RAVI MATHS TUITION CENTRE , WHATSAPP - 8056206308

Time : 125 Mins **CHEMISTRY TEST 16 EQUILIBRIUM 1** **Marks : 320**

1. On increasing the pressure, in which direction will the gas phase reaction proceed to reestablish equilibrium, is predicted by applying the Le Chatelier's principle. Consider the reaction:
   $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
   Which of the following is correct, if the total pressure at which the equilibrium is established, is increased without changing the temperature?
   a) K will remain same b) K will decrease c) Kwill increase.
   d) K will increase initially and decrease when pressure is very high.
2. Calculate Kp for the equilibrium,
   $NH_4HS_{(s)} \rightleftharpoons NH_{3(g)} + H_2S_{(g)}$
   if the total pressure inside the reaction vessel is 1.12 atm at 105°C.
   a) 0.56 b) 1.25 c) 0.31 d) 0.63
3. The yield of NH_3 in the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$; ΔH = -22.08 kcal mol^{-1} is affected by
   a) change in pressure and temperature b) change in temperature and concentration of N_2
   c) change in pressure and concentration of N_2 d) change in pressure, temperature and concentration of N_2.
4. Which of the following will produce a buffer solution when mixed in equal volumes?
   a) 0.1 mol dm^{-3} NH_4OH and 0.1 mol dm^{-3} HCl b) 0.5 mol dm^{-3} NH_4OH and 0.1 mol dm^{-3} HCl
   c) 0.1 mol dm^{-3} NH_4OH and 0.5 mol dm^{-3} HCl d) 0.1 mol dm^{-3} CH_3COONa and 0.1 mol dm^{-3} NaOH
5. The values of K_{sp} of $CaCO_3$ and CaC_2O_4 are 4.7 x 10^{-9} and 1.3 x 10^{-9} respectively at 25^{o}C. If the mixture of these two is washed with water, what is the concentration of Ca^{2+} ions in water:
   a) 7.746 x 10^{-5}M b) 5.831 x 10^{-5}M c) 6.856 x 10^{-5}M d) 3.606 x 10^{-5}M
6. Which of the following statements is incorrect?
   a)
   In equilibrium mixture of ice and water kept in perfectly insulated flask, mass of ice and water does not change with time.
   b)
   The intensity of red colour increases when oxalic acid is added to a solution containing iron (III) nitrate and potassium thiocyanate.
   c) On addition of catalyst, the equilibrium constant value is not affected.
   d) Equilibrium constant for a reaction with negative ΔH value decreases as the temperature increases.
7. What is the correct relationship between the pHs of isomolar solutions of sodium oxide (pH_1), sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH_4)?
   a) $pH_1 > pH_2 > pH_3 > pH_4$ b) $pH_1 > pH_2 \approx pH_3 > pH_4$ c) $pH_1 > pH_2 < pH_3 < pH_4$
   d) $pH_1 > pH_2 < pH_3 \approx pH_4$
8. Reaction, $BaO_2(s) \rightleftharpoons BaO(s) + O_2(g)$, ΔH = +ve. In equilibrium condition, pressure of O_2 depends on:
   a) Increased mass of BaO_2 b) Increased mass of BaO c) Increased temperature on equilibrium
   d) Increased mass of BaO_2 and BaO both
9. Concentration of the Ag^+ ion in a saturated solution of $Ag_2C_2O_2$ is 2.2 x 10^{-4} mol L^{-1}. Solubility product of $Ag_2C_2O_2$ is:
   a) 2.66x 10^{-12} b) 4.5 x 10^{-11} c) 5.3 x 10^{-12} d) 2.42 x 10^{-8}
10. If is α the fraction of HI dissociated at equilibrium in the reactions, $2HI(g) \Leftrightarrow H_2(g) + I_2(g)$ starting with the 2 moles of HI, then the total number of moles of reactants and products at equilibrium are:

