CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

CHEMICAL AND IONIC EQUILIBRIUM

Jee Main And Advanced

1. The equilibrium constant at $298K$ for a reaction, $A + B \Leftrightarrow C + D$ is 100. If the initial concentrations of all the four species were 1M each, then equilibirum concentration of D (in molL^{-1}) will be

A. 0.818

B. 1.818

C. 1.182

D. 0.182

Answer: B

Watch Video Solution

2. The standard Gibbs energy change at $300K$ for the reaction $2A \Leftrightarrow B + C$ is 2494. $2J$. At a given time, the composition of the reaction mixture is $[A] = \frac{1}{2}, [B] = 2$ and $[C] = \frac{1}{2}$. The reaction proceeds in the $(R = 8.314JK/\text{mole} = 2.718)$

A. forward direction because $Q > K_e$

B. reverse direction because $Q > K_e$

C. forward direction because $Q < K_e$

D. reverse direction because $Q < K_e$

Answer: B

Watch Video Solution

3. For the reaction, $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$ if $K_p = K_C(RT)^x$ where, the symbols have usual meaning, then the value of x is (assuming ideality)

A. -1

B. $-\frac{1}{2}$

C. $\frac{1}{2}$

D. 1

Answer: B

Watch Video Solution

4. The species present in solution when CO_2 is dissolved in water

A. $CO_2, H_2CO_3, HCO_3^-, CO_3^{2-}$

B. $H_2CO_3, CO_{30^{2-}}$

C. HCO_3^-, CO_3^{2-}

D. CO_2, H_2CO_3

Answer: A

Watch Video Solution

5. $N_2 + 3H_2 \Leftrightarrow 2NH_3$

Which is correct statement if N_2 is added at equilibrium condition?

A. The equilibrium will shift to forward direction because according to IInd law of thermodynamics, the entropy must increases in the direction of spontaneous reaction

B. The condition for equilibrium is $G(N_2) + 3G(H_2) = 2G(NH_3)$ where G is Gibbs free energy per mole of the gaseous species measured at that partial pressure. The condition of

equilibrium is unaffected by the use of catalyst, which increases the rate of both the forward and backward reactions to the same extent

C. The catalyst will increase the rate of forward reaction by α and that of backward reaction by β

D. Catalyst will not alter the rate of either of the reaction

Answer: B

Watch Video Solution

6. $Ag^{+} + NHP(3) \Leftrightarrow [Ag(NH_3)]^{+}, K_1 = 3.5 = 10^{-3}$

$[Ag(NH)_3]^{+} + NH_3 \Leftrightarrow [Ag(NH_3)_2]^{+}, K_2 = 1.7 \times 10^{-3}$

then the formation constant of $\left[Ag(NH_3)_2\right]^+$ is

A. 6.08×10^{-6}

B. 6.08×10^{6}

C. 6.08×10^{-9}

D. None of these

Answer: A

Watch Video Solution

7. Consider the following equilibrium in a closed container

$N_2O_4(g) \Leftrightarrow 2NO_2(g)$

At a fixed temperature, the volume of the reaction container is halved. For this change, which of the following

statements hold true regarding the equilibrium constant (K_p) and degree of dissociation (α)?

A. Neigther K_p nor α changes

B. Both K_p and α change

C. K_p changes but α does not change

D. K_p does not change but α changes

Answer: D

Watch Video Solution

8. At constant temperature, the equilibrium constant K_p for by $K_p = \frac{4x^2p}{(1-x^2)}$, where $p =$ pressure $x =$ extent of

decomposition. Which one of the following statement is true?

A. K_p increases with increase of p

B. K_p increases with increase of x

C. K_p increases with decreases of x

D. K_p remains constant with change in p and x

Answer: D

Watch Video Solution

9. When two reactants A and B are mixed to give products, C and D, the reaction quotient (Q) at the initial stages of the reaction

A. is zero

B. decreases with time

C. is independent of time

D. increases with time

Answer: D

Watch Video Solution

10. For the reversible reaction

$N_2(g) + 3H_2(g) hAr 2NH_3(g)$

at $500^\circ C$ the value of K_p is 1.44×10^{-5} when partial pressure is measured in atmosphere. The corresponding value of K_e with concentration in mol/L is

A. $\frac{1.44 \times 10^{-5}}{(0.082 \times 500)^{-2}}$

B. $\frac{1.44 \times 10^{-5}}{(8.314 \times 73)^{-2}}$

C. $\frac{1.44 \times 10^{-5}}{(0.082 \times 773)^{2}}$

D. $\frac{1.44 \times 10^{-5}}{(0.082 \times 773)^{-2}}$

Answer: D

Watch Video Solution

11. For the chemical reaction,

$3x(g) + Y(g) \Leftrightarrow X_3Y(g)$

the amount of X_3Y at equilibrium is affected by

A. temperature and pressure

B. temperature only

C. pressure only

D. temperature, pressure and catalyst

Answer: A

Watch Video Solution

12. For the reaction,

$CO(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g)$, at a given temperature, the equilibrium amount of $CO_2(g)$ can be increased by

A. adding a suitable catalyst

B. adding an inert gas

C. decreasing the volume of the container

D. increasing the amount of $CO(g)$

Answer: D

Watch Video Solution

13. One mole of $N_2O(g)$ at $300K$ is kept in a closed container under one atmosphere. It is heated to $600K$ when $20\,\%$ by mass of $N_2O_4(g)$ decomposes of $NO_2(g)$. The resultant pressure

A. 1.2 atm

B. 2.4 atm

C. 2.0 atm

D. 1.0 atm

Answer: B

Watch Video Solution

14. An example of a reversible reaction is

A. $Pb(NO_3)_2(aq) + 2NaI(aq) = PbI_2(s) + 2NaNO_3(aq)$

B. $AgNO_3(aq) + HCl(aq) = AgCl(s) + HNO_3(aq)$

C. $2Na(s) + 2H_2O(l) = 2NaOH(aq) + H_2(g)$

D. $KNO_3(aq) + NaCl(aq) = KCl(aq) + NaNO_3(aq)$

Answer: D

Watch Video Solution

15. Pure ammonia is placed in a vessel at a temperature where its dissociation constant (α) is appreciable. At equilibrium, $N_2 + 3H_2 \Leftrightarrow 2NH_3$

