Worksheet 5.2: Giant Covalent Structures (Diamond & Graphite) ChemistrySheets

Specification: GCSE Chemistry (AQA 5.2.2.5 & 5.2.3 / Edexcel SC7)

Core Concepts: Giant covalent structures (also known as macromolecular structures) consist of many atoms joined together by strong covalent bonds. Examples include diamond, graphite, and silicon dioxide. These structures typically have very high melting and boiling points due to the large amount of energy required to break the many strong covalent bonds. Their properties vary depending on the arrangement of atoms and bonding within the structure.

Section A: Key Terms & Concepts

1. The diagrams below show simplified representations of diamond and graphite. Label the key features of each structure.

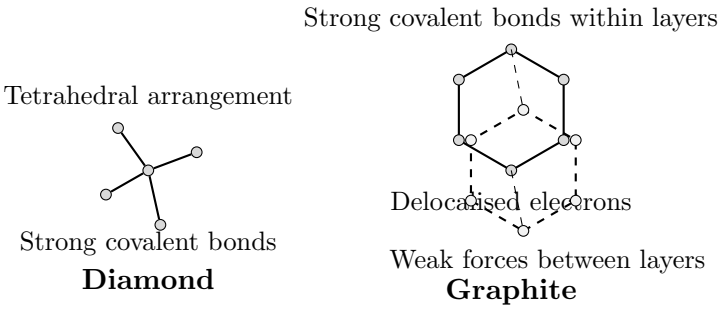

Figure 1: Simplified structures of diamond and graphite.

2. Complete the sentences below using appropriate scientific terms.

a) Giant covalent structures are also known as _____ structures.

b) In these structures, atoms are held together by strong _____ bonds.

c) The high melting and boiling points of giant covalent structures are due to the large amount of _____ required to break these bonds.

d) Graphite is able to conduct electricity because it has _____ electrons.

Section B: Core Concepts & Explanations

1. Explain why diamond is extremely hard and has a very high melting point.

2. Describe the structure of graphite and explain why it is soft and slippery.

3. Compare the electrical conductivity of diamond and graphite, explaining the difference in terms of their bonding.

4. Explain why giant covalent structures, in general, have high melting and boiling points.

Section C: Exam Application & Extended Writing

1. Graphite is used in pencils and as a lubricant, while diamond is used in cutting tools. Explain how the differences in their structures lead to these different uses.

2. Compare and contrast the structures and properties of diamond and graphite. Include details of their bonding, physical properties, and uses. (6 marks)