NEET UG (2024)
Chemistry
Quiz-5

SECTION - A

51. If the E^{o}_{cell} for a given reaction has a negative value, then which of the following gives the correct relationship for the value of ΔG° and K_{eq}?

(1) $\Delta G^{\circ} > 0; K_{eq} > 1$

(2) $\Delta G^{\circ} < 0; K_{eq} > 1$

(3) $\Delta G^{\circ} < 0; K_{eq} < 1$

(4) $\Delta G^{\circ} > 0; K_{eq} < 1$

52. What is the equilibrium expression for the following reaction?

$P_4(s) + 5O_2(g) \rightleftharpoons P_4O_{10}(s)$

(1) $K_c = [O_2]^5$

(2) $K_c = [P_4O_{10}] / 5[P_4] [O_2]$

(3) $K_c = [P_4O_{10}] / [P_4] [O_2]^5$

(4) $K_c = 1 / [O_2]^5$

53. What is the conjugate base of OH^-?

(1) O_2

(2) H_2O

(3) O^-

(4) O^{2-}

54. Standard electrode potential of three metals X, Y and Z are –1.2 V, +0.5 V and –3.0 V respectively. The reducing power of these metals will be:

(1) X > Z > Y

(2) Y > X > Z

(3) Z > X > Y

(4) X > Y > Z

55. For the reaction $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$, the value of K_p is:

(1) P_{CO_2} (2) $\dfrac{P_{CO_2}}{P_{CaCO_3}}$

(3) $\dfrac{[CaO][CO_2]}{[CaCO_3]}$ (4) $\dfrac{P_{CaCO_3}}{P_{CaO}P_{CO_2}}$

56. Which of the following is an Arrhenius base?

(1) H_2SO_4 (2) NaOH

(3) H_3PO_4 (4) All of these

57. When a concentrated solution of an electrolyte is diluted?

(1) Its specific conductance increases

(2) Its Equivalent conductance decreases

(3) Its specific conductance decreases and equivalent conductance increases

(4) Both specific and equivalent conductance inceases

58. If the solubility of $Al_2(SO_4)_3$ is s. Then its solubility product will be:

(1) $108\ s^2$ (2) $108\ s^3$

(3) $108\ s^4$ (4) $108\ s^5$

59. Unit of equilibrium constant for the reversible reaction $H_2 + I_2 \rightleftharpoons 2HI$ is:

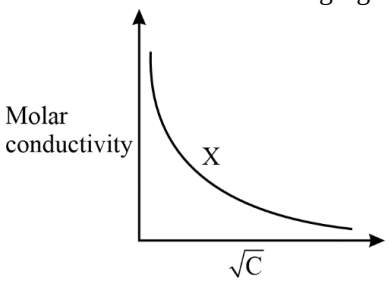
(1) mol^{-1} litre

(2) mol^{-2} litre

(3) mol $litre^{-1}$

(4) None of these

60. The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the following figure:



The electrolyte X is:

(1) NaCl (2) HCl

(3) CH_3COOH (4) KNO_3

61. When 10^{-6} mole of a monobasic strong acid is dissolved in one litre of solvent, the pH of the solution is:

(1) 6 (2) 7

(3) less than 6 (4) more than 7

62. In an equilibrium reaction for which $\Delta G^\circ = 0$, the equilibrium constant K should be equal to:
(1) 0 (2) 1
(3) 2 (4) 10

63. Calculate the cell potential (in V) if $\Delta G = -96.5$ kJ/mol and n = 1.
(1) 0.1
(2) 1
(3) 10
(4) 100

64. **Assertion:** NaCl is precipitated when HCl gas is passed in a saturated solution of NaCl.
Reason: HCl is strong acid.
(1) Both assertion and reason are true and reason is the correct explanation of assertion.
(2) Both assertion and reason are true but reason is not the correct explanation of assertion.
(3) Assertion is true but reason is false.
(4) Both assertion and reason are false.