A. K_p does not change significantly with pressure

B. α does not change with pressure

C. concentration of NH_3 does not change with pressure

D. concentration of hydrogen is less than that of nitrogen

Answer: A

Watch Video Solution

16. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$

the equilibrium constant K_p changes with

A. total pressure

B. catalyst

C. the amount of H_2 and I_2 present

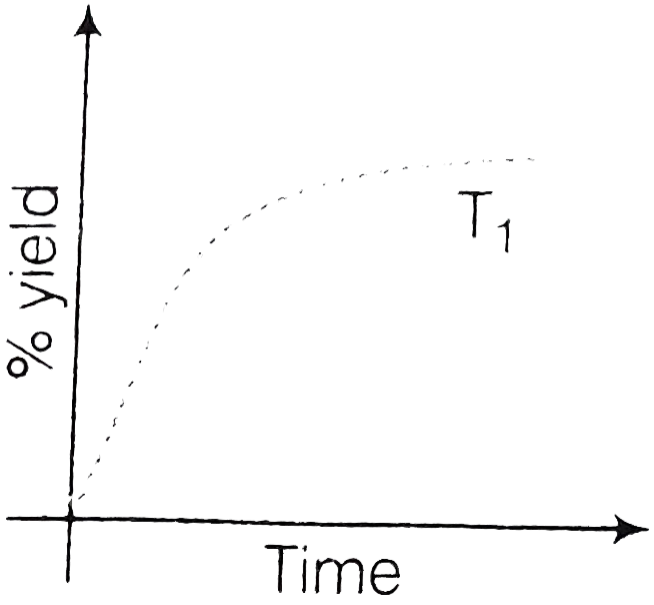
D. temperature

Answer: D

Watch Video Solution

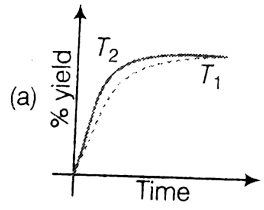
17. The % yield of ammonia as a function of time in the reaction, $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)\,'\Delta H < 0$

at (p, T_1) is given below

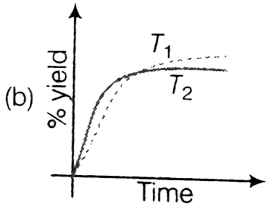


If this reaction is conducted at (p, T_2), with $T_2 > T_1$ the % yield by of ammonia as a function of time is represented by

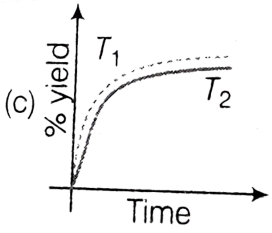
A.



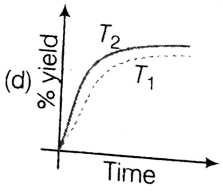
B.



C.



D.



Answer: B

Watch Video Solution

18. The thermal dissociation of equilibrium of $CaCo_3(s)$ is studied under different conditions

$$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$$

For this equilibrium, the correct statement (s) is/are

A. ΔH is dependent on T

B. K is independent of the initial amount of $CaCO_3$

C. K is dependent of the pressure of CO_2 at a given T

D. ΔH is independent of the catalyst, if any

Answer: A::B::D

Watch Video Solution

19. The initial rate of hydrolysis of methyl acetate (1M) by a weak acid $(HA, 1M)$ is $1/100th$ of that of a strong acid $(HX, 1M)$, at $25^\circ C$. The $K_a(HA)$ is

A. 1×10^{-4}

B. 1×10^{-5}

C. 1×10^{-6}

D. 1×10^{-3}

Answer: A

Watch Video Solution

20. The equilibrium

$2Cu^{1} \Leftrightarrow Cu^{0} + Cu^{11}$

in aqueous medium at $25^{\circ}C$ shifts towards the left in the presence of

A. NO_3^-

B. Cl^-

C. SCN^-

D. CN^-

Answer: B::C::D

Watch Video Solution

21. For the reaction $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ the forward reaction at constant temperature is favoured by

A. introducing an inert gas at constant volume

B. introducing chlorine gas at constant volume

C. increasing the volume of the container

D. introducing PCl_5 at constant volume

Answer: C::D

Watch Video Solution

22. The equilibrium $SO_2Cl_2(g) \Leftrightarrow SO_2(g) + Cl_2(g)$ is attained at $25^\circ C$ in a closed container and an inert gas, helium is introduced. Which of the following statements are correct?

A. Concentration of SO_2, Cl_2 and SO_2Cl_2 change

B. More chlorine is formed

C. Concentration of SO_2 is reduced

D. None of the above

Answer: D

Watch Video Solution

23. When $NaNO_3$ is heated in a closed vessel, oxygen is liberated and $NaNO_2$ is left behind. At equilibrium

A. addition of $NaNO_2$ favours reverse reaction

B. addition of $NaNO_3$ favours forward reaction

C. increasing temperature favours forward reaction

D. increasing pressure favours reverse reaction

Answer: C::D

Watch Video Solution

24. For the gas phase reaction,

$C_2H_4 + H_2 \Leftrightarrow C_2H_6(\Delta H = -32.7$ kcal) carried out in a

vessel, the equilibrium concentration of C_2H_4 can be increased by

A. increasing the temperature

B. decreasing the pressurre

C. removing some H_2

D. adding some C_2H_6

Answer: A::B::C::D

Watch Video Solution

25. For a gaseous reaction $2B \rightarrow A$,the equilibrium constant K_p is .....to/than K_c

Watch Video Solution

26. A ten-fold increase in pressure on the reaction, $N_2(g) + 3H_2(g) hAr 2NH_3(g)$ at equilibrium, results in .....in K_p

Watch Video Solution

27. For a given reversible reaction at a fixed temperature, equilibrium constants K_p and K_c are related by .....

Watch Video Solution

28. The rate of an exothermic reaction increases with increasing temperature.True or False?

Watch Video Solution

29. Catalyst makes a reaction more exothermic.True or False?

Watch Video Solution

30. If equilibrium constant for the reaction $A_2 + B_2 \Leftrightarrow 2AB$ is k, then for the backward reaction $AB \Leftrightarrow 1/2A_2 + 1/2B_2$ the equilibrium constant k' is $1/K$.

Watch Video Solution

31. When a liquid and its vapour are at equilibrium and the pressure is suddenly decreased, cooling occurs.True or false?

Watch Video Solution

32. (a) In the following equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ when 5 moles of each are taken, the temperature is kept at $298K$ the total pressure was found to be 20 bar. Given that $\Delta G_f^{\circ}(N_2O_4) = 100kJ, \Delta G_f^{\circ}(NO_2) = 50kJ$

(i) Find ΔG of the reaction.

(ii) The direction of th reaction in which the equilibrium shifts.

(b) A graph is plotted for a real gas which follows van der

Waals' equation with pV_m taken on Y-axis and p on X-axis.

Find the intercept of the ine where V_m is molar volume.

Watch Video Solution

33. When $3.06g$ of solid NH_4HS is introduced into a two-litre evacuated flask at $27^\circ C, 30\%$ of the solid decomposes into gaseous ammonia and hydrogen sulphide. (i) Calculate K_c and K_p for the reaction at $27^\circ C$. (ii) What would happen to the equilibrium when more solid NH_4HS is introduced into the flask?

