CHEMISTRY

BOOKS - KUMAR PRAKASHAN KENDRA CHEMISTRY (GUJRATI ENGLISH)

EQUILIBRIUM

Section A Questions

1. State the important biological and environmental chemical equilibrium with example.

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2. How many types of equilibrium based on proportion of reactant and product ?

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3. Explain solid-liquid equilibrium by giving example.

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4. Describe measuring equilibrium vapour pressure of water at a constant temperature.

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5. Explain liquid-vapour equilibrium.

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6. The time for complete evaporation depends on which factors ? Explain.

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7. What is Boiling point ?

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8. Explain factors affect the boiling point.

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9. What is vapour pressure ? "In open vessel rate of vaporization is constant still equilibrium is not establish" - Explain.

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10. Explain solid-vapour equilibrium by example.

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11. Explain the equilibrium when sublimation of solid take place in close vessel.

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12. Explain equilibrium involving dissolution of solid in liquid.

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13. Explain equilibrium in saturated solution and its dynamic nature.

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14. Explain equilibrium of gases in liquids.

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15. Explain equilibrium in soda water and explain it by Henry's law.

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16. Explain types of physical equilibrium by giving example.

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17. Write general characteristics of equilibria involving physical processes.

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18. Explain chemical equilibrium by giving example of general reaction.

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19. Chemical equilibrium, explain by example of 'chemical reaction'.

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20. Explain the dynamic nature of chemical equilibrium with suitable reaction of example.

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21. Explain dynamic nature of chemical system in laboratory

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22. Give law of chemical equilibrium for equilibrium process.

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23. Write equilibrium constant (equilibrium law) for the following reaction.

(i)$4NH_{3(g)} + 5O_{2(g)} \Leftrightarrow 4NO_{(g)} + 6H_2O_{(g)}$

(ii)$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

(iii)$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

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24. Obtain the relation between equilibrium constant K and K' forward and reverse reaction.

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25. If any equilibrium process equation is multiply by any factor n, still there is no change in equilibrium constant explain with example.

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26. What is homogeneous equilibrium ? Give examples.

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27. Partial pressure of (p) is in proportional to the concentration (c) - explain.

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28. aA+bB $\Leftrightarrow$ cC + dD here A,B, C , D are in gaseous phase. Derive the relation between K_p and K_c.

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29. Which type of relation of K_p and K_c when $\Delta n = 0$, $\Delta n > 0$ and $\Delta n < 0$

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30. What is heterogeneous equilibria ? Give its types with examples.

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31. Explain why pure liquids and solids can be ignored while writing the equilibrium constant expression ?

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32. Give equilibrium expression constant of the following reaction.

(a) $Ni_{(s)} + 4CO_{(g)} \Leftrightarrow Ni(CO)_{4(g)}$

(b)$Ag_2O_{(s)} + 2HNO_{3(g)} \Leftrightarrow 2AgNO_{3(aq)} + H_2O_{(l)}$

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33. Write the difference between Homogeneous equilibrium and Heterogeneous equilibrium.

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34. Write applications of equilibrium constants.

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35. Write the uses of equilibrium constant.

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36. Explain the use of equilibrium constant to predicate the proportion of reaction with example.

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37. Explain reaction quotient and prediction the direction of the reaction.

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38. Explain calculation of concentration at the value of equilibrium constant.

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39. Explain chemical equilibrium and free energy change.

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40. Explain the relation between time of equilibrium and thermodynamics.

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41. Derive relation between equilibrium constant K, Reaction quotient Q and Gibbs energy change (ΔG).

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42. How the prediction of reaction is carried out ?

(a) By the value of K

(b) By the value of Q

(c) By the value of ΔG

(d) By the value $\Delta G^{\ominus}$.

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43. (a) What is required in chemical synthesis ? What will be done for that ?

(b) Write Le-Chatelier's principle.

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44. Give requirements for chemical synthesis and give the changes in equilibrium and laws.

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45. Write effect of concentration change on equilibrium and explain by suitable example.

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46. Explain : Effect of concentration equilibrium occurs in two drops of 0.2 M potassium thiocynate (KSCN) added in 1 mL. 0.2 M Iron (III) Nitrate solution.

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47. Explain effect of concentration on equilibrium by suitable experiments.

$Fe^{3+}_{(aq)}$ Yellow + $SC\bar{N}_{(aq)}$ Colourless $\Leftrightarrow$ $[Fe(SCN)]^{2+}_{(aq)}$ Deep red

Explain effect by added, (i) Oxalic acid $\left(H_2C_2O_4\right)$ (ii) $HgCl_2$ and (iii) Potassium thiocynate (KSCN) in equilibrium reaction.

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48. Explain effect of pressure change on equilibrium system by suitable examples.

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49. Explain : Effect of Inert Gas addition on equilibrium.

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50. Explain effect of temperature change on chemical equilibrium by example.

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51. Explain effect of temperature on equilibrium by suitable experiment.

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52. Explain effect of catalyst on chemical equilibrium by example.

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53. A liquid is in equilibrium with its vapour in a sealed container at a fixed temperature. The volume of the container is suddenly increased.

(a) What is the initial effect of the change on vapour pressure ?

(b) How do rates of evaporation and condensation change initially?

(c) What happens when equilibrium is restored finally and what will be the final vapour pressure ?

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54. Does the number of moles of reaction products increase, decrease or remain same when each of the following equilibria is subjected to a decrease in pressure by increasing the volume?

(a)$PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

(b)$CaO_{(s)} + CO_{2(g)} \Leftrightarrow CaCO_{3(s)}$

(c)$3Fe_{(s)} + 4H_2O_{(g)} \Leftrightarrow Fe_3O_{4(s)} + 4H_{2(g)}$

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55. Which of the following reactions will get affected by increasing the pressure ? Also, mention whether change will cause the reaction to go into forward or backward direction.

(i)$COCl_{2(g)} \Leftrightarrow CO_{(g)} + Cl_{(2)(g)}$

(ii)$CH_{4(g)} + 2S_{2(g)} \Leftrightarrow CS_{2(g)} + 2H_2S_{(g)}$

(iii)$CO_{2(g)} + C_{(s)} \Leftrightarrow 2CO_{(g)}$

(iv)$2H_{2(g)} + CO_{(g)} \Leftrightarrow CH_3OH_{(g)}$

(v) $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

(vi)$4NH_{3(g)} + 5O_{2(g)} \Leftrightarrow 4NO_{(g)} + 6H_2O_{(g)}$

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56. Dihydrogen gas is obtained from natural gas by partial oxidation with steam as per following endothermic reaction :

$CH_{4(g)} + H_2O_{(g)} \Leftrightarrow CO_{(g)} + 3H_{2(g)}$

(a) Write as expression for K_p for the above reaction.

(b) How will the values of K_p and composition of equilibrium mixture be affected by

(i) increasing the pressure

(ii) increasing the temperature

(iii) using a catalyst ?

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57. Describe the effect of:

(a) addition of H_2

(b) addition of CH_3OH

(c) removal of CO

(d) removal of CH_3OH on the equilibrium of the reaction :

$2H_{2(g)} + CO_{(g)} \Leftrightarrow CH_3OH_{(g)}$

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58. At 473K, equilibrium constant K_c for decomposition of phosphorus pentachloride, PCl_5 is 8.3×10^{-3}. If decomposition is depicted as,

$PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}, \Delta_r H^{\ominus}$=124.0 kJ mol^{-1}

(a) Write an expression for K_c for the reaction.

(b) What is the value of K_c for the reverse reaction at the same temperature ?

(c) What would be the effect on K_c if (i) more PCl_5 is added (ii) pressure is increased (iii) the temperature is increased ?

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59. What is ionic equilibrium ? Discuss the relation of types of substance and ionic equilibrium in solution.

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60. Write a acid, base and salt available in nature.

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61. Explain hydration of sodium chloride.

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62. Write Arrhenius concept of Acids and Bases.

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63. Explain the existence of hydronium ion in aqueous solution.

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64. Explain : Proton $\left(H^{+}\right)$ does not exist in aqueous solution.

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65. Write the Bronsted - Lowry principle for acids and bases.

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66. What is meant by the conjugate acid-base pair ? Find the conjugate acid/base for the following species:

$HNO_2, CN^-, HClO_4, F^-, OH^-, CO_3^{2-}$ and S^{2-}

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67. Write Lewis Acid-Base principle.

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68. Explain acid-base and its type according (A) Arrhenius and (B) Bronsted-Lowry by examples.

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69. Get the equation of ionic product $\left(K_w\right)$ of water.

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70. Explain concentration of pure water : Equilibrium of pure water is on left side.

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71. Explain pH scale and pH.

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72. Write about methods of measurement of pH of solution.

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73. Write about relation of pH and concentration of H_3O^+ and OH^- in Acidic, Basic and Neutral solution.

