(1) 7.005
(2) 4.75
(3) 7.0
(4) Between 6 and 7

53. If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its K_{sp} is:
(1) $5.00 \times 10^{-7}\ M^3$
(2) $4.00 \times 10^{-6}\ M^3$
(3) $4.00 \times 10^{-7}\ M^3$
(4) $5.00 \times 10^{-6}\ M^3$

54. How much sodium acetate should be added to 0.1 M solution of CH_3COOH to give a solution of pH 5.5? (pK_a of $CH_3COOH = 4.5$).
(1) 0.1 M (2) 0.2 M
(3) 1.0 M (4) 10.0 M

55. What will be the value of pH of 0.01 mol dm^{-3} CH_3COOH ($K_a = 1.74 \times 10^{-5}$)?
(log 4.17 = 0.62)
(1) 3.4 (2) 3.6
(3) 3.9 (4) 3.0

56. A buffer solution is prepared in which the concentration of NH_3 is 0.30 M and the concentration of NH_4^+ is 0.20 M. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution?
(1) 8.73 (2) 9.08
(3) 9.43 (4) 11.72

(2) $H_2SO_4 + KOH$
(3) NH_4OH (excess) + HCl
(4) $CH_3COOH + NaOH$ (large excess)

59. If pH of the solution is one, what weight of HCl is present in one litre of solution?
(1) 3.65 g (2) 36.5 g
(3) 0.365 g (4) 0.0365 g

60. Which is the correct expression for hydrolysis constant of NH_4CN?
(1) $\sqrt{\dfrac{K_w}{K_a}}$ (2) $\dfrac{K_w}{K_a \times K_b}$
(3) $\sqrt{\dfrac{K_b}{c}}$ (4) $\dfrac{K_a}{K_b}$

61. A solution has pH = 5, it is diluted 100 times, then it will become (log2 = 0.3010):
(1) Almost neutral
(2) Basic
(3) Unaffected
(4) More acidic

62. The number of conjugate acid-base pairs present in the aqueous solution of H_3PO_3 is:
(1) 2 (2) 3
(3) 4 (4) 5

63. What will happen on addition of ammonium chloride to a solution of ammonium hydroxide?

(1) Dissociation of NH_4OH increases

(2) Concentration of OH^- increases

(3) Concentration of OH^- decreases

(4) Concentration of NH_4^+ and OH^- increases

64. For the following reaction in gaseous phase $CO + \frac{1}{2}O_2 \rightleftharpoons CO_2$, K_p/K_c is:

(1) $(RT)^{1/2}$ (2) $(RT)^{-1/2}$

(3) (RT) (4) $(RT)^{-1}$

65. In a chemical equilibrium, the rate constant of the backward reaction is 7.5×10^{-4} and the equilibrium constant is 1.5. So, the rate constant of the forward reaction is:

(1) 5×10^{-4} (2) 2×10^{-3}

(3) 1.125×10^{-3} (4) 9.0×10^{-4}

66. The following equilibrium constants are given:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$; K_1

$N_2 + O_2 \rightleftharpoons 2NO$; K_2

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$; K_3

The equilibrium constant for the oxidation of NH_3 by oxygen to give NO is:

$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$

(1) K_1K_2/K_3 (2) $K_2K_3^3/K_1$

(3) $K_2^2K_3/K_1$ (4) $K_2K_3^2/K_1$

67. For the reaction $AB(g) \rightleftharpoons A(g) + B(g)$, AB is 33% dissociated at a total pressure of P. Therefore, P is related to K_p by which of the following options?

(1) $P = K_p$ (2) $P = 3K_p$

(3) $P = 4K_p$ (4) $P = 8K_p$

68. The reaction, $SO_2 + Cl_2 \rightleftharpoons SO_2Cl_2$ is exothermic and reversible. A mixture of $SO_2(g)$, $Cl_2(g)$ and $SO_2Cl_2(g)$ is at equilibrium in a closed container. Now a certain quantity of extra SO_2 is introduced into the container, the volume remaining the same. Which of the following is true?

(1) The pressure inside the container will not change

(2) The temperature will not change

(3) The temperature will increase

(4) The temperature will decrease.