a) 2 + 2α b) 2 c) 1 + α d) 2 - α

11. At 100°c the K_w of water is 55 times its value at 25°C. What will be the pH of neutral solution? (log 55 = 1.74).
    a) 6.13 b) 7.00 c) 7.87 d) 5.13
12. 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 x 10^{-5}, what is the pH of this solution? (log 2.7 = 0.43)
    a) 9.43 b) 11.72 c) 8.73 d) 9.08
13. Which of the following salts does not show its correct nature mentioned against it?
    a) KBr solution - Neutral b) NaCN solution - Acidic c) NH_4NO_3 solution - Acidic d) KF solution - Basic
14. Ionisation constant of CH_3COOH is 1.7 x 10^{-5} and concentration of H^+ ions is 3.4 X 10^{-4}. Then, find out initial concentration of CH_3COOH molecules.
    a) 3.4 X 10^{-4} b) 3.4 x 10^{-3} c) 6.8 X 10^{-4} d) 6.8 x 10^{-3}
15. If the equilibrium constant for $N_2(g)+ O_2(g) \rightleftharpoons 2NO(g)$ is K, the equilibrium constant for $\frac{1}{2}N_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons NO(g)$ will be :
    a) $\frac{1}{2}$K b) K c) K^2 d) $K^{\frac{1}{2}}$
16. The pH of 0.001 M $Ba(OH)_2$ solution will be
    a) 2.7 b) 2 c) 8.4 d) 11.3
17. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
    Assertion: A solution of NH_4Cl in water is acidic in nature.
    Reason: Ammonium ions undergo hydrolysis to form NH_4OH
    a) If both assertion and reason are true and reason is the correct explanation of assertion
    b) If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false d) If both assertion and reason are false.
18. Consider the nitration of benzene using mixed conc. of H_2SO_4 and NHO_3. If a large amount of $KHSO_4$ is added to the mixture, the rate of nitration will be:
    a) faster b) slower c) unchanged d) doubled
19. Acidic character of BF_3 can be explained on the basis of which of the following concepts?
    a) Arrhenius concept b) Bronsted-Lowry concept c) Lewis concept
    d) Bronsted-Lowry as well as Lewis concept
20. The solubility product of AgCl is 1.5625 x 10^{-10} at 25°C. Its solubility in grams per litre will be
    a) 143.5 b) 108 c) 1.57 x 10^{-8} d) 1.79 x 10^{-3}
21. In which of the following equilibrium K_c and K_p are not equal
    a) $2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$ b) $SO_{2(g)} + NO_{2(g)} \rightleftharpoons SO_{3(g)} + NO_{(g)}$ c) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$
    d) $2C_{(s)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$
22. In qualitative analysis, the metals of group I can be separated from other ions by precipitating them as chloride salts. A solution initially contains Ag^+ and Pb^{2+} at a concentration of 0.10 M. Aqueous HCl is added to this solution until the Cl^- concentration is 0.10 M. What will the concentrations of Ag^+ and Pb^{2+} be at equilibrium?
    $\left(K_{SP} \text{ for } AgCl = 1.8 \times 10^{-10}\right.$
    $K_{SP} \text{ for } PbCl_2 = 1.7 \times 10^{-5},$
    a) $\left[Ag^+\right] = 1.8 \times 10^{-7} M : \left[Pb^{2+}\right] = 1.7 \times 10^{-6} M$
    b) $\left[Ag^+\right] = 1.8 \times 10^{-11} M; \left[Pb^{2+}\right] = 8.5 \times 10^{-5} M$
    c) $\left[Ag^+\right] = 1.8 \times 10^{-9} M; \left[Pb^{2+}\right] = 1.7 \times 10^{-3} M$
    d) $\left[Ag^+\right] = 1.8 \times 10^{-11} M; \left[Pb^{2+}\right] = 8.5 \times 10^{-4} M$
23. 0.05 mole of NaOH is added to 5 litres of water. What will be the pH of the solution?
    a) 12 b) 7 c) 2 d) 10
24. 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 x 10^{-5}, what is the pH of this solution?
    a) 9.08 b) 9.43 c) 11.72 d) 8.73

25. Which of the following salts with a concentration 0.1 M will give a basic solution?
    a) Ammonium acetate b) Ammonium chloride c) Ammonium sulphate d) Sodium acetate

26. What will be the correct order of vapour pressure of water, acetone and ether at 30°C, Given that among these compounds, water has maximum boiling point and ether has minimum boiling point?
    a) Water < Ether < Acetone b) Water < Acetone < Ether c) Ether < Acetone < Water
    d) Acetone < Ether < Water

27. The solubility product of CuS, CdS and HgS are 10^{-31}, 10^{-44},10^{-54}respectively. The solubility of these sulphides are in the order:
    a) CdS> HgS > CuS b) HgS > CdS> CuS c) CdS> CuS > HgS d) CuS > CdS> HgS

28. The pH of neutral water at 25°C is 7.0. As the temperature increases, ionisation of water increases, however, the concentration of H^+ ions and OH^- ions are equal. What will be the pH of pure water at 60°C?
    a) Equal to 7.0 b) Greater than 7.0 c) Less than 7.0 d) Equal to zero

29. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as:
    Assertion: In the dissociation of PCl_5 at constant pressure and temperature addition of helium at equilibrium increases the dissociation of PCl_5 .
    Reason: Helium reacts with Cl_2 and hence shifts the equilibrium in forward direction.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b) If both assertion and reason are true but reason is not the correct explanation of assertion
    c) If assertion is true but reason is false. d) If both assertion and reason are false

30. At 500 K, the equilibrium constant for the reaction $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_g$ is 24.8. If $\frac{1}{2}$ mol/L of HI is present at equilibrium, what are the concentrations of H_2 and I_2, assuming that we started by taking HI and reached the equilibrium at 500 K?
    a) 0.068 mol L^{-1} b) 1.020 mol L^{-1} c) 0.10 mol L^{-1} d) 1.20 mol L^{-1}

31. For the reaction
    $2\mathrm{BaO}_2(\mathrm{s}) \rightleftharpoons 2\mathrm{BaO}(\mathrm{s}) + \mathrm{O}_2(\mathrm{g})$
    $\Delta \mathrm{H} = +\mathrm{ve}$. In equilibrium condition, pressure of O_2 is dependent on
    a) mass of BaO_2 b) mass of BaO c) temperature of equilibriunr d) mass of BaO_2 and BaO both

32. The compound whose aqueous solution hai the highest pH is
    a) NaCl b) $NaHCO_3$ c) Na_2CO_3 d) NH_4Cl

33. The expression for equilibrium constant, K_c for thefollowing reaction is:
    $Fe^{3+}_{(aq)} + 3OH^-_{(aq)} \rightleftharpoons Fe(OH)_{3(s)}$
    a) $K_c = \frac{[Fe(OH)_3]}{[Fe^{3+}][OH^-]^3}$ b) $K_c = \frac{[Fe(OH)_3]}{[Fe^{3+}][OH^-]}$ c) $K_c = \frac{1}{[Fe^{3+}][OH^-]^3}$ d) $Fe(OH)_{3(s)}$

34. The reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3$ + Heat, will be favoured by
    a) high temperature and low pressure b) low temperature and high pressure
    c) high temperature and high pressure d) low temperature and low pressure.