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74. Derive relation of pH and pOH.

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75. Derive the equation of ionization constants K_a of weak acids HX.

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76. Write characteristics and uses of K_a value.

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77. Derive the equation of ionization constant $\left(K_b\right)$ of weak base.

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78. Write characteristics and uses of weak base equailibrium constant K_b.

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79. Write examples of weak acids and weak bases and give ionic equilibrium in its aqueous solution.

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80. Explain a general step-wise approach to evaluate the pH of the weak electrolyte.

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81. Derive $K_a \times K_b = K_w$ equation.

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82. Derive the equation of relation between weak base ionization constant K_b and its conjugate acid ionization constant K_a.

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83. Derive $K_w = K_a \times K_b$ and $K_w = pK_a + pK_b$ for weak base B and its conjugate acid BH^+.

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84. Explain ionization and ionization constant in di and polyprotic acid .

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85. Diprotic and Triprotic acid

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86. What is polyprotic acid ? Give example of polyprotic acid and its ionization.

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87. Discuss the factors affecting acid strength by examples.

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88. Write about common ion effect.

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89. Derive defination and explain common ion effect by example .

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90. Explain effect of resulting solution on addition of 0.05 M acetate ion to 0.05 M acetic acid solution .

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91. What is hydrolysis ? Give difference between unhydrolyse and hydrolyse ion.

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92. Give classification and examples of salts an the base of hydrolysis .

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93. Predict if the solutions of the following salts are neutral , acidic or basic :

NaCl , KBr, NaCN, NH_4NO_3, $NaNO_2$ and KF

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94. Following are explain by reasons :

NaCl solution is neutral.

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95. Following are explain by reasons :

The solution of strong acid and strong base salts is neutral.

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96. Following are explain by reasons :

$NaCH_3COO$ solution is basic

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97. Following are explain by reasons :

The solution of strong base and weak acid salt is basic

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98. Following are explain by reasons :

NH_4Cl solution is acidic.

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99. Following are explain by reasons :

The solution of weak base and strong acid salt is acidic.

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100. Following are explain by reasons :

The solution of NH_4CH_3COO is (almost) neutral.

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101. Following are explain by reasons :

The solution of weak acid-weak base salts is almost neutral.

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102. What is buffer solutions ? Explain types of buffer solutions by examples.

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103. Give the importance of buffer solution.

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104. Derive the Henderson-Hasselbalch equation.

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105. Derive the equation for calculation of pH of acidic buffer solution.

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106. Explain preparation of acidic buffer solution with example.

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107. How to make buffer of ammonia $\left(pK_a = 9.25\right)$, What is the pH of this buffer ?

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108. What is solubility of salt ? Explain classification of salt based on solubility ?

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109. Explain the factors affecting solubility of salts in solution.

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110. Derive the equation of solubility and solubility product of sparingly soluble salt $M_x^{p+} X_y^{q-}$

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111. Explain relation of solubility (S) and K_{sp}.

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112. Derive the equation of following sparingly soluble salt.

(a)Two ions having MX formula

(b)Three ions having MX_2 or M_2X types salts

(c) Four ions having AX_3 or A_3X type salts .

(d)Five ions A_2X_3 or A_3X_2 type salts.

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113. Explain common in effect for solubility of salts

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114. Explain solubility of salt in presence of common ion.

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115. Explain difference between ionic product and solubilities product . Explain the reaction with precipitation of sparingly soluble salt.

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116. Explain the uses of common ion effect.

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117. The solubility of salt of weak acid MX (e.g. phosphoric) is increase at tower pH explain with equation.

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118. The equilibrium constant for the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ at 731K temperature is 46.4. Calculate equilibrium constant of the following reaction at same temperature.

(1)$2H_{2(g)} + 2I_{2(g)} \Leftrightarrow 4HI_{(g)}$

(2) $\frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)} \Leftrightarrow HI_{(g)}$

(3)$HI_{(g)} \Leftrightarrow \frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)}$

(4) $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$

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119. The concentration ofH_2, I_2 and HI at 731K respectively $0.92 \times 10^{-2}, 0.20 \times 10^{-2}$ and $2.96 \times 10^{-2} \text{mol L}^{-1}$, calculate equilibrium constant.

$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

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120. The following concentrations were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium at 500K.

$[N_2] = 1.5 \times 10^{-2}$M. $[H_2] = 3.0 \times 10^{-2}$ M and $[NH_3] = 1.2 \times 10^{-2}$ M.

Calculate equilibrium constant. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

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121. At equilibrium, the concentration of : $N_2 = 3.0 \times 10^{-3}$ M, $O_2 = 4.2 \times 10^{-3}$ M and $NO = 2.8 \times 10^{-3}$ M in a sealed vessel at 800 K. What will be K_c for the reaction

$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$

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122. What is K_c for the following equilibrium when the equilibrium concentration of each substance is : $[SO_2] = 0.60M$, $[O_2] = 0.82M$ and $[SO_3]$ = 1.90 M ?

$2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

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123. The equilibrium constant expression for a gas reaction is ,

$$K_c = \frac{[NH_3]^4[O_2]^5}{[NO]^4[H_2O]^6}$$

Write the balanced chemical equation corresponding to this expression.

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124. The reaction occurs between H_2 and I at 731 K temperature equilibrium concentration of H_2, I_2 and HI are as under in Table

Experiment No.	$[H_{2(g)}]$	$[I_{2(g)}]$	$[HI_{(g)}]$
1.	1.14×10^{-2}	0.12×10^{-2}	2.52×10^{-2}
2.	0.92×10^{-2}	0.20×10^{-2}	2.96×10^{-2}
3.	0.77×10^{-2}	0.31×10^{-2}	3.34×10^{-2}
4.	0.92×10^{-2}	0.22×10^{-2}	3.08×10^{-2}

Calculate $\frac{[\mathrm{HI}]}{[H_2][I_2]}$ and $\frac{[HI]^2}{[H_2][I_2]}$ and discuss of obtained results and derive chemical equilibrium rule.

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125. The decomposition of HI in closed vessel at 731 K take place.

Experiment	$[H_{2(g)}]$	$[I_{2(g)}]$	$[HI_{(g)}]$
5.	0.345×10^{-2}	0.345×10^{-2}	2.35×10^{-2}
6.	0.86×10^{-2}	0.86×10^{-2}	5.86×10^{-2}

Calculate equilibrium constant . What is the result on the base of problem 7.7 and 7.8 ?

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126. Derive the relation of value of K_p and K_c of the following balance reaction.

$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

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127. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$, For this equilibrium reaction at given temperature find relation between K_p and K_c

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128. PCl_5, PCl_3 and Cl_2 are at equilibrium at 500 K and having concentration 1.59 M PCl_3, 1.59 M Cl_2 and 1.41 M PCl_5. Calculate K_c for the reaction , $PCl_5 \Leftrightarrow PCl_3 + Cl_2$.

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129. Nitric oxide reacts with Br_2 and gives nitrosyl bromide as per reaction given below:

$2NO_{(g)} + Br_{2(g)} \Leftrightarrow 2NOBr_{(g)}$

When 0.087 mol of NO and 0.0437 mol of Br_2 are mixed in a closed container at constant temperature, 0.0518 mol of NOBr is obtained at equilibrium. Calculate equilibrium amount of NO and Br_2.

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130. The value of K_c = 4.24 at 800K for the reaction, $CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}$ Calculate equilibrium concentrations of CO_2, H_2, CO and H_2O at 800 K, if only CO and H_2O are present initially at concentrations of 0.10M each.

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131. For the equilibrium

$2NOCl_{(g)} \Leftrightarrow 2NO_{(g)} + Cl_{2(g)}$

the value of the equilibrium constant, K_c is 3.75×10^{-6} at 1069 K. Calculate the K_p for the reaction at this temperature ?

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132. For the following equilibrium, $K_c = 6.3 \times 10^{14}$ at 1000 K. $NO_{(g)} + O_{3(g)} = NO_{2(g)} + O_{2(g)}$ Both the forward and reverse reactions in the equilibrium are elementary bimolecular reactions. What is K_c for the reverse reaction ?

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133. Reaction between N_2 and O_2. takes place as follows : $2N_{2(g)} + O_{2(g)} \Leftrightarrow 2N_2O_{(g)}$ If a mixture of 0.482 mol N_2 and 0.933 mol of O_2 is placed in a 10 L reaction vessel and allowed to form $N2O$ at a temperature for which $K_c = 2.0 \times 10^{-37}$, determine the composition of equilibrium mixture.

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134. At 450 K, $K_p = 2.0 \times 10^{10}$/ bar for the given reaction of equilibrium . $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$ What is K_c at this temperature ?