65. Which of the following pairs constitute a buffer?
(1) HNO_2 and $NaNO_2$
(2) NaOH and NaCl
(3) HNO_3 and NH_4NO_3
(4) HCl and KCl

66. What is S.I. unit of Resistivity?
(1) Ωm^2
(2) Ωm
(3) Ωcm
(4) Ωm^{-1}

67. The pK_a of acetic acid and pK_b of ammonium hydroxide are 4.76 and 4.75 respectively. Calculate the pH of the ammonium acetate solution prepared by mixing the given solutions.
(1) 7.005
(2) 10
(3) 5.005
(4) 9.5

68. For the reaction $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$ at 250°C the value of K_c is 26, then the value of K_p on the same temperature will be:
(1) 0.61
(2) 0.57
(3) 0.83
(4) 0.46

69. The molar conductances of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}\ cm^2\ mol^{-1}$ respectively. The molar conductance of CH_3COOH at infinite dilution is:
(1) 698.28 $ohm^{-1}\ cm^2\ mol^{-1}$
(2) 540.48 $ohm^{-1}\ cm^2\ mol^{-1}$
(3) 201.28 $ohm^{-1}\ cm^2\ mol^{-1}$
(4) 390.71 $ohm^{-1}\ cm^2\ mol^{-1}$

70. Which of the following statements are true?
(A) $[H^+] = [OH^-] = \sqrt{K_w}$ for a neutral solution at all temperature.
(B) $[H^+] > \sqrt{K_w}$ and $[OH^-] < \sqrt{K_w}$ for an acidic solution.
(C) $[H^+] < \sqrt{K_w}$ and $[OH^-] > \sqrt{K_w}$ for an alkaline solution.
(D) $[H^+] = [OH^-] = 10^{-7}$ M for a neutral solution at all temperatures.
(1) (A), (C) and (D)
(2) (A), (B) and (C)
(3) (B) and (D)
(4) (A) and (D)

71. The equilibrium constant for the reaction, $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ is K_1 and the equilibrium constant for the reaction, $NO(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$ is K_2 both at the same temperature. The value of K_1 and K_2 are related as:
(1) $K_1 = \left(\frac{1}{K_2}\right)^2$ (2) $K_1 = K_2^2$
(3) $K_2 = \left(\frac{1}{K_1}\right)^2$ (4) $K_2 = K_1^2$

72. **Assertion:** For the Daniel cell $Zn|Zn^{2+}||Cu^{2+}|Cu$ with E_{cell} = 1.1 V, the application of opposite potential greater than 1.1 V results into flow of electron from cathode to anode.
Reason: Zn is deposited at anode and Cu is dissolved at cathode.
(1) Both assertion and reason are true and reason is the correct explanation of assertion
(2) Both assertion and reason are true and reason is not the correct explanation of assertion
(3) Assertion is true but reason is false
(4) Both assertion and reason are false

73. At 90°C pure water has $[H_3O^+] = 10^{-6}$ M. What is the value of K_w at this temperature?

(1) 10^{-6} (2) 10^{-12}

(3) 10^{-13} (4) 10^{-14}

74. The value of K_p for the equilibrium reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ is 2.

The percentage dissociation of N_2O_4 at a pressure of 0.5 atm is:

(1) 70.7% (2) 72 %

(3) 65 % (4) 80 %

75. Match the column:

	Column-I		**Column-II (Amount of charge used for deposition/ liberation)**
(A)	1 mol Al^{3+}	(P)	F
(B)	2.3 g of Na^+	(Q)	3F
(C)	3.6 g mol Mg^{2+}	(R)	0.1F
(D)	11.2 L H_2 at S.T.P.	(S)	0.3F

(1) (A) - S; (B) - P; (C) - Q; (D) - R

(2) (A) - R; (B) - S; (C) - P; (D) - Q

(3) (A) - Q; (B) - R; (C) - P; (D) - S

(4) (A) - Q; (B) - R; (C) - S; (D) - P

76. Boric acid (H_3BO_3) is:

(1) Monobasic and weak lewis acid

(2) Tribasic and strong lewis acid

(3) Monobasic and weak bronsted acid

(4) Tribasic and weak bronsted acid

77. In the reaction, $A_2(g) + 4B_2(g) \rightleftharpoons 2AB_4(g)$, $\Delta H < 0$ the formation of AB_4 will be favoured at:

