What Are Elements and Compounds?

Worksheet

An element cannot be broken down into simpler substances by chemical means (e.g., oxygen, gold, hydrogen), while a compound is two or more elements chemically combined in a fixed ratio and can be broken down into its elements (e.g., water, HO, or table salt, NaCl).

Questions

1. Which of these is an element?

A) Water (HO)
B) Table salt (NaCl)
C) Gold (Au)
D) Carbon dioxide (CO)

2. What makes a compound different from a mixture of elements?

A) Compounds have a fixed, definite ratio of elements chemically bonded
B) Compounds can be separated by simple filtering
C) Compounds are always gases
D) Compounds contain only one type of atom

3. How many types of atoms are in a pure element?

A) Exactly two
B) Exactly one
C) Three or more
D) It varies

4. Which process can break a compound down into its elements?

A) Filtering
B) Dissolving in water
C) A chemical reaction such as electrolysis
D) Freezing

5. Classify oxygen gas (O), water (HO), and gold (Au) as elements or compounds.

6. Table salt (NaCl) is heated with electricity in a process called electrolysis and separates into sodium metal and chlorine gas. What does this show about NaCl?

7. Carbon dioxide (CO) always contains carbon and oxygen in a fixed mass ratio of about 3:8. Why can't you have 'CO' with a different ratio of carbon to oxygen?

8. Define: What is an element?

9. Define: What is a compound?

10. Define: How can you tell an element from a compound by formula?

Answer Key

1. C) Gold (Au) - Gold is made of only one type of atom, so it's an element; the others combine two different elements.

2. A) Compounds have a fixed, definite ratio of elements chemically bonded - Compounds are chemically bonded in a fixed ratio (law of definite proportions), unlike mixtures which can vary.

3. B) Exactly one - An element by definition contains only one type of atom, though that atom can appear as a molecule like O.

4. C) A chemical reaction such as electrolysis - Only chemical reactions break the bonds holding a compound's elements together; physical processes like filtering or freezing cannot.

5. Oxygen gas (O): element - made of only one type of atom (oxygen), even though two atoms bond together. Water (HO): compound - two different elements (hydrogen and oxygen) chemically bonded in a fixed 2:1 ratio. Gold (Au): element - a single type of atom found directly on the periodic table.

6. Since NaCl breaks apart into two different pure substances (Na and Cl) by a chemical process, NaCl must be a compound, not an element. Sodium and chlorine themselves cannot be broken down further by ordinary chemical means, so they are elements. This confirms the rule: compounds decompose into elements; elements do not decompose into anything simpler.

7. Compounds obey the law of definite proportions: the elements always combine in the same fixed ratio by mass. If the ratio were different, you would have a different compound entirely (for example, CO instead of CO), not variable CO. This fixed-ratio rule is what distinguishes a true chemical compound from a simple physical mixture.

8. A pure substance made of only one type of atom that cannot be broken down chemically.

9. A pure substance formed when two or more elements chemically bond in a fixed ratio.

10. An element's formula has one symbol (O, Au); a compound's formula has two or more different symbols (HO, NaCl).