

Scientific English for chemistry

Lesson2: Elements, Compounds, and Chemical Bonds

1. Elements, Compounds, and Mixtures

Matter is classified into three main types:

Element – A pure substance made of only one type of atom. Example:

Oxygen (O), Gold (Au).

Compound – A substance formed when two or more elements chemically bonded. Example: Water (H₂O), Carbon Dioxide (CO₂).

Mixture – A combination of two or more substances that are not chemically bonded. Example: Air, Saltwater.

2. Types of Chemical Bonds

Atoms form chemical bonds to achieve stability. The three main types are:

Ionic Bond – Formed when one atom transfers electrons to another. Example: Sodium Chloride (NaCl).

Covalent Bond – Formed when atoms share electrons. Example: Water (H₂O).

Metallic Bond – Found in metals, where electrons move freely. Example: Copper (Cu).

3. Grammar Focus: Describing Chemical Compounds

In scientific descriptions, we often use passive voice and prepositions like composed of, made of, consists of, contains.

Example Sentences:

--"Water is composed of hydrogen and oxygen."

--"Salt is made of sodium and chlorine."

--"Air contains nitrogen, oxygen, and other gases."

--"Carbon dioxide consists of one carbon atom and two oxygen atoms."

4. Comparing Properties of Elements, Compounds, and Mixtures

Elements have unique properties and cannot be broken down further.

Compounds have fixed ratios and different properties from their elements.

Mixtures can be physically separated and have variable compositions.

End of Lesson 2

"Grass is always greener on other side of the fence"

Activity 1: Categorize the Substances

Write E for Element, C for Compound, and M for Mixture.

1. ___ Hydrogen (H)
2. ___ Sugar (C₁₂H₂₂O₁₁)
3. ___ Air
4. ___ Sodium Chloride (NaCl)
5. ___ Iron (Fe)
6. ___ Milk
7. ___ Carbon Dioxide (CO₂)

Activity 2: Fill in the Blanks (Types of Bonds)

Complete the sentences using ionic, covalent, or metallic.

1. Water (H₂O) has a _____ bond because the atoms share electrons.
2. Sodium and chlorine form an _____ bond because one atom transfers an electron to another.
3. The free-moving electrons in a _____ bond allow metals to conduct electricity.
4. Oxygen (O₂) molecules form a _____ bond since the atoms share electrons equally.
5. Table salt (NaCl) has an _____ bond between sodium and chlorine.

Activity 3: Rewrite Using the Correct Structure

Rewrite each sentence using the correct phrase (composed of, made of, consists of, contains).

1. Oxygen and hydrogen make up water.
→ Water _____ hydrogen and oxygen.
2. Table salt includes sodium and chlorine.
→ Table salt _____ sodium and chlorine.
3. This mixture has nitrogen, oxygen, and carbon dioxide.
→ This mixture _____ nitrogen, oxygen, and carbon dioxide.
4. A diamond only has carbon atoms.
→ A diamond _____ carbon atoms.

Activity 4: Choose the Correct Answer

1. Which of the following cannot be broken down into simpler substances?

- a) Water (H₂O)
- b) Oxygen (O₂)
- c) Salt (NaCl)

2. What kind of bonding is present in NaCl?

- a) Ionic
- b) Covalent
- c) Metallic

3. Which of these can be separated by filtration?

- a) Sugar solution
- b) Air
- c) Iron filings mixed with sand

4. Which type of bond involves sharing electrons?

- a) Covalent
- b) Ionic
- c) Metallic

5. Which of the following is an example of a homogeneous mixture?

- a) Salad
- b) Air
- c) Granite

5. Writing Practice: Describe a Chemical Compound

Activity 5: Write 3-5 sentences describing a common compound. Use the following structure:

Name of the compound

Chemical formula

Elements in the compound

Type of bonding (ionic/covalent)

One important property

Example:

"Water (H₂O) is a compound made of hydrogen and oxygen. It has a covalent bond, meaning the atoms share electrons. Water is essential for life and exists in three states: solid, liquid, and gas."

6. Correct the Mistakes

Each sentence below contains one mistake. Rewrite it correctly.

Activity 6: Correct the Mistakes

1. Oxygen is a compound that contains two atoms.

→ _____

2. Salt (NaCl) is formed by sharing electrons between sodium and chlorine.

→ _____

3. Water (H₂O) is a mixture of hydrogen and oxygen.

→ _____

4. Compounds can be separated using filtration.

→ _____

5. Metallic bonds are found in salt compounds like NaCl.

→ _____

7. Speaking Practice: Describing Chemical Substances

Instructions:

Work with a partner.

One student names a chemical compound (e.g., carbon dioxide, salt, sugar).

The other student describes its properties using is made of, contains, has a bond type, is used for.

Example Dialogue:

Student A: "What do you know about carbon dioxide?"

Student B: "Carbon dioxide (CO₂) contains carbon and oxygen. It has a covalent bond. It is used in photosynthesis and exists as a gas at room temperature."

8. Homework

Research a common compound (e.g., carbon dioxide, ammonia, methane).

Write five new words you learned and their meanings.

Describe the compound using at least three sentences.