Atoms in Action

Read how particles, bonds, formulas, and Earth systems connect.

6.5 "The student will investigate and understand that all matter is composed of atoms. Key ideas include atoms consist of particles, including electrons, protons, and neutrons..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline every chemical symbol or formula. Circle the words *protons*, *neutrons*, and *electrons*, then number the four sentences that tell which elements make up most of an Earth system.

Matter From Atoms

1. Every sample of matter, from a grain of sand to a breath of air, is made of atoms. An atom has a tiny, positively charged nucleus containing protons and neutrons. Negatively charged electrons move in the space around the nucleus. The number of protons identifies an element. All oxygen atoms have eight protons, while carbon atoms have six. Atoms of one element can have different numbers of neutrons, so they may have different masses. Scientists use short chemical symbols, such as O for oxygen and C for carbon.

2. Atoms can interact when electrical attractions hold them in bonds. A group of bonded atoms from different elements is a compound. Water, written H_2O, is a compound because each water unit contains hydrogen and oxygen atoms. Oxygen gas, written O_2, has bonded oxygen atoms, but it is not a compound because it contains only one element. Chemical formulas show which elements are in a substance and how many atoms are in one unit. A chemical equation models a change: $2H_2 + O_2 \rightarrow 2H_2O$. It shows hydrogen and oxygen forming water.

3. Elements are not spread evenly through Earth systems. Oxygen, silicon, aluminum, and iron make up much of the solid Earth. Oxygen, carbon, hydrogen, and nitrogen make up most living matter. The oceans are mostly water, so oxygen and hydrogen comprise most of their mass. Nitrogen and oxygen make up most of the atmosphere. These patterns connect to familiar materials: rocks contain oxygen joined with other elements, living things contain carbon compounds, ocean water is H_2O, and air contains gases made from a few common elements.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can two atoms of oxygen differ while still being oxygen?

2. Why is H_2O a compound, while O_2 is not?

3. In the equation $2H_2 + O_2 \rightarrow 2H_2O$, which substances react, and which substance forms?

4. Name the two elements that comprise most of the oceans and the two elements that make up most of the atmosphere.

3 YOUR TURN

Your own words

Choose a compound other than water, such as ammonia or carbon dioxide. Write its chemical formula and a balanced chemical equation that models its formation, then explain why it is a compound and what holds its atoms together.

ANSWER KEY

Atoms in Action

GRADE 6 · 6.5

PART 1 · READ AND MARK

Underline every chemical symbol or formula. Circle the words *protons*, *neutrons*, and *electrons*, then number the four sentences that tell which elements make up most of an Earth system. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can two atoms of oxygen differ while still being oxygen?	**They can have different numbers of neutrons and different masses, but both have eight protons.**
2	Why is H_2O a compound, while O_2 is not?	**H_2O contains atoms of two different elements, hydrogen and oxygen. O_2 contains only oxygen atoms.**
3	In the equation $2H_2 + O_2 \rightarrow 2H_2O$, which substances react, and which substance forms?	**Hydrogen and oxygen react. Water forms.**
4	Name the two elements that comprise most of the oceans and the two elements that make up most of the atmosphere.	**Oceans: oxygen and hydrogen. Atmosphere: nitrogen and oxygen.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Nitrogen is N, and hydrogen is H. Ammonia is NH_3, a compound because each unit has atoms of two different elements held together by electrical attractions in bonds. $N_2 + 3H_2 \rightarrow 2NH_3$ models nitrogen and hydrogen forming ammonia.

Accept any accurate compound other than water with a correct formula and balanced formation equation. The explanation should state that a compound contains different elements and that electrical attractions hold atoms together in bonds.