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Elements, Compounds, and Molecules**

What is an Element?

An element is a pure substance that cannot be broken down into simpler substances by chemical means. Each element is identified by its unique chemical symbol, such as H for hydrogen, O for oxygen, and Na for sodium.

What is a Compound?

A compound is a substance composed of two or more elements chemically combined in fixed proportions by mass. Compounds have a specific chemical formula that represents the types and number of atoms present in each molecule.

What is the Difference Between a Molecule and a Compound?

A molecule is a group of atoms held together by chemical bonds. A compound is a type of molecule that contains two or more different elements.

What is the Difference Between a Compound and a Mixture?

A compound is a pure substance, while a mixture is a combination of two or more substances that retain their individual identities. In a mixture, the components can be physically separated, unlike in a compound.

Elements in Common Compounds

- **H₂O**: 2 elements (hydrogen, oxygen)
- **NaCl**: 2 elements (sodium, chlorine)

- **CO₂**: 2 elements (carbon, oxygen)
- **CaCO₃**: 3 elements (calcium, carbon, oxygen)
- **NaOH**: 3 elements (sodium, oxygen, hydrogen)
- **C₆H₁₂O₆**: 3 elements (carbon, hydrogen, oxygen)

Key Concepts

Hydrogen Bonds: Weak attractions between hydrogen atoms and electronegative atoms (such as nitrogen, oxygen, or fluorine).

Chemical Bonds: Attractions that hold atoms together to form molecules and compounds. The two main types are covalent and ionic bonds.

Breaking Down Elements: Elements cannot be chemically broken down into simpler substances.

Atoms in Elements: Elements contain only one type of atom.

Convert Molecules to Moles: Moles measure the amount of a substance. 1 mole = 6.022×10^{23} particles (atoms, molecules, etc.).

Additional Information

- Tin and gold are both elements.
- There are millions of known chemicals.
- 2H₂O has 2 elements (hydrogen, oxygen) and 5 atoms (4 hydrogen, 2 oxygen).
- Water (H₂O) is a compound made up of 2 elements (hydrogen, oxygen).
- There are 1 oxygen atom in a molecule of water.
- NaCl is not a molecule because it is an ionic compound held together by ionic bonds.

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