# Hydrogen and It's Compounds

## Question1

**Oxidation state of hydrogen in compound $X$ is -1 and in compound $Y$ is $+1$. $X$ and $Y$ are respectively**

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**Options:**

A.

$LiAlH_4, H_2O$

B.

$NH_3, NaH$

C.

$CH_4, H_2O$

D.

$H_2S, NaBH_4$

**Answer: A**

## Solution:

$LiAlH_4 =$ Total charge $= 0$

Li oxidation number $= +1$

Al oxidation number $= +3$

$$1 + 3 + x \times 4 = 0$$
$$x = -1$$

$H_2O = 2 \times x - 2 = 0, x = +1$

Hence, $X = LiAlH_4, Y = H_2O$

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# Question2

## Identify the pair of hydrides which have polymeric structure

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**Options:**

A. $LiH, NaH$

B. $BeH_2, MgH_2$

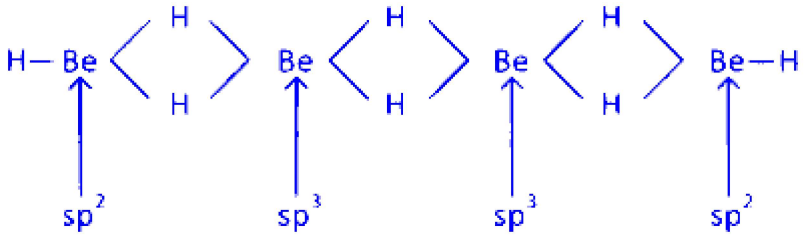
C. $NH_3, CH_4$

D. $B_2H_6, H_2O$

**Answer: B**

## Solution:

$BeH_2$ and $MgH_2$ have polymeric structure. Polymeric structure are those materials/compounds that are made up of long chain repeating molecules.




Same structure is for $MgH_2$.

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# Question3

## The proper conditions of storing $H_2O_2$ are

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**Options:**

A. placing in wax lined plastic bottle and kept in dark

B. placing in wax lined plastic bottle and exposed to light

C. placing in wax lined plastic bottle containing traces of base

D. placing in metal vessel and exposed to light

**Answer: A**

## Solution:

Hydrogen peroxide ($H_2O_2$) is decomposed by the rough surface of glass, alkali oxide present in it and light. Therefore, to prevent its decomposition $H_2O_2$ is usually stored in waxed lined plastic bottle and kept in dark.

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# Question4

### Observe the following reactions (not balanced)

$$BF_3 + LiAlH_4 \xrightarrow{(C_2H_5)_2O} X + LiF + AlF_3$$
$$X + NaH \longrightarrow Y$$

### The incorrect statement about $Y$ is

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**Options:**

A. it is a good oxidising agent.

B. it is a good reducing agent.

C. oxidation state of hydrogen in it is -1 .

D. oxidation of it with iodine gives diborane.

**Answer: A**

## Solution:

The complete reaction is as follows.

$$4BF_3 + 3LiAlH_4 \longrightarrow \underset{\substack{\text{(Product}\\ \text{Diborane}}}{2\,B_2H_6} \quad \underset{X\ )}{} + 3AlF_3 + 3LiF$$

$$B_2H_6 + 2NaH \longrightarrow \underset{\text{(Product } Y\text{)}}{2NaBH_4}$$
Sodium tetrahydroborate

It is a good reducing agent.

Oxidation state of H in $NaBH_4$ is -1 .

[ $Na = +1,\ B = +3$ oxidation state ]

$[1 + 3 + 4x = 0$ then $x = -1]$

Hence, option (a) is incorrect about compound $Y$,

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# Question5

## The dihedral angles in gaseous and solid phases of $H_2O_2$ molecule respectively are

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**Options:**

A. $90.2^\circ, 111.5^\circ$

B. $111.5^\circ, 90.2^\circ$

C. $101.9^\circ, 94.8^\circ$

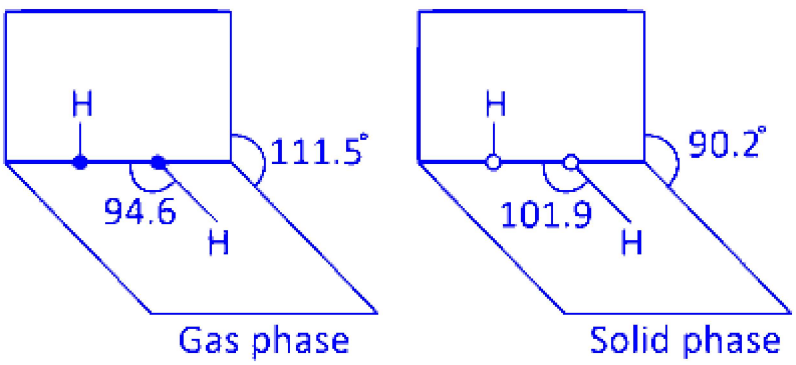
D. $94.8^\circ, 101.9^\circ$

**Answer: B**

## Solution:

$H_2O_2$ structure in gas phase, dihedral angle is $111.5^\circ$.

$H_2O_2$ structure in solid phase, dihedral angle is $90.2^\circ$.



# Question6

**Consider the following statements about the hydrides.(I) Sodium hydride with water liberates oxygen gas.(II) Methane, silane are examples of electron precise hydrides.(III) Ammonia and water molecules are examples of electron deficient hydrides.(IV) Hydrides of beryllium and magnesium are polymeric in structure.The correct statements are**

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**Options:**

A. I and II only

B. III and IV only

C. II and IV only

D. I and IV only

**Answer: C**

## Solution:

Statements II and IV are correct, while statements I and III are incorrect. Here are the corrected versions of statements I and III:

**I.** Sodium hydride reacts with water to release hydrogen gas:

$$NaH(s) + H_2O(aq) \longrightarrow NaOH(aq) + H_2(g)$$

**III.** Ammonia and water molecules are examples of electron-rich compounds.

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# Question7

**Match the following.**

| | List-I(Substance) | List-II(Use) |
|---|---|---|
| (A) | $Na_2O_2$ | I. Photoelectric cells |
| (B) | $D_2O$ | II. Antacid |
| (C) | Cs | III. Oxidising agent |
| (D) | $Mg(OH)_2$ | IV. Moderator |

**The correct answer is**

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**Options:**

A. A-III, B-IV, C-I, D-II

B. A-IV, B-III, C-II, D-I

C. A-III, B-IV, C-II, D-I

D. A-II, B-IV, C-I, D-III

**Answer: A**

# Solution:

The correct match is A – III, B · IV, C-I, D-II..

| | List-I (Substance) | List-II (Use) |
|---|---|---|
| (A) | $Na_2O_2$ | III. Oxidising agent |
| (B) | $D_2O$ | IV. Moderator |
| (C) | Cs | I. Photoelectric cells |
| (D) | $Mg(OH)_2$ | II. Antacid |

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