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135. A sample of $HI_{(g)}$ is placed in flask at a pressure of 0.2 atm. At equilibrium the partial pressure of $HI_{(g)}$ is 0.04 atm. What is K_p for the

given equilibrium ?

$2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$

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136. K_p= 0.04 atm at 899 K for the equilibrium shown below. What is the equilibrium concentration of C_2H_6 when it is placed in a flask at 4.0 atm pressure and allowed to come to equilibrium ?

$C_2H_{6(g)} \Leftrightarrow C_2H_{4(g)} + H_{2(g)}$

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137. A sample of pure PCl_5 was introduced into an evacuated vessel at 473 K. After equilibrium was attained, concentration of PCl_5 was found to be $0.5 \times 10^{-1} \text{mol L}^{-1}$. If value of K_c is 8.3×10^{-3}, what are the concentrations of PCl_3 and Cl_2 at equilibrium ?

$PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

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138. Bromine monochloride, BrCl decomposes into bromine and chlorine and reaches the equilibrium :

$$2BrCl_{(g)} \Leftrightarrow Br_{2(g)} + Cl_{2(g)}$$

for which K_c = 32 at 500 K. If initially pure BrCl is present at a concentration of $3.3 \times 10^{-3} \text{mol L}^{-1}$, what is its molar concentration in the mixture at equilibrium ?

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139. The equilibrium constant for the following reaction is 1.6×10^5 at 1024 K

$$H_{2(g)} + Br_{2(g)} \Leftrightarrow 2HBr_{(g)}$$

Find the equilibrium pressure of all gases if 10.0 bar of HBr is introduced into a sealed container at 1024 K.

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140. Dihydrogen gas used in Haber's process is produced by reacting methane from natural gas with high temperature steam. The first stage of two stage reaction involves the formation of CO and H_2. In second stage, CO formed in first stage is reacted with more steam in water gas shift reaction,

$$CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}$$

If a reaction vessel at $400\,^\circ C$ is charged with an equimolar mixture of CO and steam such that $p_{CO} = P_{H_2O}$ = 4.0 bar, what will be the partial pressure of H_2 at equilibrium ? K_p = 10.1 at 400 ° C.

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141. The value of K_c for the reaction $3O_{2(g)} \Leftrightarrow 2O_{3(g)}$ is 2.0×10^{-50} at $25\,^\circ C$. If the equilibrium concentration of O_2 in air at $25\,^\circ C$ is 1.6×10^{-2}, what is the concentration of O_3 ?

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142. The reaction, $CO_{(g)} + 3H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)}$ is at equilibrium at 1300K in a 1L flask. It also contain 0.30 mol of CO, 0.10 mol of H_2 and 0.02 mol of H_2O and an unknown amount of CH_4 in the flask. Determine the concentration of CH_4 in the mixture. The equilibrium constant, K_c for the reaction at the given temperature is 3.90.

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143. Ethyl acetate is formed by the reaction between ethanol and acetic acid and the equilibrium is represented as:

$$CH_3COOH_{(l)} + C_2H_5OH_{(l)} \Leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$$

(i)Write the concentration ratio (reaction quotient), Q_c for this reaction (note : water is not in excess and is not a solvent in this reaction)

(ii) At 293 K, if one starts with 1.00 mol of acetic acid and 0.18 mol of ethanol, there is 0.171 mol of ethyl acetate in the final equilibrium mixture. Calculate the equilibrium constant.

(iii) Starting with 0.5 mol of ethanol and 1.0 mol of acetic acid and

maintaining it at 293 K, 0.214 mol of ethyl acetate is found after sometime. Has equilibrium been reached ?

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144. At definite temperature total pressure is P bar derive equilibrium constant.

$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

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145. At definite temperature in open vessel decomposition of Ammonium carbonate take place and total pressure is P bar derive K_p.

$(NH_4)_2CO_{3(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)} + H_2O_{(g)}$

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146. In evacuated closed vessel the total pressure is P bar at equilibrium. Write equilibrium constant K_p of the following reaction.

Reaction : $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$

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147. Following equilibrium is established to decomposing of Ammonium carbonate NH_4COONH_2 in closed vessel at 700 K temperature.

$NH_4COONH_{2(s)} \Leftrightarrow 2NH_{3(g)} + CO_2$

At initial if there is vaccum and at equilibrium total pressure is P bar than derive the value of K_p with respect to P.

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148. Write the expression for the equilibrium constant, K_c for each of the following reactions

(1)$2NOCl_{(g)} \Leftrightarrow 2NO_{(g)} + Cl_{2(g)}$

(2) $2Cu\left(NO_3\right)_{2(s)} \Leftrightarrow 2CuO_{(s)} + 4NO_{2(g)} + O_{2(g)}$

(3)$CH_3COOC_2H_{5(aq)} + H_2O_{(l)} \Leftrightarrow CH_3COOH_{(aq)} + C_2H_5OH_{(aq)}$

(4)$Fe^{3+}_{(aq)} + 3OH^-_{(aq)} \Leftrightarrow Fe(OH)_{3(s)}$

(5)$I_{2(s)} + 5F_{2(s)} \Leftrightarrow 2IF_{5(g)}$

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149. Find out the value of K_c for each of the following equilibria from the value of K_p :

(i)$2NOCl_{(g)} \Leftrightarrow 2NO_{(g)} + Cl_{2(g)}, K_p = 1.8 \times 10^{-2}$, 500 K

(ii)$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}, K_p$=167 , 1073 K

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150. The value of K_p for the reaction,

$CO_{2(g)} + C_{(s)} \Leftrightarrow 2CO_{(g)}$ is 3.0 at 1000 K. If initially p_{CO_2} = 0.48 bar and p_{CO} = 0 bar and pure graphite is present, calculate the equilibrium partial pressures of CO and CO_2.

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151. At 700 K H_2 and I_2 with reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ in K_c = 57.0. At t time $\left[H_2\right]_t$ = 0.1 M, $\left[I_2\right]_t$ = 0.2 M and $[HI]_t$ = 0.40. After t time reaction proceed in which direction ?

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152. The value of K_c for the reaction 2A $\Leftrightarrow$ B+ C is 2×10^{-3}. At a given time, the composition of reaction mixture is [A] = [B] = [C] = 3×10^{-4} M. In which direction the reaction will proceed ?

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153. Equilibrium constant, K_c for the reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ at 500 K is 0.061 At a particular time, the analysis shows that composition of the reaction mixture is 3.0 mol $L^{-1}N_2$, 2.0 mol $L^{-1}H_2$, and 0.5 mol $L^{-1}NH_3$. Is the reaction at equilibrium ? If not in which direction does the reaction tend to proceed to reach equilibrium ?

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154. 13.8 g of N_2O_4 was placed in a 1 L reaction vessel at 400 K and allowed to attain equilibrium,

$N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$

The total pressure at equilibrium was found to be 9.15 bar. Calculate K_c, K_p and partial pressure at equilibrium.

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155. 3.00 mol of PCl_5 kept in 1 L closed reaction vessel was allowed to attain equilibrium at 380 K. Calculate composition of the mixture at equilibrium. K_c=1.80

$PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

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156. One of the reaction that takes place in producing steel from iron ore is the reduction of iron (II) oxide by carbon monoxide to give iron metal and CO_2.

$FeO_{(s)} + CO_{(g)} \Leftrightarrow Fe_{(s)} + CO_{2(g)} K_p$=0.265 atm at 1050 K.

What are the equilibrium partial pressures of CO and CO_2 at 1050 K if the initial partial pressures are: p_{CO} = 1.4 atm and $2p_{CO_2}$=0.80 atm ?

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157. What is the equilibrium concentration of each of the substances in the equilibrium when the initial concentration of ICl was 0.78 M ?

$2ICl_{(g)} \Leftrightarrow I_{2(g)} + Cl_{2(g)}, K_c = 0.14$

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158. At 700 K, equilibrium constant for the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ is 54.8. If 0.5 mol L^{-1} of $HI_{(g)}$ is present at equilibrium at 700 K, what are the concentration of $H_{2(g)}$ and $I_{2(g)}$

assuming that we initially started with HI(g) and allowed it to reach equilibrium at 700 K ?

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159. 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_c for the reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ is 1.7×10^2. Is the reaction mixture at equilibrium? If not, what is the direction of the net reaction ?

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160. At a certain temperature and total pressure of 10^5 Pa, iodine vapour contains 40% by volume of I atoms $I_{2(g)} \Leftrightarrow 2I_{(g)}$. Calculate K_p for the equilibrium.

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161. One mole of H_2O and one mole of CO are taken in 10 L vessel and heated to 725 K. At equilibrium 40% of water (by mass) reacts with CO according to the equation:

$$H_2O_{(g)} + CO_{(g)} \Leftrightarrow H_{2(g)} + CO_{2(g)}$$

Calculate the equilibrium constant for the reaction.

