

## Single Correct Answer Type

- The percentage of para hydrogen in ordinary hydrogen increases when:
  - Temperature is lowered
  - Temperature is increased
  - Pressure is increased and temperature is decreased.
  - None of the above
- Manufacture of  $H_2$  is made by:
  - Lane's process
  - Bosch process
  - From natural gas
  - All of these
- $H_2O_2$  on treatment with chlorine gives:
  - $H_2$
  - Oxygen
  - Hypochlorous acid
  - $ClO_2$
- Radioactive isotope of hydrogen is
  - Tritium
  - Deuterium
  - Para hydrogen
  - Ortho hydrogen
- $K_a$  of  $H_2O_2$  is of the order of
  - $10^{-12}$
  - $10^{-14}$
  - $10^{-16}$
  - $10^{-10}$
- The hardness of water is estimated by
  - EDTA method
  - Titrimetric method
  - Conductivity method
  - Distillation method
- The H – O – O bond angle in  $H_2O_2$  is
  - $107.28^\circ$
  - $97^\circ$
  - $104.5^\circ$
  - $109.28^\circ$
- Hydrogen loses its electron to form  $H^+$  ion. In this respect it resembles to:
  - Transition metals
  - Alkali metals
  - Halogens
  - Noble gases
- $TiH_{1.73}$  is an example of :
  - Ionic hydride
  - Covalent hydride
  - Metallic hydride
  - Polymeric hydride
- The decomposition of  $H_2O_2$  can be slowed down by the addition of small amount of phosphoric acid which acts as:
  - Stopper
  - Detainer
  - Inhibitor
  - promoter
- The ortho and para hydrogen possess:
  - Same physical properties but different chemical properties
  - Different physical properties but same chemical properties
  - Same chemical and physical properties
  - Different, physical and chemical properties
- The volume strength of 1.5 N  $H_2O_2$  solution is
  - 4.8
  - 8.4
  - 4.2
  - 2.4
- Which of the following is correct about heavy water?
  - Water at  $4^\circ C$  having maximum density is known as heavy water
  - It is heavier than water( $H_2O$ )
  - It is formed by the combination of heavier isotope of hydrogen and oxygen
  - None of the above
- Which is not present in clear hard water?
  - $Mg(HCO_3)_2$
  - $CaCl_2$
  - $MgSO_4$
  - $MgCO_3$
- Which of the following is not correct regarding the electrolytic preparation of  $H_2O_2$ ?
  - Lead is used as cathode
  - 50%  $H_2SO_4$  is used
  - Hydrogen is liberated at anode
  - Sulphuric acid undergoes oxidation
- Electrolysis of X gives Y at anode. Vacuum distillation of Y gives  $H_2O_2$ . The number of peroxy (O - O) bonds present in X and Y respectively are
  - 1.1
  - 1.2
  - Zero, 1
  - Zero, zero
- When  $H_2O_2$  is added to acidic ferrous sulphate solutions:
  - Electrons are gained by  $Fe^{2+}$

- b) Electrons are lost by  $\text{Fe}^{2+}$   
 c) There is no loss or gain of electrons  
 d) Iron hydroxide precipitates
18. Which of the following reactions produces hydrogen?  
 a)  $\text{H}_2\text{S}_4\text{O}_8 + \text{H}_2\text{O}$                       b)  $\text{BaO} + \text{HCl}$                       c)  $\text{Mg} + \text{H}_2\text{O}$                       d)  $\text{Na}_2\text{O}_2 + 2\text{HCl}$
19.  $\text{H}_2\text{O}_2$  is formed by which of the following compounds?  
 a)  $\text{Na}_2\text{O}_2$                       b)  $\text{NaOH}$                       c)  $\text{Na}_2\text{O}$                       d)  $\text{KO}_2$
20. Which of the following acts as both reducing and oxidising agents?  
 a)  $\text{H}_2\text{SO}_4$                       b)  $\text{H}_2\text{O}_2$                       c)  $\text{KOH}$                       d)  $\text{KMnO}_4$
21. The sum of protons, electrons and neutrons in the heaviest isotope of hydrogen is  
 a) 3                      b) 5                      c) 4                      d) 6
22. On shaking  $\text{H}_2\text{O}_2$  with acidified potassium dichromate and ether, ethereal layer becomes  
 a) Green                      b) Red                      c) Blue                      d) Brown
23. The acidified solution of  $\text{FeCl}_3$  is reduced by passing:  
 a) ordinary  $\text{H}_2$                       b)  $\text{O}_2$                       c) nascent H                      d)  $\text{H}_2$
24. Hydrogen does not combine with  
 a) Helium                      b) Bismuth                      c) Antimony                      d) Sodium
25.  $\text{H}_2$  acts as an oxidant in its reaction with:  
 a)  $\text{Br}_2$                       b) Ca                      c)  $\text{N}_2$                       d) S
26. Of the two solvents  $\text{H}_2\text{O}$  and  $\text{D}_2\text{O}$ ,  $\text{NaCl}$  dissolves:  
 a) Equally in both                      b) Only in  $\text{H}_2\text{O}$                       c) More in  $\text{D}_2\text{O}$                       d) More in  $\text{H}_2\text{O}$
27. What is formed when calcium carbide react with heavy water?  
 a)  $\text{C}_2\text{D}_2$                       b)  $\text{CaD}_2$                       c)  $\text{CaD}_2\text{O}$                       d)  $\text{CD}_2$
28. When different metals like Zn, Sn, Fe are added to dilute sulphuric acid, same gas, which burns explosively in air, is evolved. The gas is:  
 a)  $\text{O}_2$                       b)  $\text{N}_2$                       c)  $\text{Cl}_2$                       d)  $\text{H}_2$
29. Heavy water is represented as  
 a)  $\text{H}_2^{18}\text{O}$                       b)  $\text{D}_2\text{O}$                       c)  $\text{D}_2^{18}\text{O}$                       d)  $\text{H}_2\text{O}$  at  $4^\circ\text{C}$
30. Which is not a water softener?  
 a) Calgon                      b) Permutit                      c)  $\text{Na}_2\text{CO}_3$                       d)  $\text{Na}_2\text{SO}_4$
31. The boiling point of heavy water is:  
 a)  $100^\circ\text{C}$                       b)  $101.4^\circ\text{C}$                       c)  $104^\circ\text{C}$                       d)  $102.5^\circ\text{C}$
32. The volume of oxygen liberated from 15mL of 20 volume  $\text{H}_2\text{O}_2$  is  
 a) 250mL                      b) 300mL                      c) 150mL                      d) 200mL
33. Decomposition of  $\text{H}_2\text{O}_2$  is prevented by  
 a)  $\text{KOH}$                       b)  $\text{MnO}_2$                       c) Acetanilide                      d) Oxalic acid
34. The boiling point of water is high because  
 a) Water molecule is linear  
 b) Water molecule is not linear  
 c) Water molecules possess covalent bond between H and O  
 d) Water molecules associate due to H-bonding
35. The volume of '10 vol.' of  $\text{H}_2\text{O}_2$  required to liberate 500 mL  $\text{O}_2$  at NTP is:  
 a) 50 mL                      b) 25 mL                      c) 100 mL                      d) 125 mL
36. Which of the following pairs of ions make the water hard?  
 a)  $\text{NH}_4^+$ ,  $\text{Cl}^-$                       b)  $\text{Ca}^+$ ,  $\text{HCO}_3^-$                       c)  $\text{Ca}^{2+}$ ,  $\text{NO}_3^-$                       d)  $\text{Na}^+$ ,  $\text{SO}_4^{2-}$
37. Which of the following gas is insoluble in water?  
 a)  $\text{SO}_2$                       b)  $\text{NH}_3$                       c)  $\text{H}_2$                       d)  $\text{CO}_2$
38. Which will produce hard water?  
 a) Saturation of water with  $\text{CaSO}_4$   
 b) Addition of  $\text{Na}_2\text{SO}_4$  to water

- c) Saturation of water with  $\text{CaCO}_3$   
d) Saturation of water with  $\text{MgCO}_3$
39. In Bosch's process which gas is utilised for the production of hydrogen gas?  
a) Producer gas                      b) Water gas                      c) Coal gas                      d) None of these
40. Triple point of water is  
a) 203 K                      b) 193 K                      c) 273 K                      d) 373 K
41. The hybridization of the orbitals of oxygen in  $\text{H}_2\text{O}_2$  is:  
a)  $sp^3d$                       b)  $sp$                       c)  $sp^2$                       d)  $sp^3$
42. Which of the following pairs will not produce dihydrogen gas?  
a)  $\text{Cu} + \text{HCl} (\text{dil.})$                       b)  $\text{Fe} + \text{H}_2\text{SO}_4$                       c)  $\text{Mg} + \text{steam}$                       d)  $\text{Na} + \text{alcohol}$
43. Calgon used as water softner is  
a)  $\text{Na}_2[\text{Na}_4(\text{PO}_3)_6]$                       b)  $\text{Na}_4[\text{Na}_2(\text{PO}_3)_6]$                       c)  $\text{Na}_2[\text{Na}_4(\text{PO}_4)_5]$                       d) None of these
44. Permutit is:  
a) Hydrated sodium aluminium silicate  
b) Sodium hexa meta-phosphate  
c) Sodium silicate  
d) Sodium meta-aluminate
45. The rubber foam is produced by passing oxygen through rubber foaming material. This oxygen is released from:  
a) Nitric oxide                      b) Hydrogen peroxide                      c) Water                      d)  $\text{CO}_2$
46. Which is the poorest reducing agent?  
a) Atomic hydrogen                      b) Nascent hydrogen  
c) Dihydrogen                      d) All have same reducing strength
47. In context with the industrial preparation of hydrogen from water gas ( $\text{CO} + \text{H}_2$ ) which of the following is the correct statement.  
a)  $\text{CO}$  and  $\text{H}_2$  are fractionally separated using differences in their densities  
b)  $\text{CO}$  is removed by absorption in aqueous  $\text{Cu}_2\text{Cl}_2$  solution  
c)  $\text{H}_2$  is removed through occlusion with Pd  
d)  $\text{CO}$  is oxidised to  $\text{CO}_2$  with steam in the presence of a catalyst followed by absorption of  $\text{CO}_2$  in alkali
48. The number of radioactive isotopes of hydrogen is:  
a) 1                      b) 2                      c) 3                      d) None of these
49. The oxidation number of oxygen in hydrogen peroxide is  
a) + 1                      b) - 1                      c) + 2                      d) - 2
50. The normality of 30 volume  $\text{H}_2\text{O}_2$  is  
a) 2.678 N                      b) 5.336 N                      c) 8.034 N                      d) 6.685 N
51. Acidified solution of chromic acid on treatment with  $\text{H}_2\text{O}_2$  yields:  
a)  $\text{CrO}_3 + \text{H}_2\text{O} + \text{O}_2$                       b)  $\text{Cr}_2\text{O}_2 + \text{H}_2\text{O} + \text{O}_2$                       c)  $\text{CrO}_5 + \text{H}_2\text{O} + \text{K}_2\text{SO}_4$                       d)  $\text{H}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{O} + \text{O}_2$
52. The hair dyes available in the market generally contain two bottles, one containing the dye and the other hydrogen peroxide. Before applying the dye, the two solutions are mixed. The hydrogen peroxide.  
a) Is added to dilute the solution of the dye  
b) Oxidises the dye to give the desired colour  
c) Reduces the dye to give the desired colour  
d) Acidifies the solution of the dye
53. In periodic table tritium is placed in group:  
a) I                      b) II                      c) III                      d) IV
54. The *ortho* and *para* hydrogen differ in respect of which of the following?  
a) In the molecular weight                      b) In the nature of spin of protons  
c) In the nature of spin of electrons                      d) In the number of protons
55. The bond energy of covalent O—H bond in water is:  
a) Equal to bond energy of hydrogen bond

- b) Greater than bond energy of hydrogen bond  
 c) Lesser than bond energy of hydrogen bond  
 d) None of the above
56. Water acts as excellent solvent due to:  
 a) Hydrogen bonding  
 b) Neutral nature  
 c) High dielectric constant  
 d) None of the above
57.  $\text{TiH}_{1.73}$  is an example of which type of the hydride?  
 a) Metallic                      b) Ionic                      c) Covalent                      d) Polymeric
58. An aqueous solution of hydrogen peroxide is  
 a) Alkaline                      b) Neutral                      c) Strongly acidic                      d) Weakly acidic
59. The O—O bond length in  $\text{H}_2\text{O}_2$  is:  
 a) 1.54 Å                      b) 1.48 Å                      c) 1.34 Å                      d) 1.01 Å
60. Moist hydrogen peroxide cannot be dried over conc.  $\text{H}_2\text{SO}_4$  because  
 a) It can catch fire                      b) It is reduced by  $\text{H}_2\text{SO}_4$   
 c) It is oxidised by  $\text{H}_2\text{SO}_4$                       d) It is decomposed by  $\text{H}_2\text{SO}_4$
61. The strength in volumes of a solution containing 30.36g/L of  $\text{H}_2\text{O}_2$  is  
 a) 10 volume                      b) 20 volume                      c) 5 volume                      d) None of these
62. Tritium emits:  
 a)  $\alpha$ -particles                      b)  $\beta$ -particles                      c)  $\gamma$ -rays                      d) Neutrons
63. The ratio of electron, proton and neutron in tritium is:  
 a) 1 : 1 : 1                      b) 1 : 1 : 2                      c) 2 : 1 : 1                      d) 1 : 2 : 1
64. Hydrogen directly combines with  
 a) Cu                      b) Au                      c) Ca                      d) Ni
65. In which of the following reactions,  $\text{H}_2\text{O}_2$  is acting as a reducing agent?  
 a)  $\text{SO}_2 + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{SO}_4$                       b)  $2\text{KI} + \text{H}_2\text{O}_2 \rightarrow 2\text{KOH} + \text{I}_2$   
 c)  $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$                       d)  $\text{AgO}_2 + \text{H}_2\text{O}_2 \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$
66. Permutit is the technical name given to  
 a) Aluminates of calcium and sodium                      b) Hydrated silicate of aluminium and sodium  
 c) Silicates of calcium and magnesium                      d) Silicates of calcium and sodium
67. The best method to test whether a clear liquid is water, is to:  
 a) Taste the liquid  
 b) Smell the liquid  
 c) Add litmus paper  
 d) Add few drops on anhydrous copper sulphate and look for colour change
68. An inorganic compound liberates  $\text{O}_2$  when heated, turns an acid solution of KI brown and reduces acidified  $\text{KMnO}_4$ . The substance is:  
 a)  $\text{H}_2\text{O}_2$                       b)  $\text{D}_2\text{O}$                       c)  $\text{KNO}_3$                       d)  $\text{Pb}(\text{NO}_3)_2$
69. Heavy water is qualified as heavy because it is:  
 a) A heavy liquid  
 b) An oxide of a heavier isotope of oxygen  
 c) An oxide of deuterium  
 d) Denser than water
70. Permanent hardness can be removed by adding  
 a)  $\text{Cl}_2$                       b)  $\text{Na}_2\text{CO}_3$                       c)  $\text{Ca}(\text{OCl})\text{Cl}$                       d)  $\text{K}_2\text{CO}_3$
71. The ionization energy of hydrogen is:  
 a) Lower than alkali metals  
 b) Lower than halogens  
 c) Closer to alkali metals  
 d) Closer to halogens

