InkChemistry

QUESTION WORKBOOK

Ionic bonding and ionic lattices

Bonding and structure · Unit C03

AQA 3.1.3.1, 3.1.3.4 · OCR A 2.2.2

18 questions · 59 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 IBI-Q1

State what is meant by the term ionic bonding. [2]

A2 IBI-Q5

Name the type of structure in solid sodium chloride, and give the coordination number of each of its ions. [2]

A3 IBI-Q13

Calculate the distance between the centres of two chloride ions on the same line of a sodium chloride crystal, with one sodium ion between them and all three touching. Radii: Na^+ 0.102 nm, Cl^- 0.181 nm. [2]

A4 IBI-Q14

Suggest why barium oxide melts at 1923 °C, lower than magnesium oxide at 2852 °C. [2]

SECTION B · Standard, 3 to 5 marks

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B1 IBI-Q9

Explain why the ionic radius decreases along the isoelectronic series N^{3-}, O^{2-}, F^{-}, Na^{+}, Mg^{2+}, Al^{3+}, and why it increases down Group 1 from Li^{+} to Na^{+} to K^{+}. [5]

B2 IBI-Q2

Give the formulae of the ions formed by aluminium and by sulfur, and the formulae of aluminium sulfide, ammonium sulfate and calcium nitrate. [4]

B3 IBI-Q7

Explain why magnesium oxide has a much higher melting point than sodium chloride, although both have the same lattice structure. [4]

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B4 IBI-Q16 Compare the radius of a sodium atom with that of a sodium ion, and the radius of a chlorine atom with that of a chloride ion, explaining each difference. [4]

B5 IBI-Q19 Explain how an electron density map of sodium chloride provides evidence that the compound is made of ions, and how the map of a crystal of iodine, I_2, would differ. [4]

B6 IBI-Q4 Describe the dot-and-cross diagram for magnesium oxide, showing outer electrons only. [3]

B7 IBI-Q6 Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does. [3]

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B8 IBI-Q8 Explain why ionic compounds such as sodium chloride are brittle. [3]

B9 IBI-Q11 Calculate the total number of ions in 1.00 g of sodium chloride. Mr of NaCl = 58.5; L = 6.022×10^{23} mol^{-1}. [3]

B10 IBI-Q12 Calculate the number of chloride ions in 4.44 g of calcium chloride, $CaCl_2$. Ar: Ca 40.1, Cl 35.5; L = 6.022×10^{23} mol^{-1}. [3]

B11 IBI-Q15 Suggest what is seen when a crystal of purple potassium manganate(VII), $KMnO_4$, is placed in the middle of a strip of filter paper soaked in salt solution, and a potential difference is applied across the strip for twenty minutes. Explain the observation. [3]

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B12 IBI-Q17 Evaluate the claim that solid sodium chloride is made of NaCl molecules because its formula shows one sodium and one chlorine. [3]

B13 IBI-Q20 Calculate the number of oxide ions in 2.04 g of aluminium oxide, Al_2O_3. Ar: Al 27.0, O 16.0; L = 6.022×10^{23} mol^{-1}. [3]

SECTION C · Long, 6 marks or more

C1 IBI-Q18 Explain, in terms of structure and bonding, the high melting point of magnesium oxide, its electrical conductivity as a solid and when molten, and its brittleness. [6]

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