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162. At 1127 K and 1 atm pressure, a gaseous mixture of CO and CO_2 in equilibrium with solid carbon has 90.55% CO by mass.

$$C_{(s)} + CO_{2(g)} \Leftrightarrow 2CO_{(g)}$$

Calculate K_c for this reaction at the above temperature.

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163. The value of $\Delta G^{\ominus}$ for the phosphorylation of glucose in glycolysis is 13.8 kJ/mol. Find the value of K_c at 298 K.

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164. Hydrolysis of sucrose gives,

Sucrose + H_2O ⇔ Glucose + Fructose

Equilibrium constant K_c for the reaction is 2×10^{13} at 300 K. Calculate $\Delta G^{\ominus}$ at 300 K.

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165. Calculate (a) ΔG^0 and (b) the equilibrium constant for the formation of NO_2 from NO and O_2 at 298 K,

$$NO_{(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow NO_{2(g)}$$

where , $\Delta G_f^{\ominus}\left(NO_2\right)$= 52.0 kJ mol^{-1}

$\Delta G_f^{\ominus}$ (NO)=87.0 kJ mol^{-1}

$\Delta G_f^{\ominus}\left(O_2\right)$ = 0.0 kJ mol^{-1}

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166. Predict which of the following reaction will have appreciable concentration of reactants and products :

(a)$Cl_{2(g)} \Leftrightarrow 2Cl_{(g)}, K_c = 5 \times 10^{-39}$

(b) $Cl_{2(g)} + 2NO_{(g)} \Leftrightarrow 2NOCl_{(g)}, K_c = 3.7 \times 10^{8}$

(c)$Cl_{2(g)} + 2NO_{2(g)} \Leftrightarrow 2NO_2Cl_{(g)}, K_c = 1.8$

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167. What will be the conjugate bases for the following Bronsted acids : HF, H_2SO_4 and HCO_3 ?

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168. Write the conjugate acids for the following Bronsted bases : NH_2^-, NH_3 and $HCOO^-$.

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169. Classify the following species into Lewis acids and Lewis bases and show how these act as such : (i)H_2O , (ii)HCO_3^- , (iii)HSO_4^- , (iv)NH_3

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170. Classify the following species into Lewis acids and Lewis bases and show how these act as such : (a)HO^- , (b)F^- , (c)H^+ , (d) BCl_3

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171. Which of the followings are Lewis acids ?

H_2O, BF_3, H^+ and NH_4^+

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172. What will be the conjugate bases for the Bronsted acids : HF, H_2SO_4 and HCO_3^-

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173. Write the conjugate acids for the following Bronsted bases : NH_2^-, NH_3 and HCO_3^- .

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174. The species : H_2O, HCO_3^-, HSO_4^- and NH_3 can act both as Bronsted acids and bases. For each case give the corresponding conjugate acid and base.

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175. The concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3}M. what is its pH ?

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176. Calculate pH of a 1.0×10^{-8} M solution of HCl.

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177. The pH of a sample of vinegar is 3.76. Calculate the concentration of hydrogen ion in it.

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178. Assuming complete dissociation, calculate the pH of the following solutions :

(a)0.003 M HCl , (b)0.005 M NaOH , (c)0.002 M HBr , (d)0.002 M KOH

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179. Calculate the pH of the following solutions :

(a) 2 g of TIOH dissolved in water to give 2 litre of solution.

(b) 0.3 g of $Ca(OH)_2$ dissolved in water to give 500 ml, of solution.

(c) 0.3 g of NaOH dissolved in water to give 200 mL of solution.

(d) 1 mL of 13.6 M HCl is diluted with water to give 1 litre of solution.

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180. Calculate the hydrogen ion concentration in the following biological fluids whose pH are given below:

(a) Human muscle-fluid, 6.83

(b) Human stomach fluid, 1.2

(c) Human blood, 7.38

(d) Human saliva, 6.4.

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181. The pH of milk, black coffee, tomato juice, lemon juice and egg white are 6.8, 5.0, 4.2, 2.2 and 7.8 respectively. Calculate corresponding hydrogen ion concentration in each.

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182. If 0.561 g of KOH is dissolved in water to give 200 mL of solution at 298 K. Calculate the concentrations of potassium, hydrogen and hydroxyl ions. What is its pH ? (K=39,O=16,H=1)

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183. The solubility of $Sr(OH)_2$ at 298 K is 19.23 g/L of solution. Calculate the concentrations of strontium and hydroxyl lons and the pH of the solution.

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184. The ionization constant of HF is 3.2×10^{-4} . Calculate the degree of dissociation of HF in its 0.02 M solution. Calculate the concentration of all species present (H_3O^+, F^- and HF) in the solution and its pH.

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185. The pH of 0.1 M monobasic acid is 4.50 . Calculate the concentration of species H^+, A^- and HA at equilibrium . Also , Determine the value of K_a and pK_a of the monobasic acid.

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186. Calculate the pH of 0.08 M solution of hypochlorous acid , HOCl. The ionization constant of the acid is 2.5×10^{-5} . Determine the percent dissociation of HOCl.

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187. The pH of 0.004 M hydrazine solution is 9.7 . Calculate its ionization constant K_b and pK_b.

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188. Ionic product of water at 310 K is 2.7×10^{-14} .What is the pH of neutral water at this temperature ?

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189. Calculate the pH of the solution in which 0.2 M NH_4Cl and 0.1 M NH_3 are present . The pK_b of ammonia solution is pK_b= 4.75

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190. Dissociated constant of weak acid CH_3COOH is 1.8×10^{-5} . In 0.1 M solution calculate concentration CH_3COO^- and H^+ . Calculate pH of solution. If 0.1 M HCl added to this solution than calculate degree of dissociation of CH_3COOH.

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191. Hydrazine $\left(N_2H_4\right)$ is weak base and its dissociation constant is 1.8×10^{-6}. So, calculate pH of 0.25 M solution.

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192. The dissociation constant of weak acid ammonium is 5.6×10^{-10} and dissociation constant of weak base ammonia $K_b = 1.8 \times 10^{-5}$. Calculate ionic product of water.

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193. Determine the degree of ionization and pH of a 0.05 M of ammonia solution . The ionization constant of ammonia can be taken from $K_b = 1.77 \times 10^{-5}$. Also, calculate the ionization constant of the conjugate acid of ammonia .

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194. A 0.02 M solution of pyridinium hydrochloride has pH=3.44 . Calculate the ionization constant of pyridine.

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195. The ionization constant of HF, HCOOH and HCN at 298 K are 6.8×10^{-4}, 1.8×10^{-4} and 4.8×10^{-9} respectively . Calculate the ionization constants of the corresponding conjugate base.

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196. The ionization constant of phenol is 1.0×10^{-10} .What is the concentration of phenolate ion is 0.05 M solution of phenol ? What will be its degree of ionization if the solution is also 0.01 M in sodium phenolate ?

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197. The ionization constant of acetic acid is 1.74×10^{-5} . Calculate the degree of dissociation of acetic acid in its 0.05 M solution. Calculate the concentration of acetate ion in the solution and its pH.

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198. It has been found that the pH of a 0.01 M solution of an organic acid is 4.15. Calculate the concentration of the anion, the ionization constant of the acid and its pK_a.

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199. The degree of ionization of a 0.1 M bromoacetic acid solution is 0.132. Calculate the pH of the solution and the pK_a of bromoacetic acid.

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200. The pH of 0.005 M codeine $\left(C_{18}H_{21}NO_3\right)$ solution is 9.95 . Calculate its ionization constant and pK_b.

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201. Calculate the degree of ionization of 0.05 M acetic acid if its pK_a value is 4.74 . How is the degree of dissociation affected when its solution also contains (a)0.01 M , (b) 0.1 M in HCl ?

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202. The pH of 0.1 M solution of cyanic acid (HCNO) is 2.34. Calculate the ionization constant of the acid and its degree of ionization in the solution.

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203. Calculate the pH of the resultant mixtures :

10 mL 0.2 M $Ca(OH)_2$+ 25 mL 0.1 M HCl

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204. Calculate the pH of the resultant mixtures :

10 mL 0.01 M H_2SO_4 + 10 mL 0.01 M $Ca(OH)_2$

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205. Calculate the pH of the resultant mixtures :

10 mL 0.1 M H_2SO_4 + 10 mL 0.1 M KOH

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206. Calculate the pH of a 0.10 M ammonia solution . Calculate the pH after 50.0 mL of this solution is treated with 25.0 mL of 0.10 M HCl. The

dissociation constant of ammonia, $K_b = 1.77 \times 10^{-5}$

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207. The pK_a of acetic acid and pK_b of ammonium hydroxide are 4.76 and 4.75 respectively . Calculate the pH of ammonium acetate solution.

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208. The ionisation constant of chloroacetic acid is 1.35×10^{-3} .What will be the pH of 0.1 M acid and its 0.1 M sodium salt solution ?