(1) Low temperature, high pressure

(2) High temperature, low pressure

(3) Low temperature, low pressure

(4) High temperature, high pressure

78. The emf of the cell, $Zn|Zn^{2+}(0.01M)||Fe^{2+}(0.001\,M)|Fe$ at 298 K is 0.2905 V. The value of equilibrium constant for the cell reaction is:

(1) $10^{\frac{0.32}{0.0295}}$

(2) $e^{\frac{0.32}{0.0295}}$

(3) $e^{\frac{0.32}{0.0591}}$

(4) $10^{\frac{0.26}{0.0295}}$

79. If we add 0.01 mole of NaOH and 0.01 mole of $Ca(OH)_2$ in 1 L water(neglect moles of OH^- from water). Find pH of the mixture.

(1) 12 (2) 12.48

(3) 2.18 (4) 2

80. Match the standard free energy of the reaction with the corresponding equilibrium constant:

List-I		**List-II**	
A.	$\Delta G° > 0$	P.	K > 1
B.	$\Delta G° < 0$	Q.	K = 1
C.	$\Delta G° = 0$	R.	K = 0
		S.	K < 1

	A	**B**	**C**
(1)	S	P	Q
(2)	P	Q	R
(3)	Q	S	R
(4)	S	P	R

81. Which of the following is the cell reaction that occurs when the following half – Cells are combined?

$I_2 + 2e^- \rightarrow 2I^-$ (1M); E° = +0.54 V

$Br_2 + 2e^- \rightarrow 2Br^-$ (1M); E° = +1.09 V

(1) $2Br^- + I_2 \rightarrow Br_2 + 2I^-$

(2) $I_2 + Br_2 \rightarrow 2I^- + 2Br^-$

(3) $2I^- + Br_2 \rightarrow I_2 + 2Br^-$

(4) $2I^- + 2Br^- \rightarrow I_2 + Br_2$

82. A 0.2 molar solution of formic acid is 3.2% ionized, its ionisation constant is:

(1) 9.6×10^{-3} (2) 2.1×10^{-4}

(3) 1.6×10^{-3} (4) 2.1×10^{-3}

83. Which one of the following equilibrium moves backward when pressure is applied?

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

(2) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(3) $2O_3(g) \rightleftharpoons 3O_2(g)$

(4) $I_2(g) \rightleftharpoons I_2(s)$

84. When 9650 coulombs of electricity is passed through a solution of copper sulphate, the amount of copper deposited is: (given at. Wt. of Cu = 63.6)

(1) 0.318 g

(2) 3.18 g

(3) 31.8 g

(4) 63.6 g

85. From a weak acid of $pK_a = 6$, the pH range of practically possible buffer solution is:

(1) 5 to 7 (2) 6 to 8

(3) 5 to 6 (4) 6 to 7

SECTION - B

86. The oxidation of SO_2 and O_2 to SO_3 is an exothermic reaction. Maximum yield of SO_3 will be when:

(1) Temperature and pressure both are increased.

(2) Temperature decreased and pressure increased.

(3) Temperature increased and pressure constant.

(4) Temperature and pressure both are decreased.

87. In the electrochemical cell

$Zn \mid ZnSO_4$ (0.01 M) $\parallel CuSO_4$ (1.0 M) $\mid Cu$, the emf of this Daniel cell is E_1. When the concentration of $ZnSO_4$ is changed to 1.0 M and that of $CuSO_4$ changed to 0.01 M, the emf changes to E_2. From the following, which one is the relationship between E_1 and E_2? (Given: $\frac{2.303\,RT}{F} = 0.059$)

(1) $E_2 = 0 \neq E_1$

(2) $E_1 = E_2$

(3) $E_1 < E_2$

(4) $E_1 > E_2$

88. 0.6 mole of PCl_5, 0.3 mole of PCl_3 and 0.5 mole of Cl_2 are taken in a 1L flask to obtain the following equilibrium:

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

If the equilibrium constant K_c for the reaction is 0.2. Predict the direction of the reaction.

(1) Forward direction

(2) Backward direction

(3) Direction of the reaction cannot be predicted

(4) Reaction does not move in any direction

89. **Assertion:** The dimensions of K_w are mol^2L^{-2}.

