2.4 Ionic Bonding and Properties of Ionic Compounds: Test Pack

EDEXCEL 4CH1 · Calculator allowed · about 15 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State the type of bonding and the type of structure present in solid sodium chloride as taught in ionic bonding in Edexcel 4CH1.

(Total for Question 1 is 1 mark)

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2 Describe how a sodium atom forms a sodium ion when reacting with a chlorine atom in the formation of sodium chloride.

(Total for Question 2 is 2 marks)

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3 Draw a dot-and-cross diagram to show the electron transfer between sodium and chlorine to form sodium chloride, showing the outer electrons, the transfer and the final ions with their charges.

(Total for Question 3 is 3 marks)

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4 A compound contains calcium ions, Ca^{2+}, and chloride ions, Cl^{-}. Deduce its formula.

(Total for Question 4 is 1 mark)

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5 Explain why ionic compounds such as sodium chloride have high melting and boiling points, referring to the lattice and the forces involved.

(Total for Question 5 is 2 marks)

6 Two ionic lattices have ions at similar separations. In lattice A the ions have charges +1 and -1; in lattice B they have charges +2 and -2. Explain why lattice B is expected to have the higher melting point.

(Total for Question 6 is 3 marks)

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Mark scheme · 2.4 Ionic Bonding and Properties of Ionic Compounds: Test Pack

Question 1

ionic bonding and a giant ionic lattice (or giant ionic structure) **B1**

Answer: Ionic bonding; giant ionic lattice (giant ionic structure).

Question 2

sodium loses one electron from its outer shell **B1**

forms a Na^+ ion and chlorine gains that electron to form Cl^- (electron transfer) **B1**

Answer: Sodium loses one outer electron to become Na^+; chlorine gains that electron to become Cl^-, so electron transfer forms ions.

Question 3

shows Na losing one electron and Cl gaining one electron (electron transfer indicated) **B1**

shows Na^+ and Cl^- in brackets with correct charges **B1**

shows that both ions have full outer shells after transfer **B1**

Answer: Diagram showing Na -> Na^+ (loses 1 e-) and Cl -> Cl^- (gains 1 e-), ions in brackets with charges and filled outer shells.

Question 4

formula $CaCl_2$ **B1**

Answer: $CaCl_2$

Question 5

strong electrostatic attraction between oppositely charged ions in the lattice **B1**

a lot of energy is required to overcome these attractions, so melting and boiling points are high **B1**

Answer: Strong electrostatic attraction between many oppositely charged ions in the giant lattice; large energy required to overcome these attractions, so high melting and boiling points.

Question 6

the ions in lattice B have greater charge magnitudes **B1**

greater ionic charges cause stronger electrostatic attractions between oppositely charged ions **B1**

more energy is needed to overcome the stronger attractions, so lattice B has the higher melting point **B1**

Answer: The +2 and -2 ions have greater charge magnitudes, giving stronger electrostatic attractions at similar separations. More energy is needed to overcome these attractions, so lattice B has the higher melting point.

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