35. Fill in the blanks in the given table with the appropriate choice.

Species	Conjugate acid	Conjugate base
HCO_3^-	___p____	CO_3^{2-}
HSO_4^-	H_2SO_4	___q____
NH_3	___r____	___s____
H_2O	___t____	OH^-

a)

p	q	r	s	t
H_2CO_3	SO_4^{2-}	NH_4^+	NH_2^-	H_3O^+

b)

p	q	r	s	t
HCO_3^-	H_2SO_3	NH_2^-	NH_4^+	H_3O^+

c)

p	q	r	s	t
H_2CO_3	HSO_4^-	NH_4^+	NH_2^-	H_2O

d)

p	q	r	s	t
HCO_3^-	H_2SO_4	NH_2^+	NH_2^-	OH^-

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36. The value of equilibrium constant of the reaction, $HI_{(g)} \rightleftharpoons \frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)}$ is 8.0. The equilibrium constant of the reaction, $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$
a) 1/6 b) 1/64 c) 16 d) 1/8

37. At 473 K, K_c, for the reaction $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ g) is 8.3 x 10^{-3}. What will be the value of K_c for the formation of PCl_5 at the same temperature?
a) 8.3 x 10^3 b) 120.48 c) 8.3 x 10^{-3} d) 240.8

38. At 473 K, equilibrium constant, K_c for decomposition of phosphorus pentachloride, PCl_5 is 8.3 X 10^{-3}. If decomposition is depicted as :
$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$; $\Delta_r H^o$ = 124.0 kJ mol^{-1}
what would be the effect on reaction if the temperature is increased?
a) Reaction will shift in the backward direction b) Reaction will shift in the forward direction
c) Reaction is in equilibrium. d) Reaction first moves forward and then remains at equilibrium.

39. What is pOH of an aqueous solution with hydrogen ion concentration equal to 3 x 10^{-5} mol L^{-1}?
a) 9.47 b) 4.52 c) 12.69 d) 11.69

40. The ionisation constant of an acid, K_a is the measure of strength of an acid. The K_a values of acetic acid, hypochlorous acid and formic acid are 1.74 x 10^{-5}, 3.0 X 10^{-8} and 1.8 x 10^{-4} respectively. Which of the following orders of pH of 0.1 mol dm^{-3} solutions of these acids is correct?
a) Acetic acid> Hypochlorous acid> Formic acid b) Hypochlorous acid> Acetic acid> Formic acid
c) Formic acid> Hypochlorous acid> Acetic acid d) Formic acid> Acetic acid> Hypochlorous acid

41. Which of the following is most soluble?
a) $Bi_2\ S_3\ \left(K_{sp} = 1 \times 10^{-70}\right)$ b) $MnS\ \left(K_{sp} = 7 \times 10^{-16}\right)$ c) $CuS\left(K_{sp} = 8 \times 10^{-37}\right)$
d) $Ag_2\ S\ \left(K_{cn} = 6 \times 10^{-51}\right)$

42. A mixture of 1.57 mol of N_2, 1.92 mol of H_2 and 8.13 mol of NH_3 is introduced into a 20 L reaction vessel at 500 K. At this temperature, the equilibrium constant, K, for the reaction,
$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ is 1.7 x 10^2. What is the direction of the net reaction?
a) Forward b) Backward c) At equilibrium d) Data is insufficient

43. The solubility product of $BaCl_2$ is 3.2 x 10^{-9}. What will be its solubility in mol L^{-1}?
a) 4 x 10^{-3} b) 3.2 x 10^{-9} c) 1 x 10^{-3} d) 1 x 10^{-9}

44. Which of these is least likely to act as a Lewis base?
a) H_2O b) NH_3 c) BF_3 d) OH^-

45. For the following reaction:
$NO_{(g)} + O_{3(g)} \rightleftharpoons NO_{2(g)} + O_{2(g)}$
The value of K_c is 8.2 x 10^4. What will be the value of K_c for the reverse reaction?
a) 8.2 x 10^4 b) $\frac{1}{8.2 \times 10^4}$ c) (8.2 x 10^4)^2 d) $\sqrt{8.2 \times 10^4}$

46. The reaction $2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)} + D_{(g)}$ is begun with the concentration of Aand B both at an initial value of 1.00 M. When equilibrium is reached, the concentration of D is measured and found to be 0.25 M. The value for the equilibrium constant for this reaction is given by the express
a) $\left[(0.75)^3(0.25)\right] \div \left[(0.75)^3(0.25)\right]$ b) $\left[(0.75)^3(0.25)\right] \div \left[(1.00)^2(1.00)\right]$
c) $\left[(0.75)^3(0.25)\right] \div \left[(0.50)^2(0.75)\right]$ d) $\left[(0.75)^3(0.25)\right] \div \left[(0.50)^2(0.25)\right]$