Reason: K_w is a product of two concentration terms.

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

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

(3) Assertion is true but reason is false

(4) Both assertion and reason are false

90. Which one of the following ions has the highest limiting molar conductivity at 298 K?

(1) Na^+

(2) H^+

(3) K^+

(4) Mg^{2+}

91. The solubility product of CuS, Ag_2S and HgS are 10^{-37}, 10^{-44} and 10^{-54} respectively. The solubilities of these sulphides are in the order:

(1) $HgS > Ag_2S > CuS$

(2) $CuS > Ag_2S > HgS$

(3) $Ag_2S > CuS > HgS$

(4) $Ag_2S > HgS > CuS$

92. 2 moles of PCl_5 were heated in a closed vessel of 2 litre capacity. At equilibrium, 40 % of PCl_5 is dissociated into PCl_3 and Cl_2. The value of equilibrium constant is:

(1) 0.266

(2) 0.53

(3) 2.66

(4) 5.3

93. Select the correct statements among the following.

(i) Copper sulphate solution can't be stored in a zinc pot.

(ii) The potential of individual half cell can be measured at 298 K and at 1 bar pressure.

(iii) Copper can dissolve in dil. HCl but it cannot dissolve in nitric acid due to passive nature of nitrate ion towards copper.

(iv) Platinum and gold electrodes can be used both as anode and cathode.

(1) Only (i) and (iv)

(2) Only (i) and (ii)

(3) Only (i) and (iii)

(4) Only (i), (iii) and (iv)

94. Find the pH of 0.01 M sodium acetate (For acetic acid $K_a = 1.8 \times 10^{-5}$)?

(1) 4.35

(2) 6.30

(3) 7.0

(4) 8.35

95. $Q_c = 10^{-1}$ and $K_c = 10^{-1}$. Predict the direction of reaction. Reaction goes to:
(1) Forward direction
(2) Backward direction
(3) It is the equilibrium state
(4) None of the above

96. Hydrogen-oxygen fuel cells used in space craft to supply:
(1) Electric power
(2) Heat
(3) Oxygen
(4) Water

97. The correct relation between the dissociation constants of a dibasic acid is?
(1) $K_{a_1} = K_{a_2}$
(2) $K_{a_1} < K_{a_2}$
(3) $K_{a_1} = 2K_{a_2}$
(4) $K_{a_1} > K_{a_2}$

98. For which of the following reaction, the degree of dissociation (α) and equilibrium constant (K_p) are related as $\frac{4\alpha^2 P}{1-\alpha^2}$
(1) $N_2O_4(g) \rightleftharpoons 2NO_2(g)$
(2) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(4) $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$

99. Prevention of corrosion of iron by Zn coating is called:
(1) Galvanization
(2) Cathodic protection
(3) Electrolysis
(4) None of these

100. XY_2 dissociates as, $XY_2(g) \rightleftharpoons XY(g) + Y(g)$. The initial pressure of XY_2 is 600 mm of Hg. The total pressure at equilibrium is 800 mm of Hg. Assuming the volume of system to remain constant, the value of K_p is:
(1) 50
(2) 100
(3) 20
(4) 400

Solution

51. (4)

NCERT XII, Page 40

$\Delta G^\circ = -nFE^\circ_{cell} = -RT\ln K_{eq}$

As $E^\circ_{cell} = -ve$

$\Delta G^\circ = +ve$

$\Delta G^\circ > 0,\ K_{eq} < 0$

52. (4)

NCERT XI, Page 177–179

$P_4(s) + 5O_2(g) \rightleftharpoons P_4O_{10}(s)$

$$K_c = \frac{[P_4O_{10}(s)]}{[P_4(s)][O_2(g)]^5}$$

We know that concentration of a solid component is always taken as unity

$K_c = 1/[O_2]^5$

53. (4)

NCERT XI, Page 189–192

When acid gives H^+, then the remaining of its part is called the conjugate base

The conjugate base of OH^- is O^{2-}.

