



Time : 1 Hour 15 Minute

STD 11 Science Chemistry
Chapter Based Test

Total Marks : 40

SECTION A*** Choose The Right Answer From The Given Options.[1 Marks Each] [6]**

- Why does H^+ always get associated with other atoms or molecules?
(A) Ionisation enthalpy of hydrogen resembles that of alkali metals.
(B) Its reactivity is similar to halogens.
(C) It resembles both alkali metals and halogens.
(D) Loss of an electron from hydrogen atom results in a nucleus of very small size as compared to other atoms or ions. Due to small size it cannot exist freely.
- Temporary hardness of water is due to the presence of:
(A) Magnesium bicarbonate (B) Calcium chloride
(C) Magnesium sulphate (D) Calcium carbonate
- Which of the following statements regarding protium, deuterium and tritium is not correct?
(A) They are isotopes of hydrogen.
(B) They have similar electronic configurations.
(C) They exist in the nature in the ratio of 1:2:3
(D) Their atomic masses are in the ratio of 1:2:3
- Which of the following statements are not true for hydrogen?
(A) It exists as diatomic molecule.
(B) It has one electron in the outermost shell.
(C) It can lose an electron to form a cation which can freely exist.
(D) It forms a large number of ionic compounds by losing an electron.
- Interstitial hydride can be formed by:
(A) Na (B) K (C) Fe (D) Ca
- A majority of farmers in India depend upon _____ for irrigating their crops:
(A) Rains (B) Tube wells
(C) Hand pumps (D) Canals

*** Answer The Following Questions In One Sentence.[1 Marks Each] [5]**

- Arrange the following:
 CaH_2 , BeH_2 and TiH_2 in order of increasing electrical conductance.
- Give an example of reaction in which H_2 acts as oxidising agent.
- Which out of nascent hydrogen and dihydrogen, is more reactive?

- Describe the bulk preparation of hydrogen by electrolytic method. What is the role of an electrolyte in this process?
- Why is the Ionisation enthalpy of hydrogen higher than that of sodium?

SECTION B

* Given Section consists of questions of 2 marks each.

[6]

- Can phosphorus with inter electronic configuration $3s^2 3p^3$ for PH_5 ?
Give reason.
- What happens when
 - Calcium phosphide is hydrolysed
 - Ammonia reacts with water
- Name three group of d-block elements which do not form hydride.
 - What happens when hypochlorous acid reacts with H_2O_2 ?

SECTION C

* Given Section consists of questions of 3 marks each.

[9]

- Why is water molecule polar?
- Calculate strength of 20 Vol. of H_2O_2 .
 - Give one example in which it act as oxidizing and reducing agent in basic median.
- How will you account for 104.5° bond angle in water?

SECTION D

* Case study based questions

[4]

- Read the passage given below and answer the following questions from 1 to 5.

The unusual properties of water in the Condensed phase (liquid and solid states) are Due to the presence of extensive hydrogen Bonding between water molecules. This leads To high freezing point, high boiling point, high Heat of vaporisation and high heat of fusion in Comparison to H_2S and H_2Se . In comparison To other liquids, water has a higher specific Heat, thermal conductivity, surface tension, Dipole moment and dielectric constant, etc. these properties allow water to play a key role In the biosphere. In the gas phase water is a bent molecule with a bond angle of 104.5° , and O-H bond length Of 95.7 pm

It is a highly polar molecule. Its orbital overlap. In the liquid Phase water molecules are associated together By hydrogen bonds. The crystalline form of water is ice. At Atmospheric pressure ice crystallises in the Hexagonal form, but at very low temperatures It condenses to cubic form.

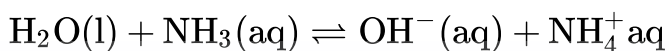
Density of ice is Less than that of water. Therefore, an ice cube Floats on water. In winter season ice formed On the surface of a lake provides thermal Insulation which ensures the survival of the Aquatic life. This fact is of great ecological Significance. Structure of Ice Ice has a highly ordered three dimensional Hydrogen bonded structure.

Examination of ice crystals with X-rays shows that each oxygen atom is Surrounded tetrahedrally by four other oxygen Atoms at a distance of 276 pm.

Hydrogen bonding gives ice a rather open Type structure with wide holes. These holes can Hold some other molecules of appropriate size Interstitially.

Water reacts with a large number of Substances. Some of the important reactions Are given below.

Amphoteric Nature: It has the ability to act as an acid as well as a base i.e., it behaves As an amphoteric substance. In the Brönsted Sense it acts as an acid with NH_3 and a base with H_2S .



