



## CHEMISTRY

# FOR IIT JEE ASPIRANTS OF CLASS 11 FOR CHEMISTRY

## HYDROGEN & ITS COMPOUCDS

### Example

1. One litre of a sample of hard water contains 1 mg of  $\text{CaCl}_2$  and 1 mg of  $\text{MgCl}_2$ . Find the total hardness of water in terms of parts of  $\text{CaCO}_3$  per  $10^6$  parts of water by mass.





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2.  $25\text{mL}$  samples of distilled water, tap water and boiled water required, respectively,  $1\text{mL}$ ,  $13\text{mL}$  and  $5\text{mL}$  of soap solution to form a permanent lather. The ratio of temporary to permanent hardness in the tap water is



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3. Washing soda ( $\text{Na}_2\text{CO}_{3.10}\text{H}_2\text{O}$ ) is widely used in softening of hard water. If  $1\text{L}$  of hard water requires  $0.0143\text{g}$  of washing soda, what is hardness of water in terms of *ppm* of  $\text{CaCO}_3$ ?



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4. 100g of a water samples is found to contain 12 mg of  $MgSO_4$  calculate the hardness of water sample.

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5. One litre of a sample of hard water contains 1 mg of  $CaCl_2$  and 1 mg of  $MgCl_2$ . Find the total hardness of water in terms of parts of  $CaCO_3$  per  $10^6$  parts of water by mass.

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6. When water is dropped over sodium peroxide, the colorless gas produced is

A. Di Nitrogen

B. Di Hydrogen

C. Di oxygen

D.  $H_2O_2$

**Answer: A**

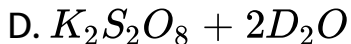
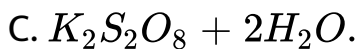


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7. Which of the following statements is incorrect for hydrogen peroxide ?

A. Ice cold 50%  $H_2SO_4$ .

B. Prolonged electrolysis of alkaline water



**Answer: C**

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8. Lead pipes are not used for carrying drinking water because

- A. They are covered with a coating of lead carbonate
- B. They are corroded by air and moisture
- C. Water containing dissolved air attacks lead forming soluble hydroxide.

D. All these are reasons

**Answer: B**

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9.  $x$  g of  $H_2O_2$  requires  $100\text{mL}$  of  $M/5KMnO_4$  in a titration in a solution having  $pOH = 1.0$  Which of the following is / are correct?

A.  $MnO_4^-$  changes to  $Mn_4^{-2}$

B.  $Mn_4^{-2}$

C. The value of  $x$  is  $1.7\text{g}$ .

D. The value of  $x$  is  $0.34\text{g}$ .

**Answer: D**

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10. 100 mL of 0.01 M  $KMnO_4$  oxidised 100 mL  $H_2O_2$  in acidic medium. The volume of same  $KMnO_4$  required in strong alkaline medium to oxidise 100 mL of same  $H_2O_2$  will be:

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11. What is the strength in g per litre of a solution of  $H_2SO_4$ , 12 mL of which neutralized 15 mL of  $N/10NaOH$  solution?



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12. A bottle of  $H_2O_2$  is labelled as 10 vol  $H_2O_2$ . 112 mL of this solution of  $H_2O_2$  is titrated against 0.04 M acidified solution of  $KMnO_4$  the volume of  $KMnO_4$  in litre is



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13. 3.4g sample of  $H_2O_2$  solution containing  $x\%$   $H_2O_2$  by weight requires  $x$  mL of a  $KMnO_4$  solution for complete oxidation under acidic condition. The normality of  $KMnO_4$  solution is



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14. If  $100\text{mL}$  of acidified  $2\text{NH}_2\text{O}_2$  is allowed to react with  $\text{KMnO}_4$  solution till there is light tinge of purple colour, the volume of oxygen produced at  $\text{STP}$  is :

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## C U Q Hydrogen

1. The lightest element in the periodic table is

- A. Lithium
- B. Fluorine
- C. Hydrogen
- D. Helium

**Answer: B**

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2. The element or elements whose position is anomalous in the periodic table is

A. Hydrogen

B. Oxygen

C. Carbon

D. Nitrogen

**Answer: D**

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3. Write two similarities of hydrogen with alkali metals.

A. Nature of oxide

B. Valence electrons

C. Electro negative nature

D. Reducing character

**Answer: C**



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4. In which property listed below hydrogen does not resemble alkali metals ?

A. Tendency to form cation

- B. Nature to oxide
- C. Combination with halogens
- D. Reducing character

**Answer: B**

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5. Hydrogen resembles halogens in many respects for which several factors are responsible. Of the following factors which one is most important in this respect ?

- A. It contains one electron only in valency shell
- B. It is short of one electron to get inert gas configuration

C. It is a diatomic gas like all halogens

D. It exhibits color like halogens

**Answer: D**

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6. The hydrogen spectrum from an incandescent source of hydrogen is:

A.  $1312\text{KJ mole}^{-1}$

B.  $520\text{KJmole}^{-1}$

C.  $495\text{KJmol}^{-1}$

D.  $1681\text{KJmol}^{-1}$

**Answer: D**

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7. Coordination number of hydrogen in a hydrogen bond is

- A. Greater than inert gases
- B. Nearer to inert gases
- C. Nearer to Halogens
- D. Nearer to alkaline earth metals

**Answer: C**

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8. Which one of the following statement is incorrect

A. Hydrogen forms more compounds than any other element

B. H-has one electron short in comparison with octet configuration

C. The ionization enthalpy of H is 1312kJ/mol

D. Hydrogen is less reactive when compared with halogens

**Answer: B**



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9. Which one of the following statement is incorrect

- A. Dihydrogen is the most abundant element in the universe.
- B. Dihydrogen is the principal element in the solar atmosphere.
- C.  $H_2$  is much less abundant in the earth crust.
- D.  $H_2$  does not occur in plant and animal tissues

**Answer: B**



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10. Tritium is obtained by



A.  $\alpha$ -particle

B. Positron

C.  $\beta$ -particle

D. Neutron

**Answer: D**



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**11.** Radioactive elements emit  $\alpha$ ,  $\beta$  and  $\gamma$  rays and are characterised by their half-lives. The radioactive isotope of hydrogen is

A. Protium

B. Tritium

C. Deuterium

D. Proton

**Answer: B**



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**12.** The metal that cannot displace hydrogen from dil. HCl is

A. Al

B. Fe

C. Cu

D. Zn

**Answer: D**

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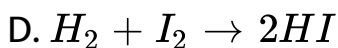
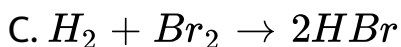
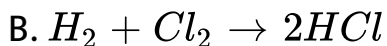
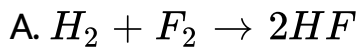
**13.** The conversion of atomic hydrogen into ordinary hydrogen is

- A. Exothermic change
- B. Endothermic change
- C. Nuclear change
- D. Photochemical change

**Answer: B**

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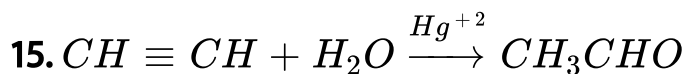
14. Which of the following reactions requires high temperature and catalyst ?



Answer: D



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The reaction is known as

A. Hydrogenation

B. Hydrofomylation

C. Carbonation

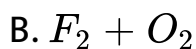
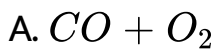
D. Decarboxylation

**Answer: B**



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**16.** Which of the following is used as rocket fuel?



D. liquid  $H_2 + O_2$

**Answer: D**

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17. During hydrogenation of oils the catalyst commonly used is

A. Pd on  $CuCl_2$

B. Fe

C. Ni

D.  $U_2O_5$

**Answer: C**



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18. Synthetic petrol is prepared by using a mixture.

- A. Coal gas +  $H_2$  gas
- B. Water gas +  $H_2$  gas
- C. Semi water gas
- D. Carburated water gas

**Answer: B**



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19. Which of the following statements are correct regarding hydrogen? (i) The largest single use of dihydrogen is in the synthesis of  $NH_3$  which is used in the manufacture of  $HNO_3$  and nitrogenous fertilizers. (ii) It is used to reduce heavy metal oxide (iii) It is used as rocket fuel. (iv) Atomic hydrogen and oxy hydrogen torches find use for cutting and welded to purpose.

A. i,iii

B. i,ii

C. i,ii,iv

D. i,ii,iii,iv

**Answer: D**





20. The temperature of \_\_\_\_\_ k is generated when atomic hydrogen is allowed to recombine on the surface to be welded.

- A. 400K
- B. 3000K
- C. 4600K
- D. 4000K

**Answer: D**



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21. Ionic hydrides are usually



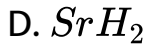
**Answer: C**



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22. Which of the following exists as polymeric chain in the solid state?





**Answer: B**



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**23.** The hypothesis that all photosynthetic organic require a source of hydrogen was give by



D.  $BaH_2$

**Answer: B**

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24. Di-hydrogen reduces CuO to

A.  $Cu_2O$

B.  $CuH_2$

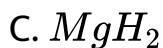
C.  $(CuH_2)$

D.  $Cu$

**Answer: D**

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25. Which of the following hydride have significant covalent character :



**Answer: B**



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26. Which of the following statements are correct about ionic hydrides ?

(i) Crystalline, non-volatile, non-conducting in solid state

(ii) Their melts conduct electricity

(iii) Hydrogen is liberated at anode when their melt is electrolysed

(iv) LiH is less reactive at moderate temperature

A. *i, iii*

B. *ii, iv*

C. *i, iii, iv*

D. *i, ii, iii, iv*

**Answer: D**



27. Law of constant composition doesnot hold good for

- A. Saline hydrides
- B. Interstitial Hydrides
- C. Covalent Hydrides
- D. Molecular Hydrides

**Answer: B**

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28. Which of the following is not correct about the hydrides of alkali metals ?

A. *Ni*

B. *Pd*

C. *Ce, Ac*

D. All

**Answer: D**



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**29.** How do you expect the metallic hydrides to be useful for hydrogen storage? Explain.

A. *Pd, Pt*

B. *Na, Li*



C. *W, Mo*

D. *Fe, Ru*

**Answer: A**



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**30.** Percentage of water present in oceans

A. 2.04

B. 6.2

C. 94.8

D. 97.3

**Answer: D**



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31. In ice, oxygen atom is surrounded-

- A. Square planar
- B. Tetrahedral
- C. Trigonal planar
- D. Angular

**Answer: B**



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32.  $H_2O$  acts as Bronsted acid in the following :

A. I only

B. I,II only

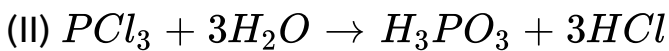
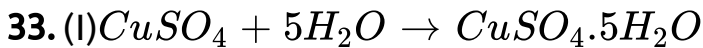
C. II,III only

D. I,II,III,

**Answer: D**



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The processes I and II are respectively

A. Hydration and dehydration

B. Hydration and Hydrolysis

C. Hydrolysis and Hydrolysis

D. Hydration and hydration.

**Answer: B**

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**34.** The temporary hardness of water is due to the presence of

A. Chlorides of Ca and Mg

B. Sulphates of Ca and Mg

C. Bicarbonates of Ca and Mg

D. Carbonates of Ca and Mg

**Answer: C**

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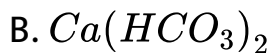
**35.** The permanent hardness of water is due to the presence of

- A. Sulphates and Chlorides of Ca and Mg
- B. Carbonates of Ca and Mg
- C. Bicarbonates of Ca and Mg
- D. Phosphates of Ca and Mg

**Answer: A**

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36. Which of the following substances cause permanent hardness of water



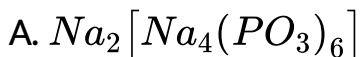
D. All of these

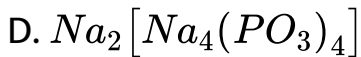
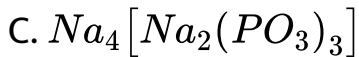
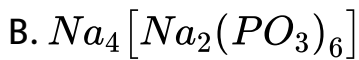
**Answer: A**



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37. Calgon (a water softener) is :



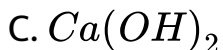
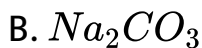


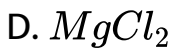
**Answer: A**



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**38.** The temporary hardness of water due to calcium bicarbonate can be removed by adding

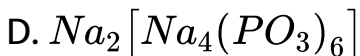
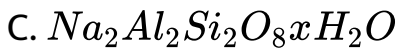
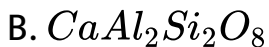
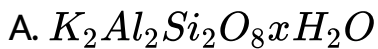




**Answer: C**

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**39.** The chemical formula of Zeolite is.....

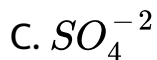


**Answer: C**

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40. When Zeolite (Hydrated sodium Aluminium silicate) is treated with hard water sodium ions are exchanged with ..... ions

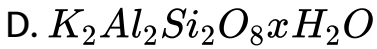
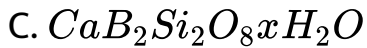
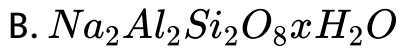
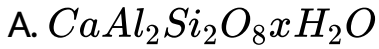


**Answer: B**



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41. The formula of exhausted pemutit is



**Answer: A**



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42. Permanent hardness in water cannot be cured by :

A. Washing soda method

B. Permutit method

C. Ion exchange method

D. Boiling

**Answer: D**



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**43.** Exhausted cation exchange resin is regenerated by using solution of moderately concentrated.