72. Which one of the following reactions represents the oxidising property of  $\text{H}_2\text{O}_2$ ?
- $2\text{KMnO}_4 + 3\text{H}_2\text{SO}_4 + 5\text{H}_2\text{O}_2 \rightarrow \text{K}_2\text{SO}_4 + 2\text{MnSO}_4 + 8\text{H}_2\text{O} + 5\text{O}_2$
  - $2\text{K}_3[\text{Fe}(\text{CN})_6] + 2\text{KOH} + \text{H}_2\text{O}_2 \rightarrow 2\text{K}_4[\text{Fe}(\text{CN})_6] + 2\text{H}_2\text{O} + \text{O}_2$
  - $\text{Pb}_2 + \text{H}_2\text{O}_2 \rightarrow \text{PbO} + \text{H}_2\text{O} + \text{O}_2$
  - $2\text{KI} + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2 \rightarrow \text{K}_2\text{SO}_4 + \text{I}_2 + 2\text{H}_2\text{O}$
73. Hydrogen peroxide is prepared in the laboratory by
- Passing  $\text{CO}_2$  into  $\text{BaO}_2$
  - Adding  $\text{MnO}_2$  to dil.  $\text{H}_2\text{SO}_4$
  - Adding  $\text{Na}_2\text{O}_2$  to cold water
  - Adding  $\text{PbO}_2$  into  $\text{KMnO}_4$
74. Heavy water is
- Water at  $0^\circ\text{C}$
  - Water containing Fe, Cr, Mn
  - $\text{D}_2\text{O}$
  - Water obtained after a number of distillations
75. *Ortho* and *para* hydrogen differ in
- Nuclear charge
  - Nuclear reaction
  - Electron spin
  - Proton spin
76. Hydrogen peroxide is manufactured by the auto-oxidation of:
- 2-ethylanthraquinol
  - Anthraquinone
  - Naphthalene
  - Anthracene
77. What is the product of the reaction of  $\text{H}_2\text{O}_2$  WITH  $\text{Cl}_2$ ?
- $\text{O}_2 + \text{HOCl}$
  - $\text{HCl} + \text{O}_2$
  - $\text{H}_2\text{O} + \text{HCl}$
  - $\text{HCl} + \text{H}_2$
78. One mole of calcium phosphide on reaction with excess water gives:
- One mole of phosphene
  - Two moles of phosphoric acid
  - Two moles of phosphine
  - One mole of phosphorus pentaoxide
79. Hydrogen may be prepared by heating a solution of caustic soda with:
- Mg
  - Zn
  - Fe
  - Ag
80.  $\text{H}_2\text{O}_2$  is manufactured these days
- By the action of  $\text{H}_2\text{O}_2$  on  $\text{BaO}_2$
  - By the action of  $\text{H}_2\text{SO}_4$  on  $\text{Na}_2\text{O}_2$
  - By electrolysis of 50%  $\text{H}_2\text{SO}_4$
  - By burning hydrogen in excess of oxygen
81. On bubbling  $\text{CO}_2$  through a solution of barium peroxide in water:
- $\text{O}_2$  is formed
  - $\text{H}_2\text{CO}_3$  is formed
  - $\text{H}_2\text{O}_2$  is formed
  - $\text{H}_2$  is formed
82. The most reactive state of hydrogen is:
- Atomic hydrogen
  - Heavy hydrogen
  - Molecular hydrogen
  - Nascent hydrogen
83. The number of protons, electrons and neutrons respectively in a molecule of heavy water is:
- 10, 10, 10
  - 8, 10, 11
  - 10, 11, 10
  - 11, 10, 10
84. Ordinary hydrogen is a mixture at:
- 75% ortho  $\text{H}_2$  + 25% para  $\text{H}_2$
  - 25% ortho  $\text{H}_2$  + 75% para  $\text{H}_2$
  - 50% ortho  $\text{H}_2$  + 50% para  $\text{H}_2$
  - 99% para  $\text{H}_2$  + 1%ortho  $\text{H}_2$
85. Heavy water freezes at:
- $-3.8^\circ\text{C}$
  - $3.8^\circ\text{C}$
  - $0^\circ\text{C}$
  - $3.2^\circ\text{C}$
86. The electronic configuration of deuterium is:
- $1s^2$
  - $1s^1, 2s^2$
  - $1s^2, 2s^1$
  - $1s^1$
87. Smell of  $\text{H}_2\text{O}_2$  resembles:
- Alcohol
  - Alkali
  - Nitric acid
  - Chloroform
88. Hydrogen produced in contact with substance which is to be reduced is:
- Ortho  $\text{H}_2$
  - Para  $\text{H}_2$
  - Active H
  - Nascent H
89.  $\text{H}_2\text{O}_2$  acts as an oxidizing agent in:
- Neutral medium

- b) Acidic medium  
 c) Alkaline medium  
 d) acidic as well as in alkaline medium
90. The concentration of  $\text{H}_2\text{O}_2$  solution of '10 volume' is  
 a) 30%                      b) 3%                      c) 1%                      d) 10%
91. Water possesses a high dielectric constant, therefore  
 a) It always contains ions                      b) It is universal solvent  
 c) Can dissolve covalent compounds                      d) Can conduct electricity
92. Tailing of mercury is a laboratory test for:  
 a)  $\text{O}_3$                       b) Hg                      c)  $\text{Cl}_2$                       d)  $\text{O}_2$
93. Which method cannot be used to remove hardness of water?  
 a) Clark's method  
 b) By adding washing soda  
 c) Calgon process  
 d) Filtration
94. Which of the following could act as a propellant for rockets?  
 a) Liq.  $\text{H}_2$  + Liq.  $\text{O}_2$                       b) Liq.  $\text{N}_2$  + Liq.  $\text{O}_2$                       c) Liq.  $\text{H}_2$  + Liq.  $\text{N}_2$                       d) Liq.  $\text{O}_2$  + Liq. Ar
95. When electric current is passed through an ionic hydride in the molten state,  
 a) Hydrogen is liberated at the cathode  
 b) Hydrogen is liberated at the anode  
 c) Hydride ion migrates towards cathode  
 d) No reaction takes place
96. Deuterium was discovered by:  
 a) Urey                      b) Aston                      c) Rutherford                      d) Chadwick
97. The percentage by weight of hydrogen in  $\text{H}_2\text{O}_2$  is:  
 a) 50                      b) 25                      c) 6.25                      d) 5.88
98. Ortho and para-hydrogen differ in the:  
 a) Number of protons                      b) Molecular weight                      c) Nature of spins of protons                      d) Nature of spins of electrons
99. Decomposition of  $\text{H}_2\text{O}_2$  is retarded by:  
 a) Acetanilide                      b) Alcohol                      c)  $\text{H}_3\text{PO}_4$                       d) All of these
100. Heavy water possesses:  
 a) Insoluble impurities like silica  
 b) Impurities like carbonates and bicarbonates of calcium and magnesium  
 c) High density and different physical properties than those of water  
 d) The capacity to expedite the rate of nuclear reactions
101. Which element forms maximum compound in chemistry?  
 a) O                      b) H                      c) Si                      d) C
102. The bleaching properties of  $\text{H}_2\text{O}_2$  are due to its:  
 a) Reducing properties                      b) Oxidizing properties                      c) Unstable nature                      d) Acidic nature
103. Which one of the following is called amphoteric solvent?  
 a) Ammonium hydroxide                      b) Chloroform  
 c) Benzene                      d) Water
104. The colour of hydrogen is  
 a) Yellow                      b) Orange                      c) Black                      d) Colourless
105. The amount of  $\text{H}_2\text{O}_2$  present in 1 L of 1.5 N  $\text{H}_2\text{O}_2$  solution is:  
 a) 2.5 g                      b) 25.5 g                      c) 3.0 g                      d) 8.0 g
106.  $\text{H}_2\text{O}_2$  is prepared in the laboratory when:  
 a)  $\text{MnO}_2$  is added to dilute cold  $\text{H}_2\text{SO}_4$   
 b)  $\text{BaO}_2$  is added to  $\text{CO}_2$  bubbling through cold water  
 c)  $\text{PbO}_2$  is added to an acidified solution of  $\text{KMnO}_4$

- d)  $\text{Na}_2\text{O}_2$  is added to boiling water
107. Decolourisation of acidified potassium permanganate occurs when  $\text{H}_2\text{O}_2$  is added to it. This is due to:
- Oxidation of  $\text{KMnO}_4$
  - Reduction of  $\text{KMnO}_4$
  - Both oxidation and reduction of  $\text{KMnO}_4$
  - None of the above
108. Which hydride is neutral?
- $\text{H}_2\text{S}$
  - $\text{H}_2\text{O}$
  - $\text{H}_2\text{Se}$
  - $\text{H}_2\text{Te}$
109. Hydrogen burns with:
- Smoky flame
  - Yellow flame
  - Blue flame
  - Pale yellow flame
110. Zeolites are extensively used in:
- Softening of water and catalyst
  - Preparing heavy water
  - Increasing the hardness of water
  - Mond's process
111. Deuterium, an isotope of hydrogen is:
- Radioactive
  - Non-radioactive
  - Heaviest
  - Lightest
112. Which is the lightest gas?
- Nitrogen
  - Hydrogen
  - Helium
  - Oxygen
113. Temporary hardness is caused due to the presence of:
- $\text{CaSO}_4$
  - $\text{CaCl}_2$
  - $\text{CaCO}_3$
  - $\text{Ca}(\text{HCO}_3)_2$
114.  $\text{H}_2\text{O}_2$  is:
- Diamagnetic
  - Paramagnetic
  - Ferromagnetic
  - None of these
115. Commercial 11.2 volume  $\text{H}_2\text{O}_2$  solution has a molarity of
- 1.0
  - 0.5
  - 11.2
  - 1.12
116. The life period of atomic hydrogen is:
- Only five minute
  - Only one third of a second
  - Only two hour
  - 10 second
117. There is a sample of 20 volume of hydrogen peroxide solution. Calculate its strength
- 6.07%
  - 3.035%
  - 2.509%
  - 4.045%
118. When the same amount of zinc is treated separately with excess of sulphuric acid and excess of sodium hydroxide, the ratio of volumes of hydrogen evolved is:
- 1 : 1
  - 1 : 2
  - 2 : 1
  - 9 : 4
119. Atomic hydrogen is obtained by:
- Electrolysis of heavy water
  - Reaction of water with heavy metals
  - Thermal decomposition of water
  - Passing silent electric discharge through hydrogen at low pressure
120. Which loses weight on exposure to the atmosphere?
- Concentrated  $\text{H}_2\text{SO}_4$
  - Solid  $\text{NaOH}$
  - A saturated solution of  $\text{CO}_2$
  - Anhydrous sodium carbonate
121. Which can adsorb large volumes of hydrogen gas?
- Colloidal solution of palladium
  - Finely divided nickel
  - Colloidal ferric hydroxide
  - Finely divided platinum
122. In the hydrogen peroxide molecule:
- Two hydrogen atoms are connected to one of the oxygen
  - All the four atoms are in the same plane

- c) The four atoms are arranged in a non-linear and non-planar manner  
d) O—H bonds are polar but molecule is non-polar
123. Fluorine reacts with water to form:  
a) Fluorine water                      b) Oxygen                      c) Ozone                      d) Oxygen, ozone
124. The hardness of water sample containing 0.002 mole of magnesium sulphate dissolved in a litre of water is expressed as  
a) 20ppm                      b) 200ppm                      c) 2000ppm                      d) 120ppm
125. Adsorbed hydrogen by palladium is known as  
a) Nascent                      b) Atomic                      c) Heavy                      d) Occluded
126. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to formation of  
a)  $\text{CrO}_3$                       b)  $\text{Cr}_2\text{O}_3$                       c)  $\text{CrO}_5$                       d)  $\text{CrO}_4^{2-}$
127. Which is false about  $\text{H}_2\text{O}_2$ ?  
a) Act as both oxidising and reducing agent                      b) Two OH bonds lie in the same plane  
c) Pale blue liquid                      d) Can be oxidised by ozone
128. The reaction of  $\text{H}_2\text{S} + \text{H}_2\text{O}_2 \rightarrow \text{S} + 2\text{H}_2\text{O}$  manifests  
a) Reducing action of  $\text{H}_2\text{O}_2$                       b) Oxidising nature of  $\text{H}_2\text{O}_2$   
c) Alkaline nature of  $\text{H}_2\text{O}_2$                       d) Acidic nature of  $\text{H}_2\text{O}_2$
129. The reagent commonly used to determine hardness of water titrimetrically is  
a) Oxalic acid  
b) Sodium thiosulphate  
c) Sodium citrate  
d) Disodium salt of EDTA
130. Ordinary hydrogen has preponderance of:  
a) Hydrogen atoms  
b) Deuterium atoms  
c) Tritium atoms  
d) The above three are in equal proportions
131. Benzene is oxidized by  $\text{H}_2\text{O}_2$  in presence of  $\text{FeSO}_4$  to :  
a) Phenol                      b) Cyclohexane                      c) Benzaldehyde                      d) Benzoic acid
132. Which of the following is an example of interstitial hydride?  
a)  $\text{NH}_3$                       b)  $\text{CH}_4$                       c)  $\text{ZnH}_2$                       d)  $\text{H}_2\text{O}$
133. If water is boiled for sometime it becomes free from:  
a) Permanent hardness  
b) Temporary hardness  
c) Suspended matter  
d) Temporary hardness and dissolved gases
134. Polyphosphates are used as water softening agents because they  
a) Form soluble complexes with anionic species  
b) Precipitate anionic species  
c) Precipitate cationic species  
d) Form soluble complexes with cationic species
135. When two ice cubes are pressed over each other they unite to form one cube. Which of the following forces are responsible to hold them together?  
a) Ionic interaction  
b) Van der Waals' forces  
c) Covalent interaction  
d) Hydrogen bond formation
136. The pH of a solution of  $\text{H}_2\text{O}_2$  is 6.0. Some chloride gas is bubbled into this solution. Which of the following is correct?