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209. The ionization constant of nitrous acid is 4.5×10^{-4} . Calculate the pH of 0.04 M sodium nitrite solution and also its degree of hydrolysis .

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210. K_{sp} of $BaSO_4 = 1.05 \times 10^{-10}$ at same temperature is the concentration of Ba^{2+} and SO_4^{2-} in saturated solution.

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211. Calculate the solubility of A_2X_3 in pure water , assuming that neither kind of ion reacts with water. The solubility product of $A_2X_3, K_{sp} = 1.1 \times 10^{-23}$.

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212. The values of K_{sp} of two sparingly soluble salts $NI(OH)_2$ and AgCN are 2.0×10^{-15} and 6×10^{-17} respectively . Which salt is more soluble ? Explain .

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213. Calculate the molar solubility of $Ni(OH)_2$ in 0.10 M NaOH. The ionic product of $Ni(OH)_2$ is 2.0×10^{-15}.

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214. Determine the solubilities of silver chromate , barium chromate , ferric hydroxide , lead chloride and mercurous constants given in Table 7.9 . Determine also the molarities of individual ions.

(i)$K_{sp}\left(Ag_2CrO_4\right) = 1.1 \times 10^{-12}$

(ii)$K_{sp}\left(BaCrO_4\right) = 1.2 \times 10^{-10}$

(iii)$K_{sp}\left(Fe(OH)_3\right) = 1.0 \times 10^{-38}$

(iv)$K_{sp}\left(PbCl_2\right) = 1.6 \times 10^{-5}$

(v) $K_{sp}\left(Hg_2Cl_2\right) = 1.3 \times 10^{-18}$

(vi)$K_{sp}\left(Hg_2I_2\right) = 4.5 \times 10^{-29}$

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215. The solubility product constant of Ag_2CrO_4 and AgBr are 1.1×10^{-12} and 5.0×10^{-13} respectively. Calculate the ratio of the molarities of their saturated solutions.

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216. Equal volumes of 0.002 M solutions of sodium iodate and cupric chlorate are mixed together . Will it lead to precipitation of copper iodate ? (For cupric iodate $K_{sp} = 7.4 \times 10^{-8}$)

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217. The ionization constant of benzoic acid is 6.46×10^{-5} and K_{sp} for silver benzoate is 2.5×10^{-13} . How many times is silver benzoate more soluble in a buffer of pH 3.19 compared to its solubility in pure water ?

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218. What is the maximum concentration of equimolar solutions of ferrous sulphate and sodium sulphide so that when mixed in equal volumes , there is no precipitation of iron sulphide ? (For iron sulphide , $K_{sp} = 6.3 \times 10^{-18}$)

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219. What is the minimum volume of water required to dissolve 1 g of calcium sulphate at 298 K ? (For calcium sulphate , $K_{sp} = 9.1 \times 10^{-6}$)

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220. The concentration of sulphide ion in 0.1 M HCl solution saturated with hydrogen sulphide is 1.0×10^{-19} M. if 10 mL of this is added to 5 mL of 0.04 M solution of the following : $FeSO_4$, $MnCl_2$, $ZnCl_2$ and $CdCl_2$

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Section A Try Your Self 2

1. At 400 K in a closed vessel $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ reaction take place. At equilibrium concentration of H_2 : 0.6 mol L^{-1} concentration of I_2 : 0.8 mol L^{-1} and concentration of HI : 0.14 mol L^{-1} than calculate the equilibrium constant.

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2. In a close vessel $PCl_{5(g)}$ is obtained by the chemical reaction between PCl_3 and Cl_2. If the equilibrium concentration in this vessel of PCl_3, Cl_2 and PCl_5 at 500 K tempe. is 1.59 M, 1.59 M and 1.41M respectively. Than find equilibrium constant.

$PCl_{3(g)} + Cl_{2(g)} \Leftrightarrow PCl_{5(g)}$

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3. In the synthesis of HI, the amounts of $H_{2(g)}, I_{2(g)}$, and $HI_{(g)}$, at equilibrium were found to be 0.8, 0.8 and 2.4 mole respectively in 10 liter vessel then calculate equilibrium constant of given reaction at constant temp and also calculate equilibrium constant of reverse reaction. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$.

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4. 8 gm H_2 and 256 gm HI in 4 L flask calculate this active mass. (H = 1 g mol^{-1}, I = 127 g mol^{-1})

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5. At definite temperature K_c is given by following equation,

$$K_c = \frac{[I_2][H_5IO_6]^5}{[IO_3^-]^7[H_2O]^9[H^+]^7}$$

Write the equilibrium equation.

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6. (i)$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ and (ii) $\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \Leftrightarrow NH_{3(g)}$ their equilibrium constant are respectively $K_c(1)$ and $K_c(2)$ state their relation.

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Section A Try Your Self 3

1. Reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ 0.4 mol H_2 and I_2 taken in 2L vessel if 0.5 mol HI form at equilibrium than calculate K_p

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2. 1 mol N_2 and 3 mol H_2 heated at 473 K and 100 atm pressure. At equilibrium moles of NH_3 is 0.5 mol. Than calculate the equilibrium

constant of the given reaction

$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

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3. Reaction $N_{2(g)} + 2O_{2(g)} \Leftrightarrow 2NO_{2(g)}$ equilibrium constant is 100. Find equilibrium constant for following reaction.

(1) $2NO_{2(g)} \Leftrightarrow N_{2(g)} + 2O_{2(g)}$

(2) $NO_{2(g)} \Leftrightarrow \frac{1}{2}N_{2(g)} + O_{2(g)}$

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4. At 673 K of $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ reaction is K_c 0.50. If pressure is in atmosphere, then calculate K_p. (R=0.082 L atm $K^{-1}\text{mol}^{-1}$)

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5. 298 K of $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ reaction is in equilibrium K_p = 0.14 atm. Calculate of K_c (R=0.082 L atm $K^{-1}mol^{-1}$)

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6. Equilibrium constant of following reaction is 0.5.

$CO_{(g)} + 2H_{2(g)} \Leftrightarrow CH_3OH_{(g)}$ at equilibrium [CO]=0.18 mol L^{-1} and $\left[H_2\right]$ = 0.22 mol L^{-1} Calculate the concentration of CH_3OH.

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7. Reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$, At 400 K is K_p=41 , So, calculate K_p of following reactions at 400 K.

(a)$2N_{2(g)} + 6H_{2(g)} \Leftrightarrow 4NH_{3(g)}$

(b)$2NH_{3(g)} \Leftrightarrow N_{2(g)} + 3H_{2(g)}$

(c)$\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \Leftrightarrow NH_{3(g)}$

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8. At 400 K for reaction $2NO_{2(g)} \Leftrightarrow N_2O_{4(g)}$ is NO_2 0.710 M and N_2O_4 0.145 Mz concentration. Find of equilibrium constant.

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9. $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$, at 298 K of K_c is 7×10^{25} than calculate for $SO_{3(g)} \Leftrightarrow SO_{2(g)} + \frac{1}{2}O_2$

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10. For the reaction $2NOCl_{(g)} \Leftrightarrow 2NO_{(g)} + Cl_{2(g)}$ the value of equilibrium constant K_p is 0.033 bar at 1060 K temp. then calculate value of K_c.

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Section A Try Your Self 4

1. At 1100 K temperature $CaCO_3$ and $CaO_{(s)}$ are in equilibrium pressure of CO_2 is 2.0×10^5 Pa. Find equilibrium constant.

$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

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2. Which are Homogenous and Heterogenous equilibrium ?

(a)$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

(b)$Ca(OH)_{2(s)} \Leftrightarrow Ca^{2+}_{(aq)} + 2OH^{-}_{(aq)}$

(c) $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(aq)}$

(d)$Ag_2O_{(cs)} + 2H^{+}_{(aq)} \Leftrightarrow H_2O_{(l)} + 2Ag^{+}_{(aq)}$

(e) $NH_{3(g)} + H_2O_{(aq)} \Leftrightarrow NH^{+}_{4(aq)} + OH^{-}_{(aq)}$

(f)$CH_3COOC_2H_{5(l)} + H_2O_{(l)} \Leftrightarrow CH_2COOH_{(l)} + C_2H_5OH_{(l)}$

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3. At 600 K Ammonium carbomate decompose in closed vessel : $NH_4COONH_{2(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)}$, at equilibrium total pressure is 3

bar, So calculate K_p.

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4. At 600 ° $NH_4COONH_{2(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)}$ is $K_p = 3.2 \times 10^2 \text{bar}^3$ of equilibrium constant , So, calculate K_c. (R=0.0831 L bar $K^{-1}\text{mol}^{-1}$)

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5. The equilibrium constant of NH_4COONH_2 in a closed vessel at 400 K temperature is 600 bar^3. Than what will be the total pressure at equilibrium ?