A.  $NaOH$

B.  $Na_2CO_3$

C.  $H_2SO_4$

D. Both 1& 2

**Answer: D**

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44. Exhausted anion exchange resin is resin by using solution of moderately concentrated.

A.  $NaOH$

B.  $Na_2CO_3$

C.  $H_2SO_4$

D.  $NaCl$

**Answer: C**

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45. De-ionized water is prepared by the following method :

A. Clark's

B. Ion exchange

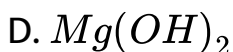
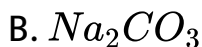
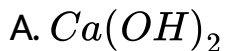
C. Permutit

D. Calgon

**Answer: B**

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46. Both temporary and permanent hardness is removed on boiling with



**Answer: B**



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47. The composition of electrolyte for the manufacture of calcium by electrolytic method is

A. *Conc. H<sub>2</sub>SO<sub>4</sub>*

B. Fused alkali

C. 50% *H<sub>2</sub>SO<sub>4</sub>*

D. 50% *aq. NaOH*

**Answer: C**



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**48.** In the laboratory, *H<sub>2</sub>O<sub>2</sub>* is prepared by the action of

A. 2-ethyl anthra quinone

B. 2-ethyl anthra quinol

C. p-benzo quinone

D. N-methyl aniline

**Answer: B**

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49. The action of  $H_2SO_4$  on KI gives  $I_2$  and  $H_2S$  Calculate the volume of  $0.2MH_2SO_4$  to produce  $3.4gH_2S$

- A.  $H_2S_2O_8$  at anode
- B.  $H_2SO_4$  at anode
- C.  $H_2SO_5$  at cathode
- D.  $H_2O_2$  at anode

**Answer: A**





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50.  $H_2O_2$  is :

A. Solid  $CO_2$  and ether

B. dil.  $H_2SO_4$

C. Quick lime

D.  $NaOH + CaO$

**Answer: A**



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51. What is the conc. Of  $H_2O_2$  obtained by auto oxidation process?

A. 50 %

B. 1 %

C. 30 %

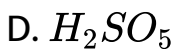
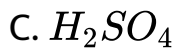
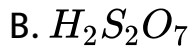
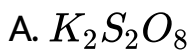
D. 85 %

**Answer: B**



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52. Write one chemical reactions for the preparation of  $D_2O_2$ .

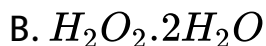
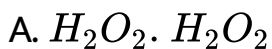


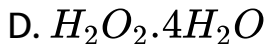
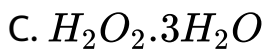
**Answer: A**



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**53.** Which of the following does not form a stable hydrate on addition of  $H_2O$  ?



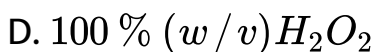
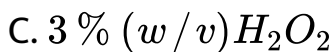
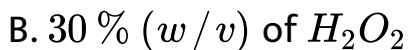
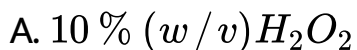


**Answer: A**



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**54. Perhydrol is**



**Answer: B**



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55. Hydrogen peroxide has a:

- A. Linear structure
- B. Closed chain structure
- C. Closed book structure
- D. Open book structure

**Answer: D**



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56. The dihedral angle in gaseous  $H_2O_2$  is

A.  $101.5^\circ$

B.  $90^\circ$

C.  $111.5^\circ$

D.  $109^\circ 28'$

**Answer: C**



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**57.** What is the dihedral angle between two  $H$  atoms of  $H_2O_2$ ?

A.  $100^\circ$

B.  $90^\circ$

C.  $109^{\circ} 28^1$

D.  $180^{\circ}$

**Answer: B**

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58. In  $H_2O_2$  molecule the O-O bond length is (in gas phase)

A.  $1.34A^{\circ}$

B.  $1.48A^{\circ}$

C.  $1.54A^{\circ}$

D.  $1.20A^{\circ}$

**Answer: B**

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59.  $H_2O_2$  acts as an oxidising agent in

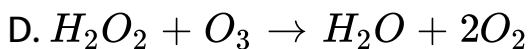
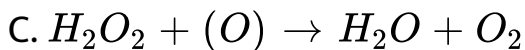
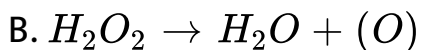
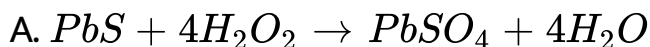
- A. Acidic medium
- B. In the presence of Glycerol
- C. Alkaline medium
- D. Neutral medium

**Answer: A**

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60. Bleaching action of  $H_2O_2$  is due to its :



**Answer: B**



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61. When  $H_2O_2$  is added to acidified ferrous sulphate solution

A. Electrons are gained by  $Fe^{2+}$

B. Electrons are lost by  $Fe^{2+}$

C. No loss (or) gain of electrons

D. Iron hydroxide is precipitated

**Answer: B**



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**62.** Which of the following is oxidized by  $H_2O_2$  in the alkaline medium

A. HCHO

B. Mn(II) salts

C. Cr(III) salts

D. All of these

**Answer: D**

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63. When  $H_2O_2$  acts as oxidizing agent, one of the end product is generally

A.  $O_2$

B.  $H_2O$

C. Both 1&2

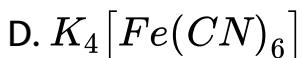
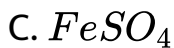
D.  $O_3$

**Answer: B**



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64. Which of the following is reduced by  $H_2I_2$  in acid medium



**Answer: A**



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65. An aqueous solution of  $H_2O_2$

- A. Neutral
- B. Strongly acidic
- C. Weakly acidic
- D. Weakly basic

**Answer: C**

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66. Which of the following statement is incorrect

- A.  $H_2O_2$  is an oxidising agent

B.  $H_2O_2$  is a reducing agent

C.  $H_2O_2$  is a bleaching agent

D.  $H_2O_2$  is a dehydrating agent

**Answer: D**



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**67.**  $H_2O_2$  Changes black lead sulphide to white

A. Pb

B.  $PbO_2$

C. PbO

D.  $PbSO_4$

**Answer: D**

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68.  $H_2O_2$  changes aqueous KI solution to

A. HI

B.  $I_2$

C.  $KI_3$

D.  $H_2$

**Answer: B**

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69.  $H_2O_2$  acts as antiseptic due to its

- A. Reducing property
- B. Oxidizing property
- C. Bleaching property
- D. Acidic property

**Answer: B**



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70. Negative catalyest for the decomposition of  $H_2O_2$  is

- A. Silica
- B.  $MnO_2$



C. Alumina

D. Acetanilide

**Answer: D**

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71. Positive catalyst for the decomposition of  $H_2O_2$  among the following is

A. Alcohol

B. Iron

C. Sodium-pyrophosphate

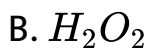
D. Urea

**Answer: B**



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72. Which compound is used for the manufacture of chemicals like sodium perborate and per-carbonate which are used in high quality detergents.



**Answer: B**



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73. Which of the following is the use of  $H_2O_2$  (i) hair bleach, disinfectant and antiseptic. (ii) In the synthesis of hydroquinone, paper pulp, (iii) Bleaching agent for textile, paper pulp, leather, oils, fats, etc. (iv) Treatment of domestic and industrial effluents.

A. i,iii

B. i,ii

C. ii,iv

D. i,ii,iii,iv

**Answer: D**



**View Text Solution**

74. The boiling point of  $D_2O$  is greater than  $H_2O$  It is because

A.  $D_2O$  has lower  $K_w$  value

B.  $D_2O$  has a lower dielectric constant

C.  $D_2O$  is an associated liquid

D. Inter molecular H-bonds are stronger in  $D_2O$  than in  $H_2O$

**Answer: D**



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75. The O-H bond energy in water when compared to O-D bond energy in heavy water is

- A. Greater
- B. Lesser
- C. Equal
- D. two times greater

**Answer: B**



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76. The physical constants which are less for  $D_2O$  than  $H_2O$  are

- A. Freezing point and Boiling point
- B. Density and viscosity
- C. Solvating ability and dielectric constant
- D. Temperature of maximum density

**Answer: C**

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**77.** Density of heavy water is maximum at

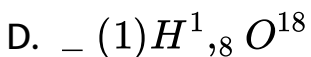
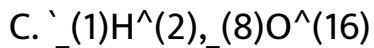
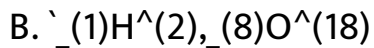
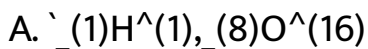
- A.  $3.82^{\circ} C$
- B.  $101.42^{\circ} C$
- C.  $11.6^{\circ} C$

D.  $4^{\circ}C$

**Answer: C**

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**78.** The numbers of protons, electrons and neutrons in a molecule of heavy water are respectively



**Answer: C**



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79. The boiling point of heavy water is

A.  $3.82^{\circ}C$

B.  $11.5^{\circ}C$

C.  $100^{\circ}C$

D.  $101.42^{\circ}C$

**Answer: D**



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80. In nuclear reactors heavy water is used as a



A. Fuel

B. Projectile

C. Moderator

D. Coolent

**Answer: C**



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**81.**  $NaOH + D_2O \rightarrow NaOD + HDO$  is known as

A. Exchange reaction

B. Deuterolysis reaction

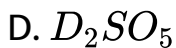
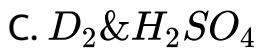
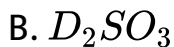
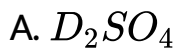
C. Hydrolysis reaction

D. Softening reaction

**Answer: A**

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82. When  $SO_3$  is treated with  $D_2O$ , the products are :



**Answer: A**

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**83.** What is formed when calcium carbide reacts with heavy water?

- A. Acetylene
- B. Calcium hydroxide
- C. Deuterium
- D. Deutero acetylene

**Answer: D**



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**84.** Same reasons are given regarding the limited use of  $H_2$  as fuel (I) Its calorific value is low (II) Its availability in free state is less (III) It is difficult to store (IV) Its transportation is easy The correct statement are

- A. I,II and III
- B. II,III and IV
- C. All are correct
- D. II and III

**Answer: D**



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85. The correct statements among (a) to (d) regarding  $H_2$  as a fuel are :

(a) It Produces less pollutants than petrol. ( b ) A cylinder if compressed dihydrogen weight ~30times more than a petrol tank producing the same amount

( c ) Dihydrogen is stored in tanks of metal alloys like  $NaNi_5$

( D ) On combustion ,values of energy released per gram of liiquid dihydrogen and LPG are 50 and 142 kj respectively

A.  $NaNi_5$

B.  $Ti - TiH_2$

C.  $Mg - MgH_2$

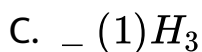
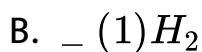
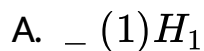
D. All

**Answer: D**

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**Level I C W**

1. The most reactive isotope of H is



D. All have same reactivity

**Answer: A**



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2. \

- A. Freezing point
- B. Boiling point
- C. Bond length
- D. Bond energy

**Answer: C**



View Text Solution

3.  $H_2$  gas is liberated at cathode and anode both by the electrolysis of the following aqueous solution except in

A. NaH

B. HCOONa

C. fused NaCl

D. LiH

**Answer: C**



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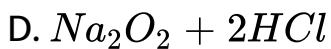
**4. Which of the following reaction produces hydrogen ?**

A. Mg+Steam

B.  $BaO_2 + HCl$

C.  $H_2S_4O_8 + H_2O$





**Answer: A**

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5. Ionic hydrides react with water to

- A. Basic solution
- B. Acidic solution
- C. Neutral solution
- D. Hydride ion

**Answer: A**

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6. Interstitial hydride is formed by

A. Be

B. Li

C. Cr

D. K

**Answer: C**



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7. Ionic hydrides are formed by :

A. Transition metals

B. Metalloids

C. Elements of high electropositivity

D. Elements of high electronegativity

**Answer: C**



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**8. Temporary hardness of water is due the presence of**

A.  $CaCl_2$

B.  $MgSO_2$

C.  $Ca(HCO_3)_2$

D. All of these

**Answer: D**



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9. In Clark's method if  $Ca(OH)_2$  is used for the removed of temporary hardness of water which is formed

A. NaOH

B.  $CaCO_3$

C.  $Ca(OH)_2$

D.  $Ca(HCO_3)_2$

**Answer: D**



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10. During the electrolysis of 50%  $H_2SO_4$ , the  $p^H$  of the solution

- A. Increases
- B. Decreases
- C. Becomes zero
- D. Remains constant

**Answer: A**



View Text Solution

11. Why can dilute solutions of hydrogen peroxide not be concentrated by heating? How can a concentrated solution of hydrogen peroxide be obtained ?

A. About 99% pure

B. About 90% pure

C. 30% pure

D. About 50% pure

**Answer: B**



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12. Hydrogen peroxide is

- A. Diamagnetic
- B. Paramagnetic
- C. Ferromagnetic
- D. Ferri magnetic

**Answer: A**



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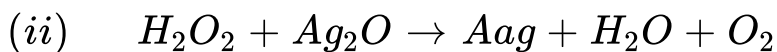
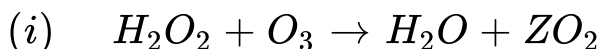
**13.** The volume strength of 1 · 5 N  $H_2O_2$  solution is

- A. `8.4 Vol
- B. 4.2 Vol
- C. 16.8 Vol

**Answer: A**

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**14.** Role of hydrogen peroxide in the following reaction is respectively.