Watch Video Solution

34. The degree of dissociation is 0.4 at $400K$ and 1.0 atm for the gaseous reaction

$PCl_5 \Leftrightarrow PCl_3 + Cl_2$

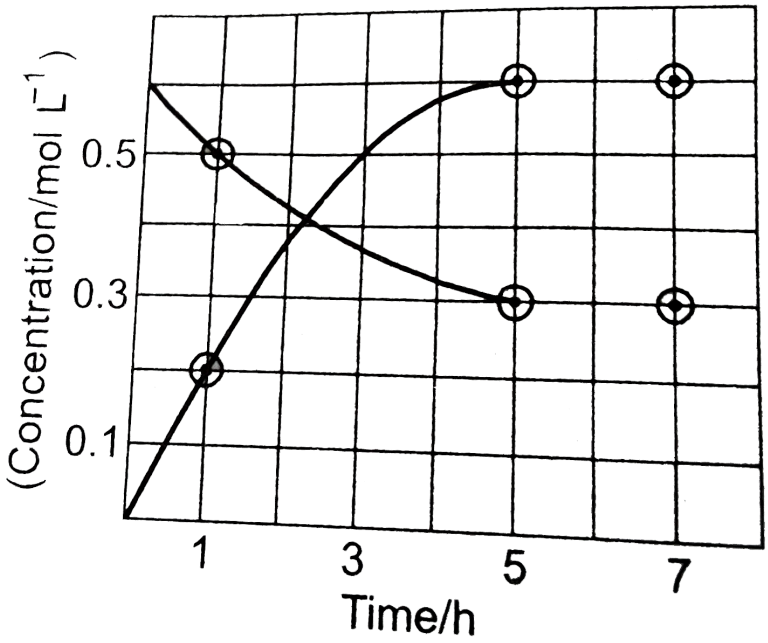
assuming ideal behaviour of all gases, calculate the density of equilibrium mixture at $400K$ and 1.0 atm (relative atomic mass of P is 31.0 and of Cl is 35.5).

Watch Video Solution

35. The progress of reaction

$A \Leftrightarrow nB$

with time, is represented in fig use given below.



Determine:

(i) the value of n

(ii) the equilibrium constant, K and

(iii) the initial rate of conversion of A

Watch Video Solution

36. When 0.15 mol of CO taken in a $2.5L$ flask is maintained at $750K$ along with a catalyst, the following reaction takes place

$CO(g) + 2H_2(g) \Leftrightarrow CH_3OH(g)$

Hydrogen is introduced until the total pressure of the system is 8.5 atm at equilibrium and 0.08 mol of methanol is formed.

Calculate

a. K_p and K_c

b. The final pressure, if the same amount of CO and H_2 as before are used, but with no catalyst so that the reaction does not take place.

Watch Video Solution

37. For the reaction

$CO(g) + 2H_2(g) \Leftrightarrow CH_3OH(g)$

Hydrogen gas is introduced into a five-litre flask at $327^\circ C$, containing 0.2 mol of $CO(g)$ and a catalyst, untill the pressure is $4.92atm$. At this point, 0.1 mol of $CH_3OH(g)$ is formed. Calculate the equilibrium constants K_p and K_c.

Watch Video Solution

38. The equilibrium constant K_p of the reaction: $2SO_2 + O_2 \Leftrightarrow 2SO_3$ is $900atm^{-1}$ at $800K$. A mixture constaining SO_3 and O_2 having initial pressure of 1 atm and 2 atm respectively, is heated at constant volume to equilibriate. Calculate the partial pressure of each gas at $800K$ at equilibrium.

Watch Video Solution

39. $N_2\_(4)$ is $25\,\%$ dissociated at $37^\circ C$ and one atmosphere pressure. Calculate (i) K_p and (ii) the percentage dissociation at 0.1 atm and $37^\circ C$

Watch Video Solution

40. At a certain temperature, equilibrium constant (K_c) is 16 for the reaction,

$SO_2(g) + NO_2(g) \Leftrightarrow SO_3(g) + NO_g$

If we take one mole each of all the four gases in a one litre container, what would be the equilibrium concentrations of NO and NO_2?

Watch Video Solution

41. The equilibrium constant of the reaction $A_2(g) + B_2(g) \Leftrightarrow 2AB(g)$ at $100^\circ C$ is 50. If a one litre flask containing one mole of A_2 is connected to a two litre flask containing two moles of B_2, how many moles of AB will be formed at $373K$?

Watch Video Solution

42. 1mol of Cl_2 and 3 mol of PCl_5 are placed in a $100L$ vessel heated to $227^\circ C$. The equilibrium pressure is 2.05 atm. Assuming ideal behaviour, calculate the degree of dissociation for PCl_5 and K_p for the reaction.

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

Watch Video Solution

43. 1 mol of nitrogen is mixed with 3 mol of hydrogen in a $4L$ container. If $0.25\,\%$ of nitrogen is converted to ammonia by the following reaction

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

then calculate the equilibrium constant K_c in concentration units. What will be the value of K_c for the following equilibrium?

$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \Leftrightarrow NH_3(g)$

Watch Video Solution

44. Thermal decomposition of gaseous X_2 to gaseous X at $298K$ takes place according to the following equation:

$X(g) \Leftrightarrow 2X(g)$

The standard reaction Gibbs energy $\Delta_r G^\circ$, of this reaction is positive. At the start of the reaction, there is one mole of X_2 and no X. As the reaction proceeds, the number of moles of X formed is given by β. Thus $\beta_{\text{equilibrium}}$ is the number of moles of X formed at equilibrium. The reaction is carried out at a constant total pressure of 2 bar. Consider the gases to behave ideally.

[Given, $R = 0.083L$ bar $K^{-1}mol^{-1}$)

The equilibrium constant K_p for this reaction at $298K$, in terms of $\beta_{\text{equilibrium}}$ is

A. $\dfrac{8\beta^2\_(\text{equilibrium})}{2-\beta_{\text{equilibrium}}}$

B. $\frac{8\beta^2 \_ (\text{equilibrium})}{4 - \beta_{\text{equilibrium}}}$

C. $\frac{4\beta^2 \_ (\text{equilibrium})}{2 - \beta_{\text{equilibrium}}}$

D. $\frac{4\beta^2 \_ (\text{equilibrium})}{4 - \beta_{\text{equilibrium}}}$

Answer: D

Watch Video Solution

45. Thermal decomposition of gaseous X_2 to gaseous X at $298K$ takes place according to the following equation:

$X(g) \Leftrightarrow 2X(g)$

The standard reaction Gibbs energy $\Delta_r G^\circ$, of this reaction is positive. At the start of the reaction, there is one mole of X_2 and no X. As the reaction proceeds, the number of moles of X formed is given by β. Thus $\beta_{\text{equilibrium}}$ is the

number of moles of X formed at equilibrium. The reaction is carried out at a constant total pressure of 2 bar. Consider the gases to behave ideally.