- a) The pH of resultant solution becomes 8.0  
 b) Hydrogen gas is liberated from resultant solution  
 c) The pH of resultant solution becomes less than 6.0 and oxygen gas is liberated  
 d)  $\text{Cl}_2\text{O}$  is formed in the resultant solution
137. Permanent hardness of water can be removed by adding Calgon ( $\text{NaPO}_3$ )<sub>n</sub>. This is an example of:  
 a) Adsorption                      b) Exchange of ion                      c) Precipitation                      d) None of these
138. Hydrogen molecules are:  
 a) Monoatomic and form  $X_2^{2-}$  ions  
 b) Diatomic and form  $X_2^{-}$  ions  
 c) Diatomic and form  $X^{-}$  ions  
 d) Monoatomic and form  $X^{-}$  ions
139. Hydrogen reacts with ..... even in the dark.  
 a)  $\text{Br}_2$                                   b)  $\text{F}_2$                                   c)  $\text{I}_2$                                   d)  $\text{Cl}_2$
140. 1000 g aqueous solution of  $\text{CaCO}_3$  contains 10 g of calcium carbonate. Hardness of the solution is:  
 a) 10 ppm                                  b) 100 ppm                                  c) 1000 ppm                                  d) 10000 ppm
141. Metal which does not react with cold water but evolves  $\text{H}_2$  with steam is:  
 a) Na    b) K    c) Pt    d) Fe
142. The pair that yields the same gaseous product on reaction with water:  
 a) K and  $\text{KO}_2$                                   b) Ca and  $\text{CaH}_2$                                   c) Na and  $\text{Na}_2\text{O}_2$                                   d) Ba and  $\text{BaO}_2$
143. The heaviest among the following is:  
 a) Deuterium                                  b) Helium                                  c) Tritium                                  d) Hydrogen
144. The molarity of a 100 mL solution containing 5.1 g of hydrogen peroxide is:  
 a) 0.15 M                                  b) 1.5 M                                  c) 3.0 M                                  d) 50.0 M
145. The metal that does not displace hydrogen from an acid is:  
 a) Hg    b) Zn    c) Al    d) Ca
146. Deionised water is obtained by passing hard water through  
 a) Anion exchanger                                  b) Zeolite  
 c) Cation exchanger                                  d) Both anion and cation exchanger
147. The strength in volumes of a solution containing 30.36 g/L of  $\text{H}_2\text{O}_2$  is  
 a) 10 V    b) 5 V    c) 20 V    d) None of these
148. Hydrogen was discovered by:  
 a) Scheele    b) Berzelius    c) Cavendish    d) Priestley
149. Hard water becomes free from ..... ions when passed through ion exchange resin containing  $\text{RCOOH}$  groups.  
 a)  $\text{Cl}^-$     b)  $\text{SO}_4^{2-}$     c)  $\text{H}_3\text{O}^+$     d)  $\text{Ca}^{2+}$
150. The sum of number of neutrons and protons in one of the isotopes of hydrogen is:  
 a) 3    b) 4    c) 5    d) 6
151. Water contracts on heating:  
 a) To 100°C    b) From 0°C to 4°C    c) To 273 K    d) From 10°C to 20°C
152. Hydrogen combines directly with:  
 a) Ca    b) Cu    c) Zn    d) Fe
153.  $\text{H}_2\text{O}_2$  restores the colour of old lead paintings, blackened by the action of  $\text{H}_2\text{S}$  gas, by:  
 a) Converting  $\text{PbO}_2$  to Pb  
 b) Oxidising PbS to  $\text{PbSO}_4$   
 c) Converting  $\text{PbCO}_3$  to Pb  
 d) Oxidising  $\text{PbSO}_3$  to  $\text{PbSO}_4$
154. 10 volumes of  $\text{H}_2\text{O}_2$  has a strength of approximately:  
 a) 3%    b) 30%    c) 10%    d) 5%
155. Ammonium persulphate solution on heating under reduced pressure gives:  
 a)  $\text{H}_2\text{O}_2$     b)  $\text{O}_2$     c)  $\text{H}_2$     d)  $(\text{NH}_4)_2\text{SO}_4$

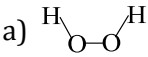
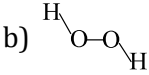
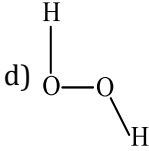
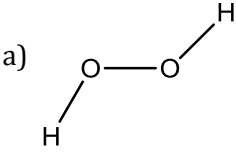
156. Which statement about zeolite is false?
- They are used as cation exchanger
  - They have open structure which enables them to take up small molecules
  - Zeolites are alumino silicates having three dimensional network
  - Some of the  $\text{SiO}_4^{4-}$  units are replaced by  $\text{AlO}_4^{5-}$  and  $\text{AlO}_6^{9-}$  ions in zeolites
157. Which of the following metal evolves hydrogen on reacting with cold dilute  $\text{HNO}_3$ ?
- Fe
  - Cu
  - Al
  - Mg
158. The reaction of water with sodium and potassium is
- Endothermic
  - Reversible
  - Exothermic
  - Irreversible and endothermic
159. High boiling point of water is due to:
- Its high specific heat
  - Hydrogen bonding
  - High dielectric constant
  - Low dissociation constant
160. Ozone reacts with  $\text{H}_2\text{O}_2$  to give oxygen. One volume of ozone gives:
- One volume of oxygen
  - Half volume of oxygen
  - 1.5 volume of oxygen
  - Two volumes of oxygen
161. Which of the following statements do not define the characteristic property of water "water is a universal solvent".?
- It has high liquid range
  - It has very low dielectric constant
  - It can dissolve maximum number of compounds
  - None of the above
162. Sodium zeolite is:
- $\text{NaAlSi}_2\text{O}_6$
  - $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_3$
  - $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$
  - $\text{NaAl}_2\text{Si}_2\text{O}_8$
163. Acidified  $\text{KMnO}_4$  is decolourised by:
- Oxygen
  - Hydrogen
  - Nitric oxide
  - Nascent hydrogen
164. The oxidizing property of  $\text{H}_2\text{O}_2$  is best explained by assuming that two oxygen atoms in its molecule are:
- Bonded differently
  - Bonded similarly
  - Bonded covalently
  - Bonded by hydrogen bonds
165.  $\text{H}_2\text{O}_2$  is stored in:
- Iron container after addition of stabilizer
  - Glass container after addition of stabilizer
  - Plastic container after addition of stabilizer
  - None of the above
166. Hydrogen is not used for:
- Manufacture of vegetable ghee
  - Production of high temperature
  - As rocket fuel with kerosene
  - As a reducing agent
167.  $\text{H}_2\text{O}_2$  is concentrated by:
- Steam distillation
  - Fractional distillation
  - Freezing in freezing mixture
  - Distillation under reduced pressure

168. Pure  $H_2$  is obtained by the action of:
- Al over KOH
  - NaH over  $H_2O$
  - Electrolysis of warm solution of  $Ba(OH)_2$  using Ni electrodes
  - All of the above
169. Heavy water is manufactured in India at:
- Delhi
  - Trombay
  - Bhilai
  - None of these
170. What is formed when calcium carbide reacts with heavy water?
- $C_2D_2$
  - $CaD_2$
  - $Ca_2D_2O$
  - $CD_2$
171. The ionization of hydrogen atom gives:
- Hydride ion
  - Hydronium ion
  - Proton
  - Hydroxyl ion
172. Which is not true in case of  $H_2O_2$ ?
- It is more stable in basic solution
  - It acts as strong oxidizing agent in acid and basic solutions
  - It is decomposed by  $MnO_2$
  - It behaves as reducing agent towards  $KMnO_4$
173. Which one of the following is a true peroxide?
- $SO_2$
  - $MnO_2$
  - $NO_2$
  - $BaO_2$
174. What is the volume of "20 volume  $H_2O_2$ " required to get  $5000\text{ cm}^3$  of oxygen at STP?
- $250\text{ cm}^3$
  - $20\text{ cm}^3$
  - $100\text{ cm}^3$
  - $125\text{ cm}^3$
175. The melting points of most of the solid substances increase with an increase of pressure. However, ice melts at a temperature lower than its usual melting point when the pressure is increased. This is because:
- Ice is less denser than water
  - Pressure generates heat
  - The chemical bonds break under pressure
  - Ice is not a true solid
176. Heavy water was discovered by:
- Nernst
  - Haber
  - Urey and Washburn
  - Aston
177. The maximum possible number of hydrogen bonds a water molecule can form is:
- 1
  - 2
  - 3
  - 4
178.  $H_2O_2$  acts as antiseptic due to its:
- Reducing property
  - Oxidizing property
  - Bleaching property
  - Acidic property
179. Hydrogen gas will not reduce:
- Heated cupric oxide
  - Heated ferric oxide
  - Heated stannic oxide
  - Heated aluminium oxide
180. Which pair does not show hydrogen isotopes?
- Ortho* and *para* hydrogen
  - Protium and deuterium
  - Deuterium and tritium
  - Tritium and protium
181. The hardness of water is due to .... Metal ions.
- $Ca^{2+}$  and  $Na^+$
  - $Mg^{2+}$  and  $K^+$
  - $Ca^{2+}$  and  $Mg^{2+}$
  - $Zn^{2+}$  and  $Ba^{2+}$
182. Under what conditions of temperature and pressure, the formation of atomic hydrogen from molecular hydrogen will be favoured more?
- High temperature and low pressure
  - Low temperature and low pressure
  - High temperature and high pressure
  - Low temperature and high pressure
183. Heavy hydrogen is used:
- In filling the balloons

- b) In studying reaction mechanism  
 c) In calculating heat of formation  
 d) Iron hydroxide precipitates
184. The reaction,  $\text{H}_2\text{S} + \text{H}_2\text{O}_2 \rightarrow \text{S} + 2\text{H}_2\text{O}$  manifests:  
 a) Acidic nature of  $\text{H}_2\text{O}_2$   
 b) Alkaline nature of  $\text{H}_2\text{O}_2$   
 c) Oxidizing nature of  $\text{H}_2\text{O}_2$   
 d) Reducing nature of  $\text{H}_2\text{O}_2$
185. Decomposition of  $\text{H}_2\text{O}_2$  is accompanied by:  
 a) Decrease in free energy  
 b) Increase in free energy  
 c) No change in free energy  
 d) Evolution of heat
186. Which of the following statements is correct? Dielectric constant of  $\text{H}_2\text{O}_2$   
 a) Increases with dilution  
 b) Decreases with dilution  
 c) Is unaffected on dilution  
 d) None of the above
187. Heavy water is not used for drinking because:  
 a) It is poisonous  
 b) It is costly  
 c) Its physiological action is different from ordinary water  
 d) Its chemical properties are different from ordinary water
188. Maximum density of heavy water is at:  
 a)  $0^\circ\text{C}$   
 b)  $4^\circ\text{C}$   
 c)  $11.6^\circ\text{C}$   
 d)  $3.8^\circ\text{C}$
189. The catalyst used in Bosch process of manufacture of  $\text{H}_2$  is:  
 a) Finely divided Ni  
 b)  $\text{V}_2\text{O}_5$   
 c) Pd  
 d)  $\text{Fe}_2\text{O}_3 + \text{Cr}_2\text{O}_3$
190. In which of the following reactions,  $\text{H}_2\text{O}_2$  behaves as a reducing agent?  
 a)  $\text{Na}_2\text{SO}_3(\text{aq}) + \text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
 b)  $\text{PbO}_2(\text{s}) + \text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{PbO}(\text{s}) + \text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$   
 c)  $2\text{KI}(\text{aq}) + \text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{KOH}(\text{aq}) + \text{I}_2(\text{s})$   
 d)  $\text{KNO}_2(\text{aq}) + \text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{KNO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
191. Among  $\text{CaH}_2$ ,  $\text{NH}_3$ ,  $\text{NaH}$  and  $\text{B}_2\text{H}_6$ , which are covalent hydride?  
 a)  $\text{NH}_3$  and  $\text{B}_2\text{H}_6$   
 b)  $\text{NaH}$  and  $\text{CaH}_2$   
 c)  $\text{NaH}$  and  $\text{NH}_3$   
 d)  $\text{CaH}_2$  and  $\text{B}_2\text{H}_6$
192. In which reaction hydrogen is not formed?  
 a) Copper and hydrochloric acid  
 b) Iron and sulphuric acid  
 c) Magnesium and steam  
 d) Sodium and alcohol
193. The adsorption of hydrogen by metals is called  
 a) Adsorption  
 b) Occlusion  
 c) Hydrogenation  
 d) Dehydrogenation
194. A molten ionic hydride on electrolysis gives:  
 a)  $\text{H}^+$  ion moving towards the cathode  
 b)  $\text{H}^+$  ion moving towards the anode  
 c)  $\text{H}_2$  is liberated at anode  
 d)  $\text{H}_2$  is liberated at cathode
195. Moist hydrogen cannot be dried over concentrated  $\text{H}_2\text{SO}_4$  because:  
 a) It can catch fire  
 b) It is reduced by  $\text{H}_2\text{SO}_4$   
 c) It is oxidized by  $\text{H}_2\text{SO}_4$   
 d) It decomposes  $\text{H}_2\text{SO}_4$
196. Both temporary and permanent hardness are removed on boiling water with:  
 a)  $\text{Ca}(\text{OH})_2$   
 b)  $\text{Na}_2\text{CO}_3$   
 c)  $\text{CaCO}_3$   
 d)  $\text{CaO}$