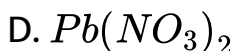
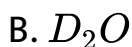
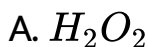
- A. Oxidizing agent
- B. Mutual reduction
- C. Reducing agent
- D. Bleaching agent



**Answer: B**

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15. An inorganic substance on heating liberates oxygen and turns an acidified solution of KI brown and also reduces acidified  $KMnO_4$ . The substance is



**Answer: A**

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16.  $H_2O_2$  acts as an oxidising agent in

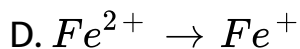
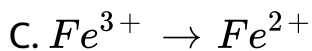
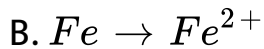
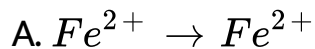
- A. Neutral medium
- B. Acidic medium
- C. Alkaline medium
- D. Acidic and alkaline medium

**Answer: D**

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17.  $H_2O_2$  converts potassium ferrocyanide to ferricyanide. The change observed in the oxidation state

of iron is



**Answer: A**



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**18.** The percentage to deuterium in heavy water is

A. 22.2

B. 11.2

C. 44

D. 20

**Answer: D**

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**Level II C W**

**1. Which property is lower for deuterium than hydrogen?**

A. Latent heat of vapourisation

B. Latent heat of fusion

C. Reactivity

D. Atomic weight

**Answer: C**

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2. The ratio of hydrogen, deuterium and tritium is

A. 3 : 2 : 1

B. 1 : 2 : 3

C. 3 : 6 : 1

D. 6 : 2 : 1

**Answer: B**

 [View Text Solution](#)

3. Which combination cannot be used for the preparation of hydrogen gas in the laboratory ?

I. Zinc/conc.  $H_2SO_4$

II. Zinc/  $HNO_3$

III. Pure zinc/dil.  $H_2SO_4$

A. I and II

B. II and III

C. III only

D. I and III

**Answer: B**



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4. High purity dihydrogen is obtained by electrolysing

- A. Electrolysis of pure water
- B. Electroluysis of pure water
- C. Action of Zn on NaOH
- D. Eelctrolysis of acidulated water

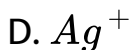
**Answer: B**



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5. In aqueous solution,  $H_2$  will not reduce :

- A.  $Fe^{3+}$



**Answer: C**



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6. Which one of the following statement is incorrect ?

A.  $H_2$  reacts with  $Cl_2$  to form HCl, an electron pair

shared between H and Cl

B. Hydrogen is reduced by sodium to form NaH. An

electron is tranferred from H to Na



C. Hydrogen reduces copper (II) oxide to copper and itself gets oxidized to  $H_2O$

D. Hydroformylation of olefins yields aldehyde which further undergoes reduction to give alcohol.

**Answer: B**



**View Text Solution**

7. What is the nature of aqueous solution of NaH

A. Acidic

B. Basic

C. Neutral

D. Amphoteric

**Answer: B**

 [View Text Solution](#)

8. Water softened by permutitt process contains

- A. Dissolved sodium salts
- B. Dissolved gases
- C. Does not give good lather with soap
- D. Dissolved calcium salts

**Answer: A**

 [View Text Solution](#)

9. The process used for the removal of hardness of water is

A. Baeyer

B. Calgon

C. Serpeck

D. Hoope

**Answer: B**



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10. The ion exchange resin which removes metal ions from hard water consists of giant organic molecule having

A.  $-Cl$  group

B.  $-COOH$  group

C.  $-OH$  group

D.  $-NH_2$  group

**Answer: B**



[View Text Solution](#)

11. The volume strength of  $1 \cdot 5 \text{ N } H_2O_2$  solution is

A.  $11.2V$

B. 22.4V

C. 1V

D. 5.6

**Answer: D**



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**12.** 3.4 gm of  $H_2O_2$  decomposes, the weight of oxygen liberated from it is

A. 1.6 gm

B. 2.24 gm

C. 1.16 gm

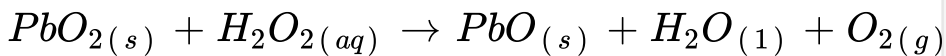
D. 3.2 gm

**Answer: A**

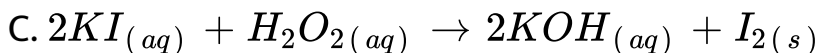
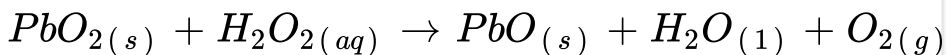
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**13.** In which of the following reactions,  $H_2O_2$  act as a reducing agent ?

A.



B.



D. All the above

**Answer: A**

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14. How does  $H_2O_2$  differ from  $O_3$  in its chemical action?

A. In oxidising PbS to  $PbSO_4$

B. In liberating  $I_2$  from KI

C. In reducing acidified  $KMnO_4$

D. In oxidising  $K_4[Fe(CN)_6]$

**Answer: C**

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15. Why does  $H^+$  ion always get associated with atoms or molecules ?

A. Ionisation enthalpy of hydrogen resembles that of alkali metal

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 free.

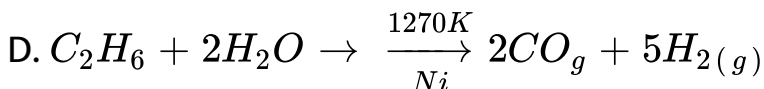
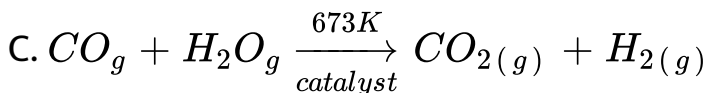
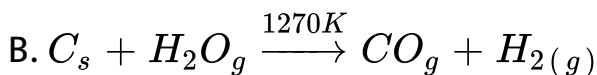
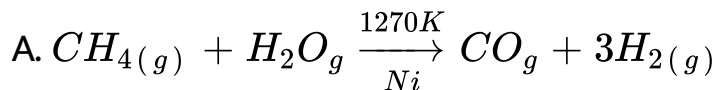
**Answer: D**



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16. Which of the following reaction increases, production of dihydrogen from synthesis gas ?

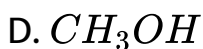
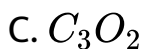
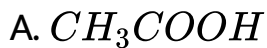


**Answer: C**



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17.  $CO + H_2 \xrightarrow[Cu]{ZnO}$  product. Identify the product formed in the given reaction.



**Answer: D**

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Level iii

1.  $Zn$  gives  $H_2$  gas with  $H_2SO_4$  and  $HCl$  but not with  $HNO_3$  because

A.  $Zn$  acts as an oxidising agent when react with



B.  $HNO_3$  is weaker acid than  $H_2SO_4$  and  $HCl$

C. In electrochemical series  $Zn$  is above hydrogen

D.  $NO_3^-$  is reduced in preference to hydronium ion

**Answer: D**



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2. Triple point of water is

A.  $273.16K$

B.  $373.15K$

C.  $203.12K$

D.  $193.16K$

**Answer: A**



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**3.** The correct statement regarding structure of ice :

A. Ice has a highly ordered three dimensional hydrogen bonded structure.

- B. Each oxygen atom in ice is surrounded tetrahedrally by four other oxygen atoms at a distance of 276 pm.
- C. Hydrogen bonding gives ice a rather open structure with wide holes. These holes can hold some other molecules of appropriate size interstitially.
- D. All are correct.

**Answer: D**

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4. How many grams of barium hydride must be treated with water to obtain 4.36L of hydrogen at  $20^{\circ}C$  and 0.975 atm pressure (Ba=137)?

A. 12.28g

B. 24.56g

C. 16.14g

D. 14.56g`

**Answer: A**



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**5. Limiting compositions of f-block hydrides are**

A.  $MH_2$  &  $MH_3$

B.  $MH_3$  &  $MH_5$

C.  $MH_2$  &  $MH_8$

D.  $MH_2$  &  $MH_6$

**Answer: A**

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6. The volume of perhydrol which on decomposition gives 1.5 lit of  $O_2$  gas at STP is

A. 25ml

B. 15ml

C. 10ml

D. 0ml

**Answer: B**



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7. Weight of  $H_2O_2$  present in 560 ml. of 20 vol .  $H_2O_2$  solution is approximately

A. 69g

B. 34g

C. 32g

D. 3.4g

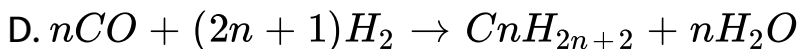
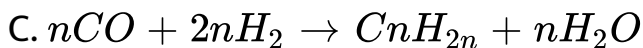
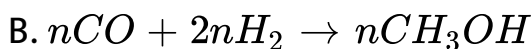
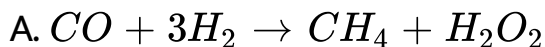
**Answer: B**



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8. Which one of the following reactions does not correspond to the preparation of "synthetic gasoline" during the Fischer-Tropsch process?



**Answer: B**



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9. In a reaction excess of  $H_2O_2$  is added to 0.1 mole of acidified  $KMnO_4$  solution. Then the S.T.P volume of  $O_2$  liberated is

A. 5.6lit.

B. 6.6lit.

C. 11.2lit

D. 22.4lit

**Answer: A**



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10.  $25\text{mL}$  of  $\text{H}_2\text{O}_2$  solution were added to excess of acidified solution of  $\text{KI}$ . The iodine so liberated required  $20\text{mL}$  of  $0.1\text{N Na}_2\text{S}_2\text{O}_3$  for titration. Calculate the strength of  $\text{H}_2\text{O}_2$  in terms of normality, percentage and volumes.

(b) To a  $25\text{mL H}_2\text{O}_2$  solution, excess of acidified solution of  $\text{KI}$  was added. The iodine liberated required  $20\text{mL}$  of  $0.3\text{N}$  sodium thiosulphate solution. Calculate the volume strength of  $\text{H}_2\text{O}_2$  solution.

A.  $0.04\text{N}$ ,  $0.136\%$

B.  $0.08\text{N}$ ,  $0.136\%$

C.  $0.08\text{N}$ ,  $0.163\%$

D.  $0.02\text{N}$ ,  $0.163\%$

**Answer: B**

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11. 20mL of  $H_2O_2$  after acidification with dilute  $H_2SO_4$  required 30mL of N/12  $KMnO_4$  for complete oxidation. Calculate the percentage of  $H_2O_2$  in the solution.

Equivalent mass of  $H_2O_2 = 17$ .

A.  $10.75 \frac{g}{l} it$

B.  $11.75 \frac{g}{l} it$

C.  $12.75 \frac{g}{l} it$

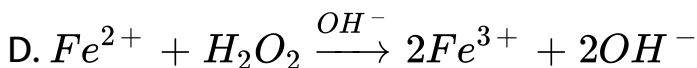
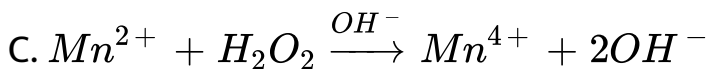
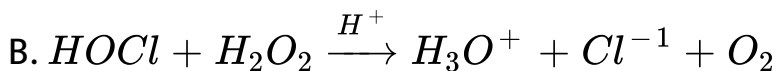
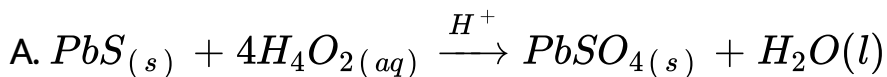
D.  $13.75 \frac{g}{l} it$

**Answer: C**



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12. In which of the following reactions,  $H_2O_2$  act as a reducing agent ?



Answer: B



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13. Observe the following statement : (I) Heavy water is harmful for the growth of animals (II) Heavy water reacts with  $Al_4C_3$  and forms deuterated acetylene (III)  $BaCl_2 \cdot 2D_2O$  is an example of interstitial deuterate

A. 1&3

B. 1&2

C. 1, 2, &3

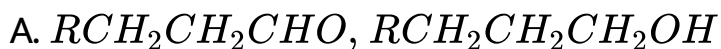
D. 2&3

**Answer: A**



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14. What is (X) and (Y) in the above reaction?

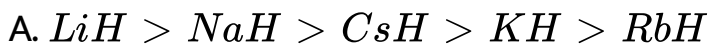


**Answer: A**



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15. Metal hydrides are ionic, covalent or molecular in nature. Among LiH, NaH, KH, RbH, CsH the correct order of increasing ionic character is

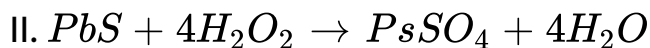
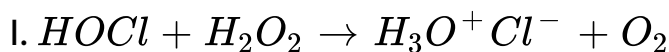


**Answer: B**



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**16.** Study the following reaction carefully



Point out the correct option.

A. In (I), HOCl is reduced and in (II) PbS is oxidised



B. In (I), HOCl is oxidised and (II) PbS is reduced

C. In both (I) and (II), HOCl and PbS are reduced

D. In both (I) and (II), HOCl and PbS are oxidised

**Answer: A**



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**17.** How many grams of barium hydride must be treated with water to obtain 4.36L of hydrogen at  $20^{\circ}C$  and 0.975 atm pressure (Ba=137)?