[Given, $R = 0.083L$ bar $K^{-1}mol^{-1}$)

The incorrect statement among the following for this reaction, is

A. Decrease in the total pressure will result in the formation of more moles of gaseous X

B. At the start of the reaction, dissociation of gaseous X_2 takes place spontaneously

C. $\beta_{\text{equilibrium}} = 0.7$

D. $K_C < 1$

Answer: D

Watch Video Solution

46. pK_a of a weak acid (HA) and pB_b of a weak base (BOH) are 3.2 and 3.4 respectively. The pH of their salt (AB) solution is

A. 7.2

B. 6.9

C. 7.0

D. 1.0

Answer: B

Watch Video Solution

47. How many litres of water must be added to $1L$ of an aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2?

A. $0.1L$

B. $0.9L$

C. $2.0L$

D. $9.0L$

Answer: D

Watch Video Solution

48. The solubility product constant (K_{sp}) of salts of types $MX, MX_2,$ and M_3X at temperature T are

$4.0 \times 10^{-8}, 3.2 \times 10^{-14}$, and 2.7×10^{-15}, respectively. The solubilities of the salts at temperature T are in the order

A. $MX > MX_2 > M_3X$

B. $M_3X > MX_2 > MX$

C. $MX_2 > M_3X > MX$

D. $MX > M_3X > MX_2$

Answer: D

Watch Video Solution

49. $2.5mL$ of $\frac{2}{5}$ weak monoacidic base ($K_b = 1 \times 10^{-12}$ at $25^\circ C$) is tittrated with $\frac{2}{15}MHCI$ in water at $25^\circ C$. The

concentration of H^+ at equivalence point is: $\left(K_w = 1 \times 10^{-14} at 25^\circ C\right)$

A. $3.7 \times 10^{-13} M$

B. $3.2 \times 10^{-7} M$

C. $3.2 \times 10^{-2} M$

D. $2.7 \times 10^{-2} M$

Answer: D

Watch Video Solution

50. 0.1 mole of $CH_3NH_2\left(K_b = 5 \times 10^{-4}\right)$ is mixed with 0.08 mole of HCl and diluted to one litre. The $\left[H^+\right]$ in solution is

A. 1.6×10^{-11}

B. 8×10^{-11}

C. 5×10^{-5}

D. 8×10^{-2}

Answer: B

Watch Video Solution

51. HX is a weak acid $\left(K_a = 10^{-5}\right)$. If forms a salt $NaX(0.1M)$ on reacting with caustic soda. The degree of hydrlysis of NaX is

A. $0.01\ \%$

B. $0.0001\ \%$

C. 0.1%

D. 0.5%

Answer: A

Watch Video Solution

52. A solution which is $10^{-3}M$ each in Mn^{2+}, Fe^{2+}, Zn^{2+}, and Hg^{2+} it treated with $10^{-16}M$ sulphide ion. If the K_{sp} of MnS, FeS, $ZnS$and HgS are 10^{-15}, 10^{-23}, 10^{-20},and 10^{-54}, respectively, which one will precipitate first?

A. FeS

B. MgS

C. HgS

D. ZnS

Answer: C::D

Watch Video Solution

53. Indentify the correct order of solubility in aqueous medium

A. $CuS > ZnS > Na_2S$

B. $ZnS > Na_2S > CuS$

C. $Na_2S > CuS > ZnS$

D. $Na_2S > ZnS > CuS$

Answer: D

Watch Video Solution

54. For a sparingly soluble salt A_pB_q, the relationship of its solubility produce (L_s) with its solubility (S) is

A. $L_S = S^{p+q}.\, p^p.\, q^q$

B. $L_s = S^{p+q}.\, p^q.\, q^p$

C. $L_s = S^{pq}.\, p^p.\, q^q$

D. $L_s = S^{pq}.\, (p.\, q)^{(p+q)}$

Answer: A

Watch Video Solution

55. The pH of $0.1M$ solution of the following salts decreases in the order

A. $NaCl < NH_4 < NaCN < HCl$

B. $HCl < NH_4Cl < NaCl < NaCN$

C. $NaCN < NH_4Cl < NaCl < HCl$

D. $HCl < NaCl < NaCN < NH_4Cl$

Answer: B

Watch Video Solution

56. Which solutionwill have pH closer to 1.0 ?

A. $100mL$ of $(M/10)HCl + 100mL$ of $(M/10)NaOH$

B. $55mL$ of $(M/10)HCl + 45mL$ of $(M/10)NaOH$

C. $10mL$ of $(M/10)HCl + 90mL$ of $(M/10)NaOH$

D. $75mL$ of $(M/5)HCl + 25mL$ of $(M/5)NaOH$

Answer: D

Watch Video Solution

57. Amongst the following hydroxides, the one which has the lowest value of K_{sp} is:

A. $Mg(OH)_2$

B. $Ca(OH)_2$

C. $Ba(OH)_2$

D. $Be(OH)_2$

Answer: D

Watch Video Solution

58. Which of the following is the strongest acid?

A. $ClO_3(OH)$

B. $ClO_2(OH)$

C. $SO(OH)_2$

D. $SO_2(OH)_2$

Answer: A

Watch Video Solution

59. When equal volumes of following solution are mixed, precipitation of $AgCl$?

$\left(K_{sp} = 1.8 \times 10^{-10}\right)$ will occur only with

A. $10^{-4}M\left(Ag^{+}\right)$ and $10^{-4}M\left(Cl^{-}\right)$

B. $10^{-5}M\left(Ag^{+}\right)$ and $10^{-6}M\left(Cl^{-}\right)$

C. $10^{-6}M\left(Ag^{+}\right)$ and $10^{-6}M\left(Cl^{-}\right)$

D. $10^{-10}M\left(Ag^{+}\right)$ and $10^{-10}M\left(Cl^{-}\right)$

Answer: A

Watch Video Solution

60. The pK_a of acteylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about $2-3$ and the pH

in the small intestine is about 8. Aspirin will be:

A. unionised in the small intestine and in the stomach

B. completely ionised in the small intestine and in the stomach

C. ionised in the stomach and almost unionised in the small intestine

D. ionised in the small intestine and almost unionsied in theh stomach

Answer: D

Watch Video Solution

61. The compound that is not a Lewis acids is

A. BF_3

B. $AlCl_5$

C. $BeCl_2$

D. $SnCl_4$

Answer: C::D

Watch Video Solution

62. The conjugate acid of amide ion $\left(NH_2^-\right)$ is

A. NH_3

B. NH_2OH

C. NH_4^+

D. N_2H_4

Answer: A

Watch Video Solution

63. The best indicator for detection of end point in titration of a weak acid and a strong base is

A. methyl orange (3 to 4)

B. methyl red (5 to 6)

C. bromothymol blue (6 to 7.5)

D. phenolphthalein (8 to 9.6)

Answer: D

Watch Video Solution

64. A certain weak acid has a dissociation constant 1.0×10^{-4}. The equilibrium constant for its reaction with a strong base is :

