservation statement.