A. 24.56g

B. 34.56g

C. 42.65g

D. 43.65g

**Answer: A**



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## Level Iv Ncert Based Questions Matching Type

1. 

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

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

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

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

**Answer: D**

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**2. Match the following**



A.  $A \quad B \quad C \quad D$   
 $IV \quad II \quad III \quad I$

B.  $A \quad B \quad C \quad D$   
 $III \quad I \quad II \quad IV$

C.  $A \quad B \quad C \quad D$   
 $II \quad III \quad I \quad IV$

D.  $A \quad B \quad C \quad D$   
 $I \quad II \quad III \quad IV$

**Answer: B**

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3. Match list I with list II and select the correct answer using the codes given below the lists:




- A.  $A \ B \ C \ D$   
 $I \ II \ IV \ V$
- B.  $A \ B \ C \ D$   
 $III \ I \ V \ IV$
- C.  $A \ B \ C \ D$   
 $III \ II \ I \ V$
- D.  $A \ B \ C \ D$   
 $I \ IV \ III \ II$

**Answer: B**



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4. Match list I with list II and select the correct answer using the codes given below the lists : 



A.  $A \quad B \quad C \quad D$   
 $IV \quad III \quad I \quad II$

B.  $A \quad B \quad C \quad D$   
 $IV \quad III \quad I \quad II$

C.  $A \quad B \quad C \quad D$   
 $IV \quad I \quad III \quad II$

D.  $A \quad B \quad C \quad D$   
 $II \quad III \quad I \quad IV$

**Answer: D**



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## 5. Match the following



- A.  $A \quad B \quad C \quad D$   
 $V \quad III \quad I \quad II$
- B.  $A \quad B \quad C \quad D$   
 $V \quad III \quad IV \quad I$
- C.  $A \quad B \quad C \quad D$   
 $IV \quad I \quad II \quad III$
- D.  $A \quad B \quad C \quad D$   
 $II \quad IV \quad V \quad I$

**Answer: C**



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## 6.

- A.  $A \quad B \quad C \quad D$   
 $I \quad III \quad IV \quad II$

- B.  $A \quad B \quad C \quad D$   
 $II \quad IV \quad III \quad I$
- C.  $A \quad B \quad C \quad D$   
 $II \quad III \quad I \quad IV$
- D.  $A \quad B \quad C \quad D$   
 $II \quad III \quad IV \quad I$

Answer: D

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7. Match the following



- A.  $A \quad B \quad C \quad D$   
 $III \quad IV \quad II \quad I$
- B.  $A \quad B \quad C \quad D$   
 $II \quad III \quad I \quad IV$
- C.  $A \quad B \quad C \quad D$   
 $I \quad III \quad IV \quad II$

D.  $A \quad B \quad C \quad D$   
 $IV \quad II \quad III \quad I$

**Answer: A**

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**8. Match the following**



A.  $A \quad B \quad C$   
 $III \quad I \quad II$

B.  $A \quad B \quad C$   
 $I \quad II \quad III$

C.  $A \quad B \quad C$   
 $III \quad II \quad I$

D.  $A \quad B \quad C$   
 $II \quad I \quad III$

**Answer: A**





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9. 

A.  $\begin{matrix} A & B & C & D \\ III & I & II & IV \end{matrix}$

B.  $\begin{matrix} A & B & C & D \\ III & I & II & V \end{matrix}$

C.  $\begin{matrix} A & B & C & D \\ II & I & III & V \end{matrix}$

D.  $\begin{matrix} A & B & C & D \\ IV & I & II & V \end{matrix}$

**Answer: B**



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10. The concentration of  $H_2O_2$  in a solution containing 34g in 500ml is



The correct match is

- A.  $A \quad B \quad C \quad D$   
 $III \quad IV \quad I \quad II$
- B.  $A \quad B \quad C \quad D$   
 $IV \quad III \quad I \quad II$
- C.  $A \quad B \quad C \quad D$   
 $III \quad IV \quad I \quad II$
- D.  $A \quad B \quad C \quad D$   
 $I \quad II \quad III \quad IV$

**Answer: B**



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11. 

The correct match is

A.  $A \quad B \quad C \quad D$   
 $I \quad III \quad IV \quad II$

B.  $A \quad B \quad C \quad D$   
 $II \quad IV \quad III \quad I$

C.  $A \quad B \quad C \quad D$   
 $IV \quad I \quad II \quad III$

D.  $A \quad B \quad C \quad D$   
 $II \quad III \quad IV \quad I$

**Answer: C**



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**Level Iv Fill In The Blanks**

1. The principal cause of hardness of water is the presence of \_\_\_\_ and \_\_\_\_ ions.

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2. In reaction of hydrogen peroxide and sodium carbonate,  $H_2O_2$  acts as \_\_\_\_.

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3. In the reaction of  $F_2$  and  $H_2O$ , water act as \_\_\_\_.

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4. Sodium Zeolite is \_\_\_\_ .



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5. The trade name of sodium hexmetaphosphate is \_\_\_\_\_



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6. The electrolysis of molten hydroxide produces \_\_\_\_ gas at anode.



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7. Bleaching action of hydrogen peroxide is due to \_\_\_\_.



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8.  $O - O - H$  bond angle in  $H_2O_2$  is approximately\_\_\_\_\_.



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9. Bleaching powder and hydrogen peroxide react to give  
\_\_\_\_\_.



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10. Dropping of water over calcium carbide produces  
\_\_\_\_\_gas.



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11. The adsorption of hydrogen by palladium is commonly known as \_\_\_\_\_.

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12. Hydrogen gas is liberated the action of aluminium with concentrated solution of \_\_\_\_\_.

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1. Polyphosphates are used as water softening agents because they

- A. form solute complexes anionic species
- B. precipitate anionic species
- C. form soluble complexes with cationic species
- D. precipitate cationic species

**Answer: C**



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2. The reagent commonly used to determine hardness of water titrimetrically is :



- A. oxalic acid
- B. disodium salt of EDTA
- C. sodium citrate
- D. sodium thiosulphate

**Answer: B**



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**3.** Among  $CaH_2$ ,  $NH_3$ , and  $B_2H_6$  which are covalent hydrides?

- A.  $NH_3$  and  $B_2H_6$
- B.  $NaH$  and  $CaH_2$

C.  $NaH$  and  $NH_3$

D.  $CaH_2$  and  $B_2H_6$

**Answer: A**

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4. The bond angle and dipole moment of water respectively are :

A.  $109.5^\circ$ ,  $1.84D$

B.  $107.5^\circ$ ,  $1.56D$

C.  $104.5^\circ$ ,  $1.84D$

D.  $102.5^\circ$ ,  $1.56D$

**Answer: C**

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5. In context with the industrial preparation of hydrogen from water gas ( $CO + H_2$ ). Which of the following is the correct statement?

- A. CO is oxidized to  $CO_2$  with steam in the presence of a catalyst followed by absorption of  $CO_2$  in alkali
- B. CO and  $H_2$  are fractionally separated using difference in their densities
- C. CO is removed by absorption in aqueous  $Cu_2Cl_2$
- D.  $H_2$  is removed through occlusion with Pd

**Answer: A**

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6. Hydrogen peroxide is now generally prepared on industrial scale by the

A. action of  $H_2SO_4$  on barium peroxide

B. action of  $H_2SO_4$  on sodium peroxide

C. electrolysis of 50%  $H_2SO_4$

D. burning hydrogen in excess of oxygen

**Answer: C**

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7. When silicon is boiled with caustic soda solution, the gas evolved is

A.  $O_2$

B.  $SiH_4$

C.  $H_2$

D. Both 1 & 2

**Answer: C**

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8. Which will produce hard water ?

A. Saturation of water with  $CaSO_4$

B. Addition of  $Na_2SO_4$  to water

C. Saturation of water with ( $CaCO_3$ )

D. Saturation of water with  $MgCO_3$

**Answer: A**



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9. Under what condition of temperature and pressure the formation of atomic hydrogen from molecular hydrogen will be favoured most ?

A. High temperature and high pressure

B. Low temperature and low pressure

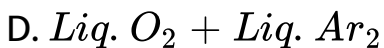
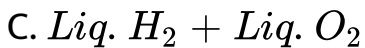
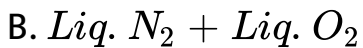
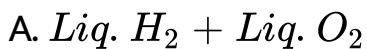
C. High temperature and high pressure

D. Low temperature and high pressure

**Answer: C**

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10. Which of the following could act as a propellant for rockets ?



**Answer: A**



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11. Hydrogen is evolved the action of cold dilute  $HNO_3$  on

:

A. Fe

B. Mg or Mn

C. Cu

D. All

**Answer: B**



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12. Metal which does not react with cold water but evolves  $H_2$  with steam is :

A. Na

B. K

C. Pt

D. Fe

**Answer: D**



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13. Whichh of the following is correct about heavy water ?

- A. Water at  $4^{\circ}C$  having maximum density is known as heavy water
- B. It is heavier than water ( $H_2O$ )
- C. It is formed by the combination of isotope of hydrogen and oxygen
- D. None of the above

**Answer: B**

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14. When zeolite, which is hydrated sodium aluminium silicate, is treated with hard water, the sodium ions are exchanged with

A.  $H^+$  ion

B.  $Ca^{2+}$  ion

C.  $SO_4^{2-}$  ion

D.  $OH^-$  ion

**Answer: B**



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**15.** Ortho and para hydrogen have :

A. identical chemical properties but different physical properties

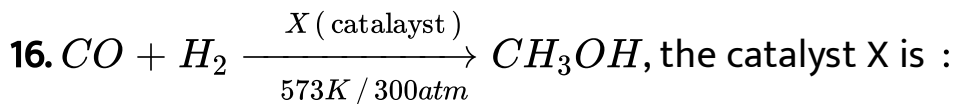
B. identical physical and chemical properties

C. identical physical properties but different chemical properties

D. different physical and chemical properties

**Answer: A**

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A. Fe

B.  $Cr_2O_3 / ZnO$

C.  $V_2O_5$

D.  $Al_2O_3$

**Answer: B**

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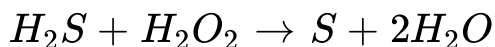
17. Which of the following undergoes reduction with  $H_2O_2$  in an alkaline medium ?



**Answer: B**

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18. In the reaction.



- A.  $H_2S$  is an acid and  $H_2O_2$  is a base
- B.  $H_2S$  is an base and  $H_2O_2$  is a acid
- C.  $H_2S$  is an oxidizing agent and  $H_2O_2$  is a reaucing agent
- D.  $H_2S$  is an reducing agent and  $H_2O_2$  is an oxidizing agent

**Answer: D**



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19. Very pure hydrogen (99.9 %) can be made by which of the following processes ?

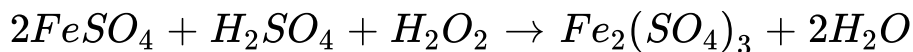
- A. Mixing natural hydrocarbons of high molecular weight
- B. Electrolysis of water
- C. Reaction of salt like hydrides with water
- D. Reaction of methane with water

**Answer: B**

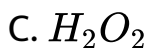
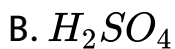
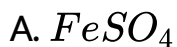


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20. In the reaction,



The oxidising agent is



**Answer: C**



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21. The molecular formula of a commercial resin used for exchanging ions in water softening is  $C_8H_7SO_3Na$  (Mol.wt.206). What would be the maximum uptake of  $Ca^{2+}$  ions by the resin when expressed in mole per gram resin?

A.  $\frac{1}{103}$

B.  $\frac{1}{206}$

C.  $\frac{2}{309}$

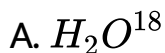
D.  $\frac{1}{412}$

**Answer: D**

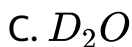


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22. Heavy water is



B. water obtained by repeated distillation



D. water at  $4^\circ C$

**Answer: C**



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23. Hydrogen peroxide in its reaction with  $KIO_4$  and  $NH_2OH$  respectively, is acting as a

A. reducing agent, oxidising agent

B. reducing agent , reducing agent

C. ioxidising agent ,oxidising agent

D. oxidising agent , reducing agent

**Answer: A**



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**24.**  $Fe^{3+}$  is reduced to  $Fe^{2+}$  by using

A.  $H_2O_2$  in presence of  $NaOH$

B.  $Na_2O_2$  in water

C.  $H_2O_2$  in presence of  $H_2SO_4$

D.  $Na_2O_2$  in presence of  $H_2SO_4$

**Answer: C::D**



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**25.** A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as .

A. Electrolytic cell

B. Dynamo

C. Ni-Cd cell

D. Fuel cell

**Answer: C**



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26. Permanent hardness in water cannot be cured by :

- A. boiling
- B. ion-exchange method
- C. Calgon's method
- D. treatment with washing soda

**Answer: C**

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27. From the following statements regarding  $H_2O_2$ , choose the incorrect statements:

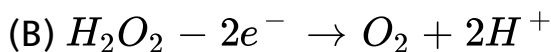
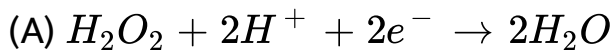
- A. It can act only as an oxidising agent
- B. It decomposes on exposure to light
- C. It has to be stored in plastic or wax lined glass bottles in dark
- D. It has to be kept away from dust.

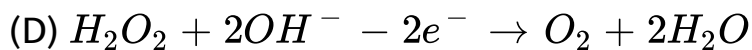
**Answer: B**



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**28.** In which of the following reactions  $H_2O_2$  acts as reducing agent?