47. At 350 K, K_p for the reaction given below is 3.0 x 10^{10} bar^{-1} at equilibrium. What will be the value of K_c at this temperature?
$2N_{2(g)} + O_{2(g)} \rightleftharpoons 2N_2O_{(g)}$
a) 7.4 x 10^{11} L mol^{-1} b) 8715 x 10^{10} L mol^{-1} c) 0.08 L mol^{-1} d) 8.715 x 10^{11} L mol^{-1}

48. K_a for CH_3COOH is 1.8 x 10^{-5} and Kb for NH_4OH is 1.8 x 10^{-5}. The pH of ammonium acetate will be
a) 7.005 b) 4.75 c) 7.0 d) between 6 and 7

49. For which of the following reactions, $K_p = K_c$?
a) $PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)}$ b) $H_{2(g)} + Cl_{2(g)} \rightleftharpoons 2HCl_{(g)}$ c) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
d) $CaCO_{3(g)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

50. A solution which is 10^{-3} M each in Mn^{2+}, Fe^{2+}, Zn^{2+} and Hg^{2+} is treated with 10^{-16} M sulphide ion. If K_{sp} of MnS, FeS, ZnS and HgS are 10^{-15}, 10^{-25}, 10^{-20} and 10^{-54} respectively, which one will precipitate first?
a) FeS b) MnS c) HgS d) ZnS

51. Which of the following salts will give basic solution on hydrolysis?
a) NH_4Cl b) KCl c) K_2CO_3 d) $(NH_4)_2CO_3$

52. The following reaction is at equilibrium,
$Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \rightleftharpoons [Fe(SCN)]^{2+}_{(aq)}$; $K_c = \frac{[Fe(SCN)]^{2+}}{[Fe^{3+}][SCN^-]}$
In the above reaction, colour intensity of red colour can be increased by
a) addition of KSCN b) addition of oxalic acid which reacts with Fe^{3+} ions.
c) addition of Hg^{2+} ions which react with SCN^- ions d) red colour intensity cannot be changed

53. 5 moles of PCl_5 are heated in a closed vessel of 5litre capacity. At equilibrium 40% of PCl_5 is found to be dissociated. What is the value of K_c?
a) 0.266 M b) 0.133 M c) 2.5 M d) 0.20 M

54. If the concentration of OH^- ion in the reaction $\mathrm{Fe(OH)_3(\ s) \rightleftharpoons Fe^{3+}(aq) + 3OH^-(aq)}$ is decreased by $\frac{1}{4}$ times, then equilibrium concentration of Fe^{3+} will increase by:
a) 8 times b) 16 times c) 64 times d) 4 times

55. The hydride ion H^- is stronger base than its hydroxide ion OH^- which of the following reactions will occur if sodium hydride (NaH) is dissolved in water?
a) $2H^-_{(aq)} + H_2O_{(l)} \longrightarrow H_2O + H_2 + 2e^-$ b) $H^-_{(aq)} + H_2O_{(l)} \longrightarrow OH^- + H_2$ c) $H^- + H_2O_{(l)} \longrightarrow$No reaction
d) None of the above

56. Solubility product of radium sulphate is $4 \times 10^{-11} mol^2L^{-2}$. What will be the solubility of Ra^{2+} in 0.10 M Na_2SO_4?
a) 4×10^{-10} M b) 2×10^{-5} M c) 4×10^{-5} M d) 2×10^{-10} M

57. 0.6 mole of PCl_5 , 0.3 mole of PCl_3 and 0.5 mole of Cl_2 are taken in a 1 L 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.
a) Forward direction b) Backward direction c) Direction of the reaction cannot be predicted
d) Reaction does not move in any direction

58. A mixture of N_2 and Ar gas in a cylinder contains 7g of N_2 and 8g of Ar. If the total pressure of the mixture of gases in the cylinder is 27 bar, the partical pressure of N_2 is: [Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]
a) 18 bar b) 9 bar c) 12 bar d) 15 bar

59. Equal volumes of three acid solutions of pH 3, 4 and 5 are mixed in a vessel. What will be the H^+ ion concentration in the mixture:
a) 1.l l x 10^{-4} M b) 3.7 x 10^{-4}M c) 3.7 x 10^{-3} M d) 1.l l x 10^{-3} M

60. Which has the highest pH?
a) CH_3COOH b) Na_2CO_3 c) NH_4Cl d) $NaNO_3$

61. Which of the following is not true about a reversible reaction?
a) The reaction does not proceed to completion. b) It cannot be influenced by a catalyst
c) Number of moles of reactants and products is always equal.
d) It can be attained only in a closed container

62. The hydrogen ion concentration of a 10^{-8} M HCl aqueous solution at 298 K (Kw = 10^{-14}) is
a) 11 x 10^{-8}M b) 9.525 x 10^{-8}M c) 10 x 10^{-8}M d) 10 x 10^{-6} M

63. For the reaction $\mathrm{N_2(\ g) + O_2(\ g) \rightleftharpoons 2NO(g)}$, the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction
$\mathrm{2NO(g) + O_2(\ g) \rightleftharpoons 2NO_2(\ g)}$
What is K for the reaction
$\mathrm{NO_2(\ g) \rightleftharpoons \frac{1}{2}\ N_2(\ g) + O_2(\ g)^+}$
a) $1/(2K_1K_2)$ b) $1/(4K_1K_2)$ c) $[1/\mathbf{K}_1\mathbf{K}_2]^{1/2}$ d) $1/(\mathrm{K_1\ K_2})$

