EXERCISE-I

Hydrogen

1. On reaction with *Mg*, very dilute nitric acid produces
(A) NH_3 (B) Nitrous oxide
(C) Nitric oxide (D) Hydrogen

2. Among the following, identify the compound which cannot act as both oxidising and reducing agents
(A) H_2O_2 (B) H_2
(C) SO_2 (D) Cl_2

3. Which of the following reaction produces hydrogen
(A) $Mg + H_2O$ (B) $BaO_2 + HCl$
(C) $H_2S_4O_8 + H_2O$ (D) $Na_2O_2 + 2HCl$

4. Hydrogen resembles in many of its properties
(A) Halogen (B) Alkali metals
(C) Both (A) and (B) (D) None of these

5. Ortho and para hydrogen differ in
(A) Proton spin (B) Electron spin
(C) Nuclear charge (D) Nuclear reaction

6. Action of water or dilute mineral acids on metals can give
(A) Monohydrogen (B) Tritium
(C) Dihydrogen (D) Trihydrogen

7. Hydrogen from *HCl* can be prepared by
(A) *Mg* (B) *Cu*
(C) *P* (D) *Pt*.

8. Which of the following can adsorb largest volume of hydrogen gas
(A) Finely divided platinum
(B) Finely divided nickel
(C) Colloidal palladium
(D) Colloidal platinum

9. The nuclei of tritium (H^3) atom would contain neutrons
(A) 1 (B) 2
(C) 3 (D) 4

10. The colour of hydrogen is
(A) Black (B) Yellow
(C) Orange (D) Colourless

11. The metal which displaces hydrogen from a boiling caustic soda solution is
(A) *As* (B) *Zn*
(C) *Mg* (D) *Fe*

12. Metals like platinum and palladium can absorb large volumes of hydrogen under special conditions. Such adsorbed hydrogen by the metal is known as
(A) Adsorbed hydrogen
(B) Occluded hydrogen
(C) Reactive hydrogen
(D) Atomic hydrogen

13. Which is poorest reducing agent
(A) Nascent hydrogen
(B) Atomic hydrogen
(C) Dihydrogen
(D) All have same reducing strength

14. The sum of protons, electrons and neutrons in the heaviest isotope of hydrogen is
(A) 6 (B) 5
(C) 4 (D) 3

15. Number of nucleons in D_2 molecule is
(A) 1 (B) 2
(C) 3 (D) 4

16. An ionic compound is dissolved simultaneously in heavy water and simple water. Its solubility is
(A) Larger in heavy water
(B) Smaller in heavy water
(C) Solubility is same in both
(D) Smaller in simple water

17. Ortho-hydrogen and para-hydrogen resembles in which of the following property
(A) Thermal conductivity
(B) Magnetic properties
(C) Chemical properties
(D) Heat capacity

18. The difference between heat of adsorption of ortho and para hydrogen is
(A) 0.4 $kJ\ mol^{-1}$ (B) 0.8 $kJ\ mol^{-1}$
(C) Zero (D) None of these

19. Hydrogen ion H^- is isoelectronic with
(A) *Li* (B) *He*
(C) H^+ (D) Li^-

20. Hydrogen can be fused to form helium at
(A) High temperature and high pressure
(B) High temperature and low pressure
(C) Low temperature and high pressure
(D) Low temperature and low pressure

21. Which of the following terms is not correct for hydrogen
(A) Its molecule is diatomic
(B) It exists both as H^+ and H^- in different chemical compounds
(C) It is the only species which has no neutrons in the nucleus
(D) Heavy water is unstable because hydrogen is substituted by its isotope deuterium

22. When electric current is passed through an ionic hydride in the molten state
(A) Hydrogen is liberated at the anode
(B) Hydrogen is liberated at the cathode
(C) No reaction takes place
(D) Hydride ion migrates towards cathode

23. Which of the halogen has maximum affinity for hydrogen
(A) F_2 (B) Cl_2
(C) Br_2 (D) I_2

24. Which of the following statements is most applicable to hydrogen
(A) It can act as a reducing agent
(B) It can act as an oxidising agent
(C) It can act both as oxidising and reducing agent
(D) It can neither act as oxidising nor as a reducing agent

25. Hydrogen is
(A) Electropositive
(B) Electronegative
(C) Both electropositive as well as electronegative
(D) Neither electropositive nor electronegative

26. Ionization energy of hydrogen is
(A) Equal to that of chlorine
(B) Lesser than that of chlorine
(C) Slightly higher than that of chlorine
(D) Much higher than that of chlorine