69. Choose the equilibrium reaction that is not influenced by pressure:

(1) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(2) $CO_2(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$

(3) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

(4) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

70. **Assertion (A):** In the dissociation of PCl_5 at constant pressure and temperature, addition of helium, at equilibrium increases the dissociation of PCl_5.

Reason (R): Helium removes Cl_2 from the field of action.

(1) Both assertion and reason are true and the reason is the correct explanation of the assertion.

(2) Both assertion and reason are true but reason is not the correct explanation of the assertion.

(3) Assertion is true but reason is false.

(4) Assertion is false but reason is true.

71. In the reaction $AB(g) \rightleftharpoons A(g) + B(g)$ at 30°C, K_p for the dissociation equilibrium is 2.56×10^{-2} atm. If the total pressure at equilibrium is 1 atm, then the percentage dissociation of AB is:

(1) 87% (2) 13%

(3) 43.5% (4) 16%

72. For the reversible reaction,

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \text{heat}$

The equilibrium shifts in the forward direction:

(1) by increasing the concentration of $NH_3(g)$

(2) by decreasing the pressure

(3) by decreasing the concentration of $N_2(g)$ and $H_2(g)$

(4) by increasing pressure and decreasing temperature

73. 3 moles of A and 4 moles of B are mixed together and allowed to come into equilibrium according to the following reaction:

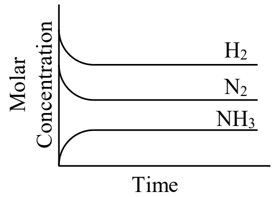
$3A(g) + 4B(g) \rightleftharpoons 2C(g) + 3D(g)$.

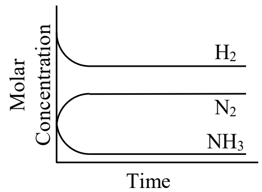
When equilibrium is reached, there is 1 mole of C. The equilibrium constant (in terms of moles) of the reaction is:

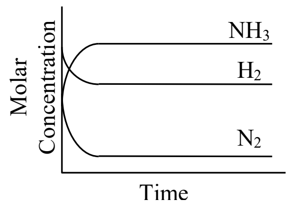
(1) $(1/4)^4$ (2) $(1/3)^3$

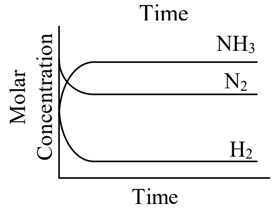
(3) $(1/2)^4$ (4) 1

74. For the synthesis of ammonia by the reaction: $N_2 + 3H_2 \rightleftharpoons 2NH_3$ in the Haber's process, the attainment of equilibrium is correctly predicted by the curve:

(1) 

(2) 

(3) 

(4) 

75. For the reaction: $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$,

Equilibrium constant $K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$

Some reactions are written below in Column I and their equilibrium constants in terms of K_c are written in Column II. Match the following reactions with the corresponding equilibrium constant.

	Column I (Reaction)		**Column II (Equilibrium constant)**
(i)	$2N_2(g) + 6H_2(g) \rightleftharpoons 4NH_3(g)$	(a)	$2\,K_c$
(ii)	$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$	(b)	$K_c^{1/2}$
(iii)	$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \rightleftharpoons NH_3(g)$	(c)	$\frac{1}{K_c}$
		(d)	K_c^2

(1) (i)-(d), (ii)-(c), (iii)-(b)
(2) (i)-(c), (ii)-(d), (iii)-(b)
(3) (i)-(c), (ii)-(b), (iii)-(d)
(4) (i)-(b), (ii)-(c), (iii)-(d)

76. **Assertion (A):** For the reaction, $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$, increase in pressure favours the formation of NO_2.

Reason (R): The reaction is exothermic.

(1) Both assertion and reason are true and the reason is the correct explanation of the assertion.
(2) Both assertion and reason are true but reason is not the correct explanation of the assertion.
(3) Assertion is true but reason is false.
(4) Assertion is false but reason is true.