64. $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$; $K_c = 5.7 \times 10^{-9}$ at 298 K At equilibrium:

a) concentration of NO_2 is higher than that of N_2O_4 b) concentration of N_2O_4 is higher than that of NO_2
c) both N_2O_4 and NO_2 have same concentration d) concentration of N_2O_4 and NO_2 keeps on changing

65. If the pH of a solution is 2, the hydrogen ion concentration in moles per litre is
a) 1×10^{-14} b) 1×10^{-2} c) 1×10^{-7} d) 1×10^{-12}

66. Which of the following salts will give highest pH in water?
a) KCl b) NaCl c) Na_2CO_3 d) $CuSO_4$

67. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
Assertion: K_p can be less than, greater than or equal to K_c
Reason: Relation between K_p and K_c depends on the change in number of moles of gaseous reactants and products (Δn).
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false. d) If both assertion and reason are false.

68. The pH value of blood does not change appreciably by a small addition of an acid or base, because the blood
a) is a body fluid b) can be easily coagulated c) contains iron as a part of the molecule
d) contains serum protein that acts as buffer

69. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
Assertion : Benzoic acid is stronger acid than acetic acid.
Reason : K_a for benzoic acid is 6.5×10^{-5} and for acetic acid is 1.74×10^{-5}
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is If both but reason is false d) If both assertion and reason are false.

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

71. Buffer solutions have constant acidity and alkalinity because:
a) These give unionized acid or base on reaction with added acid or alkali
b) Acids and alkalies in these solutions are shielded from attack by other ions
c) They have large excess of H^+ or OH^- ions d) They have fixed value of pH

72. The rate constant for forward and backward reactions of hydrolysis of ester are $1.1 \times 10^{-2}$and 1.5×10^{-3}per minute. Equilibrium constant for the
reaction, $CH_3COOC_2H_5 + H+ \; CH_3COOH + C_2H_5OH$ is:
a) 4.33 b) 5.33 c) 6.33 d) 7.33

73. A weakacid, HA, has K_a of 1.00×10^{-5}. If 0.100 mol of this acid is dissolved in one litre of water, the percentage of acid dissociated at equilibrium is closest to
a) 1.00% b) 99.9% c) 0.100% d) 99.0%

74. A solution which is 10^{-3} M each in Mn^{2+}, Fe^{2+}, Zn^{2+} and Hg^{2+} is treated with 10^{-16}M sulphide ion. If K_{sp} of MnS, FeS, ZnS and HgS are 10^{-15}, 10^{-25}, 10^{-20} and 10^{-54} respectively, which one will precipitate first?
a) FeS b) MnS c) HgS d) ZnS

75. Given the reaction between 2 gases represented by A_2 and B_2 to give the compound AB(g).
$\mathrm{A_2(\,g) + B_2(\,g) \rightleftharpoons 2AB(g)}$
At equilibrium, the concentration
of $A_2 = 3.0 \times 10^{-3}$ M
of $B_2 = 4.2 \times 10^{-3}$M
of AB = 2.8×10^{-3}M
If the reaction takes place in a sealed vessel at 527°C, then the value of K. will be:
a) 2.0 b) 1.9 c) 0.62 d) 4.5

76. Solubility of Mx_2 type electrolytes is 0.5×10^{-4} mol/lit, then find out K_{sp} of electrolytes.
a) 5×10^{-12} b) 25×10^{-10} c) 1×10^{-13} d) 5×10^{-13}

77. Which one of the following is true for any diprotic acid, H_2X?
a) $Ka_2 = Ka_1$ b) $Ka_2 > Ka_1$ c) $Ka_1 > Ka_2$ d) $Ka_2 = \frac{1}{Ka_1}$

78. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
Assertion: For the reaction:
$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, $K_p = K_c$
Reason: Concentration of gaseous reactants and products is taken as unity.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false. d) If both assertion and reason are false.

79. Calculate the pOH of a solution at 25°C that contains 1×10^{-10} M of hydronium ions,i.e.,H_3O^+.
a) 4.000 b) 9.0000 c) 1.000 d) 7.000

80. Which of the following options will be correct for the stage of half completion of the reaction: A $\rightleftharpoons$ B?
a) $\Delta G^0=0$ b) $\Delta G^0>0$ c) $\Delta G^0<0$ d) ΔG^0=-RT ln 2

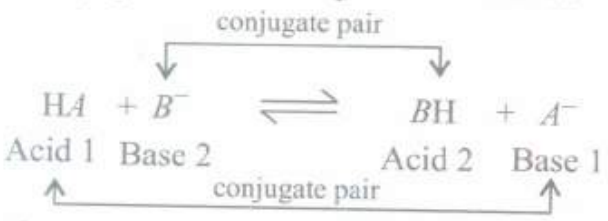
81. Equimolar solutions of HF, HCOOH and HCN at 298 K have the values of K_a as 6.8×10^{-4} ,1.8×10^{-4} and 4.8×10^{-9} respectively. What will be the order of their acidic strength?
a) HF> HCN > HCOOH b) HF > HCOOH > HCN c) HCN> HF > HCOOH d) HCOOH > HCN > HF