A. I and II

B. III and IV

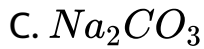
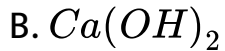
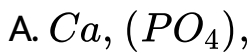
C. I and III

D. II and IV

**Answer: B**

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**29.** The reagent(s) used for softening the temporary hardness of water is (are):



**Answer: B**



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**Level I H W**

1. The total number of fundamental particles in tritium atom is

A. 4



B. 3

C. 2

D. 1

**Answer: A**



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2.  ${}_1^1\text{H}$ ,  ${}_1^2\text{H}$  and  ${}_1^3\text{H}$  will have the same

A. Mass number

B. Chemical reactivity

C. Electron configuration

D. Nuclear radius

**Answer: C**



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**3. Hydrogen does not combine with**

A. Antimony

B. Sodium

C. Bismuth

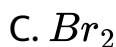
D. Helium

**Answer: D**



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4. Which of the halogen has maximum affinity for hydrogen ?



**Answer: A**



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5. The electron deficient compound is



B.  $PH_2$

C.  $B_2H_6$

D.  $C_2H_6$

**Answer: C**



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**6. IUPAC name of ammonia**

A. Nitrogen hydride

B. Ammonia

C. Azane

D. Hydrazine

**Answer: C**



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7. The raw material used for preparing permutit is

A. Soda ash

B. Alumina

C. Silica

D. All the above

**Answer: D**



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8. Compound obtained by passing  $CO_2$  through  $BaO_2$  in water is

A.  $CO$

B.  $Ba(OH)_2$

C.  $H_2O_2$

D.  $O_2$

**Answer: C**

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9. The volume of oxygen liberated from  $15ml$  of 20 volume  $H_2O_2$  is

A. 250ml

B. 300ml

C. 150ml

D. 200ml

**Answer: B**



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**10.** 20 volume  $H_2O_2$  solution has a strength of about

A. 30 %

B. 6 %

C. 3 %

D. 10 %

**Answer: B**

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11.  $H_2O_2$  will oxidise

A.  $KMnO_4$

B.  $PbS$

C.  $MnO_2$

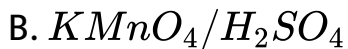
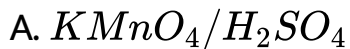
D.  $KCl$

**Answer: B**

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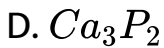
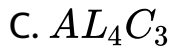
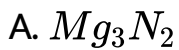
12. Which substance cannot be reduced by  $H_2O_2$



**Answer: D**

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13. Deutero methane is obtained by the deuterolysis of



**Answer: 3**



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**Level II**

1. The most abundant and least abundant isotopes of hydrogen respectively are

A. P,T

B. P,D

C. D,P

D. T,P

**Answer: 1**



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2. Which of the following statement are correct

I) Now -a days syngas is produced from sewage , saedust , scrap wood ,news paper etc. (II) The processs of proucing syngas from coal is called coal gassification .III) The producation of dihdration can be increased by the presence of iron chromate catalystr. IV) 77% of the industrial s=dihydrogen is propduced from perto chemicals

A. I,II

B. III,IV

C. I,III

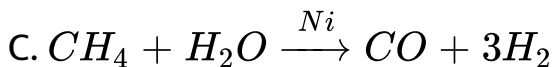
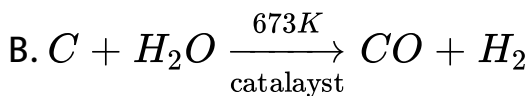
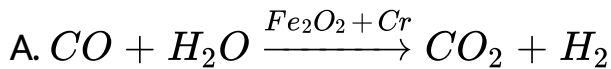
D. I,II,III,IV

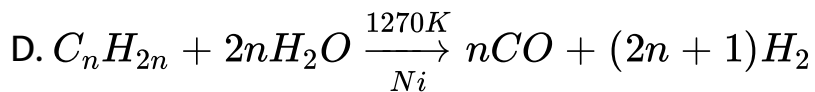
**Answer: 4**



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**3. the reaction related to coal gassification**





**Answer: 2**

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4. The gas(es) used in the hydrogenation of oils in presence of nickel as a catalyst is/are:

A. Mrthane

B. Ethane

C. Ozone

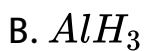
D. Hygdroogen

**Answer: 4**



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5. Electromn - defcienent hydroride is/are



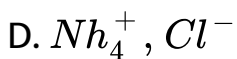
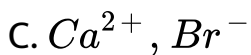
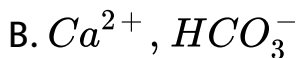
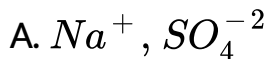
D. All

**Answer: 4**



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6. Which of the following pair of ions makes the water hard(temporary) ?

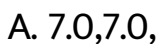


**Answer: 2**



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7. The pH of  $D_2O$  and  $H_2O$  at 298 K is



B. 7.35,7.0

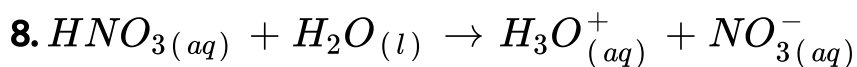
C. 7.0,6.85

D. 6.85,7.35

**Answer: 2**



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The above reaction is called as \_\_\_\_\_.

A. Acidic nature

B. Basic nature

C. Ionisation nature



## D. Amphoteric nature

**Answer: 4**

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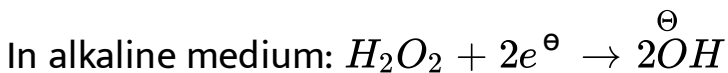
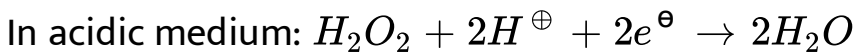
9. 1 ml of  $H_2O_2$  solution given 10 ml of  $O_2$  at NTP. It is :

- A. 10v
- B. 25V
- C. 50V
- D. 100V

**Answer: 3**

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10. Hydrogen peroxide is a powerful oxidising agent, both in the acidic and alkaline medium.

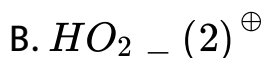


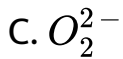
Hydrogen peroxide acts as a reducing agent towards powerful oxidising agents.

In acidic medium:  $H_2O_2 \rightarrow 2H^{\oplus} + O_2 + 2e^{\ominus}$  In alkaline medium, however, its reducing nature is more effective.



In which of the following reactions,  $H_2O_2$  acts as an oxidising agent?





D. Both 1&3

**Answer: 4**

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11. 2g of aluminium is treated, separately with excess of dilute  $H_2SO_4$ , and excess of  $NaOH$ , the ratio of volumes of hydrogen evolved is

A. 3:2

B. 1:1

C. 1:2

D. 2:1

Answer: 2

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Level V

1. Hardness of water is  $200\text{ppm}$ . The normality and molarity of  $\text{CaCO}_3$  in the water is

A.  $4 \times 10^{-3}N, 2 \times 10^{-6}M$

B.  $4 \times 10^{-3}N, 2 \times 10^{-6}N$

C.  $4 \times 10^{-3}N, 2 \times 10^{-3}M$

D.  $4 \times 10^{-3}N, 1 \times 10^{-3}M$

**Answer: C**



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2. A sample of hard water contains  $122\text{ppm}$  of  $\text{HCO}_3^\ominus$  ions,. What is the minimum weight of  $\text{CaO}$  required to remove ions completely from  $1\text{kg}$  of such water sample?

A. 244mg

B. 168mg

C. 122mg

D. 56mg

**Answer: C**



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3. There are three samples of  $H_2O_2$  labelled as  $10vol$ ,  $15vol$ ,  $20vol$ . Half liter of each sample are mixed and then diluted with equal volume of water. Calculate the volume strength of resultant solution.

A. 7.5

B. 1.339

C. 5.6

D. 15

**Answer: A**

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4. Which of the following water sample has maximum degree of hardness?

A. 9.5g of  $MgCl_2$  in  $10^5$  kg of water

B. 11.1g of  $CaCl_2$  in  $10^5$  kg of water

C. 6.8g of  $CaSO_4$  in  $10^4$  kg of water

D. 1.2g of  $MgSO_4$  in  $10^4$  of water

**Answer: C**



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5. The purity of  $H_2O_2$  in a given sample is 85%. Calculate the weight of impure sample of  $H_2O_2$  which requires

10mL of  $M/5KMnO_4$  solution in a titration in acidic medium

A. 2g

B. 0.2g

C. 0.17g

D. 0.15g

**Answer: B**



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6. 100mL of tap water containing  $Ca(HCO_3)_2$  was titrated with 30mL of HCl. Calculate the temporary hardness as parts of  $CaCO_3$  per  $10^6$  parts of water.



A. 300ppm

B. 150ppm

C. 100pm

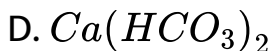
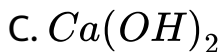
D. 600ppm

**Answer: A**



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7. Chemical A is used for water softening to remove temporary hardness. A reacts with sodium carbonate to generate caustic soda. When  $CO_2$  is bubbled through a solution of A, it turns cloudy. What is the chemical formula of A?



**Answer: C**



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8. which one of the following on oxidation gives  $H_2O_2$ ?

A. 2-Ethylanthraquinol

B. 3-ethyanthraaquinione

C. anthracence or phenontheene

D. 4-ethylanthracenae

**Answer: A**

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9. Industrially  $H_2O_2$  is obtained from :

A. 2-ethyl anthraquinol by oxidation and then reduction in a cyclic process

B.  $H_2SO_5$

C.  $H_2S_2O_8$

D.  $BaO_2$

**Answer: A**



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10. Identify the incorrect statement ?

A. The intermediate products obtained during

electrolysis of 50%  $H_2SO_4$  are  $H_2S_2O_8$  and  $H_2SO_5$

B. Complete hydrolysis of one mole of Marshall's acid

gives one mole of  $H_2O_2$  and two moles of sulphuric

acid

C.  $H_2S_4$ ,  $H_2SO_5$  and  $H_2S_2O_8$  all acts as oxidising

agents.

D. During electrolysis of 50%  $H_2SO_4$ ,  $H_2O_2$  is

obtained near anode.

**Answer: D**

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11. when changes from gaseous phase to solid phase , which one of the following statements is correct regarding  $H_2O_2$ ?

A. dral angle changes from  $92^\circ$  to  $111^\circ$

B. Bond angle changes from  $101^\circ$  to  $94^\circ$

C. The dihedral angle changes from  $94^\circ$  to  $101^\circ$

D. Bond angle changes from  $94^\circ 48'$  to  $101^\circ 54'$

**Answer: D**

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**12.** The structure of  $H_2O_2$  is

- A. Planar and tetraheassdral
- B. non-planer and non linear
- C. Trigonal planear
- D. Linear

**Answer: B**

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13. Which of the following process uses water gas shift reaction?

A. Merck's process

B. Lane ,s process

C. Permutitprocess

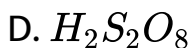
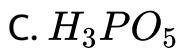
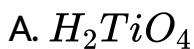
D. Bosch's process

**Answer: D**



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14. which one of the following contains more number of peroxy linkages ?



**Answer: b**



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15. (I).  $H_2O_2$  is non-linear compound

(II) In  $H_2O_2$ , the hydroxyl groups are not in the same plane

(III) The dihedral angle in  $H_2O_2$  in its vapour phase is  $90^\circ$

(IV)  $H_2O_2$  is a planar molecule.

then the correct statement (s) is/are:



A. I and IV only

B. I and II only

C. III and IV only

D. I,II,III,and Iv

**Answer: B**



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**16.** the dipole moment of  $H_2O_2$  is 2.1 D while that of water is 1.84 D But ,water ( $H_2O$ ) is a better solvent than that of  $H_2O_2$  because

A. Its dipole moment is less

B. it is less corrosive

C.  $H_2O$  gets ionised during chemical reactions

D.  $H_2O_2$  gets decomposed during chemical reactions

**Answer: D**

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17. An inorganic substance on heating liberates oxygen and turns an acidified solution of KI brown and also reduces acidified  $KMnO_4$ . The substance is

A.  $SO_2$

B.  $H_2O_2$

C.  $KNO_3$

D.  $Pb(NO_3)_2$

**Answer: B**



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**18.** The H-O-O bond angle and O-H bond lengths are  $101.9^\circ$  and  $98.8\text{ pm}$ , respectively in solid phase instead of  $94.8^\circ$  and  $95\text{ pm}$  in gaseous phase instead of the structure of  $H_2O_2$ . This indicates that the structure of  $H_2O_2$  in solid and gaseous phases are different. This is due to

- A. Intermolecular hydrogen bonding
- B. Intramolecular hydrogen bonding
- C. Van der Waal's bonding
- D. All are true

**Answer: A**

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19. 10 volume  $H_2O_2$  means \_\_\_\_\_.

A.  $1\text{ml } H_2O_2$  gives  $10\text{ml } O_2$  at NTP

B.  $1\text{g } H_2O_2$  gives  $10\text{ml } O_2$  at NTP

C.  $1\text{ mol } H_2$  gives  $10\text{ml } O_2$  at NTP

D.  $10\text{ml } H_2O_2$  gives  $1\text{ Mol } O_2$  at NTP

**Answer: A**

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20. 34g of  $H_2O_2$  is present in 1120ml of  $H_2O$  solution.

This solution is called.