$NH_4COONH_{2(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)}$

View Text Solution

Section A Try Your Self 5

1. In Glycolysis process during phosphorylation of Glucose equilibrium constant at 298 K is 3.6×10^{-3} find of $\Delta G^{\ominus}$. What is indicates ?

[R= 8.314 $JK^{-1}\text{mol}^{-1}$] ($\Delta G^{\ominus} > 0 \therefore$ Reaction is not spontaneous)

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2. 6.9g N_2O_4 is taken 0.5 L closed vessel at 400 K temperature. The equilibrium $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ total pressure at equilibrium is 9.15 atm calculate K_c, K_p and partial pressure of each component.

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3. 2 mole PCl_5 is heated in 4 L closed vessel at definite temperature. At equilibrium 55% PCl_5 remain undissociated. Find K_c. Reaction : $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

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4. Reaction $2NOCl_{(g)} \Leftrightarrow 2NO_{(g)} + Cl_{2(g)}$ at 1060 K temperature K_p is 0.033 atm^{-1}. Find K_c. (R=0.082)

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5. At definite temperature 3 atm pressure 75% PCl_5 decompose in PCl_3 and Cl_2. Find K_p.

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6. At 413 K temperature and 100 atm pressure 1 mol N_2 and 3 mol H_2 heated in closed vessel. At equilibrium 0.5 mol NH_3 is present, find K_p.

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7. 0.5 mol $CaCO_3$ solid decompose in 500 mL heated in closed vessel at 400 K reaction $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$ equilibrium constant of

$K_c = 0.9 \text{mol L}^{-1}$. Calculate mol of CO_2 at equilibrium how much percentage of reaction completed ?

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8. $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ of K_p = 0.15 atm (298 K) , so calculate K in torr and mol/L. (1 atm = 760 torr, R= 0.0821 L atm $mol^{-1}K^{-1}$)

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9. 10% PCl_5 decompose at definite temperature and 4 atm pressure. At same temperature if 20% PCl_5 decompose than find pressure. (Temperature not change.)

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10. $CO_{(g)} + 2H_{2(g)} \Leftrightarrow CH_3OH_{(g)}$ for this reaction is K_c is 0.5. If the concentration of CO and H_2 at equilibrium 0.18M and 0.22 M respectively

what is the concentration of CH_3OH ?

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11. In a closed vessel at $448^\circ C$ 0.5 mol H_2 and 0.5 mol I_2 react and from hydrogen iodide. Reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ of K_c = 50. (i) At equilibrium the moles of I_2 which are unreacted. (ii) Calculate K_p.

View Text Solution

12. At 717 K 3.2 mol HI heated in a close tube. 20% I decompose at equilibrium $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$ and find K_c and mol of HI, H_2 and I_2.

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13. At 1 bar pressure and 310 K temperature 25%, N_2O_4 decompose. Reaction : $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ (i) Find K_p (ii) At 0 bar pressure and 310 K how much percentage of N_2O_4 is decompose ?

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14. 1 mol N_2 and 3 mol H_2 taken in 4L definite temperature of closed vessel. Reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ according to 0.25% N_2 convert into ammonia. Calculate K_c and how much reaction of K_c ?

$\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \Leftrightarrow NH_{3(g)}$

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15. In 10 L vessel SO_3, SO_2 and O_2 gases and definite temperature of K_c = 100. So reaction $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2S0_{(3)g}$ at equilibrium if SO_3 and SO_2 are same in mol than find the moles of O_2. If SO_3 is double than SO_2 than what is the mol of O_2 ? ?

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16. At 380 K NH_4H_5 decompose than total pressure is 1.12 bar. Find K_p.

$NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$

View Text Solution

17. At 1000 K in 0.654 L vessel $CaCO_{3(s)}$ is taken. $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$, the equilibrium constant is 3.9×10^{-2} bar. Find the weight of CaO at equilibrium. (Ca=40 , C=12, O=16)

View Text Solution

18. At definite temp the K_c of the following reaction is 0.18. $PCl_{3(g)} + Cl_{2(g)} \Leftrightarrow PCl_{5(g)}$ At a definite temp. in reaction mixture $\left[PCl_3\right]$= 0.042 M , $\left[Cl_2\right]$= 0.024 M and $\left[PCl_5\right]$= 0.005 M . Is this reaction in equilibrium ? In which direction reaction moves ?

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19. At 298 K the K_c of reaction is 3.0×10^{14}. At definate temp in reaction mixture $\left[Cu^{2+}\right] = 1.8 \times 10^{-2} M$, $\left[Ag^{+}\right] = 3.0 \times 10^{-9}$ M is this reaction in

equilibrium ? In which direction reaction moves ?

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20. (i) $\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \Leftrightarrow NH_{3(g)}$, At 298 K is $\Delta G^{\theta} = -16.5 \text{kJ mol}^{-1}$, So find K_p.

(ii)At 298 K is $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$, Calculate K_p and ΔG^{θ}.

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21. For are reaction at 298 K is $K_p = 1.7 \times 10^{12}$, So J mol^{-1} a find ΔG^{θ}.

(R=8.314 J $mol^{-1}K^{-1}$)

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Section A Try Your Self 6

1. What will be the conjugate acid-base pair in $HCl_{(aq)} + H_2O_{(aq)} \Leftrightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$

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2. Give conjugate base - conjugate acid pair of $NH_{3(aq)} + H_2O_{(aq)} \Leftrightarrow NH^+_{4(aq)} + OH^-_{(aq)}$

View Text Solution

3. Which is the Acid in $CH_3COOH_{(aq)} + H_2O_{(aq)} \Leftrightarrow H_3O^+_{(aq)} + CH_3COO^-_{(aq)}$

View Text Solution

4. Which is the Acid in H_2O and CH_3COO^- which one is weak base ?

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5. Classify in acids and bases of following CO_2, BCl_3, NH_3, CH_3NH_2, NO_2^+ and $C_6H_5NH_3^+$

View Text Solution

6. Which are only Lewis acid but not Bronsted acid of CO_2, BCl_3, NH_3, CH_3NH_2, NO_2^+ and $C_6H_5NH_3^+$?

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7. Write conjugate base of following : HF, $CH_3NH_3^+$, H_3PO_4, HPO_4^{2-}

View Text Solution

8. Give conjugate acid of following: HS^-, NH_3, $C_6H_5COO^-$, OH^-

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9. Give conjugate acid and conjugate base of following: (i)$\left(CH_3\right)_2NH$ (ii) HPO_4^{-2} (iii)HS^-

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10. Complete the following Acid-Base reaction and define reactant as Acid / Base.

(i)$CH_3NH_2 + H_2O$

(ii)$CO_2 + H_2O$

(iii)$H_2PO_4^- + CO_3^{2-}$

(iv) $NH_2NH_2 + H_2O$

(v)$C_6H_6 + NO_2^+$

(vi) $C_6H_6 + NH_2^-$

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11. Which are the conjugate base of strong acid $HClO_4$, H_2SO_4, HNO_3 and H_3PO_4 ? It is strong or weak ?

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12. Which are the acids of this reaction ?

$$HCl_{(aq)} + H_2O_{(aq)} \Leftrightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$$

Which acid is strong ?

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13. Which are the acids of this reaction ?

$$HCl_{(aq)} + H_2O_{(aq)} \Leftrightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$$

Which base is weak ?

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Section A Try Your Self 7

1. Calculate pH and pOH of 0.03 M NaOH solution.

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2. Calculate pH of following solutions :

(a) 0.1 M HCl

(b) 0.1 M H_2SO_4

(c) 0.1 M HNO_3

(d) 0.1 M NaOH

(e) 0.1 M KOH

(f) 0.1 M $Ba(OH)_2$

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3. Water add in 1.0 mL 0.1 M HCl solution to give 50 mL. Calculate pH change of solution.

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4. Calculate pH of the following: (a) 0.002 M HNO_3 and (b) 0.06 M H_2SO_4

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5. 100 mL NaOH solution pH = 10, So calculate $\left[OH^-\right]$.

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6. Calculation of hydrogen in concentration of following: (a) 0.001 M HNO_3 (b) 0.0001 M KOH

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7. Calculate $\left[H^+\right]$ in pH=12 and 5.6

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8. If $\left[H_3O^+\right] = 3.5 \times 10^{-8}$, So calculate $\left[OH^-\right]$ and pH of solution.

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9. How many gram NaOH dissolve to make 1 L NaOH solution containing 10.06 pH ?

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10. Which pH value is more in the following ?

(a) 0.1 M HCl and 0.1 M NaOH

(b) 0.1 M HCl and 0.01 M HCl

(c) 0.1 M NaOH and 0.01 M NaOH

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Section A Try Your Self 8

1. Calculate $\left[OH^{-}\right]$ and pH of 0.001 M = $\left[H^{+}\right]$ containing solution.

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2. $K_a = 1.4 \times 10^{-5}$ of propanoic acid. Calculate its pH of 0.1 M solution.