197. The weight percentage of deuterium in heavy water is:  
 a) 22                                      b) 11.11                                      c) 4                                      d) 20
198. 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 steam
199. Density of water is maximum at:  
 a) 0°C                                      b) 100° C                                      c) 4°C                                      d) 0 K
200. The most reactive isotope of H is:  
 a)  ${}_1\text{H}^1$   
 b)  ${}_1\text{H}^2$   
 c)  ${}_1\text{H}^3$   
 d) All the same reactivity
201. Heavy water is used in atomic reactor as  
 a) Moderator                                      b) Coolant  
 c) Both moderator and coolant                                      d) Neither coolant nor moderator
202. The exhausted Permutit is generally regenerated by percolating through it a solution of:  
 a) Sodium chloride                                      b) Calcium chloride                                      c) Magnesium chloride                                      d) Potassium chloride
203. The best explanations for not placing hydrogen with the group of alkali metals or halogens is:  
 a) Hydrogen can form compounds with all other elements  
 b) Hydrogen is much lighter element than the alkali metals or the halogens  
 c) The ionization energy of hydrogen is too high for group of alkali metals but too low for halogen group  
 d) None of the above
204. Hydrogen molecule differs from chlorine molecule in the following respect.  
 a) Hydrogen molecule is non-polar but chlorine molecule is polar  
 b) Hydrogen molecule is polar while chlorine molecule is non-polar  
 c) Hydrogen molecule can form intermolecular hydrogen bonds but chlorine molecule does not  
 d) Hydrogen molecule cannot participate in coordinate bond formation but chlorine molecule can
205. The geometry of water molecule is same as that of:  
 a)  $\text{CO}_2$                                       b)  $\text{C}_2\text{H}_4$                                       c) Chlorine oxide                                      d) Boron trifluoride
206. Hydrogen peroxide does not:  
 a) Liberate iodine from KI  
 b) Turn the titanium salt yellow  
 c) Give silver peroxide with moist silver oxide  
 d) Turn the mixture of aniline,  $\text{KClO}_3$  and dil.  $\text{H}_2\text{SO}_4$  violet
207. The most dangerous method of preparing hydrogen would be by the action of dil. HCl and:  
 a) Zn                                      b) Fe                                      c) K                                      d) Al
208. When zeolite which is hydrated sodium aluminium silicate is treated with hard water, the sodium ions are exchanged with  
 a)  $\text{H}^+$  ions                                      b)  $\text{Mg}^{2+}$  ion                                      c)  $\text{Ca}^{2+}$  ion                                      d) both  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$
209. Hydrolysis of one mole of peroxodisulphuric acid produces:  
 a) Two moles of sulphuric acid  
 b) Two moles of peroxomonosulphuric acid  
 c) One mole of sulphuric acid and one mole of peroxomonosulphuric acid  
 d) One mole of sulphuric acid, one mole of peroxomonosulphuric acid and one mole of hydrogen peroxide
210. During hydrogenation of oil the catalyst commonly used is:  
 a) Pd on  $\text{CuCl}_2$                                       b) Ni                                      c) Fe                                      d)  $\text{V}_2\text{O}_5$
211. Oxygen and hydrogen react to form water. This discovery was made by:  
 a) Priestley                                      b) Cavendish                                      c) Scheele                                      d) Newton



227. Atomic hydrogen produces formaldehyde when it reacts with:  
 a)  $\text{CO}_2$                       b)  $\text{CO}$                       c)  $\text{O}_2$                       d)  $\text{C}_2\text{H}_2$
228.  $K_a$  for  $\text{H}_2\text{O}_2$  is of the order of:  
 a)  $10^{-12}$                       b)  $10^{-14}$                       c)  $10^{-16}$                       d)  $10^{-10}$
229. Which one of the following reaction does not form gaseous product?  
 a)  $\text{PbO}_2 + \text{H}_2\text{O}_2 \rightarrow$                       b) Acidified  $\text{KMnO}_4 + \text{H}_2\text{O}_2 \rightarrow$   
 c)  $\text{PbS} + \text{H}_2\text{O}_2 \rightarrow$                       d)  $\text{Cl}_2 + \text{H}_2\text{O}_2 \rightarrow$
230. The structure of  $\text{H}_2\text{O}_2$  is:  
 a)                       b)                       c)  $\text{H}-\text{O}-\text{O}-\text{H}$                       d) 
231. Which cannot be oxidised by  $\text{H}_2\text{O}_2$ ?  
 a)  $\text{Na}_2\text{SO}_3$                       b)  $\text{PbS}$                       c)  $\text{KI}$                       d)  $\text{O}_3$
232. A mixture of hydrazine and 40 to 60 per cent of  $\text{H}_2\text{O}_2$  solution is:  
 a) Antiseptic                      b) Rocket fuel                      c) Germicide                      d) Insecticide
233. Hydrogen peroxide is now generally prepared on industrial scale by the:  
 a) Action of  $\text{H}_2\text{SO}_4$  on barium peroxide  
 b) Action of  $\text{H}_2\text{SO}_4$  on sodium peroxide  
 c) Electrolysis of 50%  $\text{H}_2\text{SO}_4$   
 d) Burning hydrogen in excess of oxygen
234. The equilibrium molecular structure of hydrogen peroxide is  
 Planar as given below                      b) Linear  
 a)                       c) Tetrahedral                      d) Non-planar
235. A given solution of  $\text{H}_2\text{O}_2$  is 30 volume. Its concentration in terms of molarity is:  
 a)  $9.1M$                       b)  $2.68M$                       c)  $2.5M$                       d)  $26.8M$
236.  $\text{H}_2\text{O}_2$  turns an acidified solution of ..... to orange red.  
 a)  $\text{BaO}_2$                       b)  $\text{PbO}_2$                       c)  $\text{Na}_2\text{O}_2$                       d)  $\text{TiO}_2$
237. Tritium is obtained by:  
 a) Nuclear reactions  
 b) Passing steam over heated C  
 c) Action of  $\text{NaOH}$  on Al  
 d) Action of  $\text{H}_2\text{SO}_4$  on Zn
238. In the case of  $\text{H}_2\text{O}_2$ , the angle between the planes containing the hydrogen atom is:  
 a)  $100^\circ$                       b)  $90^\circ$                       c)  $109^\circ 28'$                       d)  $180^\circ$
239. In laboratory,  $\text{H}_2\text{O}_2$  is prepared by  
 a) Cold  $\text{H}_2\text{SO}_4 + \text{BaO}_2$   
 b)  $\text{HCl} + \text{BaO}_2$   
 c) conc  $\text{H}_2\text{SO}_4 + \text{Na}_2\text{O}_2$   
 d)  $\text{H}_2 + \text{O}_2$
240. The formula of heavy water is:  
 a)  $\text{H}_2\text{O}^{18}$                       b)  $\text{D}_2\text{O}$                       c)  $\text{T}_2\text{O}$                       d)  $\text{H}_2\text{O}^{17}$
241. Hydrogen resembles in many of its properties with:  
 a) Alkali metals                      b) Halogens                      c) Both (a) and (b)                      d) None of these
242. Hydrogen is not obtained when zinc reacts with  
 a) Cold water                      b) hot  $\text{NaOH}$  solution                      c) dil.  $\text{H}_2\text{SO}_4$                       d) dil.  $\text{HCl}$

243. The H-O-H angle in water molecule is about  
 a)  $105^\circ$                       b)  $102^\circ$                       c)  $180^\circ$                       d)  $90^\circ$
244. Hydrogen adsorbed on palladium is known as:  
 a) Atomic H                      b) Nascent H                      c) Occluded H                      d) Heavy H
245. Hydrogen molecule differs from chlorine molecule in the following respect  
 a) Hydrogen molecule is non-polar but chlorine molecule is polar  
 b) Hydrogen molecule is polar while chlorine molecule is non-polar  
 c) Hydrogen molecule can form intermolecular hydrogen bonds but chlorine molecule does not  
 d) Hydrogen molecule cannot participate in coordination bond formation but chlorine molecule can
246. Decomposition of  $\text{H}_2\text{O}_2$  is accelerated by:  
 a) Traces of acids                      b) Finely divided metals                      c) Acetanilide                      d) Alcohol
247. Which one of the following is used for reviving the exhausted 'permutit'?  
 a) HCl solution                      b) 10%  $\text{CaCl}_2$  solution                      c) 10%  $\text{MgCl}_2$  solution                      d) 10% NaCl solution
248. The volume strength of 1.5 N  $\text{H}_2\text{O}_2$  solution is  
 a) 16.8 L                      b) 8.4 L                      c) 4.2 L                      d) 5.2 L
249. Nascent hydrogen consists of:  
 a) Hydrogen atoms with excess energy  
 b) Hydrogen molecules with excess energy  
 c) Hydrogen ions in excited state  
 d) Solvated protons
250. At absolute zero:  
 a) Only para hydrogen exists  
 b) Only ortho hydrogen exists  
 c) Both para and ortho hydrogen exist  
 d) None of the above
251. Hydrogen peroxide works as:  
 a) An oxidant only  
 b) A reductant only  
 c) An acid only  
 d) An oxidant, a reductant and an acid
252. Which of the following will not give  $\text{H}_2\text{O}_2$  on hydrolysis?  
 a)  $\text{HClO}_4$                       b)  $\text{H}_2\text{S}_2\text{O}_8$                       c)  $\text{H}_2\text{SO}_5$                       d)  $\text{HNO}_4$  (pernitric acid)
253. The  $n/p$  ratio for  ${}_1\text{H}^1$  is:  
 a) 1                      b) 2                      c) 3                      d) Zero
254. The percentage by weight of hydrogen in  $\text{H}_2\text{O}_2$  is:  
 a) 5.88                      b) 6.25                      c) 25                      d) 50
255. Exhausted permutit does not contain .....ion.  
 a)  $\text{Na}^+$                       b)  $\text{Mg}^{2+}$                       c)  $\text{Al}^{3+}$                       d)  $\text{Si}^{4+}$
256. The molarity of pure water at  $4^\circ\text{C}$  is:  
 a) 1 M                      b) 2.5 M                      c) 5 M                      d) 55.5 M
257. The gas used in the hydrogenation of oils in presence of nickel as a catalyst is:  
 a) Methane                      b) Ethane                      c) ozone                      d) Hydrogen
258. The volume of oxygen liberated from 0.68 g of  $\text{H}_2\text{O}_2$  is  
 a) 112mL                      b) 224mL                      c) 56mL                      d) 336mL
259. Which hydride is an ionic hydride?  
 a)  $\text{NH}_3$                       b)  $\text{H}_2\text{S}$                       c)  $\text{TiH}_{1.73}$                       d) NaH
260.  $\text{H}_2\text{O}_2$  reduces  $\text{K}_3\text{Fe}(\text{CN})_6$  in:  
 a) Neutral solution                      b) Acidic solution                      c) Alkaline solution                      d) Non-polar medium
261. Point out the incorrect statement.  
 a) Hardness of water depends upon its soap consuming power



- b) Temporary hardness is due to bicarbonates of calcium and magnesium  
 c) Permanent hardness is due to soluble sulphates, chlorides and nitrates of Ca and Mg  
 d) Permanent hardness can be removed by boiling water
262.  $\text{H}_2\text{O}_2$  converts potassium ferrocyanide to ferricyanide. The change observed in the oxidation state of iron is:  
 a)  $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$                       b)  $\text{Fe} \rightarrow \text{Fe}^{2+}$                       c)  $\text{Fe}^{3+} \rightarrow \text{Fe}^{2+}$                       d)  $\text{Fe}^{2+} \rightarrow \text{Fe}^+$
263. Which of the following is correct about heavy water?  
 a) Water at  $4^\circ\text{C}$  having maximum density is known as heavy water  
 b) It is formed by the combination of heavier isotope of hydrogen and oxygen  
 c) It is heavier than water  
 d) None of the above
264. Hydrogen is prepared on large scale for industrial use  
 a) by  $\text{Zn} + \text{H}_2\text{SO}_4$                       b) by  $\text{Al} + \text{NaOH}$                       c) by  $\text{Na} + \text{C}_2\text{H}_5\text{OH}$                       d) From water gas
265. Hydrogen is obtained by the action of an alloy of silicon and iron with  $\text{NaOH}$ . The process is called:  
 a) Wood process                      b) Bosch process                      c) Haber process                      d) Silicol process
266. In transforming 0.01 mole of  $\text{PbS}$  to  $\text{PbSO}_4$ , the volume of 10 volume  $\text{H}_2\text{O}_2$  required will be  
 a) 11.2mL                      b) 22.4mL                      c) 33.6mL                      d) 44.8mL
267. Hydrogen peroxide when added to a solution of potassium permanganate acidified with sulphuric acid  
 a) Forms water only  
 b) Acts as an oxidising agent  
 c) Acts as a reducing agent  
 d) Reduces sulphuric acid
268. Water is oxidised to oxygen by  
 a)  $\text{ClO}_2$                       b)  $\text{KMnO}_4$                       c)  $\text{H}_2\text{O}_2$                       d) Fluorine
269. The most abundant element in the universe is thought to be  
 a) Carbon                      b) Oxygen                      c) Hydrogen                      d) Nitrogen
270. In the preparation of hydrogenated oil the chemical reaction involving hydrogen is called:  
 a) Hydrogenation                      b) Reduction                      c) Dehydrogenation                      d) Oxidation
271. The most abundant isotope of hydrogen is:  
 a) Tritium                      b) Deuterium                      c) Protium                      d) Para-hydrogen
272. Which statement is not correct for hydrogen peroxide?  
 a) Pure  $\text{H}_2\text{O}_2$  is fairly stable  
 b) It sometimes acts as a reducing agent  
 c) It acts as an oxidizing agent  
 d) Aqueous solution of  $\text{H}_2\text{O}_2$  is weakly basic
273. Which one is correct for perhydrol?  
 a) It is 30%  $\text{H}_2\text{O}_2$  or 100 vol.  $\text{H}_2\text{O}_2$   
 b) Its molarity is 8.8 M  
 c) It is used as antiseptic and germicide  
 d) All of the above
274. Hydrogen has a tendency to gain one electron in order to acquire helium configuration. It thus, resembles:  
 a) Alkali metals                      b) Noble gases                      c) Halogens                      d) Alkaline earth metals
275. Calgon is an industrial name given to:  
 a) Normal sodium phosphate  
 b) Sodium meta-aluminate  
 c) Sodium hexa meta-phosphate  
 d) Hydrated sodium aluminium silicate
276. For the bleaching of hair, the substance used is:  
 a)  $\text{SO}_2$                       b) Bleaching powder                      c)  $\text{H}_2\text{O}_2$                       d)  $\text{O}_3$
277. In solid hydrogen, the intermolecular bonding is:

