

Chemguide – questions

PERIOD 3: PROPERTIES OF THE CHLORIDES

- Sodium chloride is a high melting point solid which dissolves in water to make a colourless solution. Silicon(IV) chloride is a liquid at room temperature which fumes in moist air, and reacts violently with water.
 - Draw a diagram to show the arrangement of the particles in solid sodium chloride, making clear exactly what particles you are talking about.
 - Explain why this arrangement leads to a high melting point.
 - Draw a simple diagram to show the structure of silicon(IV) chloride, and explain why silicon(IV) chloride is a liquid at room temperature.
 - Why is there such a big difference between the chlorides of sodium and silicon?
 - Briefly describe and explain the difference in electrical conductivity between sodium chloride and silicon(IV) chloride.
 - Write an equation to show what happens when silicon(IV) chloride reacts with water.
 - Name another Period 3 chloride which behaves similarly to sodium chloride, and one which behaves similarly to silicon(IV) chloride.
- Aluminium chloride changes its structure on heating. At room temperature the aluminium is 6-coordinated - each aluminium is surrounded by 6 chlorines. The structure is essentially ionic although with a high degree of covalent character. At about 180°C, its structure changes and the aluminium becomes 4-coordinated.
 - Write the formula, and draw the electronic structure of the form of aluminium chloride at 180°C. (Show outer electrons only.)
 - What effect does this change have on the physical properties of the aluminium chloride? Explain your answer.
 - The structure changes again at higher temperatures. Write an equation to show that change.
 - The reaction of aluminium chloride with an excess of water could be written as
$$\text{AlCl}_{3(s)} + 6\text{H}_2\text{O(l)} \longrightarrow [\text{Al}(\text{H}_2\text{O})_6]^{3+}_{(aq)} + 3\text{Cl}^{-}_{(aq)}$$
The solution formed is acidic. Explain why that is.
 - If you only add a small amount of water to some solid aluminium chloride, you get a vigorous reaction with some steamy fumes given off. Explain what is happening.

Chemguide – questions

3. Phosphorus(V) chloride is a white solid which sublimes at 163°C .
- In the solid, the compound contains ions. Write the formulae for the ions it contains.
 - At the sublimation point, the structure is simple covalent PCl_5 molecules, but these go through a further change as temperature increases. Write the equation for that change.
 - In the reactions of the covalent Period 3 chlorides with water, there is one observation that is common to all of them. What is it?
 - Write the equation for the reaction of phosphorus(III) chloride and water.

You might, of course, be asked all sorts of other questions on this topic in varying amounts of detail depending on your examiners. The best way of preparing for this is by doing past papers for your particular syllabus, and checking your answers against the mark schemes and examiner's reports.