77. The wavelength of radiation emitted when the electron in an hydrogen atom undergoes transition from 8^{th} energy level to 2^{nd} energy level is:
(R = Rydberg constant)

(1) 15R/64 (2) 15/64R
(3) 64R/15 (4) 64/15R

78. How many photons of light of frequency 5×10^{15} s^{-1} can provide 5 J of energy?
($h = 6.626 \times 10^{-34}$ Js).

(1) 4.0×10^{17} (2) 1.65×10^{18}
(3) 1.5×10^{18} (4) 7.5×10^{33}

79. Ratio of masses of proton and electron is:

(1) Infinite (2) 1.8×10^3
(3) 1.8×10^2 (4) 1.8×10^4

80. If the wave number of the first line in the Balmer series of hydrogen atom is 15000 cm^{-1}, the wave number of the first line of the Balmer series of Li^{2+} is:

(1) 1.43×10^4 cm^{-1} (2) 1.66×10^9 cm^{-1}
(3) 13.5×10^5 cm^{-1} (4) 1.35×10^5 cm^{-1}

81. Out of X-rays, infrared rays, visible rays and microwaves, the largest frequency is of:

(1) X-rays (2) IR rays
(3) Visible rays (4) Microwaves

82. When the electrons of hydrogen atom return to L-shell from shell of higher energy, we get a series of lines in the spectrum. This series is called:

(1) Balmer series (2) Lyman series
(3) Brackett series (4) Paschen series

83. The isotope of hydrogen in which two neutrons are present is:

(1) Protium (2) Tritium
(3) Deuterium (4) No such isotope exists

84. All of the following are the conclusions of Rutherford's α-particle scattering experiment, except:

(1) Large empty space is present inside an atom
(2) Positive charge is concentrated in a very small region inside an atom
(3) Volume of nucleus is negligible as compared to the total volume of the atom
(4) Electrons are embedded in nucleus

85. Rutherford's experiment of scattering of α-particles showed for the first time that the atom has:

(1) Electrons (2) Protons
(3) Nucleus (4) Neutrons

SECTION-B

86. Aqueous solution of aluminium chloride is acidic due to:

(1) Cationic hydrolysis
(2) Anionic hydrolysis
(3) Hydrolysis of both cation and anion
(4) No hydrolysis

87. The solubility product of AgCl is 4.0×10^{-10} at 298 K. The solubility of AgCl in 0.04 M $CaCl_2$ will be:

(1) 2.0×10^{-5} M (2) 1.0×10^{-4} M
(3) 5.0×10^{-9} M (4) 2.2×10^{-4} M

88. The pH of 0.1 M solution of the following salts increases in the order:

(1) $NaCl < NH_4Cl < NaCN < HCl$
(2) $HCl < NH_4Cl < NaCl < NaCN$
(3) $NaCN < NH_4Cl < NaCl < HCl$
(4) $HCl < NaCl < NaCN < NH_4Cl$

89. Equal volumes of two HCl solutions of pH = 3 and pH = 5 were mixed. What is the pH of the resulting solutions? (log5.05 = 0.7033)

(1) 4.3 (2) 4
(3) 4.5 (4) 3.3

90. Which pair will show common ion effect?

(1) $BaCl_2 + Ba(NO_3)_2$
(2) $NaCl + HCl$
(3) $NH_4OH + NH_4Cl$
(4) $AgCN + KCN$

91. Ionic product of water increases, if:

(1) Pressure is reduced
(2) H^+ is added
(3) OH^- is added
(4) Temperature increases

92. N_2O_4 is 10% dissociated at a total pressure P_1 and 20% dissociated at a total pressure P_2. Then ratio P_1/P_2 is:

(1) 1/2 (2) 2/1
(3) 1/4 (4) 4/1

93. For a given exothermic reaction, K_p and K'_p are the equilibrium constants at temperature T_1 and T_2 respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that:

(1) $K_p > K'_p$ (2) $K_p < K'_p$
(3) $K_p = K'_p$ (4) $K_p = 1/K'_p$

94. The temperature at which K_c and K_p will have the same value of the equilibrium:

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$ is:

(1) 0 K (2) 273 K
(3) 1 K (4) 12.18 K

95. Consider the following equilibrium in a closed container: $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, at a fixed temperature, the volume of the reaction container is halved. For this change, which of the following statement, holds true regarding the equilibrium constant (K_p) and degree of dissociation (α)?

(1) neither K_p nor α changes
(2) both K_p and α change
(3) K_p changes but α does not change
(4) K_p does not change but α changes

96. Match the entries of column I with appropriate entries of column II and choose the correct option out of the four options (1), (2), (3), (4) given at the end of question.