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3. 5% ionization is occur in 0.01 M CH_3COOH solution. Calculate its dissociation constant.

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4. Dimethyl amine $\left(CH_3\right)_2NH$ is weak base and its ionization constant 5.4×10^{-5}. Calculate $\left[OH^{-}\right]$, $\left[H_3O^{+}\right]$, pOH and pH of its 0.2 M solution at equilibrium.

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Section A Try Your Self 9

1. Dissociation constat of weak acid HA is 1.8×10^{-4} calculate Dissociation constant of its conjugate base A^-

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2. What will be the change in pH by adding of 0.1 M CH_3COONa in 0.1M CH_3COOH at 298K temperature ? (pK_a of CH_3COOH = 4.74)

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3. What will be the change in pH by adding of 0.1 M NH_4Cl in 0.1 M NH_4OH (weak base) solution ? (K_b of $NH_4OH = 1.77 \times 10^{-5}$)

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4. The ionization constant of benzoic acid is 6.5×10^{-5} at 298 K temperature. Calculate pH of its 0.15 M solution.

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5. K_a of CH_3COOH is 1.76×10^{-5} at 298 K temperature. Calculate dissociation constant of its conjugate base.

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6. 0.1 mol acetic acid and 0.1 mol sodium acetate in 500 mL solution pH is 4.74. Find ionization constant.

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7. The pH of 0.1 M HCN solution is 5.2 calculate K_a of this solution.

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8. Calculate the volume of 0.1 M NaOH required to compute neutralization 300 mL HCl having 2.25 pH.

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9. Calculate pH of 0.02 mL $ClCH_2COOH$. Its $K_a = 1.36 \times 10^{-3}$ calculate its pK_b.

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10. Calculate pH and degree of hydrolysis of 0.01 M CH_3COONa. $\left[K_h = 5.6 \times 10^{-10}\right]$

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11. Calculate K_h and pH of 0.1 M NH_4Cl solution . $\left[K_w = 1 \times 10^{-14}, K_{NH_4OH} = 1.75 \times 10^{-5}\right]$

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12. pH of NH_4Cl solution is = 5.28 calculate degree of hydrolysis of its 0.02 M solution.

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13. Calculate $\left[H^+\right]$ of 0.2 M HCN in 1 M KCN solution. $\left[K_{HCN} = 4 \times 10^{-10}\right]$

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Section A Try Your Self 10

1. The concentration of saturated solution of $Mg(OH)_2$ is $8.2 \times 10^{-4} gL^{-1}$ at 298 K temp. Then calculate its solubility product.

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2. At 298 K temp. the K_{sp} of $Mg(OH)_2$ is 1.8×10^{-11} . If the 0.1 M NaOH solution is added in it then what is the concentration of $Mg(OH)_2$? Calculate its solubility in water.

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3. The K_{sp} of $Mg(OH)_2$ is 1.0×10^{-12} . At which pH the 0.01 M $Mg(OH)_2$ begins to precipitate ? Calculate solubility.

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4. The 2.901 L saturated solution is formed by 0.08 g CaF_2 at 298 K temp. then calculate K_{sp} (Molecular moles of CaF_2 is 78 g mol^{-1})

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5. The K_{sp} of $Mg(OH)_2$ is 1.2×10^{-11} calculate its solubility in pure water.

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View Text Solution

6. The solubility product by Lead sulphate, $PbSO_4$ is 1.3×10^{-8} calculate its solubility in pure water. The molecular mass of $PbSO_4$ = 303 g mol^{-1}

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7. The K_{sp} of CaF_2 is 1.7×10^{-10}. Then what is the volume in mililitre of saturated solution of 10 miligram CaF_2 ? (Molecular mass of Ca (40), F(19)).

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8. At 298 K temp. the K_{sp} of CaF_2 is 1.7×10^{-10}. One person daily drinks 2.5 L saturated water by CaF_2. Then how much gram CaF_2 present in his body ? (Molecular mass of CaF_2 is 78 g mol^{-1})

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9. The pH of saturated solution of $Ca(OH)_2$ is 12.25. Then calculate its solubility product.

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10. The concentration of saturated solution of $Mg(OH)_2$ is 8.2×10^{-4} % w/V. Calculate its solubility product. Its molecular mass is 58.3 g mol^{-1}

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11. The solution is 2L of 0.02 M NaOH . The solubility product of $Zn(OH)_2$ is 4.5×10^{-17} . Then how many gram $Zn(OH)_2$ maximum soluble in given NaOH solution ?

View Text Solution

12. The solubility product of magnesium hydroxide $\left(Mg(OH)_2\right)$ is 1.2×10^{-11} .Calculate its solubility in pure water and 0.05 M NaOH.

View Text Solution

13. 0.08 g/2.901 L is a saturated solution of CaF_2 at 298 K temp. calculate K_{sp} of CaF_2.

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14. The K_{sp} of $BaSO_4$ is 1.1×10^{-10}, Will a precipitate form when equal volume of $2 \times 10^{-4} BaCl_2$ and $5.0 \times 10^{-3} MH_2SO_4$ solution are mixed ? Explain by calculation.

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15. The concentration of 500 ML NaOH solution is 0.02 M. How many grams of $FeSO_4$ added in this solution for precipitation of $Fe(OH)_2$? The K_{sp} of $Fe(OH)_2$ is 1.5×10^{-15}, Molecular mass of $Fe(OH)_2$ is 152 g mol^{-1})

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16. Predict whether a precipitate of PbI_2 will be formed or not on mixing 20 mL of 3×10^{-3} M $Pb\left(NO_3\right)_2$ solution with 80 mL of 2×10^{-3}M NaI solution. K_{sp} for lead iodide $\left(PBI_2\right)$ is 6.0×10^{-9} .

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17. If the $\left[F^-\right] = 2.0 \times 10^{-5}$ M in water. Then, how many gram of $CaCl_2$ will be added for precipitation of F^- ? K_{sp} for $CaF_2 = 1.7 \times 10^{-10}$. (Molecular mass of $CaCl_2 = 111g\ mol^{-1}$)

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18. $\left[Ag^{+}\right]$ in solution is 1×10^{-6} M then what is the concentration of Br^{-} ? K_{sp} of $AgBr = 4.0 \times 10^{-13}$.

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19. At 298 K temp., the solubility product for AgCl is 1.5×10^{-10} .Calculate its solubility in gram/Litre in pure water.

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20. The solubility of AgCl is $1.435 \times 10^{-5} gL^{-1}$ at $30^{\circ} C$ temp. then calculate its solubility product .

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21. The solubility of CaF_2 in water is 1.7×10^{-3} g/100 mL at 298 K temp. Calculate solubility product of CaF_2.

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View Text Solution

22. The K_{sp} of AgCl is 1.0×10^{-10} calculate solubility of AgCl in 0.2 M $AgNO_3$

View Text Solution

23. If this is passed in solution of 0.1 M Zn^{2+} and 0.01 M Cu^{2+} and concentration of S^{2-} made 8.1×10^{-31} M . Precipitation of ZnS and CuS will take place ? K_{sp} of ZnS=3.0×10^{-23} & K_{sp} of $CuS = 8.0 \times 10^{-34}$.

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24. K_{sp} of PbI_2 is 1.4×10^{-8} . The molecular mass of PbI_2 is 461 g mol^{-1} . Then molecular mass of $Pb\left(NO_3\right)_2$ is 331.9 mol^{-1} So, (a) In 500 mL water (b) 500 mL 0.10 M KI (c) What is the weight of PbI_2 when soluble in 1.33 g $Pb\left(NO_3\right)_2$ containing 500 mL solution ?

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25. There are equal volume of 0.02 M $CaCl_2$ and 0.00004 M Na_2SO_4 solution are mixed will a precipitation of $CaSO_4$? $K_{sp} = 2.4 \times 10^{-5}$

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Section B Objective Questions

1. What is equilibrium ?

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2. What is Irreversible Reactions ? Give examples.

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3. What is reversible reaction ? Give examples.

View Text Solution

4. State the factors affecting vapour pressure of solution.

View Text Solution

5. What is boiling point ?

View Text Solution

6. At constant temperature the vapour pressure of water, acetone and ether are respectively 23.3, 24.6 and 56 atm. state the order of boiling point.

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7. At 298 K temperature the vapour pressure of water, acetone and ether are 234, 24.80 and 56.8 kPa respectively. Which are less vaporizable ?

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8. Equilibrium can be attained in water and its vapour in open vessel ? Why ?

View Text Solution

9. Which system possess eqilibrium from the following ?

(i) Saturated solution of sugar in open cup.