- a) Ionic                                      b) Van der Waals'                                      c) Metallic                                      d) Covalent
278. The species that does not contains peroxide ions is:  
 a) PbO<sub>2</sub>                                      b) H<sub>2</sub>O<sub>2</sub>                                      c) SrO<sub>2</sub>                                      d) BaO<sub>2</sub>
279. The critical temperature of water is higher than that of O<sub>2</sub> because H<sub>2</sub>O molecule has:  
 a) Fewer electrons than oxygen  
 b) Two covalent bonds  
 c) V-shape  
 d) Dipole moment
280. Pure H<sub>2</sub>O<sub>2</sub> is:  
 a) Colourless liquid  
 b) A gas  
 c) Blue syrupy liquid  
 d) Pale blue syrupy liquid
281. When silicon is boiled with caustic soda solution, the gas evolved is:  
 a) O<sub>2</sub>                                      b) SiH<sub>4</sub>                                      c) H<sub>2</sub>                                      d) None of these
282. In which of the following reactions hydrogen peroxide is a reducing agent?  
 a) H<sub>2</sub>SO<sub>3</sub> + H<sub>2</sub>O<sub>2</sub> → H<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>O  
 b) 2HI + H<sub>2</sub>O<sub>2</sub> → 2H<sub>2</sub>O + I<sub>2</sub>  
 c) 2FeCl<sub>2</sub> + 2HCl + H<sub>2</sub>O<sub>2</sub> → 2FeCl<sub>3</sub> + 2H<sub>2</sub>O  
 d) Cl<sub>2</sub> + H<sub>2</sub>O<sub>2</sub> → 2HCl + O<sub>2</sub>
283. Which does not react with cold water?  
 a) Mg<sub>3</sub>N<sub>2</sub>                                      b) CaC<sub>2</sub>                                      c) COCl<sub>2</sub>                                      d) SiC
284. Deuterium resembles hydrogen in chemical properties but reacts:  
 a) Slower the hydrogen  
 b) Faster than hydrogen  
 c) More vigorously than hydrogen  
 d) Just as hydrogen

**: ANSWER KEY :**

1)	a	2)	d	3)	b	4)	a	189)	d	190)	b	191)	a	192)	a
5)	a	6)	a	7)	b	8)	b	193)	b	194)	c	195)	c	196)	b
9)	c	10)	c	11)	b	12)	b	197)	d	198)	b	199)	c	200)	a
13)	c	14)	d	15)	c	16)	c	201)	c	202)	a	203)	c	204)	d
17)	b	18)	c	19)	a	20)	b	205)	c	206)	c	207)	c	208)	d
21)	c	22)	c	23)	c	24)	a	209)	c	210)	b	211)	b	212)	c
25)	b	26)	d	27)	a	28)	d	213)	c	214)	a	215)	d	216)	b
29)	b	30)	d	31)	b	32)	b	217)	d	218)	b	219)	b	220)	a
33)	c	34)	d	35)	a	36)	b	221)	d	222)	a	223)	a	224)	a
37)	c	38)	a	39)	b	40)	c	225)	d	226)	a	227)	b	228)	a
41)	d	42)	a	43)	a	44)	a	229)	c	230)	b	231)	d	232)	b
45)	b	46)	c	47)	d	48)	a	233)	c	234)	d	235)	b	236)	d
49)	b	50)	b	51)	c	52)	b	237)	a	238)	b	239)	a	240)	b
53)	a	54)	b	55)	b	56)	c	241)	c	242)	a	243)	a	244)	c
57)	a	58)	d	59)	b	60)	d	245)	d	246)	b	247)	d	248)	b
61)	a	62)	b	63)	b	64)	c	249)	a	250)	a	251)	d	252)	a
65)	d	66)	b	67)	d	68)	a	253)	d	254)	a	255)	a	256)	d
69)	c	70)	b	71)	d	72)	d	257)	d	258)	b	259)	d	260)	c
73)	a	74)	c	75)	d	76)	c	261)	d	262)	a	263)	b	264)	d
77)	b	78)	c	79)	b	80)	c	265)	d	266)	d	267)	c	268)	d
81)	c	82)	a	83)	a	84)	a	269)	c	270)	a	271)	c	272)	d
85)	b	86)	d	87)	c	88)	d	273)	d	274)	c	275)	c	276)	c
89)	d	90)	b	91)	b	92)	a	277)	b	278)	a	279)	d	280)	d
93)	d	94)	a	95)	b	96)	a	281)	c	282)	d	283)	d	284)	a
97)	d	98)	c	99)	d	100)	c								
101)	b	102)	b	103)	d	104)	d								
105)	b	106)	b	107)	b	108)	b								
109)	c	110)	a	111)	b	112)	b								
113)	d	114)	a	115)	a	116)	b								
117)	a	118)	a	119)	d	120)	c								
121)	a	122)	c	123)	d	124)	b								
125)	d	126)	c	127)	b	128)	b								
129)	d	130)	a	131)	a	132)	c								
133)	b	134)	d	135)	d	136)	c								
137)	b	138)	c	139)	b	140)	d								
141)	d	142)	b	143)	b	144)	b								
145)	a	146)	d	147)	a	148)	c								
149)	d	150)	a	151)	b	152)	a								
153)	b	154)	a	155)	a	156)	d								
157)	d	158)	c	159)	b	160)	d								
161)	b	162)	c	163)	d	164)	a								
165)	c	166)	c	167)	d	168)	d								
169)	b	170)	a	171)	c	172)	a								
173)	d	174)	a	175)	a	176)	c								
177)	d	178)	b	179)	d	180)	a								
181)	c	182)	a	183)	b	184)	c								
185)	a	186)	a	187)	c	188)	c								

**: HINTS AND SOLUTIONS :**

- 1 **(a)**  
It is a fact.
- 2 **(d)**  

$$3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2 \quad (\text{Lane's process})$$

$$\text{CO} + \text{H}_2 + \text{H}_2\text{O} \xrightarrow[\Delta]{\text{Fe}_2\text{O}_3} \text{CO}_2 + 2\text{H}_2 \quad (\text{Bosch process})$$

$$\text{CH}_4 + \text{H}_2\text{O} \xrightarrow{\text{Ni-Cr}} \text{CO} + 3\text{H}_2$$
- 3 **(b)**  

$$\text{Cl}_2 + \text{H}_2\text{O}_2 \rightarrow 2\text{HCl} + \text{O}_2$$
- 4 **(a)**  
The radioactive isotope of hydrogen is tritium. Its half-life is 12.16 yr. It shows  $\beta^-$ -disintegration.  

$${}^3_1\text{H} \rightarrow {}^3_2\text{He} + {}^0_{-1}e(\beta)$$
- 5 **(a)**  
 $\text{H}_2\text{O}_2$  (hydrogen peroxide) is a corrosive volatile liquid. It is slightly acidic in nature. Its  $pK_a$  value is approximately  $10^{-12}$ .
- 6 **(a)**  
Ethylene diaminetetraacetic acid (EDTA) when treated with water, forms stable complex with metal ions and hence, remove hardness of water.
- 8 **(b)**  
Alkali metals also form  $\text{H}^+$  ion by the loss of their c
- 9 **(c)**  
Transitions metals form metallic hydrides.
- 10 **(c)**  
 $\text{H}_3\text{PO}_4$  acts as negative catalyst for the decomposit
- 11 **(b)**  
Ortho and para-hydrogen possess same electronic arrangement but different spin of nuclei.
- 12 **(b)**  
Volume strength =  $5.6 \times \text{normality}$   

$$= 5.6 \times 1.5$$
  

$$= 8.4$$
- 13 **(c)**  
 $\text{D}_2\text{O}$  had deuterium (heavier isotope of H) and O (t
- 14 **(d)**  
 $\text{MgCO}_3$  is insoluble in water.
- 15 **(c)**  
 $\text{H}_2\text{O}_2$  can be prepared by electrolysis of 50%
- $\text{H}_2\text{SO}_4$ . In this method, hydrogen is liberated at cathode.
- $$\text{H}_2\text{SO}_4 \rightleftharpoons 2\text{H}^+ + 2\text{HSO}_4^-$$
- At anode :** 
$$2\text{HSO}_4^- \rightarrow \text{H}_2\text{S}_2\text{O}_8 + 2e^-$$
- $$\text{H}_2\text{S}_2\text{O}_8 + 2\text{H}_2\text{O} \rightarrow 2\text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2$$
- At cathode :** 
$$2\text{H}^+ + 2e^- \rightarrow \text{H}_2 \uparrow$$
- 16 **(c)**  
A 30% solution of hydrogen peroxide can be obtained by the electrolysis of 50% sulphuric acid followed by vacuum distillation. The first product of electrolysis is perdisulphuric acid ( $\text{H}_2\text{S}_2\text{O}_8$ ) which reacts with water during distillation to form  $\text{H}_2\text{O}_2$ .
- $$2\text{H}_2\text{SO}_4 \rightarrow 2\text{H}^+ + 2\text{HSO}_4^-$$
- $$2\text{HSO}_4^- \rightarrow \text{H}_2\text{S}_2\text{O}_8 + 2e^- \quad (\text{At anode})$$
- $$\text{H}_2\text{S}_2\text{O}_8 + 2\text{H}_2\text{O} \rightarrow 2\text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2$$
- 'X' is  $\text{H}_2\text{SO}_4$  and 'Y' is  $\text{H}_2\text{S}_2\text{O}_8$ . So, 'X' and 'Y' contains zero and one peroxy bond respectively.
- 17 **(b)**  

$$2\text{FeSO}_4 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 2\text{H}_2\text{O}$$
- 18 **(c)**  

$$\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2 \uparrow$$
- 19 **(a)**  

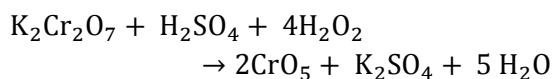
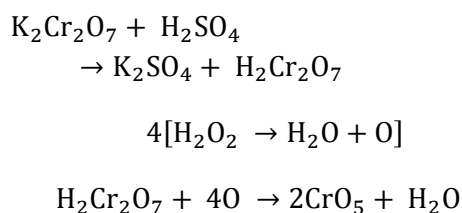
$$\text{Na}_2\text{O}_2 + \text{H}_2\text{SO}_4 \xrightarrow{\text{Ice cold}} \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}_2$$

$$\therefore \text{H}_2\text{O}_2 \text{ is formed by reaction of } \text{Na}_2\text{O}_2 \text{ on dil } \text{H}_2\text{SO}_4$$
- 20 **(b)**  

$$\text{O}_2^{1-} + 2e^- \rightarrow 2\text{O}^{2-} \quad (\text{As oxidant})$$

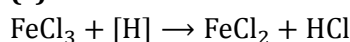
$$\text{O}_2^{1-} \rightarrow \text{O}_2^0 + 2e^- \quad (\text{As reductant})$$
- 21 **(c)**  
 ${}_1\text{H}^3$  has 3 nucleons (1 proton + 2 neutrons) and one electron, so sum of these is  $3 + 1 = 4$

22 (c)



Acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  is oxidised to blue peroxide of chromium ( $\text{CrO}_5$ ) which is soluble in ether and produces blue coloured solution.

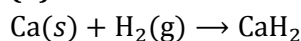
23 (c)



24 (a)

Helium is a noble gas and does not combine with hydrogen

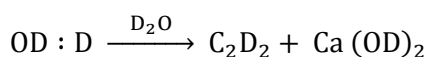
25 (b)



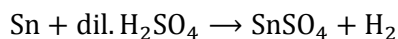
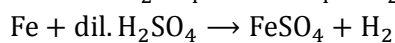
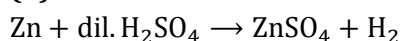
26 (d)

$\text{D}_2\text{O}$  has higher viscosity which is responsible for low solubility of  $\text{NaCl}$  inspite of high dielectric constant.

27 (a)



28 (d)



29 (b)

Heavy water is the oxide of heavy hydrogen (deuterium), hence named heavy water. It is represented by  $\text{D}_2\text{O}$ . It is used in nuclear reactor as moderator.

30 (d)

Calgon, permutit and  $\text{Na}_2\text{CO}_3$  are used for the removal of hardness.

31 (b)

It is a fact.

32 (b)

Quantity of  $\text{H}_2\text{O}_2 = 15$  mL and volume of  $\text{H}_2\text{O}_2 = 20$

We know that 20 volume of  $\text{H}_2\text{O}_2$  means 1 L of

this solution will give 20 L of oxygen at NTP.

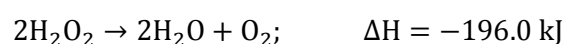
Since, oxygen liberated from 1000mL (1L) of

$\text{H}_2\text{O}_2 = 20$  L, therefore, oxygen liberated from 15mL of  $\text{H}_2\text{O}_2$

$$= \frac{20}{1000} \times 15 = 0.3 \text{ L} = 300 \text{ mL.}$$

33 (c)

Pure hydrogen peroxide is an unstable liquid and decomposes into water and oxygen either upon standing or heating.



To prevent decomposition of  $\text{H}_2\text{O}_2$ , phosphoric acid, acetanilide or glycerol are added. These acts as negative catalyst.

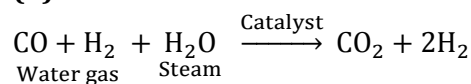
35 (a)

10 vol.  $\text{H}_2\text{O}_2$  means that 1 mL  $\text{H}_2\text{O}_2$  gives 10 mL  $\text{O}_2$ ; thus, 50 mL  $\text{H}_2\text{O}_2$  will give 500 mL  $\text{O}_2$ .

38 (a)

$\text{CaSO}_4$  is soluble in water and provides  $\text{Ca}^{2+}$  ions to develop hardness.  $\text{CaCO}_3$  and  $\text{MgCO}_3$  are insoluble in water.

39 (b)



40 (c)

The triple point of any substance is that temperature and pressure at which the material can exist in all three phases (solid, liquid and gas) in equilibrium, specifically the triple point of water is 273.16 K at 611.2 Pa

41 (d)

It is a fact.

42 (a)

Cu has  $E_{OP}^0$  lesser than H.

43 (a)

Calgon is represented by sodium hexa metaphosphate,  $(\text{NaPO}_3)_6$  or  $\text{Na}_2[\text{Na}_4(\text{PO}_3)_6]$ .

44 (a)

Permutit are complex inorganic salts like sodium aluminosilicate ( $\text{Na}_2\text{Al}_2\text{SiO}_3 \cdot x\text{H}_2\text{O}$ ) or zeolite ( $\text{Na}_2\text{Z}$ ) where Z is  $\text{Al}_2\text{SiO}_3 \cdot x\text{H}_2\text{O}$ .

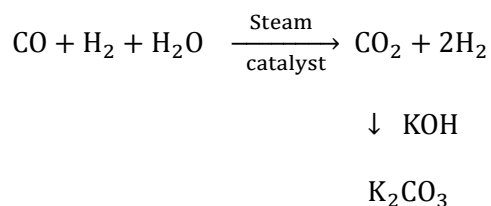
45 (b)

It is a fact.

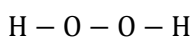
46 (c)

Because dihydrogen is less reactive

- 47 (d)  
CO is oxidised to CO<sub>2</sub> with steam in the presence of a catalyst followed by absorption of CO<sub>2</sub> in alkali.



- 48 (a)  
Only tritium is radioactive.
- 49 (b)  
Oxidisation number of oxygen in hydrogen peroxide is -1.