A. 1.0×10^{-4}

B. 1.0×10^{-10}

C. 1.0×10^{10}

D. 1.0×10^{-14}

Answer: C::D

Watch Video Solution

65. A certain buffer solution contains equal concentartion of X^{Θ} and HX. The K_b for X^{Θ} is 10^{-10}. The pH of the buffer is

A. 4

B. 7

C. 10

D. 14

Answer: A

Watch Video Solution

66. The precipitate of $CaF_2\left(K_{sp} = 1.7 \times 10^{-10}\right)$ is obtained when equal volumes of the following are mixed

A. $10^{-4}MCa^{2+} + 10^{-4}MF^{-}$

B. $10^{-2}MCa^{2+} + 10^{-3}MF^{-}$

C. $10^{-5}MCa^{2+} + 10^{-3}MF^{-}$

D. $10^{-3}MCa^{2-} + 10^{-5}MF^{-}$

Answer: B

Watch Video Solution

67. An acidic buffer solution can be prepared by mixing solution of

A. acetate and acetic acid

B. ammonium chloride and ammonium hydroxide

C. sulphuric acid and sodium sulphate

D. sodium chloride and sodium hydroxide

Answer: A

Watch Video Solution

68. Of the given anions, the strongest base is

A. ClO^-

B. ClO_2^-

C. ClO_3^-

D. ClO_4^-

Answer: A

Watch Video Solution

69. At $90^\circ C$ pure water has $\left[H_3O^+\right]$ as $10^{-6}molL^{-1}$. What is the value of K_w at $90^\circ C$?

A. 10^{-6}

B. 10^{-12}

C. 10^{-14}

D. 10^{-8}

Answer: B

Watch Video Solution

70. The pH of $10^{-8}M$ solution of HCl in water is

A. 8

B. -8

C. between 7 and 8

D. between 6 and 7

Answer: D

Watch Video Solution

71. 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 $0.1MAgNO_3$

solution is

A. 1.1×10^{-11}

B. 1.1×10^{-10}

C. 1.1×10^{-12}

D. 1.1×10^{-9}

Answer: B

Watch Video Solution

72. Aqueous solution of HNO_3, CH_3, CH_3COOH, and CH_3COOK of identical concentrations are given. The pair (s) of the solution which may form a buffer upon mixing is (are):

A. HNO_3 and CH_3COOH

B. KOH and CH_3COONa

C. HNO_3 and CH_3COONa

D. CH_3COOH and CH_3COONa

Answer: C::D

Watch Video Solution

73. A buffer solution can be prepared from a mixture of

A. sodium acetate and acetic acid in water

B. sodium acetate and HCl in water

C. ammonia and ammonium chloride in water

D. ammonia and sodium hydroxide in water

Answer: A::B::C

Watch Video Solution

74. $\left(CH_3(OH)_2^1\right)$ is..acidic than $\left(CH_3NH_3^+\right)$.

Watch Video Solution

75. In the reaction, $I^- + I_2 \rightarrow I_3^-$ the Lewis acid is.....

Watch Video Solution

76. Silver chloride is sparingly soluble in water because its lattice energy is greater than_____

Watch Video Solution

77. An element which can exist as a positive ion in acidic solution and also as a negative ion in basic solution is said to be.....

Watch Video Solution

78. The conjugate base of HSO_4^- in aqueous solution is.

Watch Video Solution

79. The following species are in increasing order of their acidic proporty: ZnO, Na_2O, P_2O_5, MgO

Watch Video Solution

80. The solubility of sodium hydroxide increases with increase of temperature.

Watch Video Solution

81. Aluminium chloride $(AlCl_3)$ is a Lewis acid because it can donate electrons.

Watch Video Solution

82. The molar conductivity of a solution of a weak acid $HX(0.01M)$ is 10 times smalller than the molar conductivity of a solution of a weak acid $HY(0.10M)$. If $\lambda^{\circ}_{X^-} = \lambda^{\circ}_{Y^-}$, the difference in their pK_a values, $pK_a(HX) - pK_a(HY)$, is (consider degree of ionisation of both acids to be $< <1$):

Watch Video Solution

83. MX_2 dissociates into M^{2+} and X^- ions in an aqeous solution, with a degree dissociation (α) of 0.5. The ratio of the observed depression of freezing point of the aqueous solution to the value of the depression of freezing point in the absence of ionic dissociation is

Watch Video Solution

84. In 1L saturated solution of $AgCI\left[K_{SP}(AgCI) = 1.6 \times 10^{-10}\right], 0.1$ mole of CuCI $\left[K_{SP}(CuCI) = 1.0 \times 10^{-6}\right]$ is added. The resulrant concentration of Ag^{+} in the solution is 1.6×10^{-x}. The value of x is:

Watch Video Solution

85. The total number of diprotic acids among the following is

$H_3PO_4, H_2SO_4, H_3PO_3$

$H_2CO_3, H_2S_2O_7, H_3BO_3$

$H_3PO_2, H_2CrO_4, H_2SO_3$

Watch Video Solution

86. Amonst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is:

KCN K_2SO_4 $(NH_4)_2C_2O_4$ $NaCI$
$Zn(NO_3)_2$ $FeCI_3$ K_2CO_3 NH_4NO_3
$LiCN$

Watch Video Solution

87. The dissociation constant of a substituted benzoic acid at $25^\circ C$ is 1.0×10^{-4}. The pH of $0.01M$ solution of its sodium salt is

Watch Video Solution

88. $0.1MNaOH$ is titrated with $0.1MHA$ till the end point. K_a of HA is 5.6×10^{-6} and degree of hydrolysis is less compared to 1. Calculate pH of the resulting solution at the end point ?

Watch Video Solution

89. $500mL$ of $0.2M$ aqueous solution of acetic acid is mixed with $500mL$ of $0.2HCI$ at $25^\circ C$.

a. Calculate the degree of dissociation of acetic acid in the resulting solution and pH of the folution.

b. If $6g$ of $NaOH$ is added to the above solution determine the final pH. $[K_a$ of $CH_3COOH = 2 \times 10^{-5}$.

Watch Video Solution

90. The average concentration of SO_2 in the atmosphere over a city on a cetrain 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 $litre^{-1}$ and the pK_a of H_2SO_3 is 1.92, estimate the pH of rain on that day.

Watch Video Solution

91. The solubility of $Pb(OH)_2$ in water is 6.7×10^{-6}M. Calculate the solubility of $Pb(OH)_2$ in a buffer solution of $pH = 8$.