82. For a given exothermic reaction $\mathrm{K_p}$ and $\mathrm{K'_p}$ 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 observation that:
a) $\mathrm{K_P} > \mathrm{K'_p}$ b) $\mathrm{K_P} < \mathrm{K'_p}$ c) Kp = K'p d) $\mathrm{K_P} = \frac{1}{\mathrm{K'_p}}$

83. Which of the following relations between the reactions and equilibrium constant for a general reaction, aA + bB $\rightleftharpoons$ cC + dD is not correct?
a) aA + bB $\rightleftharpoons$ cC + dD : K_c b) cC + dD $\rightleftharpoons$ aA + bB : $K_c' = \frac{1}{K_c}$ c) naA + nbB $\rightleftharpoons$ncC + ndD : $K_c'' = K_c''$
d) aA + bB $\rightleftharpoons$ cC + dD : $K_c = K_p$

84. In the relation, $K_p = K_c(RT)^{\Delta n}$ the value of Δn is
a) number of moles of gaseous reactants - number of moles of gaseous products in a balanced equation
b) number of moles of gaseous products - number of moles of gaseous reactants in a balanced equation.
c) number of moles of gaseous products x number of moles of gaseous reactants in a balanced equation.
d) number of moles of gaseous reactants + number of moles of gaseous products in balanced equation.

85. According to Bronsted-Lowry concept of acids and bases a conjugate acid-base pair can exist as



Mark the option in which conjugate pair is correctly matched.

a)

Species	Conjugate acid	Conjugate base
HCO_3^-	CO_3^{2-}	H_2CO_3

b)

Species	Conjugate acid	Conjugate base
HPO_4^{2-}	$H_2PO_4^-$	PO_4^{3-}

c)

Species	Conjugate acid	Conjugate base
NH_3	NH_2^-	NH_4^+

d)

Species	Conjugate acid	Conjugate base
HS^-	S^{2-}	H_2S

86. Which of the following statements about pH and H^+ ion concentration is incorrect?
a) Addition of one drop of concentrated HCl in NH_4OH solution decreases pH of the solution.
b) A solution of the maximum of one equivalent of each of CH_3COOH and NaOH has a pH of 7.
c) pH of pure neutral water is not zero.
d) A cold and concentrated H_2SO_4 has lower H^+ ion concentration than a dilute solution of H_2SO_4

87. What is the pH at which $Mg(OH)_2$ begins to precipitate from a solution containing 0.1 M Mg^{2+} ions? [Ksp for $Mg(OH)_2$ = 1.0 x10^{-11}]
a) 4 b) 6 c) 9 d) 7

88. A base when dissolved in water yields a solutions with a hydroxyl ion concentration of 0.05 mol litre^{-1}. The solution is:
a) basic b) acidic c) neutral d) either b'or'c'

89. In which of the following equilibrium K_c and K_p are not equal?
a) $2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$ b) $SO_{2(g)} + NO_{2(g)} \rightleftharpoons S0_{3(g)} + NO_{(g)}$ c) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ d) $2C_{(s)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$

90. The strongest conjugate base is
a) NO_3^- b) Cl^- c) SO_4^{2-} d) CH_3COO^-

91. In HS^-, I^- , R - NH_2 and NH_3, order of proton accepting tendency will be:
a) $I^- > NH_3 > RNH_2 > HS^-$ b) $HS^- > RNH_2 > NH_3 > I^-$ c) R - NH_2 > NH_3 > HS^- > I^-
d) $NH_3 > RNH_2 > HS^- > I^-$

92. If α is the fraction of HI dissociated at equilibrium in the reaction, $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ starting with the 2 moles of HI, then the total number of moles of reactants and products at equilibrium are
a) 2+2α b) 2 c) 1+α d) 2-α

93. The reaction quotient (Q) for the reaction $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ is given by

$$Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

The reaction will process towards right side, if :
a) $Q > K_C$ b) $Q = 0$ c) $Q = K_C$ d) $Q < K_C$

94. In the system X + 2 Y $\rightleftharpoons$ Z, the equilibrium concentrations are, [X] = 0.06 mol L^{-1}, [y] = 0.12 mol L^{-1}, [Z] = 0.216 mol L^{-1}. Find the equilibrium constant of the reaction.
a) 250 b) 500 c) 125 d) 273

95. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
Assertion: If reaction quotient, Q_c for a particular reaction is greater than K_C the reaction will proceed in the direction of reactants.
Reason: Reaction quotient is defined in the same way as the equilibrium constant K_c except that the concentrations in Q_c are not necessarily equilibrium values.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false

96. What is $[H^+]$ in mol/L of a solution that is 0.20Min CH_3COONa and 0.10M in CH_3COOH? (K_a for CH_3COOH = 1.8 x 10^{-5})
a) 3.5 x 10^{-4} b) 1.1 X 10^{-5} c) 1.8 x 10^{-5} d) 9.0 x 10^{-6}

97. In the following reaction:
$NO_{(g)} + Cl_{2(g)} \rightleftharpoons 2NOCl_{(g)}$
it is observed that equilibrium is not attained and the rate of forward reaction is greater than rate of backward reaction. Which of the following is true for the reaction?
a) $K_p = Q_p$ b) $Q_p > K_p$ c) $Q_p < K_p$ d) $Q_p = 0$

