2.5 Covalent Bonding: Simple Molecules and Giant Structures: Test Pack

EDEXCEL 4CH1 · Calculator allowed · about 15 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define covalent bonding in terms of electrons, for the Edexcel 4CH1 covalent bonding topic.

(Total for Question 1 is 2 marks)

2 A pure sample of silicon dioxide is a solid with a very high melting point. Identify the type of structure present in the sample.

(Total for Question 2 is 1 mark)

3 Draw a dot-and-cross diagram showing the covalent bonding in a molecule of hydrogen chloride (HCl). Name which atom provides which electron(s) in the shared pair, and show lone pairs on chlorine.

(Total for Question 3 is 2 marks)

4 A student tests a piece of graphite and finds that it conducts electricity. Explain this observation using the bonding in graphite.

(Total for Question 4 is 2 marks)

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5 Describe three general properties of simple molecular substances such as chlorine, methane and water that arise from their bonding and intermolecular forces. Give a brief explanation for each property in terms of bonds or intermolecular forces.

(Total for Question 5 is 3 marks)

6 A student compares graphite and silicon dioxide. Graphite conducts electricity, while silicon dioxide does not. Explain the difference in electrical conductivity by referring to their particles and bonding.

(Total for Question 6 is 3 marks)

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Mark scheme · 2.5 Covalent Bonding: Simple Molecules and Giant Structures: Test Pack

Question 1

states that covalent bonding involves sharing of electrons **B1**

mentions that it forms between non-metal atoms so each atom achieves a full outer shell or stable electron arrangement **B1**

Answer: Covalent bonding is the sharing of electrons between non-metal atoms so each atom attains a full outer shell or stable electron arrangement.

Question 2

Giant covalent structure (giant covalent lattice). **B1**

Answer: A giant covalent structure.

Question 3

shows H with 1 electron and Cl with 7 valence electrons in their separate shells **B1**

shows one shared pair between H and Cl so H has a full shell and Cl shows eight electrons total, with three lone pairs on Cl **B1**

Answer: Diagram showing H (1 electron) and Cl (7 electrons) with one shared pair between them so H has 2 and Cl has 8 valence electrons; Cl has three lone pairs remaining.

Question 4

Each carbon atom in graphite forms three covalent bonds, leaving an electron delocalised. **B1**

The delocalised electrons can move through the structure and carry charge. **B1**

Answer: Each graphite carbon forms three covalent bonds, leaving delocalised electrons that move through the structure and carry charge.

Question 5

states a property, for example: low melting and boiling points **B1**

explains that this is because weak intermolecular forces require little energy to overcome while covalent bonds within molecules remain intact **B1**

states another property and explains it, for example poor electrical conductivity in solid and liquid forms because there are no mobile charged particles to carry charge **B1**

Answer: Properties include low melting and boiling points because weak intermolecular forces are easily overcome, and poor electrical conductivity because molecules are neutral with no mobile ions or electrons to carry charge. Many simple molecular substances are gases or liquids at room temperature for these reasons.

Question 6

In graphite, each carbon forms three covalent bonds and has a delocalised electron. **B1**

Graphite's delocalised electrons are mobile and carry electrical charge. **B1**

Silicon dioxide has no mobile charged particles, so it does not conduct electricity. **B1**

Answer: Each graphite carbon forms three bonds and contributes a delocalised electron. These electrons move and carry charge. Silicon dioxide has no mobile charged particles, so it does not conduct.

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