2.6 The Periodic Table and Inorganic Chemistry: 10-minute Pack

AQA 7405 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question is about the trend in oxidising power of the Group 7 halogens and its practical consequences.

(a) Atomic radii (pm): F = 64, Cl = 99, Br = 114, I = 133. Using this data, explain the trend in oxidising power of the halogens from F_2 to I_2. **(3)**

(b) Iodine can be prepared industrially by oxidising iodide ions in brine using chlorine gas. Write the ionic equation for this reaction, and use oxidising power to explain why chlorine, but not iodine, can perform this oxidation. **(3)**

(c) Explain why fluorine is not used in this type of displacement reaction to prepare I_2 or Br_2 from aqueous halide solutions, even though F_2 is by far the strongest oxidising agent in the group. **(2)**

(Total for Question 1 is 8 marks)

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Mark scheme · 2.6 The Periodic Table and Inorganic Chemistry: 10-minute Pack

Question 1

(a) atomic radius increases down the group **B1**

(a) so the incoming electron (during reduction, X2 + 2e- -> 2X-) is added at a greater distance from the nucleus and is more shielded by inner electron shells, oe **B1**

(a) the electrostatic attraction between the nucleus and the incoming electron is therefore weaker, so oxidising power (the tendency to gain electrons) decreases down the group, oe **B1**

(a) Answer: Oxidising power decreases down the group as atomic radius and shielding increase.

(b) $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ **B1**

(b) chlorine, being higher up the group with a smaller atomic radius, has a stronger oxidising power (greater tendency to gain electrons) than iodine, oe **B1**

(b) so Cl_2 is able to remove electrons from (oxidise) I^- ions, forming I_2 and Cl^-, whereas I_2, being a weaker oxidising agent, could not oxidise Cl^- in the reverse direction, oe **B1**

(b) Answer: $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$; chlorine is a stronger oxidising agent than iodine.

(c) F_2 reacts directly and violently with water itself (e.g. oxidising water to oxygen), rather than remaining available to oxidise the halide ions in solution, oe **B1**

(c) so F_2 cannot be used as a simple aqueous displacement reagent in the way that Cl_2 and Br_2 can, oe **B1**

(c) Answer: F_2 reacts with water itself, so it cannot be used as an aqueous displacement reagent.

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