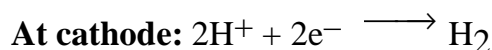
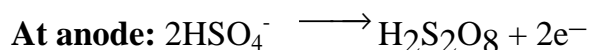


## HYDROGEN AND ITS COMPOUNDS

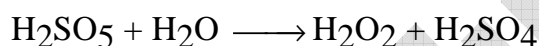
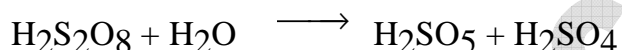
### Short Answer Questions:

1. Write any two methods for the preparation of  $\text{H}_2\text{O}_2$ ?

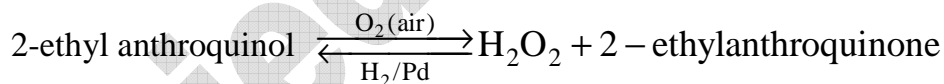
**Ans. I) Electrolytic Method:** Hydrogen peroxide is manufactured on a large scale by the electrolysis of 50% sulphuric acid using platinum anode and lead cathode followed by vacuum distillation. A current of high density is used for electrolysis. At cathode hydrogen gas is liberated and at anode peroxy disulphuric acid is formed.



i. On distillation Peroxydisulphuric acid undergoes hydrolysis to give hydrogen peroxide.



ii. Industrially  $\text{H}_2\text{O}_2$  is prepared by auto oxidation of 2-alkyl anthroquinone.

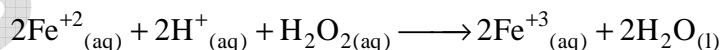


2. Write any two oxidising properties and two reducing properties of  $\text{H}_2\text{O}_2$  with equations.

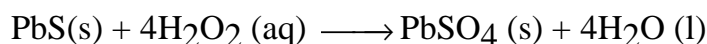
**Ans.**

#### Oxidising Properties:

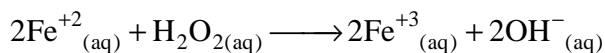
i. It oxidises ferrous salts to ferric salts in acidic medium.



ii. It oxidises black lead sulphide to white lead sulphate.

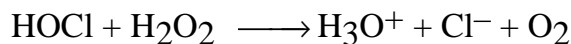


iii. . It oxidises ferrous salts to ferric salts in basic medium

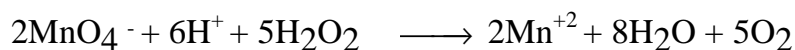


### Reducing Properties:

i. It reduces HOCl into  $\text{Cl}^{-}$ .



ii. It reduces acidified potassium permanganate to colourless  $\text{Mn}^{+2}$ .



iii. In alkaline solution it reduces potassium permanganate to manganese dioxide.



**3. What do you mean by hardness of water? Give the reactions in the Ion-exchange method.**

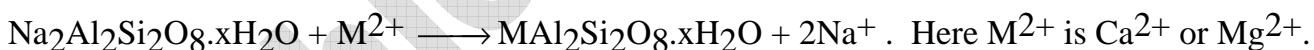
**Ans.** A sample of water which does not give good lather with soap is known as hard water.

**Hardness of water is of two types:**

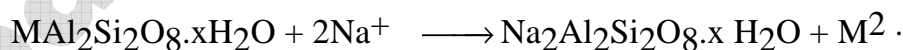
a) Temporary hardness (It is due to presence of bicarbonates of calcium and magnesium)

b) Permanent hardness. (It is due to presence of chlorides and sulphates of calcium and magnesium)

**permutit process :** Permutit is artificial zeolite. Chemically it is hydrated sodium aluminium orthosilicate ( $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot x\text{H}_2\text{O}$ ). Calcium and magnesium ions which cause hardness in water are replaced by sodium ions which do not cause hardness. Thus water is softened. This method is called "Ion- exchange process".



After some use, all the sodium ions in the permutit are replaced by  $\text{Ca}^{2+}$  or  $\text{Mg}^{2+}$  ions and then it is said that permutit is 'exhausted'. The exhausted permutit can be regenerated by soaking it with 10% brine ( $\text{NaCl}$  solution). Chemical reaction during the revival of exhausted permutit is given as



**Here:**  $\text{M}^{2+}$  is  $\text{Ca}^{2+}$  or  $\text{Mg}^{2+}$

**4. Write a few lines on the utility of hydrogen as fuel? (March 2013)**

**Ans.** i) Hydrogen is widely used as an industrial fuel as its heat of combustion is higher than other fuels like LPG, methane, petrol etc.