98. Match the column I with column II and mark the appropriate choice.

Column I		**Column II**	
(A)	$Fe(OH)_3$	(i)	$K_{sp}=s^2$
(B)	Ag_2CrO_4	(ii)	$K_{sp} = 27s^4$
(C)	CH_3COOAg	(iii)	$K_{sp} = 108s^5$
(D)	$Ca_3(PO_4)_2$	(iv)	$K_{sp} = 4s^3$

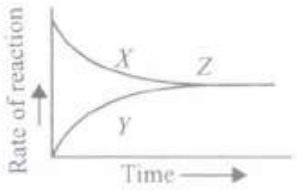
a) (A)$\rightarrow$(iii), (B)$\rightarrow$(ii), (C)$\rightarrow$(iv), (D)$\rightarrow$(i) b) (A)$\rightarrow$(ii), (B)$\rightarrow$(iv), (C)$\rightarrow$(i), (D)$\rightarrow$(iii)
c) (A)$\rightarrow$(i), (B)$\rightarrow$(iii), (C)$\rightarrow$(ii), (D)$\rightarrow$(iv) d) (A)$\rightarrow$(iv), (B)$\rightarrow$(i), (C)$\rightarrow$(iii), (D)$\rightarrow$(ii)

99. For the reaction, $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction, $2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)}$,
What is K for the reaction, $NO_{2(g)} \rightleftharpoons \frac{1}{2}N_{2(g)} + O_{2(g)}$?
a) $1/(4\ K_1K_2)$ b) $\left[1/K_1K_2\right]^{\frac{1}{2}}$ c) $1/(K_1K_2)$ d) $1/(2K_1K_2)$

100. A reaction is said to be in equilibrium when:
a)
the rate of transformation of reactants to products is equal to the rate of transformation of products to the reactants
b) 50% of the reactants are converted to products
c) the reaction is near completion and all the reactants are converted to products
d) the volume of reactants is just equal to the volume of the products.

101. The solubility of $BaSO_4$ in water $2.42 \times 10^{-3} gL^{-1}$ at 298 K.The value of solubility product (K_{sp}) will be (Given molar mass of $BaSO_4$ = 233 g mol^{-1})
a) $1.08 \times 10^{-10} mol^2L^{-2}$ b) $1.08 \times 10^{-12} mol^2L^{-2}$ c) $1.08 \times 10^{-14} mol^2L^{-2}$ d) $1.08 \times 10^{-8} mol^2L^{-2}$

102. Study the given figure and label X, Y and Z.



a)

X	Y	Z
Backward reation	Forward reaction	Products

b)

X	Y	Z
Forward reaction	Backward reation	Equilibrium

c)

X	Y	Z
Reversible reaction	Irreversible reation	Equilibrium

d)

X	Y	Z
Forward reaction	Forward reaction	Backward reaction

103. The values of K_{p1} and K_{p2} for the reactions:
$X \rightleftharpoons Y + Z \quad (a)$ and $A \rightleftharpoons 2B \ldots (b)$ are in the ratio of 9: 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (a) and (D) are in the ratio:
a) 3: 1 b) 1: 9 c) 36: 1 d) 1: 1

104. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is $2.2 \times 10^{-4} mol^{-1}$ solubility product of $Ag_2C_2O_4$ is :
a) 2.42×10^{-8} b) 2.66×10^{-12} c) 4.5×10^{-11} d) 5.3×10^{-12}

105. What is the pH of a solution obtained by mixing 10 mL of 0.1 M HCl and 40 mL of 0.2 M H_2SO_4?
a) 0.74 b) 7.4 c) 4.68 d) 0.468

106. What is the concentration $[OH^-]$ in the final solution prepared by mixing 20.0 mL of 0.050M HCl with 30.0mL of 0.10M$Ba(OH)_2$?
a) 0.10M b) 0.40M c) 0.0050M d) 0.12M

107. According to Lewis concept, an acid is a/an
a) proton donor b) electron pair donor c) proton acceptor d) electron pair acceptor.

108. Dissociation constants of CH_3COOH and NH_4OH in aqueous solution are 10^{-5}. If pH of a CH_3COOH solution is 3, What will be the pH of NH_4OH?
a) 3.0 b) 4.0 c) 10.0 d) 11.0

109. For the reaction
$\mathrm{CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(l)}$
$\triangle H_r = 170.8$ kJmol^{-1}
Which of the following statement is not true?
a) The equilibrium constant for the reaction is given by $\mathrm{K_C = \frac{[CO_2]}{[CO_4][O_2]}}$
b) Addition of $CH_{4(g)}$, or $O_{2(g)}$ at equilibrium will cause a shift to the right. c) The reaction is exothermic

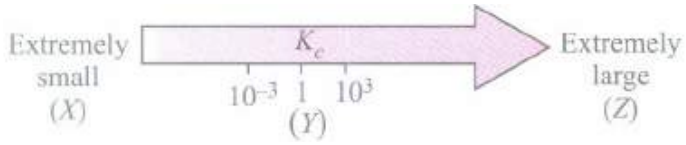
d) At equilibrium, the concentrations of $CO_2(g)$ and $H_2O(l)$ are not equal

110. PCl_5, PCl_3 and Cl_2 are at equilibrium at 500 K in a closed container and their concentrations are 0.8×10^{-3} mol L^{-1}, 1.2×10^{-3} mol L^{-1} and 1.2×10^{-3} mol L^{-1} respectively. The value of K_c for the reaction: $PCl_5 \rightleftharpoons PCl_3(g)+Cl_2(g)$ will be
a) 1.8×10^{3} mol L^{-1} b) 1.8×10^{-3} c) 1.8×10^{-3} L mol^{-1} d) 0.55×10^{4}

