Date Planned : __ / __ / __	Daily Tutorial Sheet-4	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Advanced (Archive)	Exact Duration :_____

46. For the reaction, $\left[Ag(CN)_2\right]^- \rightleftharpoons Ag^+ + 2CN^-$. The equilibrium constant, at $25°C$, is 4.0×10^{-19}. Calculate the silver ion concentration in a solution which was originally 0.10 M in KCN and 0.03 M in $AgNO_3$. **(2000)**

47. The average concentration of SO_2 in the atmosphere over a city on a certain day is 10 ppm, when the average temperature is 298 K. Given that the solubility of SO_2 in water at 298 K is 1.3653 mol/L and pK_a of H_2SO_3 is 1.92, estimate the pH of rain on that day. **(2000)**

48. For a sparingly soluble salt A_pB_q, the relationship of its solubility product (L_s) with its solubility (S) is:

(A) $L_s = S^{p+q}\cdot p^p\cdot q^q$ **(B)** $L_s = S^{p+q}\cdot p^q.q^p$ **(2001)**

(C) $L_s = S^{pq}\cdot p^p\cdot q^q$ **(D)** $L_s = S^{pq}\cdot (p\cdot q)^{(p+q)}$

49. Identify the correct order of solubility of Na_2S, CuS and ZnS is aqueous medium. **(2002)**

(A) CuS > ZnS > Na_2S **(B)** ZnS > Na_2S > CuS

(C) Na_2S > CuS > ZnS **(D)** Na_2S > ZnS > CuS

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 $10^{-15}, 10^{-23}$, 10^{-20} and 10^{-54} respectively, which one will precipitate first? **(2003)**

(A) FeS **(B)** MgS **(C)** HgS **(D)** ZnS

51. 0.1 M of HA is titrated with 0.1 M NaOH, calculate the pH at end point. Given $K_a(HA) = 5\times10^{-6}$ and $\alpha << 1$ **(2004)**

52. HX is a weak acid ($K_a = 10^{-5}$). It forms a salt NaX (0.1M) on reacting with caustic soda. The degree of hydrolysis of NaX is: **(2004)**

(A) 0.01% **(B)** 0.0001% **(C)** 0.1% **(D)** 0.5%

53. CH_3NH_2(0.1 mole, $K_b = 5\times10^{-4}$) is added to 0.08 mole of HCl and the solution is diluted to one litre, resulting hydrogen ion concentration is: **(2005)**

(A) 1.6×10^{-11} **(B)** 8×10^{-11} **(C)** 5×10^{-5} **(D)** 8×10^{-2}

54. Solubility product (K_{sp}) of salts of types MX, MX_2 and M_3X at temperature 'T' are 4.0×10^{-8}, 3.0×10^{-14} and 2.7×10^{-15}, respectively. Solubilities (mol dm^{-3}) of the salts at temperature 'T' are in the order **(2008)**

(A) MX > MX_2> M_3X **(B)** M_3X > MX_2> MX

(C) MX_2> M_3X < MX **(D)** MX > M_3X > MX_2

55. The dissociation constant of a substituted benzoic acid at $25°C$ is 1.0×10^{-4}. The pH of 0.01 M solution of its sodium salt is: **(2009)**

56. Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is: **(2010)**

KCN K_2SO_4 $(NH_4)_2C_2O_4$ NaCl $Zn(NO_3)_2$ $FeCl_3$
K_2CO_3 NH_4NO_3 LiCN

***57** Aqueous solutions of HNO_3 KOH, CH_3COOH and CH_3COONa of identical concentrations are provided. The pair(s) of solutions which form a buffer upon mixing is: **(2010)**

(A) HNO_3 and CH_3COOH **(B)** KOH and CH_3COONa

(C) HNO_3 and CH_3COONa **(D)** CH_3COOH and CH_3COONa

58. The total number of diprotic acids among the following is: **(2010)**

H_3PO_4 H_2SO_4 H_3PO_3
H_2CO_3 $H_2S_2O_7$ H_3BO_3
H_3PO_2 H_2CrO_4 H_2SO_3

59. In 1 L saturated solution of AgCl [K_{sp}(AgCl) $= 1.6 \times 10^{-10}$], 0.1 mole of CuCl [K_{sp}(CuCl) $= 1.0 \times 10^{-6}$] is added. The resultant concentration of Ag^+ in the solution is 1.6×10^{-x}. The value of 'x' is **(2011)**

60. **(A)** Find the solubility product of a saturated solution of Ag_2CrO_4 in water at 298 K if the emf of the cell $Ag|Ag^+$ (saturated. Ag_2CrO_4 solution) $||$ Ag^+ (0.1 M) $|$ Ag is 0.164 V at 298 K. **(2011)**

(B) What will be the resultant pH when 200 mL of an aqueous solution of HCl (pH = 2.0) is mixed with 300 mL of an aqueous of NaOH (pH = 12.0) ?

