3055 BA SANGAM COLLEGE

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WORKSHEET 7

School: Ba Sangam College **Year:** 13
Subject: Chemistry **Name:**

Strand	**4 - Materials**
Sub strand	**4.1- Inorganic Chemistry**
Content Learning Outcome	**-Investigate the properties and reactions of hydrides, oxides and chlorides.**

Hydrides

-is a chemical compound in which hydrogen is combined with another element. Eg; NaH, MgH_2.

Classification of Hydrides

1. Ionic Hydrides

- Ionic hydrides are formed when the hydrogen anion (H^-) reacts with the very active elements, such as the Group I elements and some Group II elements.
- Ionic hydrides have ionic lattice structure where the positive and negative ions are held together by strong electrostatic forces of attraction.

Examples of Ionic Hydrides

Formula	Name	Formation Equations
LiH	Lithium hydride	$2Li_{(s)} + H_{2(g)} \rightarrow 2LiH_{(s)}$
BeH_2	Beryllium hydride	$Be_{(s)} + H_{2(g)} \rightarrow BeH_{2(s)}$
NaH	Sodium hydride	$2Na_{(s)} + H_{2(g)} \rightarrow 2NaH_{(s)}$
MgH_2	Magnesium hydride	$Mg_{(s)} + H_{2(g)} \rightarrow MgH_{2(s)}$

Ionic Hydrides of some Period 2 and 3 Elements

LiH (Lithium hydride)

- Colourless to grey solid.
- Has an ionic lattice structure.
- Has high melting point (around 692 °C).
- Good conductor of electricity in molten state.
- Is basic in nature.
- Reacts with water to form basic solution.

$$LiH_{(s)} + H_2O_{(l)} \rightarrow LiOH_{(aq)} + H_{2(g)}$$

BeH_2 (Beryllium hydride)

- Amorphous white solid.
- Has an ionic lattice structure.
- Has high melting point (around 250 °C).
- Good conductor of electricity in molten state.
- Is basic in nature.
- Reacts with water to form basic solution.

$$BeH_{2(s)} + 2H_2O_{(l)} \rightarrow Be(OH)_{2(aq)} + 2H_{2(g)}$$

NaH (Sodium hydride)

- White or grey solid.
- Has an ionic lattice structure.
- Has high melting point (around 300 °C).
- Good conductor of electricity in molten state.

- Is basic in nature.
- Reacts with water to form basic solution.

$NaH_{(s)} + H_2O_{(l)} \rightarrow NaOH_{(aq)} + H_{2(g)}$

MgH_2 (Magnesium hydride)

- White crystals.
- Has an ionic lattice structure.
- Has high melting point (around 285 °C).
- Good conductor of electricity in molten state.
- Is basic in nature.
- Reacts with water to form basic solution.

$MgH_{2(s)} + 2H_2O_{(l)} \rightarrow Mg(OH)_{2(aq)} + 2H_{2(g)}$

Physical Properties of Ionic Hydrides	Chemical Properties of Ionic Hydrides (Reaction with water)
• Thermally very stable. • Have high melting and boiling points. • Solids at room temperature. • Conductors of electricity in molten state (electrolytes). • Soluble in water and insoluble in organic compounds.	• Ionic hydrides react with water to produce hydrogen gas and form basic solutions. • Violent reactions with water are utilised in ionic hydrides being used as drying agents where traces of water need to be removed.

2. Covalent Hydrides

- Covalent hydrides are formed by the reaction of hydrogen with non-metals.
- Most covalent hydrides have simple molecular structure where the molecules are held together by weak van der-waals forces of attraction.

Examples of Covalent Hydrides

Formula	Name	Formation Equations
CH_4	Methane	$C_{(s)} + 2H_{2(g)} \rightarrow CH_{4(g)}$
NH_3	Ammonia	$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
HF	Hydrogen fluoride	$F_{2(g)} + H_{2(g)} \rightarrow 2HF_{(g)}$
PH_3	Phosphorous hydride	$2P_{(s)} + 3H_{2(g)} \rightarrow 2PH_{3(g)}$
H_2S	Hydrogen sulphide	$S_{(s)} + H_{2(g)} \rightarrow H_2S_{(g)}$

Exercise

1. Fill in the blanks.

a. When a hydrogen atom gains an electron, it ends up with two electrons in its outer energy level and thus is called a_____. **(1 mark)**

b. Hydrogen fluoride has a/an _____ bond and its chemical formula is _____. **(1 mark)**

c. A hydride that contains a hydrogen bonded to a lesser electronegative element is known as a/an _____hydride. **(1 mark)**

2. What type of hydrides are made up of cations and hydrogen anions?

_____

_____ **(1 mark)**

3. Which of the following molecules would be most polar?

A. H_2 B. HF C. HCl D. HBr **(1 mark)**

4. Suggest reasons for the following.

The boiling point of CH_4 is much lower than that of HF.

_____ **(1 mark)**