A. 10V solution

B. 20V solution

C. 34V solution

D. 32 V solution

**Answer: A**



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21. The volume of perhydrol which on decomposition gives

1L of  $O_2$  at STP is

A. 10mL

B. 1mL

C. 100mL

D. 10L

**Answer: A**



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22. 10mL of a solution of  $H_2O_2$  of 10 V secolouries es 100 ml of  $KmnO_4$  solution acidified with dilute sulphuric acid ,the amount of  $KMnO_4$  in the given solution is (AW of k=39, Mn =55)

A. 1.125gm

B. 0.155gm

C. 0.56gm

D. 0.28gm

**Answer: C**



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23.  $10\text{mL}$  of  $\text{H}_2\text{O}_2$  solution (volume strength =  $x$ ) requires  $10\text{mL}$  of  $N/0.56\text{MnO}_4^\ominus$  solution in acidic medium. Hence  $x$  is

A. 5.6

B. 0.1

C. 10

D. 0.56

**Answer: C**

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**24.** A 5.0 mL solution of  $H_2O_2$  liberates 1.27 g of iodine from an acidified KI solution. The percentage strength of  $H_2O_2$  is

A. 5.6

B. 1.7

C. 3.4

D. 11.2



**Answer: C**

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25.  $H_2$  molecule has two electrons and two nuclei. In which form of hydrogen the spin of electrons and also the spin of nuclei are in opposite directions.

A. Ortho hydrogen

B. Para hydrogen

C. Meta hydrogen

D.  $\beta$ -hydrogen

**Answer: B**

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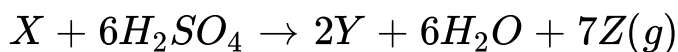
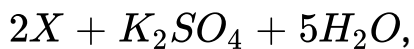
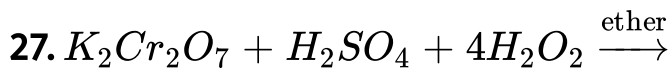
26. Select correct statements

- A. Ortho hydrogen are different due to difference in their nuclear spins
- B. Ortho and para hydrogen are different due to difference in their electron spins
- C. Parahydrogen has a lower internal energy than that of ortho hydrogen
- D. Para hydrogen is more stable at lower temperature

**Answer: ACD**



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the correct statement (s) regarding the above eq:

A. The oxidation state of central atom in X is +10 and

has butterfly structure

B. The oxidation state of central atom in Y is +3 and

has green colour

C. Z is colourless paramagnetic gas

D. The oxidation state of central atom in X is +6 and

has 2 peroxy linkages with butterfly like structure.

Answer: BCD

 [View Text Solution](#)

28. Incorrect statement (s) regarding  $H_2O_2$  is s/are

A.  $H_2O_2$  has higher boiling point than water

B. AS physical state of  $H_2O_2$  chsanges the bond angles  
and dihesdreal angles chages

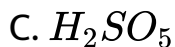
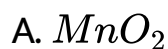
C.  $H_2O_2$  acts as a reading agent during its bleaching  
action

D.  $H_2O_3$  is manufactured by eleectrolysis of hot dilute  
aq solution of  $H_2SO_4$

**Answer: CD**

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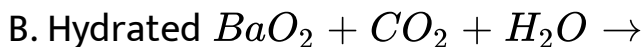
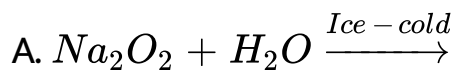
**29.** Peroxide linkage is present in :



**Answer: BCD**

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30. Which one the following reaction gives hydrogen peroxide ?



C. Aerial oxidation of 2-rthyl anthraquimiol



**Answer: ABCD**

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31. Identify the correct statement :

A. Pure  $H_2O_2$  is weakly acidic

B. Aq  $H_2O_2$  is neutral towards litmus

C. In alkaline solution  $H_2O_2$  is a disproportionation reaction.

D. Decomposition of  $H_2O_2$  is a disproportionation reaction.

**Answer: ABCD**

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32. Excess of KI and Dil  $H_2SO_4$  were mixed in 50 mL  $H_2O_2$  thus,  $I_2$  liberated requires 20 mL of 0.1 N  $Na_2S_2O_3$ , the incorrect statement among the following

A. Strength of hydrogen peroxide is 100V \

B. Strength of  $H_2O_2$  in  $g.L^{-1}$  is 0.68

C. Strength of  $H_2O_2$  in  $g. mL^{-1}$  is 0.68

D. Molarity of  $H_2O_2$  is 1M

**Answer: ACD**



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**33.** Which of the following statements is/are correct about 6.8 % strength of  $H_2O_2$ .

A. Its normality is 4N

B. Its molarity is 2M

C. Its volume strength is 22.4V



D. Volum strenght =  $11.2 \times \text{Molarity}$

**Answer: ABCD**

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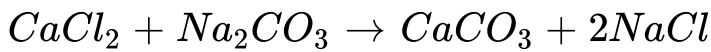
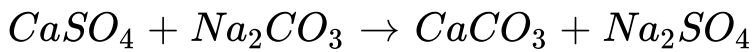
**34.** In which of the following proces ,hydrogen is produced

- A. Bosch method
- B. Lane process
- C. Uyeno 's mrhtod
- D. Merck process

**Answer: ABC**

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35. Permanent hardness is due to  $Cl^{\ominus}$  and  $SO_4^{2-}$  of  $Mg^{2+}$  and  $Ca^{2+}$  and is removed by adding  $Na_2CO_3$ .



Which of the

following statements is / are correct?

A. If hardness is 100PPm  $CaCO_3$  the amount of

$Na_2CO_3$  required to soften 10L of hard water is

10.6h

B. If hardness is 100PPm,  $CaCO_3$ , the amount of

$Na_2CO_3$  required to soften is 10l of hard water is

10.6g

C. If hardness is 420 ppm  $MgCO_3$  the amount of

$Na_2CO_3$  required to soften 10L of hard water is

5.3g

D. If hardness is 420 ppm  $MgCO_3$  the amount of

$Na_2CO_3$  required to soften 10L of hard water is

53.0g

**Answer: A,D**



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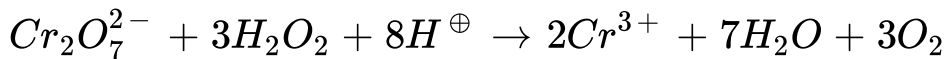
**36.** Which of the following statements is/are correct about 6.8% strength of  $H_2O_2$ .

- A. Its normality is 4N
- B. Its molarity is 2M
- C. Its volume strength is 22.4V
- D. Volume strength =  $11.2 \times M$

**Answer: A,B,C,D**

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**37.** Which of the following statements about the following reaction is / are not correct?



- A.  $\text{H}_2\text{O}_2$  is oxidised to  $\text{O}_2$
- B.  $\text{H}_2\text{O}_2$  is reduced to  $\text{H}_2\text{O}$

C. the oxidation number of chromium atom changes by 3

D. Hydrogen ions are oxidised to  $H_2O$

**Answer: B,D**

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**38.** Which of the following is /are basic hydroxide ?

A. HCl

B.  $NH_3$

C.  $H_2S$

D.  $PH_3$

**Answer: B,D**

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**39.** The presence of water can be inferred by

- A. Using anhydrous  $CUSO_4$  which changes colour
- B. Using anhydrous  $CoCl_2$  which changes colour
- C. the use of hydrated  $CuSO_4$
- D. Taste and smell

**Answer: A,B**

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40. Which of the following statement is(are) correct?

A.  $H_2O$  is a pale blue viscous liquid

B.  $H_2O_2$  can act as an oxidizing as well as a reducing agent

C. In  $H_2O_2$  the two hydroxyl groups lie on the same phase

D. None of these

**Answer: A::B**

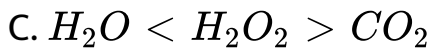
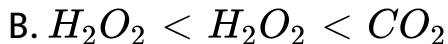
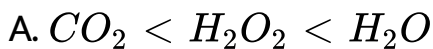


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**41.** Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide. On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%  $H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can be expressed in a number of ways namely normality, molarity, percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well as a reducing agent both in acidic and basic media.

The correct increasing order of the acidity of  $CO_2$ ,  $H_2O$  and  $H_2O_2$  is





**Answer: B**



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**42.** Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide. On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%

$H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can be expressed in a number of ways namely normality, molarity, percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well as a reducing agent both in acidic and basic media.

The volume of 10 volume  $H_2O_2$  solution that decolourises 200 ml of 2N  $KMnO_4$  solution in acidic medium is

- A. 112 ml
- B. 336 ml
- C. 200 ml
- D. 224 ml

**Answer: D**

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**43.** Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide. On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%  $H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can be expressed in a number of ways namely normality, molarity, percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well as a reducing agent both in acidic and

basic media.

Hydrolysis of one mole of peroxodisulphuric acid produces

A. Two moles of sulphuric acid only

B. Two moles of peroxmonosulphuric acid

C. one mole of sulphuric acid , and one mole of peroxmonosulphuric acid

D. One mole of sulphuric acid, one mole of peroxmonosulphuric acid and one mole of hydrogen peroxide.

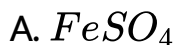
**Answer: C**

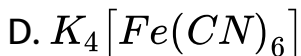
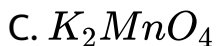


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44. Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide. On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%  $H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can be expressed in a number of ways namely normality, molarity, percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well as a reducing agent both in acidic and basic media.

In acidic medium,  $H_2O_2$  acts as a reducing agent in its reaction with





**Answer: B**



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**45.** Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide.

On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%  $H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can

be expressed in a number ways namely normality , molarity , percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well a reducing agent both in acidic and basic media.

What will be the volume of oxygen at NTP liberated upon the complete decomposition of 100 mL of the 2M  $H_2O_2$  solution?

- A. 2.24 L
- B. 22.4 L
- C. 44.8 L
- D. 11.2 L

**Answer: A**



**46.** Hydrogen peroxide can be prepared by the action of dil.  $H_2SO_4$  or  $H_3PO_4$  on barium peroxide or by bubbling carbon dioxide through a thin paste of barium peroxide. On an industrial scale, it can be prepared by hydrolysis of peroxodisulphuric acid obtained by electrolysis of 50%  $H_2SO_4$  or an equimolar mixture of  $H_2SO_4$  and ammonium sulphate. The strength of  $H_2O_2$  solution can be expressed in a number of ways namely normality, molarity, percentage strength and volume of  $O_2$  produced at N.T.P by decomposition of 1 mL of  $H_2O_2$  acts as an oxidising as well as a reducing agent both in acidic and basic media.

Hydrogen peroxide is used as



A. An oxidant only

B. A reductant only

C. An acid only

D. An oxidant , a reductant and an acid

**Answer: D**



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**47.** A compound C is produced on an industrial scale by oxidation of 2-ethylantraquinol by air. Compound C decolourises an acidic solution of  $KMnO_4$  with the evolution of  $O_2$ . Compound C produces a brown precipitate when it reacts with  $MnSO_4$  in alkaline

solution.

Compound C reacts with  $K_2Cr_2O_7$  in acidic solution in presence of an organic solvent impart colour to the organic phase

A. orange

B. yellow

C. blue

D. green

**Answer: C**



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48. A compound C is produced on an industrial scale by oxidation of 2-ethylanthraquinol by air. Compound C decolourises an acidic solution of  $KMnO_4$  with the evolution of  $O_2$ . Compound C produces a brown precipitate when it reacts with  $MnSO_4$  in alkaline solution.

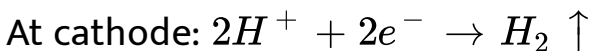
In industrial preparation of compound C, 2-ethylanthraquinone is also produced which can be converted back to 2-ethylanthraquinol by

- A. Addition of strong acid
- B. Addition of strong base
- C. Catalytic oxidation
- D. Catalytic reduction using  $H_2 / Pd$

**Answer: D**

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**49.** At one time  $H_2O_2$  was obtained by electrolysis of 50%  $H_2SO_4$ . The process of electrolysis involves following reaction :



Which of the following statements are correct with respect to X, Y and Z ? (i) In all compounds the covalency of Sulphur is 6

(ii) Peroxy bond is present in both Y and Z

(iii) Basicity of all acids is 2

In X there is no S-S linkage

A. ii, iv

B. ii, iii, iv

C. I, ii, iv

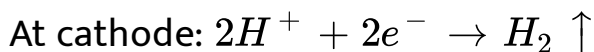
D. I, iii, iv

**Answer: D**



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**50.** At one time  $H_2O_2$  was obtained by electrolysis of 50%  $H_2SO_4$ . The process of electrolysis involves following reaction :



Among X, Y and Z which is an oxidising agent ?

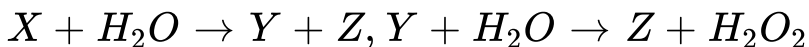
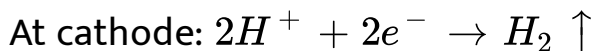
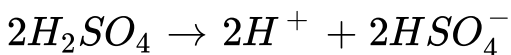
- A. only X
- B. Only Y
- C. X,Y and Z
- D. only Z

**Answer: C**



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51. At one time  $H_2O_2$  was obtained by electrolysis of 50%  $H_2SO_4$ . The process of electrolysis involves following reaction :



The number of -OH groups in X:

A. 3

B. 2

C. 4

D. zero

**Answer: B**



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52. Matching the following



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53. Matching the following



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54. Matching the isotopes of hydrogen (and compounds) in Column I with their properties given in Column II and



mark the correct option from the codes given below,



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**55.** Match the hydrides in Column I with their nature (may be more than one) given in Column II and mark the correct answer option from the codes given below.