61. The K_{sp} of Ag_2CrO_4 is 1.1×10^{-12} at 298K. The solubility (in mol/L) of Ag_2CrO_4 in a 0.1 M $AgNO_3$ solution is: **(2013)**

(A) 1.1×10^{-11} **(B)** 1.1×10^{-10} **(C)** 1.1×10^{-12} **(D)** 1.1×10^{-9}

Paragraph for Question No. 62 – 63

When 100 mL of 1.0 M HCl was mixed with 100 mL of 1.0 M NaOH in an insulated beaker at constant pressure, a temperature increase of 5.7°C was measured for the beaker and its contents (Expt.1). Because the enthalpy of neutralization of a strong acid with a strong base is a constant $(-57.0 kJ\ mol^{-1})$, this experiment could be used to measure the calorimeter constant.

In a second experiment (Expt. 2) 100 mL of 2.0 M acetic acid $(K_a = 2.0 \times 10^{-5})$ was mixed with 100 mL of 1.0 M NaOH (under identical conditions to Expt.1) where a temperature rise of 5.6°C was measured. (Consider heat capacity of all solutions as $4.2 J g^{-1} K^{-1}$ and density of all solutions as $1.0 g mL^{-1}$)

62. Enthalpy of dissociation (in kJ mol^{-1}) of acetic acid obtained from the Expt. 2 is **(2015)**

(A) 1.0 **(B)** 10.0 **(C)** 24.5 **(D)** 51.4

63. The pH of the solution after Expt.2 is **(2015)**

(A) 2.8 **(B)** 4.7 **(C)** 5.0 **(D)** 7.0

64. The solubility of a salt of weak acid (**AB**) at pH 3 is $Y \times 10^{-3}$ mol L^{-1}. The value of Y is_____.
(Given that the value of solubility product of **AB** $(K_{sp}) = 2 \times 10^{-10}$ and the value of ionization constant of **HB** $(K_a) = 1 \times 10^{-8}$) **(2016)**

65. Dilution processes of different aqueous solutions, with water, are given in LIST-I. The effects of dilution of the solutions on $[H^+]$ are given in LIST-II. **(2018)**

(Note: Degree of dissociation (α) of weak acid and weak base is << 1; degree of hydrolysis of salt <<1; $[H^+]$ represents the concentration of H^+ ions)

LIST-I		**LIST-II**	
(P)	(10 mL of 0.1 M NaOH + 20 mL of 0.1 M acetic acid) diluted to 60 mL	**1.**	the value of $[H^+]$ does not change on dilution
(Q)	(20 mL of 0.1 M NaOH + 20 mL of 0.1 M acetic acid) diluted to 80 mL	**2.**	the value of $[H^+]$ changes to half of its initial value on dilution
(R)	(20 mL of 0.1 M HCl + 20 mL of 0.1 M ammonia solution) diluted to 80 mL	**3.**	the value of $[H^+]$ changes to two times of its initial value on dilution
(S)	10 mL saturated solution of $Ni(OH)_2$ in equilibrium with excess solid $Ni(OH)_2$ is diluted to 20 mL (solid $Ni(OH)_2$ is still present after dilution).	**4.**	the value of $[H^+]$ changes to $\frac{1}{\sqrt{2}}$ times of its initial value on dilution
		5.	the value of $[H^+]$ changes to $\sqrt{2}$ times of its initial value on dilution

Match each process given in LIST-I with one or more effect(s) in LIST-II. The correct option is :

(A) $P \to 4,\ Q \to 2;\ R \to 3;\ S \to 1$ **(B)** $P \to 4,\ Q \to 3;\ R \to 2;\ S \to 3$

(C) $P \to 1,\ Q \to 4;\ R \to 5;\ S \to 3$ **(D)** $P \to 1,\ Q \to 5;\ R \to 4;\ S \to 1$