	Column I (Equilibrium constant of a dissociation reaction = K)		**Column II (New equilibrium constant)**
(A)	Reaction is reversed	(p)	$\sqrt{K}$
(B)	Reaction is divided by 2.	(q)	K^2
(C)	Reaction is multiplied by 2.	(r)	$1/K$
(D)	Formation constant for double the number of moles.	(s)	$1/K^2$

(1) A-r, B-p, C-s, D-q
(2) A-r, B-p, C-q, D-s
(3) A-p, B-q, C-r, D-s
(4) A-q, B-p, C-s, D-r

97. In the given reaction,

$2X(g) + Y(g) \rightleftharpoons 2Z(g) + 80$ kcal,

which combination of pressure and temperature will give the highest yield of Z at equilibrium?

(1) 1000 atm and 100°C

(2) 500 atm and 500°C

(3) 500 atm and 200°C

(4) 500 atm and 300°C

98. Suppose 10^{-17} J of energy is needed by the interior of human eye to see an object. How many photons of green light (λ = 550 nm) are needed to generate this minimum amount of energy?

(1) 14 (2) 28

(3) 39 (4) 42

99. The increasing order (lowest first) for the values of e/m (charge/mass) for electron (e), proton (p), neutron (n), α-particle is:

(1) e, p, n, α (2) n, p, e, α

(3) n, p, α, e (4) n, α, p, e

100. $({}^{76}_{32}Ge, {}^{76}_{34}Se)$ and $({}^{30}_{14}Si, {}^{32}_{16}S)$, respectively are the examples of:

(1) Isotopes and isobars

(2) Isobars and isotones

(3) Isotones and isotopes

(4) Isobars and isotopes

52. **(3)**

NCERT XI, Part-I, Page 226

$pH = 7 + \frac{1}{2}(pK_a - pK_b)$

Here, $pK_a = pK_b$

$\therefore \quad pH = 7$

53. **(1)**

NCERT XI, Part-I, Page 228, 229

$pH = 12, pOH = 2$

$[OH^-] = 10^{-2}$

$Ba(OH)_2 \rightleftharpoons Ba^{2+} + 2OH^-$

$1 - s \qquad s \qquad 2s$

$K_{sp} = 4s^3 \quad (2s = 10^{-2}; s = 5 \times 10^{-3})$

$= 4(5 \times 10^{-3})^3$

$K_{sp} = 5 \times 10^{-7}\ M^3$

54. **(3)**

NCERT XI, Part-I, Page 227

$pH = pK_a + \log\frac{[Salt]}{[Acid]}$

$5.5 = 4.5 + \log[salt] - \log 0.1$

$1 = \log[salt] + 1$

$\log[salt] = 0$

$[salt] = 1\ M$

55. **(1)**

NCERT XI, Part-I, Page 219, 220

$[H^+] = \sqrt{K_a.C}$

$= \sqrt{1.74 \times 10^{-5} \times 0.01}$

$= \sqrt{1.74 \times 10^{-7}} \quad = \sqrt{17.4 \times 10^{-8}}$

$= 4.17 \times 10^{-4} \quad pH = 3.37$

56. **(3)**

NCERT XI, Part-I, Page 227

57. **(2)**

NCERT XI, Part-I, Page 219, 220

Acidic Strength $\propto \frac{1}{pK_a}$

Lesser pK_a, stronger is acid.

$\therefore \quad pK_a = 5$ is the strongest acid.

58. **(3)**

NCERT XI, Part-I, Page 227

$NH_4OH + HCl \rightarrow NH_4Cl + H_2O$. NH_4OH is in excess. So, the mixture contains $NH_4OH + NH_4Cl$.

59. **(1)**

NCERT XI, Part-I, Page 218

$[H^+] = 10^{-1}\ M$

$\frac{w}{36.5} = 10^{-1}$ or $w = 36.5 \times 10^{-1} = 3.65\ g$

60. **(2)**

NCERT XI, Part-I, Page 226

NH_4CN is a salt of weak acid and weak base and thus for it:

$K_h = \frac{K_w}{K_a \times K_b}$

61. **(1)**

NCERT XI, Part-I, Page 218

$pH = 5$, means $[H^+] = 10^{-5} M$.

After dilution $[H^+] = \frac{10^{-5}}{100} = 10^{-7} M$

$[H^+]$ from H_2O cannot be neglected.

