

CHEMISTRY-1

Hydrogen

[Set-1]

SECTION-A

- Which of the following metal will liberate H_2 gas on reaction with acid as well as with $NaOH$?
 (i) Al (ii) Zn (iii) Fe (iv) Cu
- In which of the following reactions hydrogen peroxide is acting as a reducing agent?
 (i) $SO_2 + H_2O_2 \longrightarrow H_2SO_4$ (ii) $2KI + H_2O_2 \longrightarrow 2KOH + I_2$
 (iii) $PbS + 4H_2O_2 \longrightarrow PbSO_4 + 4H_2O$ (iv) $Ag_2O + H_2O_2 \longrightarrow 2Ag + H_2O + O_2$
- Which of the following hydride is an electron deficient hydride?
 (i) NH_3 (ii) NaH (iii) B_2H_6 (iv) All of these
- The pure hydrogen of 99.9% purity can be made by
 (i) mixing natural hydrocarbons of high molecular mass
 (ii) Electrolysis of acidified water
 (iii) Bosch's process
 (iv) Reaction of methane with steam

5. Match the following:

Column-I

(Hydrides)

- A. $LiAlH_4$
 B. SiH_4
 C. NH_3
 D. BeH_2

Column-II

(Nature)

- Electron deficient covalent hydride
- Electron rich covalent hydride
- Electron precise covalent hydride
- Ionic hydride
- Electron precise molecular hydride

	A	B	C	D
(i)	4	5	1	2
(ii)	4	3	2	1
(iii)	3	4	1	2
(iv)	4	5	2	1

Assertion-Reason type Questions:

- (a) Both A and R are true and R is the correct explanation of A
 (b) Both A and R are true and R is not the correct explanation of A
 (c) A is true but R is false
 (d) A is false but R is true
6. A: The decomposition of H_2O_2 into water and oxygen is a disproportionation reaction.
 R: Hydrogen peroxide is less volatile than water
7. A: Electrolysis of molten hydrolith produces hydrogen gas at anode
 R: In hydrolith, hydrogen is present as H^- ion.

Passage based questions:

H_2O_2 is miscible with water in all proportions and form a hydrate $\text{H}_2\text{O}_2 \cdot \text{H}_2\text{O}$. A 30% solution of H_2O_2 is marketed as 100 volume H_2O_2 . It means that one milliliter of 30% H_2O_2 solution will give 100 V of O_2 at STP. Commercially, it is marketed as 10V. H_2O_2 can act as an oxidizing agent as well as reducing agent. H_2O_2 has a non planar structure in the gas phase as well as in the solid state. H_2O_2 used as a bleaching agent.

8. In the hydrogen peroxide hydrate $\text{H}_2\text{O}_2 \cdot \text{H}_2\text{O}$, the bonding between the H_2O_2 and H_2O is ___bonding
 (i) covalent (ii) ionic
 (iii) hydrogen (iv) coordinate covalent
9. In which of the following reaction, H_2O_2 act as an oxidizing agent?
 (i) $2\text{Fe}^{2+} + \text{H}_2\text{O}_2 \longrightarrow 2\text{Fe}^{3+} + 2\text{OH}^-$ (ii) $\text{PbS} + 4\text{H}_2\text{O}_2 \longrightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$
 (iii) $2\text{Fe}^{2+} + 2\text{H}^+ + \text{H}_2\text{O}_2 \longrightarrow 2\text{Fe}^{3+} + 2\text{H}_2\text{O}$ (iv) In all of these
10. The strength of 10V solution of hydrogen peroxide is
 (i) 15.18 g/L (ii) 3.29 g/L (iii) 30.36 g/L (iv) 32.9 g/L

SECTION-B

11. Complete the following reactions:
 (i) $\text{CO(g)} + \text{H}_2\text{(g)} \xrightarrow[\text{Catalyst}]{\text{Heat}}$
 (ii) $\text{Ca}_3\text{N}_2\text{(s)} + \text{H}_2\text{O(l)} \longrightarrow$
12. Arrange the following in order of increasing property indicated:
 (i) LiH, NaH and CsH (ionic character)
 (ii) H - H, D - D and F - F (bond dissociation enthalpy)

OR

What is the difference between the terms 'hydration' and 'hydrolysis'? Explain with examples.

13. Give reason:

- (i) Anhydrous BaO_2 is not used for preparation of H_2O_2
- (ii) Beryllium hydride is covalent while calcium hydride is an ionic hydride.
- (iii) Conc. H_2SO_4 on reaction with Zn does not liberate hydrogen gas.

OR

- (i) Give one reaction in which dihydrogen acts
 - (a) as an oxidising agent
 - (b) as a reducing agent.
 - (ii) Name one property in which hydrogen differs from both alkali metals and halogen?
14. Distinguish between
- (i) hard and soft water
 - (ii) temporary and permanent hardness.
15. (i) Write equations for the following reactions:
- (a) A solution of 2-ethylanthraquinol in a mixture of benzene and cyclohexane is oxidized.
 - (b) H_2O_2 is treated with acidified ferrous sulphate
- (ii) Explain
- (a) H_2O_2 has a higher boiling point than water
 - (b) H_2O_2 can be stored in wax lined glass vessels in dark.
 - (c) Density of ice is less than that of water.

OR

- (i) What do you understand by the term 'non-stoichiometric hydrides'? Do you expect this type of the hydrides to be formed by alkali metals? Justify your answer.
- (ii) How many hydrogen-bonded water molecule (s) are associated in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
- (iii) How does the atomic hydrogen or oxy-hydrogen torch function for cutting and welding purpose? Explain.