54. (3)

NCERT XII, Page 37

Higher the reduction potential lesser is reducing power

Reducing power : Z > X > Y

55. (1)

NCERT XI, Page 179–181

$$K_p = \frac{1.P_{CO_2}}{1} = P_{CO_2}$$

56. (2)

NCERT XI, Page 189–192

Compounds that dissociate in water to give hydroxide ions OH^-(aq) are Arrhenius base.

Here, NaOH has OH^- ions and it is a base.

57. (3)

NCERT XII, Page 41–43

From the relation $\Lambda_{eq} = \kappa \times V$, as V increases, Λ_{eq} also increases whereas κ decreases.

58. (4)

NCERT XI, Page 204–206

$Al_2(SO_4)_3 \rightleftharpoons 2Al^{+3} + 3SO_4^{-2}$

$K_{sp} = [Al^{+3}]^2 \times [SO_4^{-2}]^3$

$K_{sp} = [2s]^2 \times [3s]^3$

$K_{sp} = 108s^5$

59. (4)

NCERT XI, Page 175–177

Unit of K_p = (atm) $^{\Delta ng}$

Unit of K_c = (mole/litre) $^{\Delta ng}$ = [mole/litre]^0 = 1

60. (3)

NCERT XII, Page 46–47

The given graph represents a weak electrolyte.

Among the given electrolyte only CH_3COOH is a weak electrolyte. Hence electrolyte X is CH_3COOH.

61. (1)

NCERT XI, Page 193–195

Number of moles of monobasic strong acid = 10^{-6} mole

Volume of solvent = 1L

$\therefore$ Concentration of monobasic strong acid

$$= \frac{10^{-6}}{1\,L}\text{mole} \Rightarrow 10^{-6}\,M$$

pH of the solution = $-\log[H^+]$

$= -\log[10^{-6}] = 6$

62. (2)

NCERT XI, Page 184

If $\Delta G^\circ = 0$,

$\Delta G^\circ = -2.303RT\log K$

Log K = 0

K = 1

63. (2)

NCERT XII, Page 40

From the relation; $-nFE_{cell} = \Delta G$

$$E_{cell} = \frac{\Delta G}{-nF}$$

$$= \frac{-96.5 \times 1000\ J/mol}{-1mol \times 96500\ C}$$

$$= \frac{96500\ J}{96500\ C}$$

= 1V

[J/C = V]

64. (2)

NCERT XI, Page 206

When HCl is passed through saturated NaCl solution, then the concentration of Cl^- increases so equilibrium will move backward results in formation of NaCl means there is decrease in solubility of NaCl, so solid NaCl starts separating out.

65. (1)

NCERT XI, Page 202–204

HCl and HNO_3 are strong acids.
NaOH is a strong base.
HNO_2 (nitrous acid) is a weak acid and $NaNO_2$ is a salt of a conjugate base of weak acid.

66. (2)

NCERT XII, Page 41

S.I. unit of resistivity is ohm metre (Ωm).

67. (1)

NCERT XI, Page 201–202

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

(Formula of pH of salt of weak acid and weak base)

$$pH = 7 + \frac{1}{2}(4.76 - 4.75)$$

$$pH = 7.005$$

68. (1)

NCERT XI, Page 177–178

$\Delta n_g = 1 - 2 = -1$

$K_p = K_c(RT)^{\Delta ng} = 26(0.0821 \times 523)^{-1} = 0.61$

69. (4)

NCERT XII, Page 47–50

$\Lambda_m^\circ(CH_3COOH)$

$= \Lambda_m^\circ(CH_3COONa) + \Lambda_m^\circ(HCl) - \Lambda_m^\circ(NaCl)$

$= (91 + 426.16) - 126.45$

$= 390.71 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$

70. (2)

NCERT XI, Page 193

For a neutral solution $[H^+] = [OH^-]$
But $[H^+]$ and $[OH^-]$ not always equal to 10^{-7} M,
Since, value of K_w depend upon temperature.

71. (1)

NCERT XI, Page 175–176

$$K_2 = (K_1)^{-1/2} = \frac{1}{\sqrt{K_1}} \Rightarrow K_1 \cdot K_2^2 = 1$$

72. (2)

NCERT XII, Page 38–39

On applying an external voltage greater than 1.1 V in a Daniell cell, the current flows in the reverse direction i.e., from Zn to Cu and electrons from Cu to Zn.