27. Hydrogen acts as a reducing agent and thus resembles
(A) Halogen (B) Noble gas
(C) Radioactive elements (D) Alkali metals

28. Which position for hydrogen explain all its properties
(A) At the top of halogen
(B) At the top of alkali metals
(C) At the top of carbon family
(D) None of these

29. Hydrogen readily combines with non-metals and thus it shows its
(A) Electronegativity character
(B) Electropositive character
(C) Both (A) and (B)
(D) None of these

30. The oxidation states shown by hydrogen are
(A) –1 only (B) Zero only
(C) +1, –1, 0 (D) +1 only

31. Which of the following statements concerning protium, deuterium and tritium is not true
(A) They are isotopes of each other
(B) They have similar electronic configurations
(C) They exist in the nature in the ratio of 1 : 2 : 3
(D) Their mass numbers are in the ratio of 1 : 2 : 3

32. When SO_3 is treated with heavy water the product is/are
(A) Deuterium and sulphuric acid
(B) Deuterium and sulphurous acid
(C) Only deuterium
(D) Dideuterosulphuric acid

33. Hydrogen has three isotopes, the number of possible diatomic molecules will be
(A) 2 (B) 6
(C) 9 (D) 12

34. In which of the compounds does hydrogen have an oxidation state of –1
(A) CH_4 (B) NH_3
(C) *HCl* (D) CaH_2

35. Pure hydrogen is obtained by carrying electrolysis of
(A) Water containing H_2SO_4
(B) Water containing *NaOH*
(C) $Ba(OH)_2$ solution
(D) *KOH* solution

36. 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

37. Deuterium differs from hydrogen in
(A) Chemical properties
(B) Physical properties
(C) Both physical and chemical properties
(D) Radioactive properties

38. Tritium undergoes radioactive decay giving
(A) α-particles (B) β-particles
(C) Neutrons (D) γ-rays

39. The gas used in the hydrogenation of vegetable oils in the presence of nickel as catalyst is
(A) Methane (B) Ethane
(C) Ozone (D) Hydrogen

40. The conversion of atomic hydrogen into ordinary hydrogen is
(A) Exothermic change
(B) Endothermic change
(C) Nuclear change
(D) Photochemical change

41. Ionic hydrides are usually
(A) Good electrically conductors when solid
(B) Easily reduced
(C) Good reducing agents
(D) Liquid at room temperature

42. When $NaBH_4$ is dissolved in water
(A) It decomposes with the evolution of H_2
(B) Na^+ and BH_4^- are formed which are stable
(C) BH_4^- ions formed initially decompose to produce OH^- ions, which prevent further decomposition
(D) *NaH* and B_2H_6 are produced

43. Systematic name of H_2O (oxide of hydrogen) is
(A) Water (B) Hydrogen oxide
(C) Oxidane (D) None of these

44. Group 2 hydrides with significant covalent character is/are
(A) BeH_2 (B) MgH_2
(C) Both (A) and (B) (D) None of these

45. Limiting compositions of *f*-block hydrides are
(A) MH_2 and MH_3 (B) MH_3 and MH_5
(C) MH_2 and MH_8 (D) MH_2 and MH_6

46. Hydrogen directly combines with
(A) *Au* (B) *Cu*
(C) *Ni* (D) *Ca*

47. Chemical *A* is used for water softening to remove temporary hardness. *A* reacts with sodium carbonate to generate caustic soda. When CO_2 is bubbled through a solution of *A*, it turns cloudy. What is the chemical formula of *A*
(A) $CaCO_3$ (B) *CaO*
(C) $Ca(OH)_2$ (D) $Ca(HCO_3)_2$

48. When same amount of zinc is treated separately with excess of sulphuric acid and excess of sodium hydroxide solution the ratio of volumes of hydrogen evolved is
(A) 1 : 1 (B) 1 : 2
(C) 2 : 1 (D) 9 : 4

49. Which one of the following substances is used in the laboratory for a fast drying of neutral gases
(A) Phosphorus pentoxide
(B) Active charcoal
(C) Anhydrous calcium chloride
(D) Na_3PO_4

50. Which is the lightest gas
(A) Nitrogen (B) Helium
(C) Oxygen (D) Hydrogen

Water or hydride of oxygen

51. Heavy water is compound of
(A) Oxygen and heavier isotopes of hydrogen
(B) Hydrogen and heavier isotopes of oxygen
(C) Heavier isotopes of oxygen and hydrogen
(D) None of these

