

Covalent and Metallic Bonding

Structure and Bonding of Covalent Substances

Covalent substances can exist as:

- Simple covalent molecules
- Giant covalent molecules

Simple Covalent Molecules

How are oxygen molecules represented in all states? Why?

- There are **very strong electrostatic forces of attraction** between the shared pair of electrons and the positively charged nuclei of the **atoms** sharing the electrons, which is also known as a **covalent bond**.

How is the arrangement of the molecules

different in each state?

- The forces of attraction between the molecules are **weak**
- These forces are known as **intermolecular forces of attraction**

During State Change

- **Intermolecular forces of attraction are weakened** as the state changes. Hence, oxygen molecules are not held closely together anymore.
- Covalent bonds are intact, hence oxygen atoms are still bonded together

Giant Covalent Molecules

Giant Covalent Molecules

1. Diamond
2. Graphite
3. Silicon Dioxide

Allotropes

- **Allotropes** are physical forms of the **same chemical element** in which the **atoms are bonded together in different arrangements**

Description of Structure and Bonding

Name of Substance	Type of Structure
Diamond	Giant molecular structure

Description of Structure of Diamond

- Each carbon atom uses all its **4 valence electrons** to form 4 covalent bonds with **4 other carbon atoms** to form a **tetrahedral structure**. Diamond exists as a **giant molecular structure**.

Description of Structure of Graphite

- Each carbon atom uses **3 valence electrons** to form 3 covalent bonds with **3 other carbon atoms** to form **hexagonal layers** of carbon atoms with **weak intermolecular forces of attraction between layers**.
- Fourth valence electron is delocalised** between layers of carbon atoms.