↑

peroxide linkage

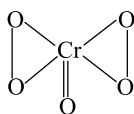
- 50 (b)  
Volume strength = 5.6 × normality

$$30 = 5.6 \times N$$

$$\Rightarrow N = \frac{30}{5.6} = 5.3$$

- 51 (c)  
K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> + H<sub>2</sub>SO<sub>4</sub> → K<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>  
H<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> + 4H<sub>2</sub>O<sub>2</sub> → 2CrO<sub>5</sub> + 5H<sub>2</sub>O  
Chromic acid

CrO<sub>5</sub> is blue peroxide of Cr



- 52 (b)  
It is the property of H<sub>2</sub>O<sub>2</sub>.
- 54 (b)  
The *Ortho* and *Para* hydrogen differ in the nature of spin of protons. In *Ortho* hydrogen, the spin of proton are in the same direction, while in *para* hydrogen the spin of proton are in opposite direction.

- 55 (b)  
Covalent bonding is stronger than H-bonding.

- 58 (d)  
H<sub>2</sub>O<sub>2</sub> ⇌ H<sup>+</sup> + HO<sub>2</sub><sup>-</sup>

- 59 (b)  
It is a fact.

- 60 (d)

Moist H<sub>2</sub>O<sub>2</sub> cannot be dried over conc. H<sub>2</sub>SO<sub>4</sub> because it is decomposed by H<sub>2</sub>SO<sub>4</sub>.

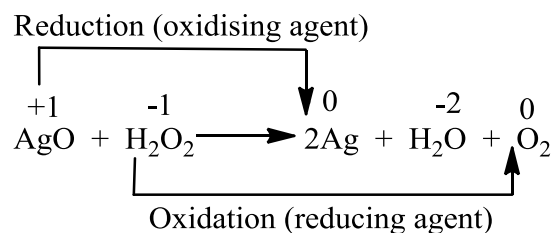
- 61 (a)  
Strength of H<sub>2</sub>O<sub>2</sub> in g/L =  $\frac{68}{22.4} \times V$   
Given strength of H<sub>2</sub>O<sub>2</sub> = 30.36 g/L  
Or  $V = \frac{30.36 \times 22.4}{68}$   
= 10 volumes

- 62 (b)  
 ${}_1\text{H}^3 \rightarrow {}_2\text{He}^3 + {}_{-1}\text{e}^0$

- 63 (b)  
1 : 1 : 2 :: e : p : n

- 64 (c)  
H<sub>2</sub> does not react with Au, Cu or Ni. with Ca, it gives CaH<sub>2</sub>

- 65 (d)  
H<sub>2</sub>O<sub>2</sub> is acting as reducing agent in the reaction that involve increase in the oxidation state of oxygen H<sub>2</sub>O<sub>2</sub> (*i.e.*, in which H<sub>2</sub>O<sub>2</sub> is being oxidised).



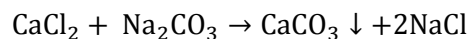
- 66 (b)  
It is Na<sub>2</sub>Al<sub>2</sub>Si<sub>2</sub>O<sub>8</sub> · xH<sub>2</sub>O

- 67 (d)  
CuSO<sub>4</sub><sub>Anhydrous</sub> (White) + H<sub>2</sub>O →  
CuSO<sub>4</sub> · 5H<sub>2</sub>O<sub>Hydrated</sub> (Blue)

- 68 (a)  
These are the oxidizing and reducing properties of

- 69 (c)  
Its (D<sub>2</sub>O) molecular weight is 20 whereas mol. wt. of

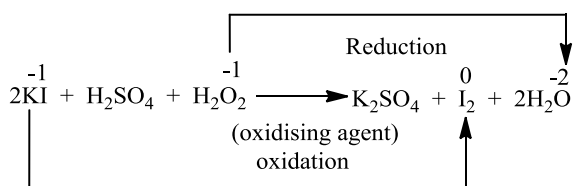
- 70 (b)  
Permanent hardness is removed by precipitating carbonates of Ca<sup>2+</sup> and Mg<sup>2+</sup>.



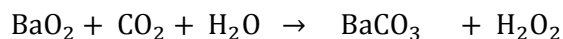
- 71 (d)  
IE of H = -13.6 eV ; IE of halogens = 13.0 for Cl;  
17.4 for F.

- 72 (d)

The reaction in which  $\text{H}_2\text{O}_2$  is reduced while the other reactant is oxidised, represents the oxidising property of  $\text{H}_2\text{O}_2$ .



$\text{CO}_2$  on barium peroxide peroxide ( $\text{BaO}_2$ ).

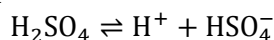


barium peroxide                      barium carbonate      hydrogen peroxide

73 (a) Hydrogen peroxide is prepared by the action of

76 (c) Industrial preparation of  $\text{H}_2\text{O}_2$ :

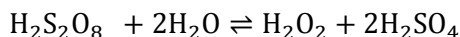
(A) **By the electrolysis of 50 %  $\text{H}_2\text{SO}_4$ :** 50 %  $\text{H}_2\text{SO}_4$  solution is electrolyzed at  $0^\circ\text{C}$  between Pt electrodes. The perdisulphuric acid is formed.



**At Anode ;**  $2\text{HSO}_4^- \rightarrow \text{H}_2\text{S}_2\text{O}_8 + 2e$

**At Cathode ;**  $2\text{H}^+ + 2e \rightarrow \text{H}_2$

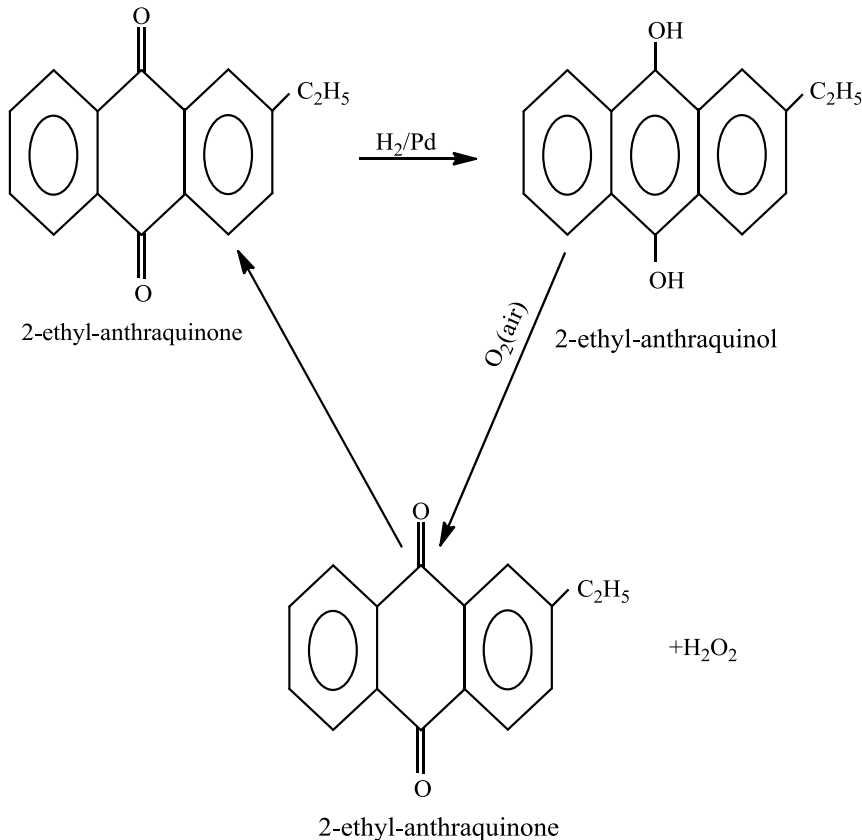
The obtained perdisulphuric acid gives  $\text{H}_2\text{O}_2$  on hydrolysis.



This  $\text{H}_2\text{O}_2$  is separated by distillation at reduced pressure and thus, 30 % solution of  $\text{H}_2\text{O}_2$  is obtained.

(B) **By the auto-oxidation of 2-ethyl-anthraquinol (Modern method) :** Anthraquinol, in a mixture of benzene and *n*-heptanol on treatment with air gives  $\text{H}_2\text{O}_2$  and 2-ethyl-anthraquinone. This 2-ethyl-anthraquinone on hydrogenation gives 2-ethyl-anthraquinol in presence of Pd catalyst.

It is a cyclic process and in it only  $\text{H}_2$  is consumed, 2-ethyl-anthraquinone is reobtained during reaction.

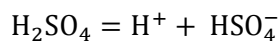


78 (c)  $\text{Ca}_3\text{P}_2 + 6\text{H}_2\text{O} \rightarrow 3\text{Ca}(\text{OH})_2 + 2\text{PH}_3$

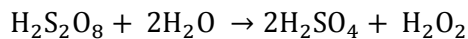
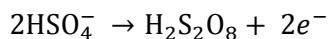
79 (b)  $\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$

80 (c) Electrolysis of 50% sulphuric acid is the commercial method for the preparation of

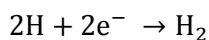
hydrogen peroxide.



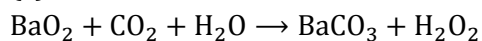
**At anode**



**At cathode**



81 **(c)**



82 **(a)**

It is a fact.

83 **(a)**

$(\text{H}^2)_2 \text{O}^{16}$  or  $\text{D}_2\text{O}$ .

D has  $1n$ ,  $1p$  and  $1e$

O has  $8n$ ,  $8p$  and  $8e$

84 **(a)**

It is a fact.

85 **(b)**

It is a fact.

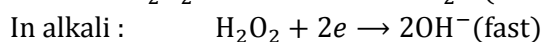
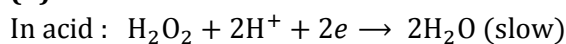
86 **(d)**

Electronic configuration of  ${}_1\text{H}^1$  and  ${}_1\text{H}^2$  is same.

87 **(c)**

It is a fact.

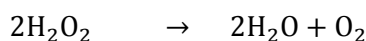
89 **(d)**



90 **(b)**

"10 volume  $\text{H}_2\text{O}_2$ " means 1 mL of its solution on decomposition at NTP, give 10 mL oxygen gas.

Volume of oxygen formed from 100 mL of solution at NTP = 1000 mL.



2 moles                      1 mole

$2 \times 34 \text{ g}$                       22400 mL.

$\therefore$  22400 mL  $\text{O}_2$  formed at NTP by decomposition of 68 g  $\text{H}_2\text{O}_2$ .

$\therefore$  1 mL  $\text{O}_2$  formed at NTP from  $\frac{68}{22400}$  of  $\text{H}_2\text{O}_2$

$\therefore$  1000 mL  $\text{O}_2$  formed at NTP from

$$\frac{68 \times 1000}{22400} \text{ g } \text{H}_2\text{O}_2 = 3.035 \text{ g } \text{H}_2\text{O}_2$$

So, concentration of "10 volume  $\text{H}_2\text{O}_2$ "

= 3.0% approximately

92 **(a)**

$\text{O}_3$  reacts with Hg to form  $\text{Hg}_2\text{O}$  which sticks on the walls of glass. This is called tailing of mercury,  $\text{O}_3 + 2\text{Hg} \rightarrow \text{Hg}_2\text{O} + \text{O}_2$ . The tailing is removed by the action of  $\text{H}_2\text{O}_2$  on  $\text{Hg}_2\text{O}$ .  $\text{H}_2\text{O}_2 + \text{Hg}_2\text{O} \rightarrow 2\text{Hg} + \text{H}_2\text{O} + \text{O}_2$

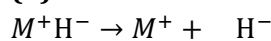
93 **(d)**

The ions responsible for hard water are soluble in water.

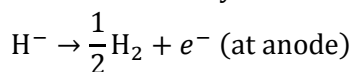
94 **(a)**

Liq.  $\text{H}_2$  because of low atomic mass and high enthalpy of combustion and liq.  $\text{O}_2$  a strong supporter for combustion.

95 **(b)**



hydride ion



96 **(a)**

It is a fact.

97 **(d)**

34 g  $\text{H}_2\text{O}_2$  has 2 g  $\text{H}_2$ .

99 **(d)**

Acetanilide, alcohol,  $\text{H}_3\text{PO}_4$  act as negative catalyst

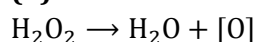
100 **(c)**

$\text{D}_2\text{O}$  has different properties than  $\text{H}_2\text{O}$ .

101 **(b)**

Hydrogen forms maximum number of compounds in chemistry (not carbon).

102 **(b)**



103 **(d)**

Amphoteric solvent dissolves both acids and bases.

$\therefore$   $\text{H}_2\text{O}_2$  is amphoteric solvent because it dissolves both acids and bases.

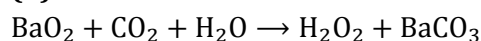
105 **(b)**

Meq. of  $\text{H}_2\text{O}_2 = 1000 \times 1.5$

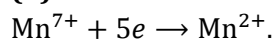
$$\therefore \frac{w}{34/2} \times 1000 = 1000 \times 1.5 (E_{\text{H}_2\text{O}_2} = M/2)$$

$$\therefore w = 25.5 \text{ g}$$

106 **(b)**



107 **(b)**





108 (b)

Its pH is 7.

109 (c)

A characteristic of hydrogen.

111 (b)

Deuterium ( ${}_1\text{H}^2$ ) has stable nuclei, because the ratio of  $\frac{n}{p} = 1$ .

113 (d)

Bicarbonates of Ca and Mg are responsible for temporary hardness.

114 (a)

It does not have impaired electrons.

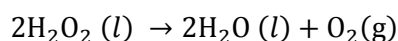
115 (a)

1 mL  $\text{H}_2\text{O}_2$  solution gives 11.2 mL  $\text{O}_2$  at NTP

$\therefore$  100 mL  $\text{H}_2\text{O}_2$  solution gives  $\text{O}_2 = 100 \times 11.2$

$$= 1120.0 \text{ mL } \text{O}_2 \text{ at NTP}$$

$\text{H}_2\text{O}_2$  decomposes as



$\therefore$  22400 mL  $\text{O}_2$  at NTP is obtained from 68g  $\text{H}_2\text{O}_2$

$\therefore$  1 mL  $\text{O}_2$  at NTP is obtained from

$$= \frac{68}{22400} \text{ g } \text{H}_2\text{O}_2$$

$\therefore$  1120 mL  $\text{O}_2$  at NTP is obtained from

$$= \frac{68}{22400} \times 1120$$

$$= 34 \text{ g}$$

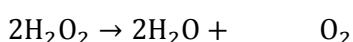
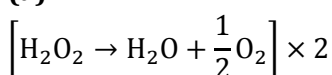
$$w = \frac{M \times m \times V}{1000}$$

$$M = 1.0$$

116 (b)

It is a fact.

