HL Questions on Trends across period 3

1. Explain why magnesium oxide, MgO, aluminium oxide, Al_2O_3 and magnesium chloride, $MgCl_2$, have high melting points and conduct electricity when molten whereas aluminium chloride, $AlCl_3$, which is a solid at room temperature, has a much lower melting point and does not conduct electricity when molten.

2. Sulfur trioxide, SO_3, melts at 17 ^oC and boils at 45^oC. Explain why molten sulfur trioxide does not conduct electricity and yet a solution of sulfur trioxide in water is a good conductor of electricity.

3. The chlorides in which the elements of period 3 have their highest oxidation state are:

$NaCl$, $MgCl_2$, $AlCl_3$, $SiCl_4$, PCl_5, SCl_6, Cl_2

Iodine can form an interhalogen compound IF_7. Suggest a reason why chlorine cannot form $ClCl_7$.

4. (a) State the equation for the reaction of silicon tetrachloride with water

(b) Carbon and silicon are both in group 4.

Suggest a reason why tetrachloromethane, CCl_4 does not react with water.

5. Sodium chloride and magnesium chloride are both ionic and both are soluble in water. Explain why sodium chloride forms a neutral solution in water whereas a solution of magnesium chloride is slightly acidic.

6. State the equations for the reactions of phosphorus trichloride, PCl_3, and phosphorus pentachloride, PCl_5, with water. Suggest a reason why both reactions are strongly exothermic.

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