111. In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as :
Assertion: The equilibrium constant for the reverse reaction is equal to the inverse of the equilibrium constant for the forward reaction.
Reason: The value of equilibrium constant is independent of initial concentrations of the reactants and products.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is If both but reason is false. d) If both assertion and reason are false

112. 0. 1 m solution of which one of these substances will be basic?
a) Sodium borate b) Calcium nitrate c) NH_4Cl d) Sodium sulphate

113. Study the figure given below and mark the correct statement about K_c and dependence of extent of reaction on it.



a)

X	Y	Z
Reaction does not occur	Reaction proceeds to completion	Reaction does not occur

b)

X	Y	Z
Reaction completes	Reaction does not occur	Reactants and products are at equilibrium

c)

X	Y	Z
Reaction hardly occurs	Reactants and products are at equilibrium	Reaction proceeds to completion

d)

X	Y	Z
Reaction proceeds to completion	Reactants and products are at equilibrium	Reaction hardly occurs

114. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is:
a) 6.50×10^{-12} b) 5.65×10^{-13} c) 5.65×10^{-12} d) 5.65×10^{-10}

115. 5 moles of SO_2 and 5 moles of O_2 react in a dosed vessel. At equilibrium 60% of the SO_2 is consumed. The total number of gaseous moles (SO_2 , O_2 and SO_3) in the vessel is
a) 5.1 b) 3.9 c) 10.5 d) 8.5

116. Identify the correct order of solubility in aqueous medium:
a) ZnS > Na_2S > CuS b) Na_2S>CuS>ZnS c) Na_2S > ZnS > CuS d) CUS>ZnS>Na_2S

117. The solubility product of AgCl is 1.8×10^{-10}. Precipitation of AgCl will occur by mixing which of the following solutions are mixed in equal volumes?
a) 10^{-8} M Ag^+ and 10^{-8} M Cl^- ions b) 10^{-3} M Ag^+ and 10^{-3} M Cl^- ions c) 10^{-6} M Ag^+ and 10^{-6} M Cl^- ions
d) 10^{-10} M Ag^+ and 10^{-10} M Cl^- ions

118. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as:
Assertion: The pH of NH_4Cl solution in water is less than 7 and pH of CH_3COONa solution is more than 7.
Reason: NH_4Cl is a salt of weak base NH_4 OH and strong acid HCl whereas CH_3COONa is salt of a weak acid CH_3COOH and strong base NaOH.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

119. If K_I and K_2 are the respective equilibrium constants for the two reactions,
$XeF_{6(g)} + H_2O_{(g)} \rightleftharpoons XeOF_{4(g)} + 2HF_{(g)}$
$XeO_4(g) + XeF_{6(g)} \rightleftharpoons XeOF_{4(g)} + XeO_3F_2(g)$
The equilibrium constant of the reaction. $XeO_{4(g)} + 2HF_{(g)} \rightleftharpoons XeO_3F_2(g) + H_2O_{(g)}$ will be:
a) $K_1/(K_2)^2$ b) $K_1.K_2$ c) K_1/K_2 d) K_2/K_I

120. The K_{sp} of Ag_2CrO_4, AgCl, AgBr and AgI are .respectively, 1.1×10^{-12}, 1.8×10^{-10}, 5.0×10^{-13}, 8.3×10^{-17}.Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr Nal and Na_2CrO_4?
a) AgBr b) Ag_2CrO_4 c) Agl d) AgCl

121. If the value of an equilibrium constant for a particular reaction is 16×10^{12}, then at equilibrium the system will contain:
a) mostly reactants b) mostly products c) similar amounts of reactants and products d) all reactants

122. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as:
Assertion: The acidic strength of haloacids increases in the order: HI << HBr << HCI << HF
Reason: Strength of acid HA depends only on the electronegativity difference between H and A.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

123. What is the minimum concentration of SO_4^{2-} required to precipitate $BaSO_4$ in a solution containing 1×10^{-4} mole of Ba^{2+}? (K_{sp} for $BaSO_4 = 4 \times 10^{-10}$)
a) 4×10^{-10} M b) 2×10^{-10} M c) 4×10^{-6} M d) 2×10^{-3} M

124. Hydrolysis of sucrose is given by the following reaction
$$\text{Sucrose} + \text{H}_2\text{O} \rightleftharpoons \text{Glucose} + \text{Fructose}$$
If the equilibrium constant (K_c) is 2×10^{13} at 300K, the value of $\Delta_r G^{\Theta}$ at the same temperaiure will be
a) -8.314J mol^{-1} K^{-l} x 300K x ln(4×10^{13}) b) -8.314J mol^{-1} K^{-l} x 300K x ln(2×10^{13})
c) 8.314J mol^{-1} K^{-l} x 300K x ln(2×10^{13}) d) 8.314J mol^{-1} K^{-l} x 300K x ln(3×10^{13})

125. If the equilibrium constant for the given reaction is 0.25 NO $\rightleftharpoons \frac{1}{2}N_2 + \frac{1}{2}O_2$, then the equilibrium constant for the reaction $\frac{1}{2}N_2 + \frac{1}{2}O_2 \rightleftharpoons$NO will be
a) 1 b) 2 c) 3 d) 4