52. Which of the following pair of ions makes the water hard
(A) Na^+, SO_4^{2-} (B) K^+, HCO_3^-
(C) Ca^{2+}, NO_3^- (D) NH_4^+, Cl^-

53. Temporary hardness of water can be removed by
(A) Addition of potassium permagenate
(B) Boiling
(C) Filtration
(D) Addition of chlorine

54. When zeolite (Hydrated sodium aluminium silicate) is treated with hard water the sodium ions are exchanged with
(A) OH^- ions (B) SO_4^{2-} ions
(C) Ca^{2+} ions (D) H^+ ions

55. Which of the following statements do not define the characteristic property of water "Water is a universal solvent"
(A) It can dissolve maximum number of compounds
(B) It has very low dielectric constant
(C) It has high liquid range
(D) None of these

56. The velocity of neutrons in nuclear reactor is slowed down by
(A) Heavy water (D_2O)
(B) Ordinary water (H_2O)
(C) Zinc rod
(D) Fused caustic soda

57. Temporary hardness of water is due to the presence of
(A) Magnesium bicarbonate
(B) Calcium chloride
(C) Magnesium sulphate
(D) Calcium carbonate

58. Which of the following is not true
(A) Hardness of water depends on its behaviour towards soap
(B) The temporary hardness is due to the presence of *Ca* and *Mg* bicarbonates
(C) Permanent hardness is due to the presence of soluble *Ca* and *Mg* sulphates, chlorides and nitrates
(D) Permanent hardness can be removed by boiling the water

59. The molarity of pure water at $4°C$ is
(A) 1 *M* (B) 2.5 *M*
(C) 5 *M* (D) 55.5 *M*

60. Which of the following is not a hard water
(A) Water containing $CaCl_2$
(B) Water containing dil. *HCl*
(C) Water containing $MgSO_4$
(D) None of these

61. Lead pipes are not used for carrying drinking water because
(A) They are covered with a coating of lead carbonate
(B) They are corroded by air and moisture
(C) Water containing dissolved air attacks lead forming soluble hydroxide
(D) None of these

62. Which one of the following removes temporary hardness of water
(A) Slaked lime (B) Plaster of Paris
(C) Cuprous (D) Hydrolith

63. Which of the following will cause softening of hard water
(A) Passing it through cation exchange resin
(B) Passing it through anion exchange resin
(C) Passing it through sand
(D) Passing it through alumina

64. which of the following process permanent hardness of water can be removed, by adding
(A) Sodalime
(B) Sodiumbicarbonate
(C) Washing soda
(D) Sodium chloride

65. Permutit is technical name given to
(A) Aluminates of calcium and sodium
(B) Silicates of calcium and sodium
(C) Hydrated silicates of aluminium and sodium
(D) Silicates of calcium and magnesium

66. Which of the following metal will not reduce H_2O
(A) *Ca* (B) *Fe*
(C) *Cu* (D) *Li*

67. Which of the following is correct about heavy water
(A) Water at $4°C$ having maximum density is known as heavy water
(B) It is heavier than water (H_2O)
(C) It is formed by the combination of heavier isotope of hydrogen and oxygen
(D) None of these

68. The boiling point of water is exceptionally high because
(A) There is covalent bond between *H* and *O*
(B) Water molecule is linear
(C) Water molecules associate due to hydrogen bonding
(D) Water molecule is not linear

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

	List I		List II
1	Heavy water	(A)	Bicarbonates of *Mg* and *Ca* in water
2	Temporary hard water	(B)	No foreign ions in water
3	Soft water	(C)	D_2O
4	Permanent hard water	(D)	Sulphates and chlorides of *Mg* and *Ca* in water

Codes
(A) 1-*c*, 2-*d*, 3-*b*, 4-*a* (B) 1-*b*, 2-*a*, 3-*c*, 4-*d*
(C) 1-*b*, 2-*d*, 3-*c*, 4-*a* (D) 1-*c*, 2-*a*, 3-*b*, 4-*d*

70. The $H-O-H$ angle in water molecule is about
(A) 90° (B) 180°
(C) 102° (D) 105°

71. When two ice cubes are pressed over each other, they unite to form one cube. Which of the following forces is responsible to hold them together
(A) Hydrogen bond formation
(B) Van der Waals forces
(C) Covalent attraction
(D) Ionic interaction