Watch Video Solution

92. Find the solubility product of a saturated solution of Ag_2CrO_4 in water at $298K$, if the EMF of the cell :

$Ag|Ag^{\oplus}(satAg_2CrO_4sol)||Ag(0.1M)|Agis0.164V$ at $298K$.

Watch Video Solution

93. A sample of AgCI was treated with $5.00mL$ of $1.5M$ Na_2CO_3 solubility to give Ag_2CO_3 . The remaining solution contained $0.0026gofCI^-$ per litre. Calculate the solubility product of AgCI. $\left(K_{SP}f \text{ or } Ag_2CO_3 = 8.2 \times 10^{-12}\right)$

Watch Video Solution

94. An acid type indicator, H In differs in colour from its conjugate base $\left(In^{-}\right)$. The human eye is sensitive to colour differences only when the ratio $\left[In^{-}\right]/[HIn]$ is greater than 10 or smaller than 0.1. What should to observe a complete colour change ? $\left(K_a = 1.0 \times 10^{-5}\right)$

Watch Video Solution

95. The ionization constant of $\overset{\oplus}{N}H_4$ ion in water is 5.6×10^{-10} at $25^{\circ}C$. The rate constant the reaction of $\overset{\oplus}{N}H_4$ and $\overset{\ominus}{O}H$ ion to form NH_3 and H_2O at $25^{\circ}C$ is $3.4 \times 10^{10} Lmol^{-1}s^{-1}$. Calculate the rate constant for proton transfer form water to NH_3.

Watch Video Solution

96. What is the pH of a $0.50M$ aqueous NaCN solution ? $(pK_b ofCN^- = 4.70)$

Watch Video Solution

97. Calculate the pH of an aqueous solution of $1.0M$ ammonium formate assuming complete dissociation. (pK_a of formic acid $= 3.8$ and pK_b of ammonia $= 4.8$)

Watch Video Solution

98. For the reaction

$Ag(CN)_2^{\ominus} \Leftrightarrow Ag^{\oplus} + 2CN^{\ominus}$, the K_c at $25^\circ C$ is

4×10^{-19} Calculate $[Ag^{\oplus}]$ in solution which was originally $0.1M$ in KCN and $0.03M$ in $AgNO_3$.

Watch Video Solution

99. An aqueous solution of a metal bromide $MBr_2(0.05M)$ is saturated with H_2S. What is the minimum pH at which MS will precipitate ? K_{SP} for $MS = 6.0 \times 10^{-21}$. Concentration of saturqated $H_2S = 0.1M, K_1 = 10^{-7}$ and $K_2 = 1.3 \times 10^{-13}$ for H_2S .

Watch Video Solution

100. The pH of blood stream is maintained by a proper balance of H_2CO_3 and $NaHCO_3$ concentrations. What volume of 5 M $NaHCO_3$ solution, shnould be mixed with 10 mL sample of blood, which is 2 M in H_2CO_3 in order to maintain a pH of $7.4(K_af$ or H_2CO_3in blood = $7.8 \times 10^{-7})$

Watch Video Solution

101. The $K_{SP}ofCa(OH)_2is4.42 \times 10^{-5}at25^\circ C$. A 500 mL of saturated solution of $Ca(OH)_2$ is mixed with equal volume of $0.4MNaOH$. How much $Ca(OH)_2$ in mg is preciptated ?

Watch Video Solution

102. A 50 mL solution of weak base BOH is titrated with $0.1NHCI$ solution. The pH of solution is found to be 10.04 and 9.14 after the addition of $5.0mL$ and 20.0 mL of acid respectively. Find out K_b for weak base.

Watch Video Solution

103. The K_{SP} of $Ag_2C_2O_4$ at $25^\circ C$ is $1.29 \times 10^{-11} mol^3 L^{-3}$. A solution of $K_2C_2O_4$ containing 0.152 mole in 500 mL water is shaken at $25^\circ C$ with excess of Ag_2CO_3 till the equilbirium is reached.

$$Ag_2CO_3 + K_2C_2O_4 \Leftrightarrow Ag_2C_2O_4 + K_2CO_3$$

Ar equilibrium the solution contains 0.0358 mole of K_2CO_3. Assuming degree of dissociation of $K_2C_2O_4$ and K_2CO_3 to be same, calculate K_{SP} of Ag_2CO_3.

Watch Video Solution

104. What is the pH of 1 M solution of acetic acid ? To what volume one litre of this solution be diluted so that pH of the resulting solution will be twice of the original value ? $\left(K_a = 1.8 \times 10^{-5}\right)$

Watch Video Solution

105. Freshly precipiteated Al and Mg hydroxides are stirred vigorously in a buffer solution containing $0.25M$ of NH_4CI and $0.05M$ of NH_4OH. Calculate $\left[Al^{3+}\right]$ and $\left[Mg^{2+}\right]$ in solution. K_b for $NH_4OH = 1.8 \times 10^{-5} K_{SP}$ of

$Al(OH)_3 = 6 \times 10^{-32}$ and K_{SP} of $Mg(OH)_2 = 8.9 \times 10^{-12}$.

Watch Video Solution

106. How many mole of HCI will be required to prepare one litre of buffer solution (containing $NaCN + HCI$) of $pH 8.5$ using $0.01g$ formula weight of NaCN ? $K_{HCN} = 4.1 \times 10^{-10}$)

Watch Video Solution

107. What is the pH of the solution when $0.20mol$ of HCI is added to $1L$ of a solution containing

a. $1M$ each of acetic acid and acetate ion.

b. $0.1M$ each of aceta acid and acetate ion.

Assume the total volume is $1L$. K_a for acetic acid is 1.8×10^{-5}.

Watch Video Solution

108. The solubility of $Mg(OH)_2$ in pure water is 9.57×10^{-3}g $litre^{-1}$. Calculate the pH of its saturated solution. (Assume $100\,\%$ ionisation)

Watch Video Solution

109. The concentration of hydrogen ions in a $0.2M$ solution of formic acid is $6.4 \times 10^{-3} molL^{-1}$. To this solution, sodium formate is added so as to adjust the concentration

of sodium formate to $1molL^{-1}$. What will be the pH of this solution? The dissociation constant of formic acid is 2.4×10^{-4} and the degree of dissociation fo sodium formate is 0.75.

Watch Video Solution

110. A solution contains a mixture of $Ag^{+}(0.10M)$ and $Hg_2^{2+}(0.10M)$ which are to be separated by selective precipitation. Calculate the miximum concentreation of iodide ion at which one of them gets precipitated almost completely. What % of that metal ion is precipitated ? $\left(K_{SP}ofAgI = 8.5 \times 10^{-17} \text{ and } K_{SP} \text{ of } Hg_2I_2 = 2.5 \times 10^{-26}\right)$

Watch Video Solution

111. The dissociation constant of weak acid HA is 4.9×10^{-8}. After making the necessary approximations, calculate pH in $0.1M$ acid.