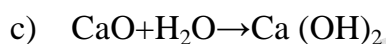
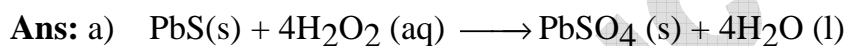
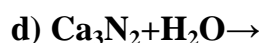
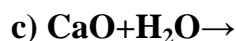
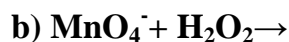
ii. Pollutants in combustion of Hydrogen are only the oxides of Nitrogen which are easily removed by injecting small amount of water in to Hydrogen cylinder. Thus it is a better fuel than petrol.

iii. It is used in Fuel cells for generating electricity.

iv. The atomic hydrogen and Oxy Hydrogen torch are used for welding purposes and for melting platinum metal and quartz.

v. Liquid hydrogen is used as rocket fuel.

**5. Complete and balance the following chemical equations:**



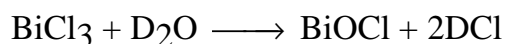
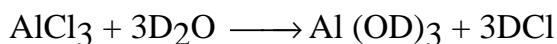
## Very Short Answer Questions

### 1. Write any two uses of D<sub>2</sub>O.

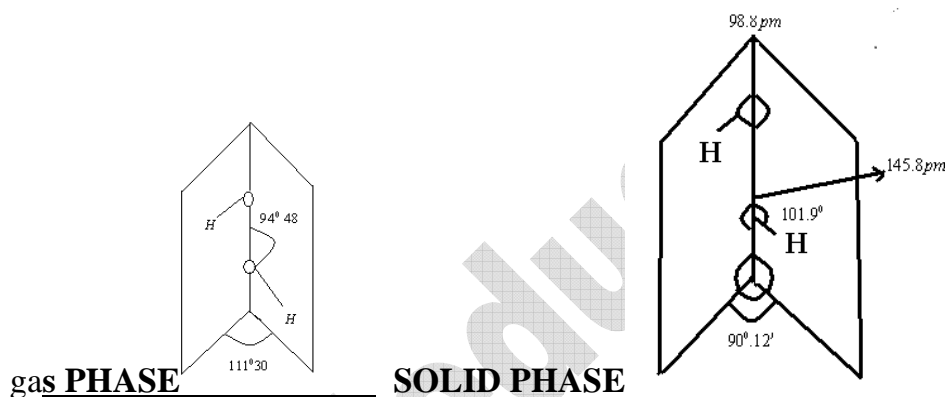
**Ans.** It is extensively used as moderator in nuclear reactors and in exchange reactions for studying reaction mechanisms

### 2. What is deuterolysis? Give an equation for Deuterolysis?

**Ans.** The reaction of salts with heavy water is called deuterolysis.



### 3. Draw the structure of H<sub>2</sub>O<sub>2</sub>.



### 4. Write any two modern uses of H<sub>2</sub>O<sub>2</sub>

**Ans.** 1. It is used in the manufacture of chemicals like sodium perborate and per carbonate which are useful in making high quality detergents.

2. It is used in manufacture of hydroquinone, tartaric acid and Pharmaceuticals (Cephalosprin).

### 5. What is perhydrol? Give its volume strength?

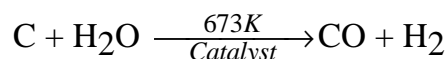
**Ans.** A 30(w/v) % solution of hydrogen peroxide is called as **perhydrol**. Its volume strength is '100 volumes'

**6. Give the melting point and boiling point of D<sub>2</sub>O?**

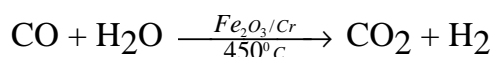
**Ans.** Freezing point of D<sub>2</sub>O is 3.82<sup>0</sup>C Or 276.82K and  
Boiling point is 101.42<sup>0</sup>C or 374.42K

**7. What is meant by coal gasification? Give relevant equation?**

**Ans.** The process of producing syngas from coal is called 'coal gasification'.

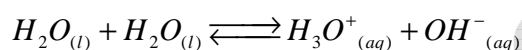


The production of hydrogen can be increased by reacting carbon monoxide of syngas mixture with steam in the presence of iron chromate as catalyst.



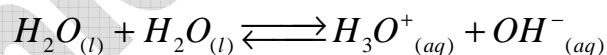
**8. What do you mean by autoprotolysis? Give the equation to represent the auto protolysis of water.**

**Ans.** The self ionisation of water is called auto protolysis.



**9. Water behaves as amphoteric substance in the bronsted sense? Explain.**

**Ans.** H<sub>2</sub>O has the ability to act as a Bronsted acid when dissolving alkalies and as a Bronsted base when an acid is dissolved in it. This is due to the autoprotolysis ,



**10). Explain the term "SYNGAS"?**

**Ans.** The mixture of CO and H<sub>2</sub> is called water gas or synthesis i.e. syngas. It is used as a fuel gas.