Total $[H^+] = 10^{-7} + 10^{-7} = 2 \times 10^{-7}$

$pH = 7 - 0.3010 = 6.6990$

62. (2)

NCERT XI, Part-I, Page 215

$H_3PO_3 + H_2O \rightarrow H_2PO_3^- + H_3O^+$

$H_2PO_3^- + H_2O \rightarrow HPO_3^{-2} + H_3O^+$

Conjugate acid-base pairs are:

H_3PO_3 & $H_2PO_3^-$, $H_2PO_3^-$ & $H_2PO_3^{-2}$, H_2O & H_3O^+

63. (3)

NCERT XI, Part-I, Page 225

Due to common ion effect.

64. (2)

NCERT XI, Part-I, Page 202

$$K_p = K_c(RT)^{\Delta n_g}$$

$$\Delta n_g = 1 - 1.5 = -0.5$$

$$K_p = K_c(RT)^{-1/2} \quad \therefore \frac{K_p}{K_c} = (RT)^{-1/2}$$

65. (3)

NCERT XI, Part-I, Page 200

$$K_c = \frac{k_f}{k_b}$$

$$k_f = K_c \times k_b = 1.5 \times 7.5 \times 10^{-4} = 1.125 \times 10^{-3}$$

66. (2)

NCERT XI, Part-I, Page 200

Reverse equation (1) and add eq. (2) to it.

$2NH_3 + N_2 + O_2 \rightleftharpoons N_2 + 3H_2 + 2NO$;

$$K_{eq} = \frac{1}{K_1}.K_2$$

Multiply eq. (3) by 3 and add to above equation.

$$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O; \quad K_{eq.} = \frac{K_2.K_3^3}{K_1}$$

67. (4)

NCERT XI, Part-I, Page 201

	AB $\rightleftharpoons$	A +	B
t = 0	1	–	–
t = T	$1-\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

$$\text{Total moles} = \frac{2}{3}+\frac{1}{3}+\frac{1}{3}=\frac{4}{3}$$

$$K_p = \frac{p_A \cdot p_B}{p_{AB}} = \frac{\left(\frac{1}{3}\Big/\frac{4}{3}\right)p \times \left(\frac{1}{3}\Big/\frac{4}{3}\right)p}{\left(\frac{2}{3}\Big/\frac{4}{3}\right)p}$$

$$K_p = \frac{1}{8}p$$

68. (3)

NCERT XI, Part-I, Page 209

$SO_2 + Cl_2 \rightleftharpoons SO_2Cl_2$ + Heat. On adding SO_2, the equilibrium will shift forward, i.e., more heat will be evolved. So, temperature will increase.

69. (4)

NCERT XI, Part-I, Page 210

Δ_{ng} = Zero

70. (3)

NCERT XI, Part-I, Page 211

To keep pressure constant, addition of helium is accompanied by increase in volume of the reaction mixture. According to Le-Chatelier's principle, the equilibrium will shift in the direction in which the number of moles are increasing i.e. forward direction.

Helium does not react with chlorine , therefore it cannot remove chlorine from the reaction mixture.

Hence the assertion is true but the reason in false.

71. (4)

NCERT XI, Part-I, Page 204, 207

AB(g) $\rightleftharpoons$	A(g) +	B(g)
1 mole		
$1-\alpha$	α	α

Total moles = $1 + \alpha$

If P is total pressure,

$$p_{AB} = \frac{1-\alpha}{1+\alpha}P,\ p_A = \frac{\alpha}{1+\alpha}P,\ p_B = \frac{\alpha}{1+\alpha}P$$

$$K_p = \frac{\alpha^2 P}{1-\alpha^2} = \frac{\alpha^2}{1-\alpha} \qquad (\because P = 1 \text{ atm})$$

$$\alpha = \sqrt{K_p} = \sqrt{2.56 \times 10^{-2}} = 0.16,\ \text{i.e., } 16\%$$

72. (4)

NCERT XI, Part-I, Page 210, 211

As forward reaction is accompanied by decrease in the number of moles, applying Le Chatelier's principle, increase of pressure will shift the equilibrium in the forward direction. Also, as forward reaction is exothermic, increase of temperature will shift the equilibrium in the backward direction or decrease of temperature will shift the equilibrium in the forward direction.