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**56.** The number of species having peroxy bonds among the following

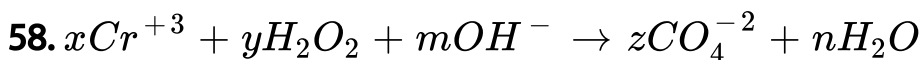
Pertitanic acid ,  $Na_2O_2$ ,  $PbO_2$ ,  $CrO_5$

Perchloric cid, Potassium permanganate

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57. One kilogram sample of hard water contains 4.44 mg of  $CaCl_2$  and 1.9 mg of NaCl. The total hardness in tems of ppm of  $CaCO_3$  is :

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In the above balance the equation , what is the value of  $x+y+z$  is :

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59. Give the total number of peroxide linkages present in Caro's acid, Marshall's acid and hydrogen peroxide

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60. What is the sum of protons, electrons and neutrons in the heaviest isotope of hydrogen?

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61. What is the sum of protons, electrons and neutrons in the lightest isotope of hydrogen?

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**62.** How many moles of ammonia are produced when one mole of calcium nitride reacts with water?

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**63.** How many moles of phosphine are produced when one of the calcium phosphides reacts with water?

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**64.** What is the molarity of a commercial sample of 33.6 volume hydrogen peroxide solution?

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Level Vi

1. Which of the following statement is incorrect regarding the complete hydrolysis of Marshall's acid?

A. Caro's acid is an intermediate product

B. Two molecules of  $H_2SO_4$  and one molecule of  $H_2O_2$  are the final product

C. Hybridisation and oxidation state of central atom remain unchanged in the final product

D. Both final products can act as oxidising as well as reducing agent

**Answer: D**

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2. The volume strength of  $10NH_2O_2$  is :

A. 112

B. 11.2

C. 0.112

D. 56

**Answer: D**

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3. I. Bleaching action of  $H_2O_2$  is its oxidising property

II.  $H_2O_2$  oxidises benzene to phenol in the presence of Fenton's reagent

III. Hydrogen gas is evolved if  $H_2O_2$  oxidises formaldehyde to formic acid

IV.  $H_2O_2$  gives red colouration with ethereal solution of acidified  $K_2Cr_2O_7$

Then the incorrect statements is / are

A. Only IV

B. Only I and III

C. Only II and IV

D. I,II,III and IV

**Answer: A**

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4. The molarity of 20 ml of 20 volumes  $H_2O_2$  is

A. 0.9

B. 1.8

C. 2.7

D. 1.9

**Answer: B**

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5. Identify the incorrect statements



- A.  $H_2O_2$  gives yellow colour on reaction with  $Cr(OH)_3$
- B.  $H_2O_2$  gives blue colouration with titanium salt solution
- C.  $H_2O_2$  decolourises pink colour of  $KMnO_4$
- D.  $H_2O_2$  turns starch iodide paper to blue

**Answer: B**

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6. The boiling point of water is exceptionally high because

- A. Of covalent bond between H and O

- B. Water is linear in structure
- C. Inter-molecular hydrogen bonding
- D. Water molecule has high dielectric constant

**Answer: C**

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7. Which of the following statement is/are correct regarding  $H_2O_2$  ?

- A. It oxidises Fe(II) to Fe(III) in acidic medium
- B. It is obtained by electrolysis of dilute  $H_2SO_4$
- C. It reduces Mn(VII) to Mn(II)

D. It is a weak base

**Answer: D**

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8. Sample of water has hardness 77.5ppm  $Ca^{2+}$ . If this is passed through an ion exchange column where  $Ca^{2+}$  is replaced by  $H^+$ , what is the pH of water after it has been so treated

A. 1.4

B. 4.4

C. 2.4

D. 5.4

**Answer: C**

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9. Which one of the following statements is / are correct?

1)  $H_2O_2$  solutions are stored in plastic or wax coated glass vessels since contact with rough surfaces accelerates its decomposition

2) Urea, sodium stannate, acetanilide, sodium pyrophosphate etc., act as stabilizers (inhibitors) (negative catalyst) for the decomposition of  $H_2O_2$

3) Silica,  $MnO_2$ , iron, manganese, alumina act as accelerators (positive catalysts) for the decomposition of  $H_2O_2$

$H_2O_2$  is a very powerful oxidising agent and a poor reducing agent

A. All are correct

B. 1,2,4 correct

C. 1,3 correct

D. 2,4 correct

**Answer: A**



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**10.** An alkaline solution of  $H_2O_2$  converts benzene into phenol in the presence of  $FeSO_4$ .

Thus, the solution of alkaline  $H_2O_2 + FeSO_4$  is a strong oxidising agent and is known as

- A. Fenton's reagent
- B. Tollen's reagent
- C. Etar's reagent
- D. Schmidt's reagent

**Answer: A**

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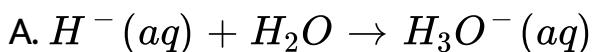
**11.** If one assume linear structure instead of bent structure for water then which on of the following properties cannot be explained ? .

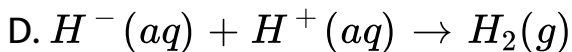
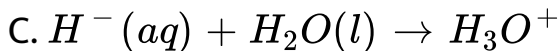
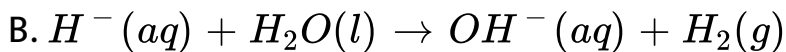
- A. The formation of intermolecular hydrogen bonds in water
- B. The high boiling point of water
- C. Solubility of polar compounds in water
- D. Ability of water to form co-ordinate covalent bonds.

**Answer: C**

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12. The hydride ion  $H^-$  is a stronger base than its hydroxide ion  $OH^-$ . Which of the following reactions will occur if sodium hydride (NaH) is dissolved in water ?





**Answer: B**



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**13.** When the same amount of zinc is treated separately with excess of sulphuric acid and excess of sodium hydroxide, the ratio of volume of hydrogen evolved is

A. 1:1

B. 1:4

C. 4:1



D. 9: 7

**Answer: A**

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14. For preparing  $H_2O_2$  in the laboratory

A.  $MnO_2$  is added to dilute cold  $H_2SO_4$

B.  $BaO_2$  is added to  $CO_2$  bubbling through cold water

C.  $PbO_2$  is added to an acidified solution of  $KMnO_4$

D.  $Na_2O_2$  is added to  $CO_2$  bubbling through cold  
water

**Answer: B**



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15. Molarity and volume strength of perhydrol respectively

A. 100M and 8.9 V

B. 8.9 M and 100V

C. 8.9M and 30V

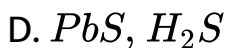
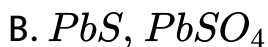
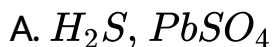
D. 30M and 8.9 V

**Answer: B**



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16. The lead of the lead paintings becomes black due to formation of.....  $H_2O_2$  converts the black colour to white lead is.....



**Answer: B**



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17. Bleaching action of  $H_2O_2$  is due to its :

- A. Oxidation
- B. Reduction
- C. Acidic behaviour
- D. Basic nature

**Answer: A**



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**18.** Which of the following is the most suitable test to identify water

- A. Smell the liquid
- B. Addition of anhydrous copper sulphate turns it blue

C. Dip a litmus paper into the liquid and look for a colour change

D. Moisten  $K_2Cr_2O_7$  paper with the solution

**Answer: B**

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**19.** Which of the following statements are correct

A.  $H_2O_2$  reduces  $MnO_4^-$  both in acidic and basic media

B.  $H_2O_2$  oxidises  $Fe^{2+}$  both in acidic and basic media

C.  $H_2O_2$  oxidises  $Mn^{2+}$  ions in basic media

D.  $H_2O_2$  liberates  $I_2$  from acidified KI solution and reduces  $I_2$  to  $I^-$  ions in basic media

**Answer: A::B::C::D**

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20. Which of the following statements about  $H_2O_2$  is not true ?

- A.  $H_2O_2$  is used to clean oil paintings
- B.  $H_2O_2$  acts as oxidising as well as reducing agent
- C. Two hydroxyl group in  $H_2O_2$  lie in the same plane
- D. It retains same structural in liquid and solid form

**Answer: A::B::D**

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21.  $H_2O_2$  is "5.6 volume" then

A. It is 1.7% weight by volume

B. It is 1 N

C. It is 1 M

D. It is 5.6 M

**Answer: A::B**

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22. Deuterium is heavy hydrogen, which is used in

- A. Artificial transmutation of elements
- B. In nuclear reactors as a moderator
- C. As a tractor in chemical engineering
- D. As a radioactive isotope of hydrogen used for dating

**Answer: A::B::C**



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23. Amongst the following, choose the correct statements



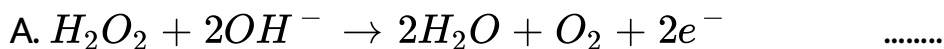
- A. Atomic hydrogen is obtained by passing hydrogen through an electric arc
- B. hydrogen gas will not reduce heated aluminium oxide
- C. Finely divided palladium absorbs large amount of hydrogen gas
- D. Pure nascent hydrogen is the best obtained by Na with  $C_2H_5OH$

**Answer: A::B::C**

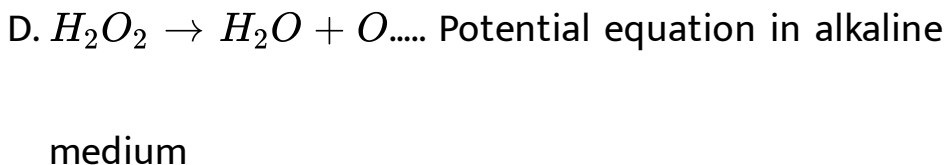
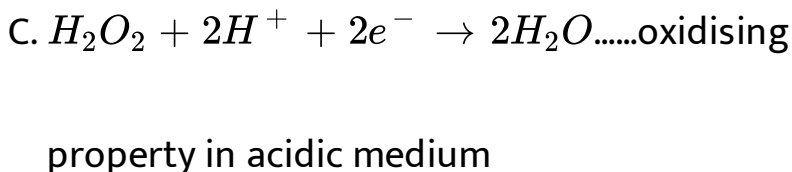
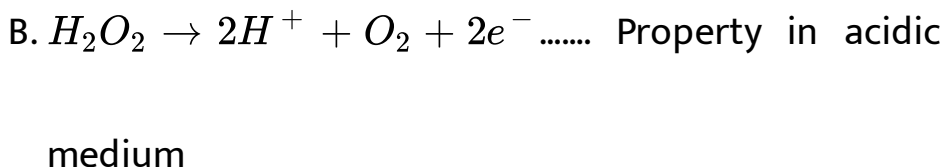


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24. Which of the following is / are matched properly ?



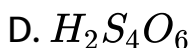
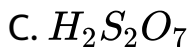
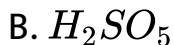
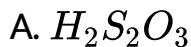
Reducing property in alkaline medium



**Answer: A::B::C::D**

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25. Which of the following does not give hydrogen peroxide on hydrolysis ?

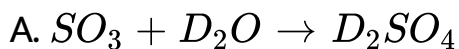


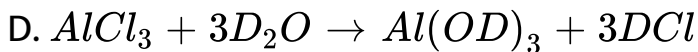
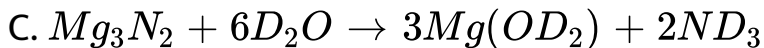
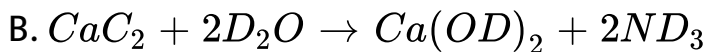
**Answer: A::C::D**



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26. Which of the following is a Deuterolysis reaction





**Answer: B::C::D**



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**27. Which is / are true statements?**

A. The layer of ice on the surface of river in the winter acts as a thermal insulator between the water below and the air above

- B. The fish and other marine organisms are enabled to survive long periods of freezing weather due to the fact that ice is lighter than water
- C. When ice is formed volume decreases
- D. Density of ice is maximum at  $0^{\circ}\text{C}$

**Answer: A::B**

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**28.** 1.78N of  $\text{H}_2\text{O}_2$  solution is :

- A. 10 volumes of  $\text{H}_2\text{O}_2$
- B. 3.03%  $\left(\frac{w}{v}\right)$  of  $\text{H}_2\text{O}_2$

C. 2.56M  $H_2O_2$

D. 1 mL  $H_2O_2$  liberates 10 mL of  $O_2$  at STP

**Answer: A::B::D**

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**29.** Which of the following statements is / are correct?