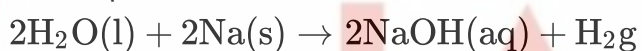
The auto protolysis (self-ionization) of water takes place as follow:



acid-1 base-2 (acid-2) base-1

(acid) (base) (conjugate acid) (conjugate base)

Redox Reactions Involving Water: Water Can be easily reduced to dihydrogen by highly Electropositive metals.

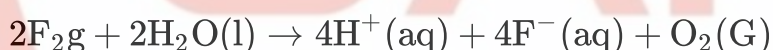


Thus, it is a great source of dihydrogen.

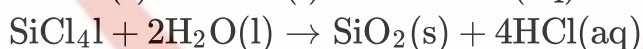
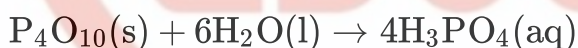
water is oxidised to O_2 during photosynthesis.



With fluorine also it is oxidised to O_2 .

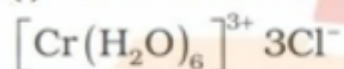


Hydrolysis Reaction: Due to high Dielectric constant, it has a very strong Hydrating tendency. It dissolves many ionic Compounds. However, certain covalent and Some ionic compounds are hydrolysed in water.



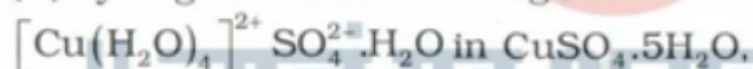
Hydrates Formation: From aqueous Solutions many salts can be crystallised as Hydrated salts. Such an association of water is of different types viz., Coordinated water e.g.,

(i) coordinated water e.g.,



(ii) interstitial water e.g., $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$

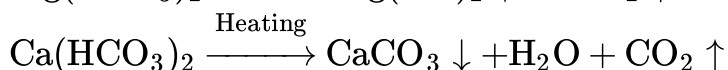
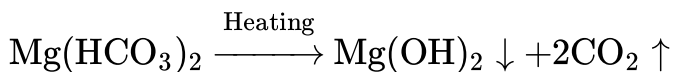
(iii) hydrogen-bonded water e.g.,



Hard and Soft Water- Rain water is almost pure (may contain some Dissolved gases from the atmosphere). Being a Good solvent, when it flows on the surface of The earth, it dissolves many salts. Presence of Calcium and magnesium salts in the form of Hydrogencarbonate, chloride and sulphate in Water makes water 'hard'. Hard water does Not give lather with soap. Water free from Soluble salts of calcium and magnesium is Called Soft water. It gives lather with soap Easily. Temporary hardness is due to the presence of Magnesium and calcium hydrogen- Carbonates. It can be removed by:
Boiling: During boiling, the soluble $\text{Mg}(\text{HCO}_3)_2$ is converted into insoluble $\text{Mg}(\text{OH})_2$ And $\text{Ca}(\text{HCO}_3)_2$ is changed to insoluble CaCO_3 . It is because of high solubility product of

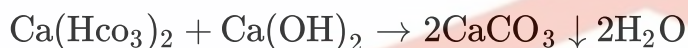
Mg(OH)₂ as compared to that of MgCO₃, that Mg(OH)₂ is precipitated. These precipitates can be removed by filtration. Filtrate thus obtained

Will be soft water.



Clark's method: In this method calculated amount of lime is added to hard water. It precipitates out calcium carbonate and magnesium hydroxide which can be filtered off.

Permanent hardness is due to the presence of soluble salts of magnesium and calcium in the form of chlorides and sulphates in water. Permanent hardness is not removed by boiling.



Permanent hardness is due to the presence of soluble salts of magnesium and calcium in the form of chlorides and sulphates in water. Permanent hardness is not removed by boiling.

- i. In the gas phase water is a bent molecule with a bond angle of:
 - a. 104.5°
 - b. 94.5°
 - c. 110.5°
 - d. 95.5°
- ii. At atmospheric pressure ice crystallises in the ... form.
 - a. Cubic
 - b. Hexagonal
 - c. Octagonal
 - d. Pentagonal
- iii. Water free from soluble salts of calcium and magnesium is called ...
 - a. hard water
 - b. dry water
 - c. soft water
 - d. None of above
- iv. Water has.... Nature.
 - a. acidic
 - b. basic
 - c. neutral
 - d. amphoteric
- v. Water is.... Molecule.
 - a. Polar
 - b. Non-Polar
 - c. Ionic
 - d. All the above

SECTION E

* Given Section consists of questions of 5 marks each.

[10]

1. Calculate the strength of 5 volume H₂O₂.
2. Write chemical reactions to justify that hydrogen peroxide can function as an oxidising as well as reducing agent.



॥ ज्ञानं एव श्रमस्य पुंजः ॥