Zn is deposited at Zn electrode and Cu dissolves at Cu electrode. The reaction is:

$Zn^{2+} + Cu \rightarrow Zn + Cu^{2+}$

73. (2)

NCERT XI, Page 193

$$H_2O \rightleftharpoons H^+ + OH^-$$

$$K_h = \frac{(H^+).(OH^-)}{H_2O}$$

$$\underbrace{H_2O.K_h}_{K_w} = (H^+).(OH^-) \quad [H_3O^+ = OH^-]$$

at 90° $K_w = (H^+).(OH^-)$ $\quad [\because H^+ = H_3O^+]$

10^{-12} $\quad \downarrow 10^{-6} \quad \downarrow 10^{-6}$

$K_w = 10^{-12}$ $\quad$ [Given at 90°C $H_3O^+ = 10^{-6}$]

74. (1)

NCERT XI, Page 177–181

	$N_2O_4(g) \rightleftharpoons$	$2NO_2(g)$
Initial moles	1	0
Moles at eqm	$(1-\alpha)$	2α

(α = degree dissociation)
Total number of moles at equilibrium
$= (1-\alpha) + 2\alpha = (1+\alpha)$

$$P_{N_2O_4} = \frac{(1-\alpha)}{(1+\alpha)} \times P$$

$$P_{NO_2} = \frac{2\alpha}{(1+\alpha)} \times P$$

$$K_p = \frac{\left(P_{NO_2}\right)^2}{P_{N_2O_4}}$$

$$= \frac{\left(\frac{2\alpha}{(1+\alpha)} \times P\right)^2}{\left(\frac{1-\alpha}{1+\alpha}\right) \times P} = \frac{4\alpha^2 P}{1-\alpha^2}$$

Given, $K_p = 2$, P = 0.5 atm

$$\therefore \quad K_p = \frac{4\alpha^2 P}{1-\alpha^2}$$

$$2 = \frac{4\alpha^2 \times 0.5}{1-\alpha^2}$$

$\alpha = 0.707$

$\therefore$ Percentage dissociation
$= 0.707 \times 100 = 70.7$ %

75. (4)

NCERT XII, Page 52–54

1 mole Al^{3+} will require 3F charge.
2.3 g of Na^+ will require 0.1F charge.
3.6 g of Mg^{2+} will require 0.3F charge.
11.2 L H_2 at S.T.P. will require 1F charge.

76. (1)

NCERT XI, Page 189–192

Boric acid is H_3BO_3 is monobasic and weak lewis acid according to the following reaction:

$$H_3BO_3 + H_2O \longrightarrow B(OH)_4^{\ominus} + H^{\oplus}$$

77. (1)

NCERT XI, Page 184–188

According to Le-Chatelier principle exothermic reaction is forwarded by low temperature, in forward direction number of moles is less, hence pressure is high.

78. (1)

NCERT XII, Page 38–39

For the given cell, reaction is

$$Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$$

$$E = E^\circ - \frac{0.0591}{n}\log\frac{[Zn^{2+}]}{[Fe^{2+}]}$$

or, $\quad E^\circ = E + \frac{0.0591}{n}\log\frac{[Zn^{2+}]}{[Fe^{2+}]}$

$$= 0.2905 + \frac{0.0591}{2}\log\frac{10^{-2}}{10^{-3}} = 0.32V$$

$$E^\circ = \frac{0.0591}{2}\log K_c$$

$$\therefore \quad \log K_c = \frac{0.32\times 2}{0.0591} = \frac{0.32}{0.0295}$$

$$K_c = 10^{\frac{0.32}{0.0295}}$$

79. (2)

NCERT XI, Page 193–195

Moles of $[OH^-]_{Total} = 0.01 + 2 \times 0.01 = 3 \times 10^{-2}$

So, $\quad pOH = -\log(3 \times 10^{-2})$

$pOH = 1.52$

$pH = 14 - pOH = 12.48$

80. (1)

