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WORKSHEET 8

School: **Ba Sangam College** Subject: **Chemistry**
Year: **12** Name:

Strand	**4 Materials**
Sub strand	**4**.1 Inorganic Chemistry
Content Learning Outcome	Investigate the properties and reactions of chlorides of elements.

Chlorides of Period 3 elements

i. Sodium chloride (NaCl)

- White solid at 20 °C. mPT is 801 °C.
- Has ionic bonds and a giant array of sodium and chloride ions (ionic lattice).
- A conductor of electricity in solution and molten form but not in solid state.
- Dissolves readily in water to form sodium and chloride ions (neutral solution).
- $NaCl(aq) \rightarrow Na+(aq) + Cl^-(aq)$

ii. Magnesium chloride (MgCl2)

- White solid at 20 °C. mPT is 712 °C.
- Has ionic bonds and a giant array of magnesium and chloride ions (ionic lattice).
- A conductor of electricity in solution and molten form but not in solid state.
- Dissolves readily in water to form magnesium and chloride ions. The solution is slightly acidic.
- $MgCl2(aq) \rightarrow Mg^{2+(}aq) + 2Cl^-(aq)$

iii. Aluminum chloride (AlCl3)

- White solid at 20 °C. mPT is 180 °C.
- Has an ionic lattice but with a lot of covalent character at room temperature.
- A very poor conductor of electricity in molten form.
- Aluminum chloride reacts dramatically with small amounts of water producing heat and hydrogen chloride fumes. $AlCl_3(s) + H2O(l) \rightarrow AlCl_2OH(s) + HCl(g)$

iv. Silicon tetrachloride ($SiCl_4$)

- Colorless liquid at 20 °C.mPT is 68 °C.
- Has covalent bonds and simple molecular structure.
- It does not conduct electricity.
- Reacts violently with small amounts of water producing heat and hydrogen chloride fumes.
- $SiCl_{4(l)} + 4H_2O_{(l)} \rightarrow Si(OH)_{4(s)} + 4HCl_{(g)}$

. **v. Phosphorous trichloride (PCl3)**

- A colorless fuming liquid at 20 °C.Melting point is -91 °C.
- Has covalent bonds with simple molecular structure.It does not conduct electricity.
- It reacts violently with water to produce phosphorous acid (acidic solution) and fumes of hydrogen chloride. $PCl3(l) + 3H2O(l) \rightarrow H3PO3\ (aq) + 3HCl(g)$

vi. Sulphur dichloride (SCl2)

- Cherry red liquid at 20 °C. mPT is -80 °C.
- Has covalent bonds with simple molecular structure. Is a non-conductor of heat and electricity.
- It reacts violently with water to form HCl (acidic solution) and sulphur dioxide.
- $SCl_2\ (l) + H_2O\ (l) \rightarrow SO_2\ (g) + HCl\ (aq)$

vii. Chlorine (Cl_2)

- Greenish yellow gas at 20 °C. mPT is -101 °C.

- Has covalent bonds with simple molecular structure. Non-conductor of heat and electricity.
- Reacts with water to form hypochlorous and hydrochloric acids. $Cl_{2(g)} + H_2O_{(l)} \rightarrow HClO_{(aq)} + HCl_{(aq)}$

Activity

1. Most of the oxides of non-metallic elements are

A. ionic and basic.
B. ionic and acidic.
C. covalent and basic.
D. covalent and acidic. (1 mark)

2. Which of the following chlorides gives a neutral solution when added to water?

I NaCl II AlCl3 III PCl3

A. I only. B. I and II only. C. II and III only. D. I, II and III. (1 mark)

3. Describe the trend in bond type and the nature of the chlorides of Period 3 elements.

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_____ (2 marks)

4. State the trend in the melting points of Period 3 chlorides. Give explanations for the suggested trend.

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_____(2 marks)

5. The properties of two compounds of an element Q from Period 3 are given in the table below.

	State at 25°C	Structure	Effect of adding water
Oxide of Q	Solid	Ionic lattice	Dissolves in water; forms alkaline solution.
Chloride of Q	Solid	Ionic lattice	Dissolves in water; forms a neutral solution.

i. What is the identity of element Q?

_____ (1 mark)

ii. Justify your answer in i above with suitable explanation and equations.

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_____ (2 marks)

5. Which of the following chlorides has the lowest melting point?

A. NaCl B. PCl3
C. SiCl4 D. MgCl2 (1 mark)

Summary

General trends in the chlorides of Period 3 elements:

1. Bonding and structure
Ionic (lattice) → covalent (simple molecular)

2. Melting Point
High → low (decreases across the period)

3. Nature
Neutral → acidic

4. Conductivity
Conductor to non-conductor

5. State
Solid → liquid → gas