73. (3)

NCERT XI, Part-I, Page 202, 203

$$3A + 4B \rightleftharpoons 2C + 3D$$

	3A	4B	2C	3D
Initial Moles:	3	4	0	0
At eq.	3 – 3x	4 – 4x	2x	3x

Given, 2x = 1,

$\therefore$ x = 1/2

$$K_n = \frac{[C]^2[D]^3}{[A]^3[B]^4} = \frac{1 \times (3/2)^3}{\left(\frac{3}{2}\right)^3 \times (2)^4}$$

$$K_n = \left(\frac{1}{2}\right)^4$$

74. (1)

NCERT XI, Part-I, Page 198

Option (1) is correct because concentrations of H_2 and N_2 decrease with time while that of NH_3 increases with time, and after equilibrium, all of them remain constant.

75. (1)

NCERT XI, Part-I, Page 200, 201

(i) Required equation is $2\times$ given equation

Hence, $K = K_c^2$, i.e., $(i)-(d)$.

(ii) Required equation is reverse of given equation

Hence, $K = 1/K_c$, i.e., $(ii)-(c)$.

(iii) Required equation is given equation divided by 2.

Hence, $K = \sqrt{K_c} = K_c^{1/2}$, i.e., $(iii)-(b)$.

76. (2)

NCERT XI, Part-I, Page 210

The reaction is accompanied by decrease in the number of moles. Hence, increase in pressure favours forward reaction.

77. (4)

NCERT XIth, Part-I, Page 48

$n_2 = 8$, $n_1 = 2$

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$\frac{1}{\lambda} = R \cdot 1^2\left[\frac{1}{2^2} - \frac{1}{8^2}\right]$$

$$\frac{1}{\lambda} = R\left[\frac{1}{4} - \frac{1}{64}\right]$$

$$\frac{1}{\lambda} = R\left[\frac{16-1}{64}\right]$$

$$\frac{1}{\lambda} = R\frac{15}{64} \qquad \lambda = \frac{64}{15R}$$

78. (3)

NCERT XIth, Part-I, Page 41

$E_{total} = n(h\nu)$

$$n = \frac{E_{total}}{h\nu} = \frac{5}{6.626 \times 10^{-34} \times 5 \times 10^{15}}$$

$$= \frac{1}{6.626} \times 10^{19}$$

$$= 1.5 \times 10^{18}$$

79. (2)

NCERT XIth, Part-I, Page 33

$$\frac{\text{Mass of proton}}{\text{Mass of electron}} = \frac{1.67 \times 10^{-27}\,\text{kg}}{9.1 \times 10^{-31}\,\text{kg}} = 1.8 \times 10^3$$

80. (4)

NCERT XIth, Part-I, Page ??

$$\bar{\nu} = Z^2 \bar{\nu}_H$$

$$\bar{\nu} = 3^2 \times 15000\ \text{cm}^{-1}$$

$$= 1.35 \times 10^5\ \text{cm}^{-1}$$

81. (1)

NCERT XIth, Part-I, Page 38

Order of frequency:

γ-rays > X-rays > UV > Visible > IR > Microwaves > Radiowaves.

82. (1)

NCERT XIth, Part-I, Page 45, 46

The lines are called Balmer series.

83. (2)

NCERT XIth, Part-I, Page 35

Tritium ${}^3_1H$, neutrons = 3 – 1 = 2

84. (4)

NCERT XIth, Part-I, Page 34

According to Rutherford's model of atom, positive charge is concentrated in a very small region called nucleus and not electrons.

85. **(3)**

NCERT XIth, Part-I, Page 34

Rutherford's experiment discovered the atomic nucleus.

86. **(1)**

NCERT XI, Part-I, Page 226

Hydrolysis of salt of strong acid and weak base is known as cationic hydrolysis.