117 (a)



68 g

22.4 L at NTP

$\therefore$  22.4 L  $\text{O}_2$  at NTP is obtained by 68 g of  $\text{H}_2\text{O}_2$

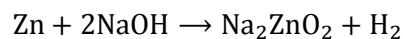
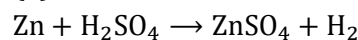
$\therefore$  20 L  $\text{O}_2$  at NTP will be obtained by  $\text{H}_2\text{O}_2$

$$= \frac{68}{22.4} \times 20 = 60.7 \text{ g/L}$$

$\therefore$  1000 mL  $\text{O}_2$  at NTP is obtained by  $\text{H}_2\text{O}_2$   
 $= 60.7 \text{ g}$

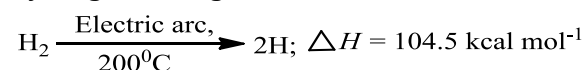
$\therefore$  Percentage strength =  $\frac{60.7 \times 100}{1000} = 6.07 \text{ g}$

118 (a)



119 (d)

Atomic hydrogen is obtained by passing ordinary hydrogen through an electric arc.



120 (c)

$\text{CO}_2$  escapes out slowly.

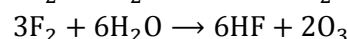
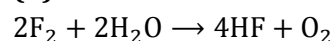
121 (a)

Colloidal Pd has larger surface area.

122 (c)

It is a fact.

123 (d)



124 (b)

The hardness of water sample containing 0.02 mole of  $\text{MgSO}_4$  dissolved in 1 L of water.

Number of moles = mass/molecular mass

$$0.002 = \text{mass}/120$$

$$\text{mass} = 0.24 \text{ g}$$

0.24 g mass of  $\text{MgSO}_4$  in 1 L of water.

$\therefore$   $10^3$  g of  $\text{H}_2\text{O}$  contains = 0.24 g of  $\text{MgSO}_4$

$\therefore$   $10^6$  g of  $\text{H}_2\text{O}$  contains =  $\frac{0.24 \times 10^6}{10^3}$  g of  $\text{MgSO}_4$

$$= 0.24 \times 10^3 \text{ g}$$

$$= 0.24 \text{ g of } \text{MgSO}_4$$

$10^6$  g of water contains = 240 g of  $\text{MgSO}_4$

$$120 \text{ g } \text{MgSO}_4 \equiv 100 \text{ g of } \text{CaCO}_3$$

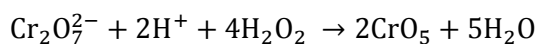
$$240 \text{ g of } \text{MgSO}_4 = \frac{100 \times 240}{120}$$

$$= 200 \text{ g of } \text{CaCO}_3$$

Hence, hardness of  $\text{H}_2\text{O} = 200 \text{ ppm}$ .

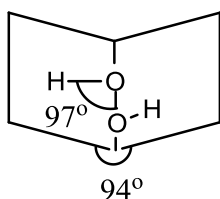
126 (c)

$\text{H}_2\text{O}_2$  oxidises the acidified potassium dichromate solution into blue peroxide of chromium,  $\text{CrO}_5$ .



127 (b)

$\text{H}_2\text{O}_2$  is pale blue liquid, it can be oxidised by ozone.  $\text{H}_2\text{O}_2$  acts as both oxidising and reducing agent. The value of dipole moment of  $\text{H}_2\text{O}_2$  is 2.1 D which suggests it cannot be planar. In fact it has open book like structure.



The two O-H bonds lie in different planes

129 (d)

It forms calcium and magnesium complex with EDTA salt

130 (a)

Ordinary hydrogen mainly contains Protium ( ${}_1\text{H}^1$ ).

132 (c)

$\text{ZnH}_2$  is an example of interstitial hydride while  $\text{NH}_3$ ,  $\text{CH}_4$  and  $\text{H}_2\text{O}$  are the examples of covalent hydride.

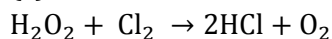
133 (b)

It is a fact.

134 (d)

Polyphosphates like sodium hexametaphosphates, sodium tripolyphosphate or STPP) form soluble complexes with  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  present in hard water

136 (c)



HCl is formed by the reduction of chlorine by  $\text{H}_2\text{O}_2$ , hence pH further decreases.

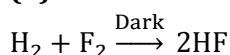
137 (b)

It is a fact.

138 (c)

$\text{H}_2$  is diatomic and forms  $\text{H}^-$  and  $\text{H}^+$  ions.

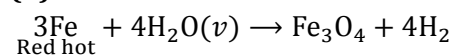
139 (b)



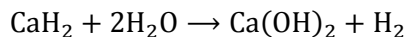
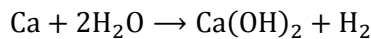
140 (d)

Hardness is expressed in g of  $\text{CaCO}_3$  present in  $10^6$  g of  $\text{H}_2\text{O}$ .

141 (d)



142 (b)



143 (b)

Atomic mass of helium ( ${}_2\text{He}^4$ ) is maximum.

144 (b)

$$M = \frac{5.1 \times 1000}{34 \times 100} = 1.5$$

145 (a)

Hg is placed below H in electrochemical series.

146 (d)

Deionised or demineralised water is obtained by passing hard water through both cation and anion exchangers one after the other

147 (a)

Eq. wt. of  $\text{H}_2\text{O}_2 = 17$

$$N = \frac{30.36}{17} = 1.78 \text{ N}$$

Volume strength =  $5.6 \times \text{normality}$

$$= 5.6 \times 1.78 = 10 \text{ V}$$

148 (c)

It is a fact.

149 (d)

Water becomes hard when it contains dissolved salts of calcium, Mg of Fe such as chloride, sulphates, bicarbonates and carbonates.

150 (a)

In tritium, it is three.

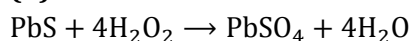
151 (b)

It is a fact.

152 (a)

Hydrogen reacts with active metals (like alkali and alkaline earth metals) form corresponding hydrides.  $\text{Ca}(s) + \text{H}_2(g) \rightarrow \text{CaH}_2$

153 (b)



154 (a)

Per cent conc. of  $\text{H}_2\text{O}_2 = \frac{17}{56} \times \text{volume conc. of } \text{H}_2\text{O}_2 = \frac{17}{56} \times 10 = 3\% \text{ app.}$

156 (d)

First three choices are characteristics of zeolites.

159 (b)

- Extra energy is required to break these hydrogen bonds.
- 160 **(d)**  
 $O_3 + H_2O_2 \rightarrow 2O_2 + H_2O$
- 161 **(b)**  
 Water has high dielectric constant, *ie*, 82, high liquid range and can dissolve maximum number of compounds. That's why it is used as universal solvent
- 162 **(c)**  
 Sodium zeolite is used for softening of water having the formula  $Na_2Al_2Si_2O_8$ .
- 163 **(d)**  
 Nascent hydrogen, (i.e., hydrogen at the moment of generation) is more powerful reducing agent than ordinary  $H_2$ .
- 164 **(a)**  
 It is a fact.
- 165 **(c)**  
 $H_2O_2$  easily decomposes into water and oxygen and the decomposition speeds up in the presence of metallic impurities, or strong bases and on exposure to light. Hence, it is stored in plastic container after addition of stabilizer.
- 166 **(c)**  
 It is a fact.
- 167 **(d)**  
 It is a method to concentrate  $H_2O_2$ .
- 168 **(d)**  
 $2Al + 2KOH + 2H_2O \rightarrow 2KAlO_2 + 3H_2$   
 (Uyeno's methods)  
 $NaH + H_2O \rightarrow NaOH + H_2$  and electrolysis of  $Ba(OH)_2$ . These all are methods to prepared pure  $H_2$ .
- 169 **(b)**  
 It is a fact.
- 170 **(a)**  
 $CaC_2 + 2D_2O \rightarrow Ca(OD)_2 + C_2D_2$
- 171 **(c)**  
 $H \rightarrow H^+ + e$
- 172 **(a)**  
 $H_2O_2$  is di-basic acid and thus, less stable in basic medium.
- 174 **(a)**  
 '20 volume  $H_2O_2$ ' means that 1mL of this  $H_2O_2$  gives 20mL oxygen on decomposition at STP.  
 Hence, 5000  $cm^3$   $O_2$  will be obtained by  $= \frac{5000}{20}$   
 $= 250 \text{ cm}^3$
- 175 **(a)**  
 $Ice \rightleftharpoons Water$ ; Also volume of ice > volume of water. Thus, an increase in pressure favours the forward reaction.
- 176 **(c)**  
 $D_2O$  was discovered by Urey and Wash burn.
- 177 **(d)**  
 It is a fact.
- 178 **(b)**  
 An important property of  $H_2O_2$ .
- 179 **(d)**  
 Stannic and ferric oxides are reduced to stannous and ferrous oxides.
- 180 **(a)**  
*Ortho* and *para* hydrogens are two forms of hydrogen which differ only in direction of spin of proton.  
 Protium ( ${}^1_1H$ ), deuterium ( ${}^2_1D$ ) and tritium ( ${}^3_1T$ ) are three isotopes of hydrogen. All of them have one proton and electron each. Protium has no neutron, deuterium has one neutron and tritium has two neutrons.
- 181 **(c)**  
 $Ca^{2+}$  and  $Mg^{2+}$  forms insoluble salts with soap.
- 182 **(a)**  
 $H_2 \rightarrow H + H, \Delta H = +ve$   
 The reaction is favoured by low pressure and high temperature
- 184 **(c)**  
 $S^{2-} \rightarrow S^0 + 2e$
- 186 **(a)**  
 Dielectric constant of  $H_2O_2$  increases with dilution. It is 93.7 for pure  $H_2O_2$ , 97 for 90%  $H_2O_2$  and 120 for 65%  $H_2O_2$ .
- 187 **(c)**  
 It is a fact.
- 188 **(c)**  
 It is a fact (density of  $D_2O$   
 $= 1.1073 \text{ g/mL at } 284.6 \text{ K}$ ).
- 189 **(d)**  
 It is a fact.
- 191 **(a)**  
 Hydrides are binary compounds of hydrogen. These can be classified in four groups *viz* :  
 (i) Ionic hydrides *e.g.*,  $NaH, CaH_2, LiH$  etc.  
 (ii) Covalent hydrides *e.g.*,  $B_2H_6, NH_3, SbH_3$  etc.  
 (iii) Polynuclear hydrides *e.g.*,  $LiAlH_4, NaBH_4$  etc.

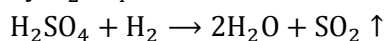
(iv) Interstitial hydrides, in which hydrogen is trapped in the interstitial spaces of transition metals.

194 (c)

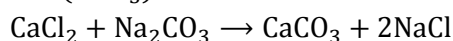
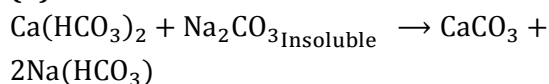
Ionic hydride has  $H^-$  ion.

195 (c)

Moist hydrogen cannot be dried over concentrated  $H_2SO_4$  because it is oxidized by  $H_2SO_4$  and catches fire.



196 (b)



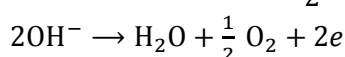
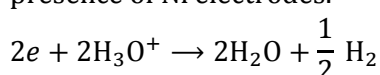
$Ca^{2+}$  of  $Mg^{2+}$  ions are removed as insoluble carbonates

197 (d)

20 g  $D_2O$  has 4 g deuterium.

198 (b)

Hydrogen of high purity is obtained by electrolyzing aqueous barium hydroxide in presence of Ni electrodes.



199 (c)

It is a fact.

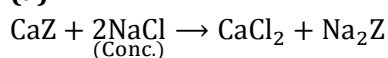
200 (a)

Lighter isotopes are more reactive.

201 (c)

Heavy water is used as a moderator to slow down the speed of fast moving neutrons and as well as a coolant

202 (a)



203 (c)

It is fact.

205 (c)

Both are V-shaped.

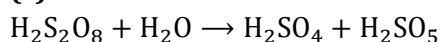
206 (c)

No such reaction exists.

207 (c)

Potassium reacts violently with acids.

209 (c)



210 (b)

It is a fact.

211 (b)

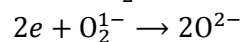
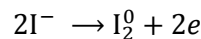
It is a fact.

212 (c)

Alkaline earth metal salts are causing hardness :

Temporary hardness caused by soluble Ca and Mg hydrogen carbonates. Calcium and magnesium soluble sulphates and chlorides cause permanent hardness.

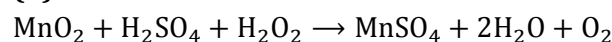
214 (a)



215 (d)

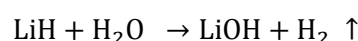
Electrolysis of 50% sulphuric acid gives per disulphuric acid ( $H_2S_2O_8$ ) which on distillation yields 30% solution of hydrogen peroxide

216 (b)



217 (d)

Ionic hydrides give basic solution when reacts with water *e.g.*,



218 (b)

Only Mg and Mn react with cold dil.  $HNO_3$  to give H

219 (b)

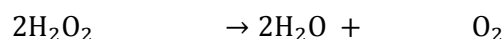
Thenard obtained  $H_2O_2$  for the first time.

220 (a)

*Ortho* and *para* hydrogen show different spin in a hydrogen molecule, hence, these are not the isotopes

221 (d)

10 volume = 1 volume of  $H_2O_2$  gives 10 volume of  $O_2$  at NTP.



$$2(2 + 32) = 68 \text{ g} \qquad \qquad \qquad 22400 \text{ mL at NTP}$$

At NTP

$\therefore$  22400 mL of  $O_2$  is obtained from

$$= 68 \text{ g } H_2O_2$$

$\therefore$  10 mL of  $O_2$  is obtained from

$$= \frac{68 \times 10}{22400} = 0.03035 \text{ g } H_2O_2$$

1 mL of  $H_2O_2$  solution contains

$$= 0.03035 \text{ g } H_2O_2$$

100 mL of  $H_2O_2$  solution contains

$$= 0.03035 \times 100$$

$$= 3.035 \text{ g H}_2\text{O}_2$$

∴ Strength of 10 volume H<sub>2</sub>O<sub>2</sub>

$$= 3.035 \times 10$$

$$= 30.35 \text{ g/L}$$

222 (a)

Bond formation is exothermic.

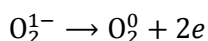
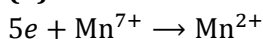
223 (a)

Ortho-hydrogen is more stable and para form always try to convert in ortho form.