NCERT XI, Page 184

$\Delta G^\circ = -RT\ln K$

So, $\quad \Delta G^\circ > 0$

$-RT\ln K > 0$

$RT\ln K < 0$

$K < 1$

$\Delta G^\circ < 0$

$-RT\ln K < 0$

$K > 1$

$\Delta G^\circ = 0$

$-RT\ln K = 0$

$K = 1$

81. (3)

NCERT XII, Page 33–34

Higher the reduction potential, stronger is the oxidising agent.

$$2I^- \rightarrow I_2 + 2e^- \text{ [Oxidation]}$$

$$Br_2 + 2e^- \rightarrow 2Br^- \text{[Reduction]}$$

$$2I^- + Br_2 \rightarrow I_2 + 2Br^- \text{ [Net reaction]}$$

82. (2)

NCERT XI, Page 195–197

$$\underset{C-C\alpha}{\overset{C}{HCOOH}} + H_2O \rightarrow \underset{C\alpha}{\overset{0}{H_3O^+}} + \underset{C\alpha}{\overset{0}{HCOO^-}}$$

We know

$$K_a = \frac{C^2\alpha^2}{C(1-\alpha)}$$

We are given, C = 0.2 M

$$\alpha = 3.2\% = 0.032$$

$$K_a = \frac{0.2\times(0.032)^2}{(1-0.032)}$$

$$K_a = 2.1\times10^{-4}$$

83. (3)

NCERT XI, Page 184–188

1. Δn_g is negative thus increase in pressure will lead to movement of reaction in the forward direction.
2. Δn_g is equal to zero thus there will not be any effect in the equilibrium due to change in pressure.
3. Δn_g is positive thus increase in pressure will lead to movement reaction in the backward direction.
4. Same as option (1)

84. (2)

NCERT XII, Page 52–54

$$\underset{}{Cu^{2+}} + \underset{2\times96500\,C}{2e^-} \rightarrow \underset{63.6g}{Cu(s)}$$

9650 C will deposit

$$= \frac{63.6}{2\times96500}\times9650 = 3.18 \text{ g}$$

85. (1)

NCERT XI, Page 202–204

For any given buffer solution, the pH range is given as $pK_a \pm 1 = 6 \pm 1 \Rightarrow 5$ to 7

86. (2)

NCERT XI, Page 184–188

It is an exothermic reaction, so on decreasing the temperature, it will move in the forward direction. Similarly, on increasing the pressure, it will move towards the forward direction as it contains less number of gaseous atoms according to the chemical equation:

$$SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$$

87. (4)

NCERT XII, Page 38–39

$$Zn\,|\,ZnSO_4(0.01M)\,||\,CuSO_4(1.0\ M)\,|\,Cu$$

$$\therefore \quad E_1 = E^{\circ}_{cell} - \frac{2.303RT}{2\times F}\times\log\frac{(0.01)}{1}$$

When concentrations are changed

$$\therefore \quad E_2 = E^{\circ}_{cell} - \frac{2.303RT}{2F}\times\log\frac{1}{0.01}$$

i.e., $E_1 > E_2$

88. (2)

NCERT XI, Page 181–182

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

$$Q_c = \frac{0.5\times0.3}{0.6} = 0.25$$

$K_c = 0.2$, since $Q_c > K_c$ reaction will be proceed in backward direction.

89. (1)

NCERT XI, Page 193

$K_w = [H^+]\,[OH^-] = [mol/L]\,[mol/L]$

$$K_w = \frac{mol^2}{L^2}$$

90. (2)

NCERT XII, Page 46–50

H^+ ion has highest limiting molar conductance due to Grotthus draper mechanism.