87. **(3)**

NCERT XI, Part-I, Page 228, 229

$$AgCl \rightleftharpoons \underset{S}{Ag^+} + \underset{(S+0.08)}{Cl^-} \qquad (S + 0.08 \approx 0.08)$$

$K_{sp} = [Ag^+][Cl^-]$

$4 \times 10^{-10} = S \times (S + 0.08)$

$$S = \frac{4 \times 10^{-10}}{0.08} = 5 \times 10^{-9}\,M$$

88. **(2)**

NCERT XI, Part-I, Page 226

NaCN = S.B. + W.A, pH > 7

NaCl = S.B. + S.A, pH = 7

NH_4Cl = S.A. + W.B., pH < 7

HCl = S.A., pH << 7

89. **(4)**

NCERT XI, Part-I, Page 218

$$[H^+] = \frac{10^{-3} + 10^{-5}}{2}$$

$$[H^+] = 5.05 \times 10^{-4}$$

$pH = -\log(5.05 \times 10^{-4})$

pH = 3.3

90. **(3)**

NCERT XI, Part-I, Page 224, 225

$$NH_4OH \rightleftharpoons \boxed{NH_4^+} + OH^-$$

$$NH_4Cl \rightleftharpoons \boxed{NH_4^+} + Cl^-$$

Common ion

91. **(4)**

NCERT XI, Part-I, Page 217

K_w increases with increase in temperature.

92. **(4)**

NCERT XI, Part-I, Page 207

$N_2O_4 \rightleftharpoons 2NO_2$

$1 \qquad -$

$1 - \alpha \qquad 2\alpha$

Total moles = $1 - \alpha + 2\alpha = 1 + \alpha$

$$K_p = \frac{p^2_{NO_2}}{p_{N_2O_4}} = \frac{(2\alpha)^2(1+\alpha).p^2}{(1+\alpha)^2 \times (1-\alpha)p} = 4\alpha^2 p$$

$$p = \frac{K_p}{4\alpha^2}$$

$$\text{At } 10\%,\ p_1 = \frac{K_p}{4(0.01)}$$

$$\text{At } 20\%,\ p_2 = \frac{K_p}{4(0.04)}$$

$$\frac{p_1}{p_2} = \frac{4}{1}$$

93. **(1)**

$$\log\frac{K_2}{K_1} = \frac{\Delta H^\circ}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

For exothermic reaction, ΔH = negative

i.e., heat is evolved. Now, heat of reaction is constant for given range of temperature. So, release of heat increases the temperature.

$\therefore \quad T_2 > T_1$

$\log K_2 - \log K_1 = -ve$ (So, $K_p > K'_p$)

94. **(4)**

NCERT XI, Part-I, Page 202

$K_p = K_c(RT)^{\Delta ng}$

$K_p = K_c(RT)^1$

Now, $K_p = K_c$

$$\therefore \quad \frac{K_p}{K_c} = 1$$

$1 = 0.0821 \times T$

T = 12.18 K

95. **(4)**

NCERT XI, Part-I, Page 210

K is constant at constant temperature. As volume is halved, pressure will be doubled. Hence, equilibrium will shift in the backward direction, i.e., degree of dissociation decreases.

96. **(2)**

NCERT XI, Part-I, Page 200, 201

Characteristics of equilibrium constant.

97. (1)

NCERT XI, Part-I, Page 210, 211

As $n_p < n_r$, higher the pressure, greater will be yield of Z. As reaction is exothermic in the forward direction, lower the temperature, greater is the yield of Z (As at low temperature the reaction is slow, usually optimum temperature is used).

98. (2)

NCERT XIth, Part-I, Page 41

$$E = \frac{n \times h \times c}{\lambda}$$

$$n = \frac{E\lambda}{hc} = \frac{10^{-17}\ J \times 550 \times 10^{-9}\ m}{6.626 \times 10^{-34} \times 3 \times 10^{8}} = 27.6 \approx 28$$

99. (4)

NCERT XIth, Part-I, Page 31

Particle	**Specific Charge (e)**	**Mass (u)**	**e/m**
neutron (n)	0	1	0
alpha (He^{2+})	2	4	1/2
Proton	1	1	1
Electron	1	1/1837	1837

100. (2)

NCERT XIth, Part-I, Page 35

Isobars are the atoms of different elements having the same mass number but different atomic number. Therefore $^{76}_{32}Ge$ and $^{76}_{34}Se$ are isobars

No. of neutrons = Mass number – Atomic number

For $^{30}_{14}Si$, $n = 30 - 14 = 16$

For $^{32}_{16}S$, $n = 32 - 16 = 16$

Both are atoms of different elements with same number of neutrons but different mass number.

$\therefore$ Both are isotones.