Watch Video Solution

112. Given reason for the statement that the pH of an aqueous solution of sodium acetate is more than 7.

Watch Video Solution

113. $20ml$ of $0.2MNaOH$ is added to $50ml$, of $0.2MCH_3COOH$ to give $70ml$, of the solution. What is

the pH of the solution? The ionization constant of acetic acid is 2×10^{-5}

Watch Video Solution

114. What amount of solution propanoate should be added to one litre of an aqueous solution containing 0.02 mole of propanoic acid ($K_a = 1.0 \times 10^{-5}$ at $25^\circ C$) to obtain a buffer solution of $pH6$

Watch Video Solution

115. When $100mL$ of $1.0MHCl$ was mixed with $100mL$ of $1.0MNaOH$ in an insulated beaker at constant pressure, a temperature increase of $5.7^\circ C$ was measured for the

beaker and its contents (Expt.1). Because the enthalpy of neutralisation of a strong acid with a strong base is constant $\left(-57.0kJmol^{-1} \right)$ this experiment couldbe used to measure the calorimeter constant. In a second experiment (Expt.2), $100mL$ of $2.0M$ acetic acid $K_a = 2.0 \times 10^{-5}$) was mixed with $100mL$ of $1.0MNaOH$ (under identical conditions to Expt. 1) where a temperature rise of $5.6^\circ C$ was measured.

Enthalpy of dissociation (in $kJmol^{-1}$) of acetic acid obtained from the Expt. 2 is

A. 1.0

B. 10.0

C. 24.5

D. 51.4

Answer: A

Watch Video Solution

116. When $100mL$ of $1.0MHCl$ was mixed with $100mL$ of $1.0MNaOH$ in an insulated beaker at constant pressure, a temperature increase of $5.7^{\circ}C$ was measured for the beaker and its contents (Expt.1). Because the enthalpy of neutralisation of a strong acid with a strong base is constant $\left(-57.0kJmol^{-1}\right)$ this experiment couldbe used to measure the calorimeter constant. In a second experiment (Expt.2), $100mL$ of $2.0M$ acetic acid $K_a = 2.0 \times 10^{-5}$) was mixed with $100mL$ of $1.0MNaOH$ (under identical conditions to Expt. 1) where a temperature

rise of $5.6^{\circ} C$ was measured.

The pH of the solution after Expt. 2 ils

A. 2.8

B. 4.7

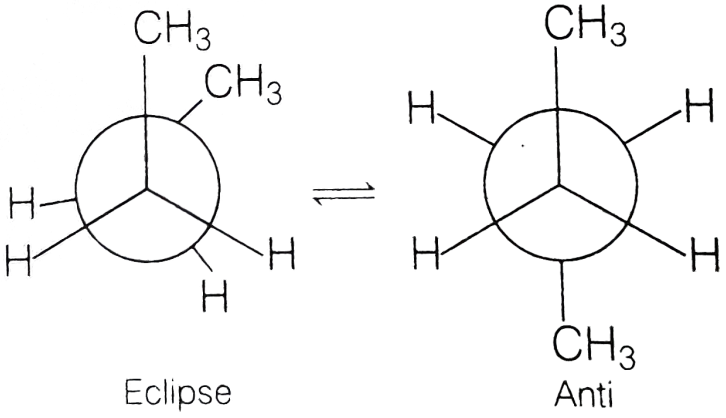
C. 5.0

D. 7.0

Answer: D

Watch Video Solution

117. Consider the equilibrium in the right margin.



A. The change is exothermic and increasing temperature decreases the equilibrium amount of eclipse form

B. The change is exothermic and increasing temperature increases the equilibrium amount of anti form

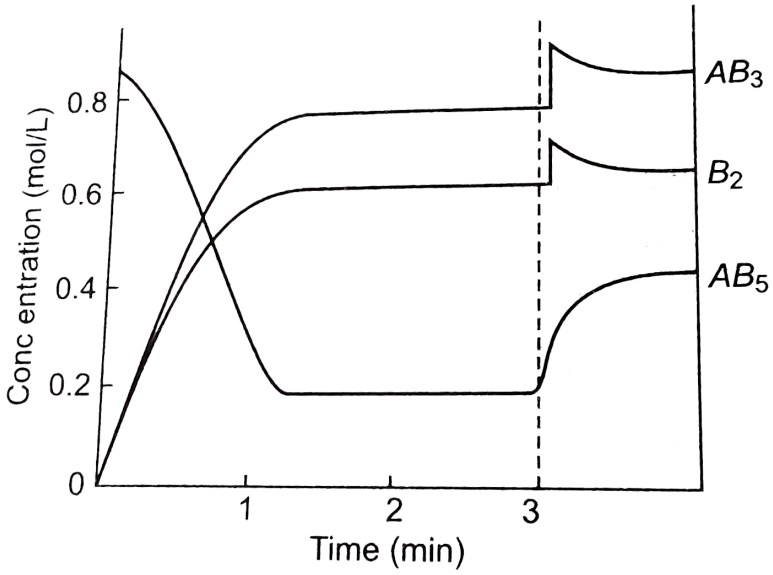
C. The change is exothermic and decreasing temperature decreases the equilibrium amount of eclipse form

D. The change is endothermic and increasing temperature decreases the equilibrium amount of anti form

Answer: C

Watch Video Solution

118. The equation for the reaction in the figure given below is



$AB_5(g) + Heat \Leftrightarrow AB_3(g) + B_2(g)$

At time three minutes what change was imposed into the equilibrium?

A. Pressure was increased

B. Temperature was increased

C. B_2 was added to the system

D. AB_3 was added to the system

Answer: A

Watch Video Solution

119. Which of the following mixtures would result in a buffered solution?

A. Mixing $100.0mL$ of $0.100MHCl$ with $100.0mL$ of $0.100MNaOH$

B. Mixing $100.0mL$ of $0.100MNH_3$ with $100.0mL$ of $0.100MNaOH$

C. Mixing $100.0mL$ of $0.100MHCl$ with $100.0mL$ of $0.100MNH_3$

D. Mixing $50.0mL$ of $0.100MHCl$ with $100.0mL$ of $0.100MNHP(3)$

Answer: D

Watch Video Solution

120. 0.03 M aqueous solution of a weak monobasic acid solution $\left(K_a = 10^{-12}\right)$ is titrated against a $0.01MNaOH$ solution. What is the $\left[H^+\right]$ at the end point?