72. What is formed when calcium carbide reacts with heavy water
(A) C_2D_2 (B) CaD_2
(C) Ca_2D_2O (D) CD_2

73. Pure water can be obtained from sea water by
(A) Centrifugation (B) Plasmolysis
(C) Reverse osmosis (D) Sedimentation

74. Action of water or dilute mineral acids on metals can give
(A) Monohydrogen (B) Tritium
(C) Dihydrogen (D) Trihydrogen

75. Metal which does not react with cold water but evolves H_2 with steam is
(A) *Na* (B) *K*
(C) *Pt* (D) *Fe*

76. *pH* of neutral water at room temperature nearly
(A) 0 (B) 14
(C) 7 (D) 10^{-7}

77. Maximum number of hydrogen bonding in H_2O is
(A) 1 (B) 2
(C) 3 (D) 4

78. The low density of ice compared to water is due to
(A) Induced dipole-induced dipole interactions
(B) Dipole-induced dipole interaction
(C) Hydrogen bonding interactions
(D) Dipole-dipole interactions

79. Which of the following acid is formed when SiF_4 reacts with water
(A) SiF_4 (B) H_2SiF_4
(C) H_2SO_4 (D) H_2SiF_6

80. Triple point of water is
(A) 273K (B) 373K
(C) 203K (D) 193K

Hydrogen peroxide

81. Fenton's reagent is
(A) $FeSO_4 + H_2O_2$ (B) $Zn + HCl$
(C) $Sn + HCl$ (D) None of these

82. The structure of H_2O_2 is
(A) Planar (B) Linear
(C) Spherical (D) Non-planar

83. The volume strength of 1.5 *N* H_2O_2 solution is
(A) 8.4 *litres* (B) 4.2 *litres*
(C) 16.8 *litres* (D) 5.2 *litres*

84. The volume of oxygen liberated from 15 *ml* of 20 volume H_2O_2 is
(A) 250 *ml* (B) 300 *ml*
(C) 150 *ml* (D) 200 *ml*

85. The strength in volumes of a solution containing 30.36 *g/litre* of H_2O_2 is
(A) 10 volume (B) 20 volume
(C) 5 volume (D) None of these

86. Hydrogen peroxide is used as
(A) Oxidising agent
(B) Reducing agent
(C) Both as oxidising and reducing agent
(D) Drying agent

87. Equivalent weight of H_2O_2 is
(A) 17 (B) 34
(C) 68 (D) 18

88. 20 volume H_2O_2 solution has a strength of about
(A) 30% (B) 6%
(C) 3% (D) 10%

89. H_2O_2 is manufactured these days
(A) By the action of H_2O_2 on BaO_2
(B) By the action of H_2SO_4 on Na_2O_2
(C) By electrolysis of 50% H_2SO_4
(D) By burning hydrogen in excess of oxygen

90. Which one of the following is a true peroxide
(A) NO_2 (B) MnO_2
(C) BaO_2 (D) SO_2

91. H_2O_2 is
(A) Poor polar solvent than water
(B) Better polar solvent than H_2O
(C) Both have equal polarity
(D) Better polar solvent but its strong auto oxidising ability limits its use as such

92. H_2O_2 used in rockets has the concentration
(A) 50% (B) 70%
(C) 30% (D) 90%

93. H_2O_2 is a
(A) Weak acid (B) Weak base
(C) Neutral (D) None of these

94. Nitrates of all metals are
(A) Soluble in water (B) Insoluble
(C) Coloured (D) Unstable

95. Decomposition of H_2O_2 is prevented by
(A) *NaOH* (B) MnO_2
(C) Acetanilide (D) Oxalic acid

96. H_2O_2 is always stored in black bottles because
(A) It is highly unstable
(B) Its enthalpy of decomposition is high
(C) It undergo autooxidation on prolonged standing
(D) None of these

97. H_2O_2 on reacting with ethene gives
(A) Ethane (B) Ethanal
(C) Ethylene glycol (D) Ethanol

98. Which of the following is wrong about H_2O_2? It is used
(A) As aerating agent in production of spong rubber
(B) As an antichlor
(C) For restoring white colour of blackened lead painting
(D) None of these

99. $H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$; $E° = -0.68\,V$. This equation represents which of the following behaviour of H_2O_2
(A) Reducing (B) Oxidising
(C) Acidic (D) Catalytic

100. The structure of H_2O_2 is
(A) Open book like (B) Linear
(C) Closed book (D) Pyramidal