91. (3)

NCERT XI, Page 204–206

For CuS, $CuS \rightleftharpoons Cu^{+2} + S^{-2}$

$$K_{sp} = S^2$$

$$S = (Ksp)^{1/2} = (10^{-37})^{1/2} = 3.16\times10^{-19}$$

For Ag_2S, $K_{sp} = 4S^3$

$$S = \left(\frac{K_{sp}}{4}\right)^{1/3} = 1.58\times10^{-15}$$

For HgS, $K_{sp} = S^2$

$S = (K_{sp})^{1/2} = 10^{-27}$

92. (1)

NCERT XI, Page 177–181

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

Initially, $[PCl_5] = \frac{2\,moles}{2\,litre} = \frac{1\,mol}{litre}$

$[PCl_5]$ and $[Cl_2] = 0$

At equilibrium,

$$[PCl_5] = \frac{2\times0.6}{2} = 0.6$$

$$[PCl_5] = \frac{2\times0.4}{2} = 0.4$$

and $[Cl_2] = \frac{2\times0.4}{2} = 0.4$

$$K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]} = \frac{0.4\times0.4}{0.6} = 0.266$$

93. (1)

NCERT XII, Page 36–38

Copper displaces zinc according to the reaction

$$Cu^{2+} + Zn \rightarrow Zn^{2+} + Cu$$

So copper sulphate cannot be stored in zinc vessel. Pt and Au electrodes $\Rightarrow$ Inert

$\rightarrow$ Cu dissolves in HNO_3 but not in HCl

$\rightarrow$ Absolute value of potential cannot be measured, its the potential difference which is experimentally measurable.

94. (4)

NCERT XI, Page 195–197

Salt of SB + WA

$K_a = 1.8 \times 10^{-5}$

$pK_a = -\{\log(1.8 \times 10^{-5})\}$

$pK_a = -\{(\log 10^{-5} + \log 1.8)\}$

$pK_a = -(-5 + 0.3)$

$pK_a = 4.7$

$$pH = = 7 + \frac{pK_a + \log C}{2}$$

(Formula of pH for Basic salt)

$$pH = 7 + \frac{\{(4.7 + \log10^{-2})\}}{2}$$

$$pH = 7 + \frac{2.7}{2} = 8.35$$

95. (3)

NCERT XI, Page 181–182

$Q_c = K_c$, so it is the state of equilibrium already.

96. (1)

NCERT XII, Page 56

Those cells in which energy produced from combustion of fuels such as H_2, CO, CH_4 can be converted directly into electrical energy are known as fuel cells.

e.g. $H_2 - O_2$ fuel cell.

97. (4)

NCERT XI, Page 199–200

Let us consider a dibasic acid

$$\underset{\text{stable}}{H_2X} \rightleftharpoons H^+ + HX^-, K_{a_1}$$

Now HX^- is present in the solution, it can dissociate to give H^+ and X^{-2} as well as also associate with H^+ to give H_2X hence its dissociation is less than H_2X, because it has tendency to gain H^+.

$\therefore \quad K_{a_2} < K_{a_1}$

98. (1)

NCERT XI, Page 177–181

$$\underset{1}{N_2O_4(g)} \rightleftharpoons \underset{0}{2NO_2(g)}$$

Finally:

Conc. Of $N_2O_4 = 1 - \alpha$

Conc. Of $NO_2 = \alpha$

$$n_T = 1 - \alpha + 2\alpha = 1 + \alpha$$

$$\text{Mole fraction}(X) = \frac{\text{no. of moles}}{\text{total moles}}$$

P = Total pressure

$$K_{sp} = \frac{(p_{NO_2})^2}{(pN_2O_4)} = \frac{(X_{NO_2}.P)^2}{(X_{N_2O_4}.P)}$$

$$= \frac{\left(\frac{2\alpha}{1+\alpha}\right)^2}{\left(\frac{1-\alpha}{1+\alpha}P\right)} = \frac{\frac{4\alpha^2}{(1+\alpha)^2}P^2}{\frac{1-\alpha}{1+\alpha}P}$$

$$K_p = \frac{4\alpha^2 P}{(1-\alpha)(1+\alpha)} = \frac{4\alpha^2 P}{1-\alpha^2}$$

99. (1)

NCERT XII, Page 57

Galvanization is the process of applying a protective zinc coating to steel or iron to prevent corrosion.

100. (2)

NCERT XI, Page 177–181

Initial pressure = 600 mm Hg

P is the partial pressure of each product formed.

At $t = t_{eq}$

For reactant, 600 – p

And for product it will be p each

Finding p.

Total pressure at equilibrium = 600 – p + p + p

800 = 600 + p

p = 200 mm Hg

$$K_p = \frac{200 \times 200}{400} = 100$$