A. $1.15 \times 10^{-12}M$

B. $2 \times 10^{-12}M$

C. $5 \times 10^{-12}M$

D. $4 \times 10^{-12}M$

Answer: B

Watch Video Solution

121. The reaction for which $K_C > K_P$ at a given temperature is (are)

A. $H_2(g) + I_2(g) \rightarrow 2Hl(g)$

B. $2NH_3(g) + H_2S(g) \rightarrow (NH_4)_2S(s)$

C. $N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$

D. $3O_2(g) \rightarrow 2O_3(g)$

Answer: B::C::D

Watch Video Solution

122. Which of the following solution will have pH greater than 7 at $25^\circ C$?

A. $10mL0.1MCH_3COOH + 6mL0.1MNaOH$

B. $5mL0.1MCH_3COOH + 5mL0.05MCa(OH)_2$

C. $10mL0.1MNH_3 + 5mL0.1MHCl$

D. $10mL0.1MNa_2CO_3 + 5mL0.1MHCl$

Answer: B::C::D

Watch Video Solution

123. Assertion: To a system at equilibrium addition of inert gas at constant pressure and temperature drive the

reaction to the side where larger number of active species is present.

Reason: Addition of inert gas at constant temperature and pressure increases the equilibrium volume.

A. Both Assertion and Reason are correct and Reason is the correct explanation on the Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: D

 Watch Video Solution

124. A $50mL10^{-3}MHCl$ solutions is mixed with $50mL8 \times 10^{-4}MNaOH$ solution. What would be the pH of resulting solution?

Watch Video Solution

Objective Type

1. Which of the following statement(s) is (are) correct?

A. The pH of $1.0 \times 10^{-8}M$ solution of HCl is 8

B. The conugate base of $H_2PO_4^-$ is HPO_4^{2-}

C. Autoprotolysis constant of water increases with temperature

D. When a solution of a weak monoprotic acid is titrated against a strong base, at half-neutralisation point

$$pH = \left(\frac{1}{2}\right) pK_a$$

Answer: B::C

View Text Solution

2. The salts AgX, AgY and AgZ are all equally soluble in water (and none are very soluble at all). When each saltis added to separate beakers of $100mL$ of $1.0MHNO_3$, you notice that AgY is much more soluble than AgZ in acid. The salt AgX is no more soluble in strong acid than it is in water. Which of the following best explains this?

A. HX, HY and HZ are all weak acids

B. HX is a weak acid and HY and HZ are strong acids

C. HY and HZ are weak acids and HX is a strong acid, HY is a stronger acid than HZ

D. HY and HZ are weak acids and HX is a strong acid HZ is a stronger acid than HY

Answer: D

View Text Solution

3. Solubility of which of the following salts can be increased by adding some HNO_3 solution?

A. BaF_2

B. CH_3COOAg

C. $BaSO_4$

D. PbS

Answer: A::B::D

View Text Solution

Comprehension Type

1. To determine molar solubility of an unknown metal hydroxide, $M(OH)_3$ in $0.00101MNaOH$, Jane adds $0.250g$ of $M(OH)_3$ solid to $200mL$ of a $0.00101MNaOH$ solution and stirred for a long time.A cloudy solution is formed. The undissolved hydroxide is separated from the

solution by filtratin $25.00mL$ of filtrate is pipetted into a flask $30mL$ of water is added adn then the solution is titrated with $0.00444MHCl$ solution $13mL$ of HCl is used for this titration.

The molar concentration of hydroxide ion in filtrate solution is

A. $0.0015M$

B. $0.0023M$

C. $0.00333M$

D. $0.00462M$

Answer: B

View Text Solution

2. To determine molar solubility of an unknown metal hydroxide, $M(OH)_3$ in $0.00101MNaOH$, Jane adds $0.250g$ of $M(OH)_3$ solid to $200mL$ of a $0.00101MNaOH$ solution and stirred for a long time.A cloudy solution is formed. The undissolved hydroxide is separated from the solution by filtratin $25.00mL$ of filtrate is pipetted into a flask $30mL$ of water is added adn then the solution is titrated with $0.00444MHCl$ solution $13mL$ of HCl is used for this titration.

The solubility product of $M(OH)_3$ is

A. 4.8×10^{-9}

B. 5.6×10^{-11}

C. 2.1×10^{-11}

D. 5.34×10^{-12}

Answer: D

View Text Solution

3. To determine molar solubility of an unknown metal hydroxide, $M(OH)_3$ in $0.00101MNaOH$, Jane adds $0.250g$ of $M(OH)_3$ solid to $200mL$ of a $0.00101MNaOH$ solution and stirred for a long time.A cloudy solution is formed. The undissolved hydroxide is separated from the solution by filtratin $25.00mL$ of filtrate is pipetted into a flask $30mL$ of water is added adn then the solution is titrated with $0.00444MHCl$ solution $13mL$ of HCl is used for this titration.

If Jane carelessly added $20mL$ of water tothe flask instead of $30mL$ how would this affect the determination of

solubility product (K_{sp}) and molar solubility?

(1) The value of K_{sp} determined by Jane would be same as true value

(2) The value of K_{sp} determined by Jane would be higher than the true value.

(3) The value of K_{sp} determined by Jane would be lower as true value.

(4) The molar solubility of $M(OH)_3$ determined by Jane woud be same as true value.

(5) The molar solubility of $M(OH)_3$ determined by Jane would be higher than true value.

(6) The molar solubililty of $M(OH)_3$ determined by Jane would be lower than the true value

A. 1 and 4

B. 2 and 5

C. 3 and 6

D. 1 and 6

Answer: A

View Text Solution

Ar Type

1. Assertion: Addition of $NaCN$ to a saturated solution of $AgCN$ increases the solubility of $AgCN$

Reason: $NaCN$ produces common ion effect when added to a saturated solution of $AgCN$

A. Both Assertion and Reason are correct and Reason is the correct explanation on the Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: B

View Text Solution

Match The Column

1. Match the column I and Column II

	Column I		Column II
A.	Addition of small amount of HCl decreases the solubility of sparingly soluble salt	p.	A saturated solution of AgCl ($K_{sp} = 2 \times 10^{-10}$)
B.	Addition of small amount of NaOH decreases solubility of sparingly soluble salt.	q.	A saturated solution of $PbCl_2$ ($K_{sp} = 4 \times 10^{-6}$)
C.	Addition of small amount of HCl increases solubility of sparingly soluble salt.	r.	HCl solution saturated with AgCl
D	Addition of small amount of $AgNO_3(s)$ increases solubility of sparingly soluble salt.	s.	NaOH solution saturated with $Mg(OH)_2$ (K_{sp} of $Mg(OH)_2 = 4 \times 10^{-7}$)

View Text Solution

Integer Type

1. Consider the following reversible system:

$$A(g) + 2B(g) \Leftrightarrow C(g) + 2D(g)$$

At equilibrium there are 1.0 mole of A and 2.0 moles of each

B, C and D present. If 2.0 moles of B is added so that moles of A and D do not change?

View Text Solution