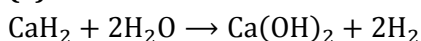
224 (a)

These are facts.

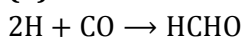
225 (d)



226 (a)



227 (b)



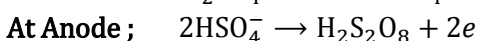
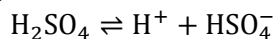
228 (a)

It is a fact.

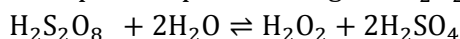
233 (c)

Industrial preparation of H<sub>2</sub>O<sub>2</sub>:

(A) **By the electrolysis of 50 % H<sub>2</sub>SO<sub>4</sub>**: 50 % H<sub>2</sub>SO<sub>4</sub> solution is electrolyzed at 0°C between Pt electrodes. The perdisulphuric acid is formed.



The obtained perdisulphuric acid gives H<sub>2</sub>O<sub>2</sub> on hydrolysis.



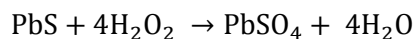
This H<sub>2</sub>O<sub>2</sub> is separated by distillation at reduced pressure and thus, 30 % solution of H<sub>2</sub>O<sub>2</sub> is obtained.

(B) **By the auto-oxidation of 2-ethyl-anthraquinol (Modern method)** : Anthraquinol, in a mixture of benzene and *n*-heptanol on treatment with air gives H<sub>2</sub>O<sub>2</sub> and 2-ethyl-anthraquinone. This 2-ethyl-anthraquinone on hydrogenation gives 2-ethyl-anthraquinol in presence of Pd catalyst.

It is a cyclic process and in it only H<sub>2</sub> is consumed, 2-ethyl-anthraquinone is reobtained

229 (c)

Hydrogen peroxide oxidise lead sulphide into lead sulphate which is a solid.



230 (b)

H<sub>2</sub>O<sub>2</sub> has open book structure.

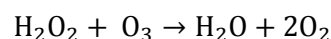
231 (d)

Na<sub>2</sub>SO<sub>3</sub> is oxidised by H<sub>2</sub>O<sub>2</sub> to Na<sub>2</sub>SO<sub>4</sub>

PbS is oxidised by H<sub>2</sub>O<sub>2</sub> to PbSO<sub>4</sub>

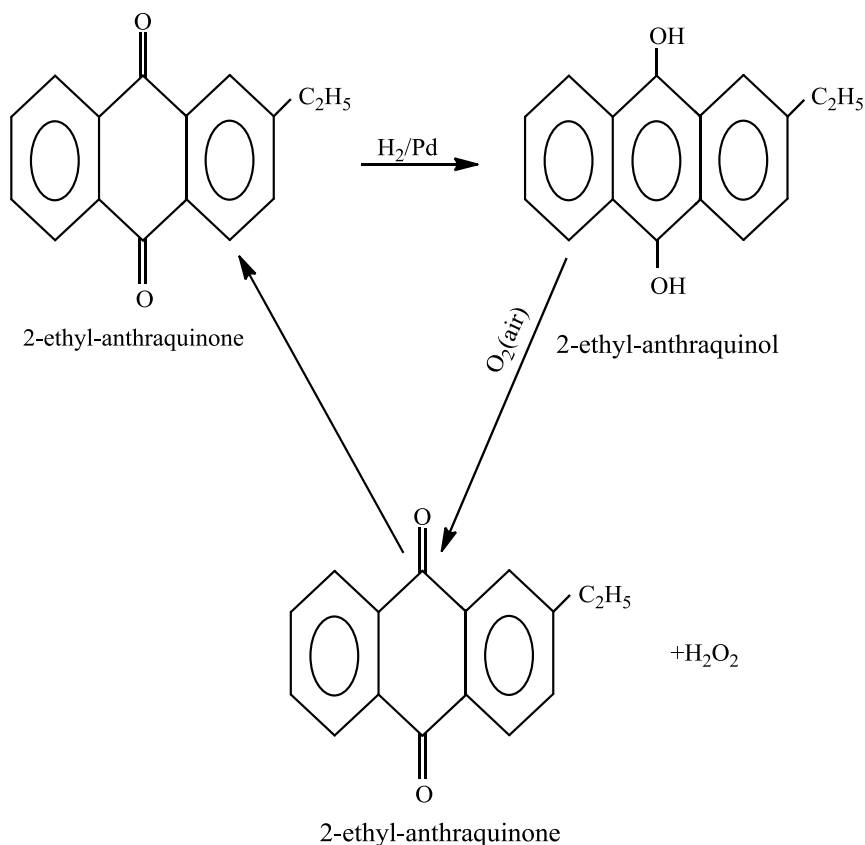
KI is oxidised by H<sub>2</sub>O<sub>2</sub> to I<sub>2</sub>

O<sub>3</sub> cannot be oxidised by H<sub>2</sub>O<sub>2</sub> but it is reduced to O<sub>2</sub> by H<sub>2</sub>O<sub>2</sub>



232 (b)

It is one of the uses of H<sub>2</sub>O<sub>2</sub>.



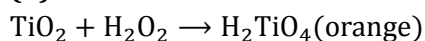
during reaction.

235 (b)

30 mL  $\text{O}_2$  is obtained by  $\frac{34 \times 30}{11200}$  g  $\text{H}_2\text{O}_2/\text{mL}$

$$\therefore M = \frac{34 \times 30 \times 100}{11200 \times 34} = 2.68 \text{ M}$$

236 (d)



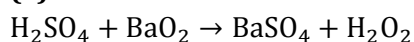
237 (a)

Tritium ( ${}_1\text{H}^3$ ) is a heavy isotope of hydrogen which is obtained by nuclear reactions.

238 (b)

It is a fact.

239 (a)



240 (b)

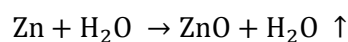
The formula of heavy water is  $\text{D}_2\text{O}$ .

241 (c)

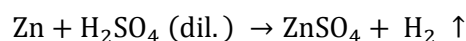
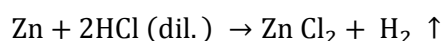
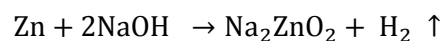
It resembles with alkali metals as it forms  $\text{H}^+$  ion by losing its outer electron and resembles with halogen as it forms  $\text{H}^-$  ion by gaining one electron.

242 (a)

Zinc does not react with cold water.



steam



243 (a)

The  $\text{H}-\text{O}-\text{H}$  angle in water molecule is about  $105^\circ$  (due to two lone pairs of electrons)

244 (c)

Some transition metals such as Pt, Ni, Pd, Os, Cr, Mn, Fe, etc., adsorb relatively large amount of hydrogen gas, which is called occluded hydrogen.

245 (d)

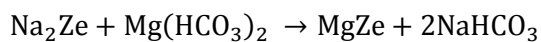
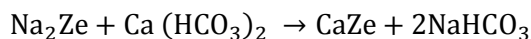
Chlorine has lone pair which it can donate to form coordinate bond while hydrogen cannot

246 (b)

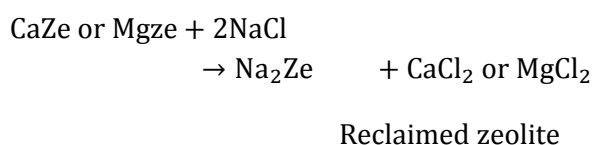
Metals in finely divided state possess larger surface area and are more reactive.

247 (d)

During the softening process the reaction takes place as :



After sometime, the zeolite is completely converted into calcium and magnesium zeolites. Eventually, the bed ceases to soften water *i.e.*, it gets exhausted. At this stage, the supply of hard water is stopped and the exhausted zeolite is reclaimed by treating the bed with a 10% NaCl solution (Brine soln.) when the following reaction takes place



248 (b)

$$\begin{aligned} \text{Volume strength} &= 5.6 \times \text{normality} \\ &= 5.6 \times 1.5 = 8.4 \text{ L} \end{aligned}$$

249 (a)

Follow reactive nature of nascent hydrogen.

250 (a)

It is a fact.

251 (d)

These are characteristic properties of  $\text{H}_2\text{O}_2$ .

252 (a)

$\text{HClO}_4$  does not give  $\text{H}_2\text{O}_2$  on hydrolysis. Rest all contains O—O bond and gives  $\text{H}_2\text{O}_2$  on heating.

253 (d)

$${}_1\text{H}^1 \text{ has no neutron, } i.e., n = 0, p = 1, \frac{n}{p} = \frac{0}{1} = 0$$

254 (a)

$$\begin{aligned} 34 \text{ g } \text{H}_2\text{O}_2 \text{ has } 2 \text{ g H} \\ \therefore 100 \text{ g } \text{H}_2\text{O}_2 \text{ has } \frac{2 \times 100}{34} = 5.88 \text{ g H} \end{aligned}$$

255 (a)

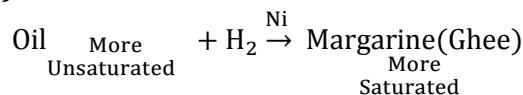
Permutit or zeolite is the aluminosilicate of sodium. It is used to remove hardness of water. It converts insoluble salts of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  into soluble zeolites. It exchange these ions with  $\text{Na}^+$  and water becomes soft.

Thus, exhausted permutit does not contain  $\text{Na}^+$  ions.

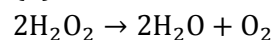
256 (d)

$$M_{\text{H}_2\text{O}} = \frac{1000}{18 \times 1} = 55.6$$

257 (d)



258 (b)



$$2 \times 34 \text{ g} \quad \quad \quad 22400 \text{ mL}$$

$$\therefore 68 \text{ g of } \text{H}_2\text{O}_2 \text{ liberates } 22400 \text{ mL } \text{O}_2$$

$$\begin{aligned} \therefore 0.68 \text{ g of } \text{H}_2\text{O}_2 \text{ liberates} &= \frac{0.68 \times 22400}{68} \\ &= 224 \text{ mL } \text{O}_2 \end{aligned}$$

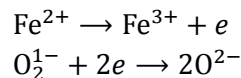
260 (c)

$\text{H}_2\text{O}_2$  reduces potassium ferricyanide (alk. Solution)  $\text{K}_3\text{Fe}(\text{CN})_6$  to potassium ferrocyanide.

261 (d)

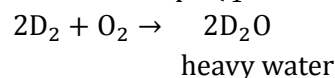
Permanent hardness in the name because this type of hardness is not removed by only boiling the water.

262 (a)



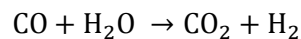
263 (b)

Heavy water is formed by the combination of heavier isotope ( ${}_1\text{H}^2$  or D) with oxygen.



264 (d)

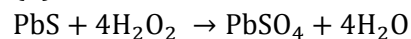
Industrially, hydrogen is prepared from water gas which is a mixture of carbon monoxide and hydrogen, by removing carbon monoxide by Bosch process or by liquefaction.



265 (d)

It is a fact.

266 (d)



from the above equation

$$\therefore 1 \text{ mole of PbS required } 4 \text{ moles of } \text{H}_2\text{O}_2$$

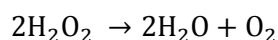
$$0.01 \text{ moles of PbS required } 0.04 \text{ mole of } \text{H}_2\text{O}_2$$

$$\text{Weight of } 0.04 \text{ mole } \text{H}_2\text{O}_2 = 1.36 \text{ g}$$

10 volume of  $\text{H}_2\text{O}_2$  means,

1 mL of such solution of  $\text{H}_2\text{O}_2$  on decomposition by heat produces 10 mL of oxygen at NTP.

$\text{H}_2\text{O}_2$  decomposes as,



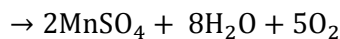
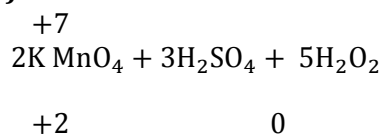
Thus 1 mL of 10 volume  $\text{H}_2\text{O}_2$  solution contains

$$\begin{aligned} &= \frac{68}{22400} \times 10 \text{ g of } \text{H}_2\text{O}_2 \\ &= 0.03035 \text{ g of } \text{H}_2\text{O}_2 \end{aligned}$$

$\therefore$  0.03035 g of  $\text{H}_2\text{O}_2$  is present in 1 mL of 10 volume  $\text{H}_2\text{O}_2$ .

$$\begin{aligned} \therefore 1.36 \text{ g of } \text{H}_2\text{O}_2 \text{ present in } &\frac{1}{0.03035} \\ &\times 1.36 \text{ mL of 10 volume of } \text{H}_2\text{O}_2 \\ &= 44.81 \text{ mL} \end{aligned}$$

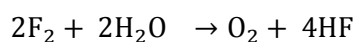
267 (c)



In this reaction hydrogen peroxide acts as a reducing agent and it reduces  $\text{KMnO}_4$  to  $\text{Mn}^{2+}$  ions.

268 (d)

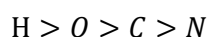
Water is oxidised to oxygen by fluorine as



269 (c)

Hydrogen forms about 75% of the mass (total amount) of the universe. It has been estimated that more than 90% of all atoms in the universe are H-atoms. While most of the remaining atoms are of He.

The order of abundance of given elements in the universe is



270 (a)

It is a fact.

271 (c)

Protium is  ${}_1\text{H}^1$ .

272 (d)

$\text{H}_2\text{O}_2$  is weak di-basic acid.

273 (d)

These are characteristics of perhydrol.

274 (c)

Both halogen ( $ns^2np^5$ ) and hydrogen  $1s^1$  have one electron short to attain configuration of nearest noble gas.

275 (c)

Calgon is sodium hexa meta – phosphate ( $\text{NaPO}_3$ )<sub>6</sub> or  $\text{Na}_2[\text{Na}_4(\text{PO}_3)_6]$ .

276 (c)

It is one of the uses of  $\text{H}_2\text{O}_2$ .

277 (b)

Covalent molecules occupy solid structure due to increasing van der Waals' forces.

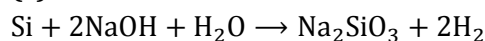
278 (a)

$\text{PbO}_2$  does not contain  $-\text{O}-\text{O}-$  bond. It is lead dioxide.

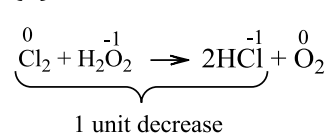
280 (d)

It is a fact.

281 (c)



282 (d)



In this reaction,  $\text{H}_2\text{O}_2$  works as a reducing agent

283 (d)

$\text{SiC}$  is a covalent compound.

284 (a)

The reactivity order of isotopes decreases with increase in mass no.