A.  $H_2O_2$  is reduced to  $O_2$  by a strong reducing agent

B.  $H_2O_2$  is a non-planer molecule

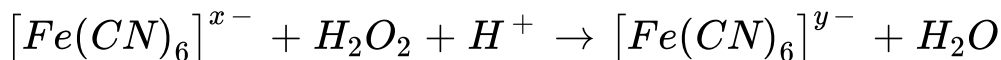
C. The formation of  $CrO_5$  from  $Cr_2O_7^{2-}$  ion by the action of  $H_2O_2$  in an acid medium is not a redox reduction

D.  $H_2O_2$  is oxidised to  $OH^-$  ions by a two electron change

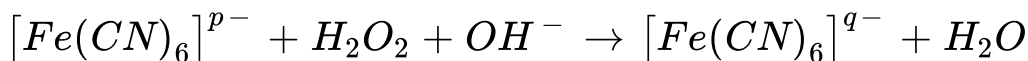
**Answer: A::B::D**

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30. (i)



(ii)



Select the correct statements:

A. x and y are 3 and 4 respectively

B. p and q are 3 and 4 respectively

C. in (i),  $H_2O_2$  acts as an oxidising agent

D. In (ii),  $H_2O_2$  acts as an reducing agent

**Answer: A::B::C::D**

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**31.** The oxidation states of the most electronegative element in the products of the reaction between  $BaO_2$  with dilute  $H_2SO_4$  are

A.  $-1$

B.  $+1$

C.  $-2$

D.  $0$



Answer: A:C

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32. The hardness of water due to  $HCO_3$  is  $122\text{ppm}$ . Select the correct statement(s).

A. The hardness of water in terms of  $CaCO_3$  is 200 ppm

B. The hardness of water in terms of  $CaCO_3$  is 100 ppm

C. The hardness of water in terms of  $CaCO_3$  is 222 ppm

D. The hardness of water in terms of  $CaCO_3$  is 95 ppm

**Answer: B::D**

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33.  $x$  g of  $H_2O_2$  requires 100 mL of  $M/5KMnO_4$  in a titration in a solution having  $pOH = 1.0$  Which of the following is / are correct?

A. The value of  $x$  is 1.7 g

B. The value of  $x$  is 0.34 g

C.  $MnO_4^\oplus$  changes to  $MnO_4^{2-}$

D.  $H_2O_2$  changes to  $O_2$

**Answer: B::C::D**

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34. 20 mL of  $H_2O_2$  is reacted completely with acidified  $K_2Cr_2O_7$  solution. 40 mL of  $K_2Cr_3O_7$  solution was required to oxidise the  $H_2O_2$  completely. Also, 2.0 mL of the same  $K_2Cr_2O_7$  solution required 5.0 mL of a 1.0 M  $H_2C_2O_4$  solution to reach equivalence point. Which of the following statements is/are correct?

- A. The  $H_2O_2$  solution is 5M
- B. The volume strength of  $H_2O_2$  is 56 V
- C. The volume strength of  $H_2O_2$  is 112 V
- D. If 40 mL more  $H_2O_2$  solution, the volume strength of the resulting solution is changed to 16.8 V

**Answer: A::B::D**

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**35.** In the reaction of sodium hydride and water:

- A. Sodium is reduced
- B. Hydrogen is oxidised
- C. Hydrogen is oxidised
- D. Hydrogen is reduced

**Answer: B::C**

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**36.** Hardness of water is measured in terms of ppm  $CaCO_3$ . It is the amount in gms of  $CaCO_3$  present in  $10^6$  gms of  $H_2O$ . In a sample of 10 litre water, 0.56 gm of CaO is required to remove temporary hardness of  $HCO_3^-$ . Permanent hardness due to  $SO_4^{2-}$  and  $Cl^-$  of  $Ca^{2+}$  and  $Mg^{2+}$  and is removed by the addition of  $Na_2CO_3$ . Temperature hardness is due to  $HCO_3^-$  of  $Ca^{2+}$  and  $Mg^{2+}$ . It is removed by the addition of CaO.



mass of CaO required  $\rightarrow$   $\sphericalangle$  is 2 gm of  $CaCO_3$  is

- A. 2.00 gm
- B. 0.56 gm
- C. 0.28 gm
- D. 1.12 gm

**Answer: B**



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**37. Temporary hardness is**

A. 200 ppm

B. 100 ppm

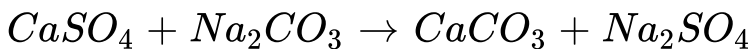
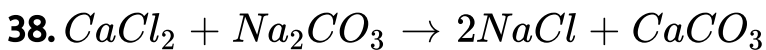
C. 50 ppm

D. 25 ppm

**Answer: A**



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If hardness is 100 ppm amount of  $\text{Na}_2\text{CO}_3$  required to soften 10 lt. Of hard water is

A. 2.12 gm

B. 0.10 gm

C. 10.6 gm

D. 1.06 gm

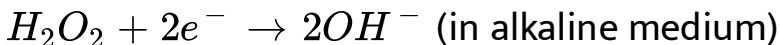
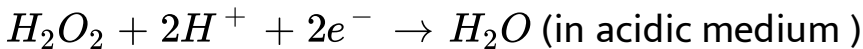
**Answer: D**



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1. Hydrogen peroxide is a powerful oxidising agent.

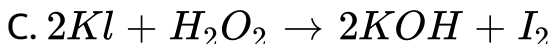
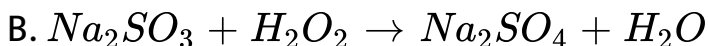
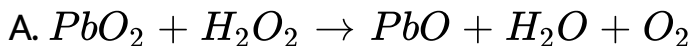
It is an electron acceptor in acidic and alkaline mediums .



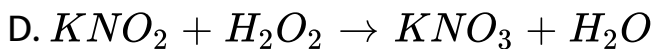
It can also act as reducing agent towards powerful oxidising agents .  $H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$

In alkaline medium , however , its reducing nature is more effective .  $H_2O_2 + 2OH^- \rightarrow 2H_2O + O_2 + 2e^-$

In which of the following reactions ,  $H_2O_2$  acts a reducing agent ?





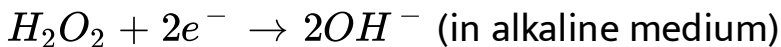
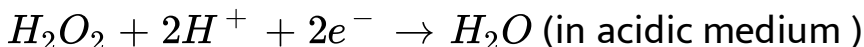


**Answer: A**

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2. Hydrogen peroxide is a powerful oxidising agent.

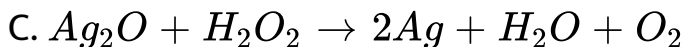
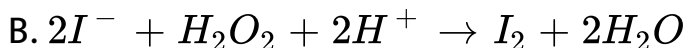
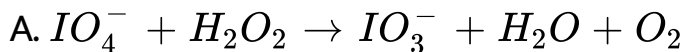
It is an electron acceptor in acidic and alkaline mediums .



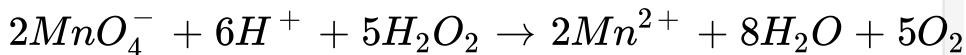
It can also act as reducing agent towards powerful oxidising agents .  $H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$

In alkaline medium , however , its reducing nature is more effective .  $H_2O_2 + 2OH^- \rightarrow 2H_2O + O_2 + 2e^-$

In which of the following reactions ,  $H_2O_2$  acts as an oxidising agent ?



D.



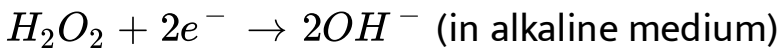
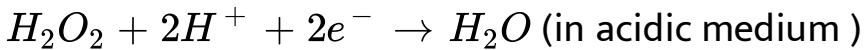
**Answer: B**



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**3.** Hydrogen peroxide is a powerful oxidising agent.

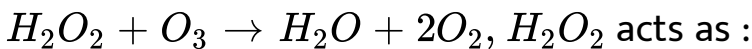
It is an electron acceptor in acidic and alkaline mediums .



It can also act as reducing agent towards powerful oxidising agents .  $H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$

In alkaline medium , however , its reducing nature is more effective .  $H_2O_2 + 2OH^- \rightarrow 2H_2O + O_2 + 2e^-$

In the reaction ,



- A. An acid
- B. An oxidizing
- C. A reducing agent
- D. Both as a reducing agent and an oxidising agent

**Answer: C**



4. Strength of the sample of  $H_2O_2$  is generally expressed in terms of volume strength . It means the volume of oxygen liberated at NTP by heating one volume of  $H_2O_2$  . The concentration of  $H_2O_2$  in a solution can also expressed as percentage of  $H_2O_2$  in solution . Normality of this solution can be calculated if the equivalent mass of  $H_2O_2$  is known .

25 mL of  $H_2O_2$  solution was added to the excess of acidified KI solution . The iodine so liberated required 40 mL of  $0.1N Na_2S_2O_3$  solution . what is normality of  $H_2O_2$  solution ?

A. 0.08

B. 0.02

C. 0.16

D. 0.20

**Answer: C**



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5. Strength of the sample of  $H_2O_2$  is generally expressed in terms of volume strength . It means the volume of oxygen liberated at NTP by heating one volume of  $H_2O_2$  . The concentration of  $H_2O_2$  in a solution can also expressed as percentage of  $H_2O_2$  in solution . Normality of this solution can be calculated if the equivalent mass of

$H_2O_2$  is known .

Percentage strength of the above  $H_2O_2$  solution is

A. 0.126

B. 0.272

C. 0.544

D. 0.136

**Answer: B**

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**6.** Strength of the sample of  $H_2O_2$  is generally expressed in terms of volume strength . It means the volume of oxygen liberated at NTP by heating one volume of  $H_2O_2$  .

The concentration of  $H_2O_2$  in a solution can also be expressed as percentage of  $H_2O_2$  in solution. Normality of this solution can be calculated if the equivalent mass of  $H_2O_2$  is known.

Volume strength of above  $H_2O_2$  solution is ?

A. 0.448

B. 0.632

C. 0.896

D. 0.556

**Answer: C**



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7.  $H_2O_2$  is an unstable liquid . On standing or on heating it decomposes to  $H_2O$  and  $O_2$ .  $H_2O_2$  can acts as oxidising agent and reducing agent . The concentration of  $H_2O_2$  is expressed differently with volume strength and the concentration of  $H_2O_2$  at a particular time is measured by titrating it with acidified  $KMnO_4$  or by titrating liberated  $I_2$  from acidified KI and  $H_2O_2$  with hypo solution . A sample of  $H_2O_2$  has 3.4 g of  $H_2O_2$  in 100 mL solution . The bottle containing this sample was kept at  $25^0C$  for 15 days then 20mL of this sample is treated with excess KI and the liberated iodine requires 50 mL , 0.2 M  $Na_2S_2O_3$  solution . Assume the volume of solution remains unchanged .

*The volumestren > hofH\_(2)O\_(2)` in the begining and after 15 days are*



A. 5.6, 3.4

B. 11.2, 2.8

C. 5.6, 4.6

D. 11.2, 5.6

**Answer: B**



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8.  $H_2O_2$  is an unstable liquid . On standing or on heating it decomposes to  $H_2O$  and  $O_2$ .  $H_2O_2$  can acts as oxidising agent and reducing agent . The concentration of  $H_2O_2$  is expressed differently with volume strength and the concentration of  $H_2O_2$  at a particular time is

measured by titrating it with acidified  $KMnO_4$  or by titrating liberated  $I_2$  from acidified KI and  $H_2O_2$  with hypo solution . A sample of  $H_2O_2$  has 3.4 g of  $H_2O_2$  in 100 mL solution . The bottle containing this sample was kept at  $25^0C$  for 15 days then 20mL of this sample is treated with excess KI and the liberated iodine requires 50 mL , 0.2 M  $Na_2S_2O_3$  solution . Assume the volume of solution remains unchanged .

The volume of  $H_2O_2$  sample (after 15 days ) that is required to reduce 40 mL of 0.2 M acidified  $KMnO_4$  solution is :

- A. 40 mL
- B. 200 mL
- C. 80 mL

D. 100 mL

**Answer: C**

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## Matrix Matching

1. Match the following :  $H_2O_2$  reacts with compounds of column-I



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2. Match the following



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3. Match the reactions in Column I with nature of water in Column II and mark the correct option from the codes given below :



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4. Match the species in Column I with corresponding properties in Column II and select the answer from the

codes given .



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## Integer Type Questions

1. If the total number of neutrons present in  $D_2O^{18}$  molecules is  $x$  then the value of  $\frac{x}{2}$  is \_\_\_.

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2. The mass number of the element obtained when tritium undergoes  $\beta$  - decay is \_\_\_

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3. What is the Normality of a commercial sample  $H_2O_2$  of the 16.8V?

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4. What is the molarity of  $H_2O_2$  of the 11.2V (volume strength)?

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5. 100 mL of tap water containing  $Ca(HCO_3)_2$  was titrated with N/50 HCl with MeOH as indicator . If 30 mL of

HCl were required , calculate the temporary hardness as parts of  $CaCO_3$  per  $10^6$  parts of water . If your answer is 'a x 100' , what is the value of 'a'.

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6. What is the molarity of  $H_2O_2$  of the 11.2 V (volume strength) ?

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7. A bottle of  $H_2O_2$  is labelled as 10 vol  $H_2O_2$ . 112 mL of this solution of  $H_2O_2$  is titrated against 0.04 M acidified solution of  $KMnO_4$  the volume of  $KMnO_4$  in litre is

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8. The oxidation state of oxygen of  $H_2O_2$  in the final products when it reacts with  $ClO_3^\ominus$  is

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9. What is the oxidation state of oxygen of  $H_2O_2$  in the final products when it reacts with  $As_2O_3$ ?

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10. Washing soda ( $Na_2CO_{3.10}H_2O$ ) is widely used in softening of hard water. If  $1L$  of hard water requires



0.0143g of washing soda, what is hardness of water in terms of *ppm* of  $\text{CaCO}_3$ ?



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