2.5 Covalent Bonding: Simple Molecules and Giant Structures: 10-minute Pack

EDEXCEL 4CH1 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Methane is a gas at room temperature and has a low boiling point. Explain its low boiling point using its structure and the forces between its particles.

(Total for Question 1 is 1 mark)

2 Draw a dot-and-cross diagram for a water molecule (H_2O) showing all bonding pairs and lone pairs on the oxygen atom. State how many lone pairs remain on oxygen after bonding.

(Total for Question 2 is 2 marks)

3 Graphite and diamond are both forms of carbon. State how many covalent bonds each carbon atom forms in graphite and in diamond.

(Total for Question 3 is 1 mark)

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4 State two similarities and two differences between simple molecular substances and giant covalent structures, in terms of bonding, melting points and electrical conductivity. Use specific reference to examples such as methane and diamond in your answer.

(Total for Question 4 is 3 marks)

5 Each substance is either simple molecular or giant covalent. Substance A has a low boiling point and does not conduct electricity. Substance B has a very high melting point and does not conduct electricity. Compare their structures and explain the difference in their melting or boiling points.

(Total for Question 5 is 2 marks)

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Mark scheme · 2.5 Covalent Bonding: Simple Molecules and Giant Structures: 10-minute Pack

Question 1

Methane consists of small molecules with weak intermolecular forces, so little energy is needed to separate them. **B1**

Answer: Methane has small molecules with weak intermolecular forces, so little energy is needed to separate them.

Question 2

shows oxygen with 6 valence electrons and two hydrogens each with 1 electron **B1**

shows two bonding pairs between O and each H and two lone pairs on O (states two lone pairs) **B1**

Answer: Oxygen with 6 electrons sharing one with each H to form two bonding pairs, and oxygen retains two lone pairs.

Question 3

Graphite: 3 bonds per carbon; diamond: 4 bonds per carbon. **B1**

Answer: Graphite: 3; diamond: 4.

Question 4

one similarity: both have covalent bonding within molecules or between atoms **B1**

second similarity: both are composed of non-metal elements (carbon, silicon, etc.) **B1**

one difference or two differences: simple molecular substances have weak intermolecular forces and low melting points and usually do not conduct electricity, whereas giant covalent structures have strong covalent bonds throughout, very high melting points and usually do not conduct electricity except where delocalised electrons exist (graphite) **B1**

Answer: Similarities: both involve covalent bonds and are made from non-metal atoms. Differences: simple molecular substances like methane have weak intermolecular forces, low melting points and do not conduct electricity, while giant covalent structures like diamond have a continuous network of strong covalent bonds, very high melting points and do not conduct electricity; graphite is an exception because of delocalised electrons.

Question 5

A consists of simple molecules with weak intermolecular forces; B is a giant covalent structure with strong covalent bonds throughout. **B1**

Separating A's molecules needs little energy, whereas overcoming bonds throughout B needs much more energy. **B1**

Answer: A is simple molecular with weak intermolecular forces, while B is giant covalent with strong bonds throughout. Little energy separates A's molecules, but much more energy is needed to overcome bonds in B.

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