(ii) At constant temperature mercury in thermometer and its vapour

(iii) boiling water in open vessel

(iv) floating ice in water at $0^{\circ} C$

(v) ice in water at $15^{\circ} C$.

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10. Is equilibrium establish in open vessel between vapour and water ? Why ?

View Text Solution

11. What is the effect of pressure on gas dissolve in liquid ?

View Text Solution

12. 5 mL water in watch glass and 10 mL in beaker which water will disappear first ? Why ?

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13. The boiling point of water at (i) sea shore (ii) 5000 ft. height is 373 K and 370 K respectively ? Why ?

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14. What is physical equilibrium ?

View Text Solution

15. In the equilibrium process of ammonia if deuterium is added than which new components are observed ?

View Text Solution

16. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ and $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$ what is indicates ?

View Text Solution

17. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ and $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$ If the volume of vessel is same them what can be predicted for equilibrium mixture ?

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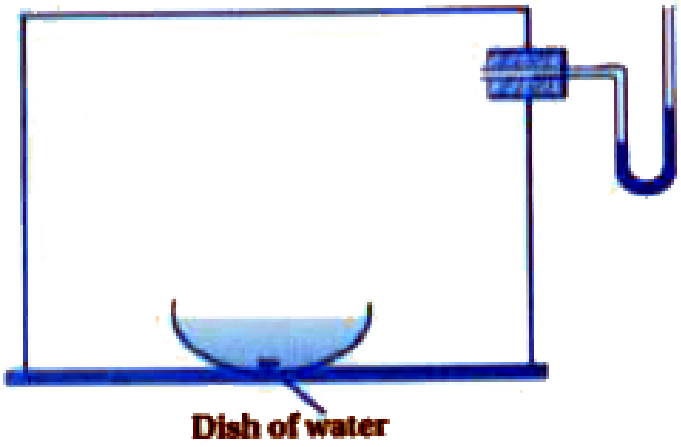
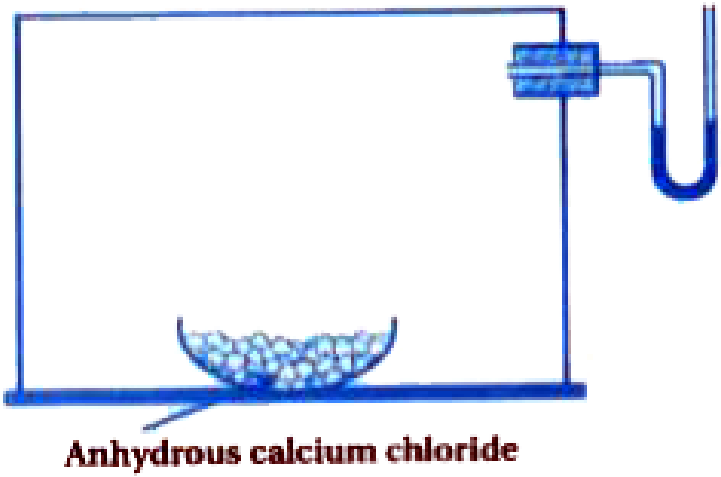
18. What indicated by following figure ?



View Text Solution

19. What indicated by figure ?



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20. In open vessel sugar solution $\Leftrightarrow \text{sugar}_{(s)}$ which information is obtained in this reaction ?

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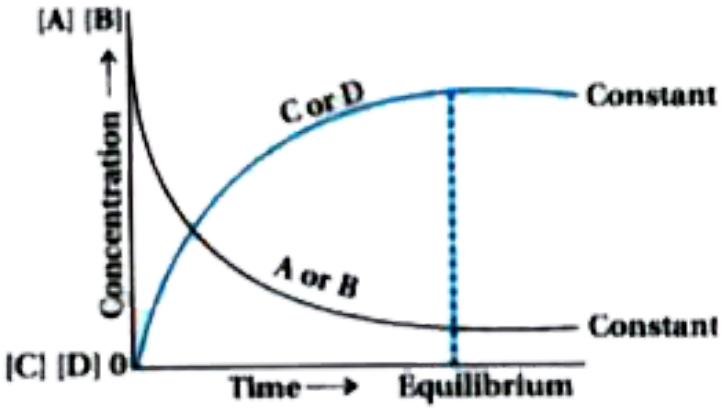
21. Which information give following figure ?



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22. What change observe when dihydrogen and dinitrogen taken in closed vessel ? Give its diagram.

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23. Give explanation of above figure.

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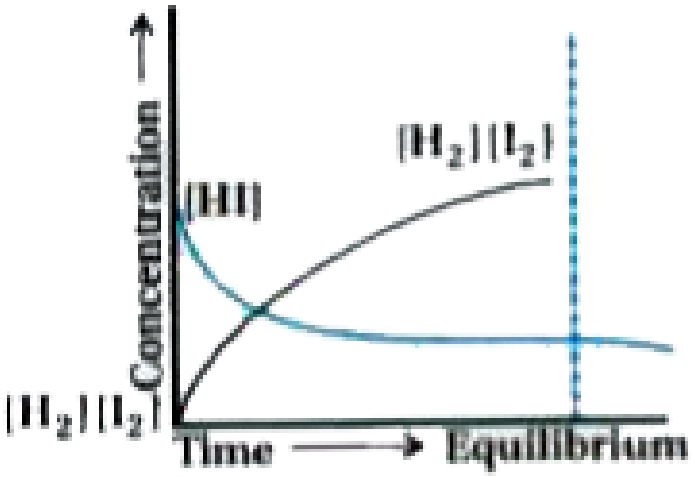
24. Which information obtained from following figure ?



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25. $H_2O_{(s)} \Leftrightarrow H_2O_{(l)}$ Explain.

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26. What is the standard pressure of atmosphere ?

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27. What is the meaning of the boiling point of water is $100^{\circ} C$?

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28. In a closed vessel the rate of solubility of sugar and rate of crystallization is same. What it indicate ?

View Text Solution

29. $NH_4Cl_{(s)} \Leftrightarrow NHCl_{(g)}$, this equilibrium is which physical reaction ?

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30. $H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$ (con. T, closed vessel) At this time what is the pressure of vessel ?

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31. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ in this equilibrium process what is the relation between K_c and K'_c.

View Text Solution

32. $\frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)} \Leftrightarrow HI_{(g)}$ in this equilibrium what is the relation between K_c and K'_c

View Text Solution

33. (i)$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

(ii)$\frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)} \Leftrightarrow HI_{(g)}$

(iii)$nH_{2(g)} + nI_{2(g)} \Leftrightarrow 2HI_{(g)}$

For these reactions the equilibrium constant is respectively $K_c(1), K_c(2)$ and $K_c(3)$ state their relation ?

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34. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ for this reaction $K_c = \frac{[HI]^2}{[H_2][I_2]} = 9$ what is the equilibrium constant for reverse reaction ?

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35. In $p = \left(\frac{n}{V}\right)RT$ explain the terms and derive p=cRT.

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36. In which equilibrium it will $K_p = K_c$.

(i)$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

(ii)$2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$

(iii)$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

(iv)$C_{(s)} + O_{2(g)} \Leftrightarrow CO_{2(g)}$

(v)$PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

(vi)$CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}$

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37. Derive the reaction between K_p and K_c in these three reactions.

(a)$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

(b)$2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

(c) $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$

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38. At 298 K temperature for this reaction $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}, K_p = 4.0 \times 10^{24}$ then at 500 K. What will be the value of K_p from these two value 2.5×10^{10} and 2.5×10^{-10} ?

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39. For reaction, $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}, K_c = 1.79\text{L mol}^{-1}$.Then at 500 K state the value of K_p with respect to R.

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40. In this reaction $CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}$ initially [CO]=0.1 M and at equilibrium [CO]=0.067 M so, in this reaction will $K_c > 0$ or $K_c < 0$?

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41. In this reaction $CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}$ initially [CO]=0.1 M and at equilibrium [CO]=0.067 M so, if K_c=4.24 than what will be the value of K_p ?

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42. State relation between K_p and K_c based on $\Delta n_{(g)} = 0, \Delta n_{(g)}$= positive and $\Delta n_{(g)}$ = negative.

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43. Which are heterogenous equilibrium ?

(i)$H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$

(ii)$Ca(OH)_{2(s)} + aq \Leftrightarrow Ca^{2+}_{(aq)} + 2OH^{-}_{(aq)}$

(iii)$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

(iv)$CH_3COOC_2H_{5(l)} + H_2O_{(l)} \Leftrightarrow CH_3COOH_{(l)} + C_2H_5OH_{(l)}$

(v)$Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \Leftrightarrow [Fe(SCN)]^{2+}_{(aq)}$

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44. Which are heterogenous equilibrium ?

state the unit of K_c.

(i)$H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$

(ii)$Ca(OH)_{2(s)} + aq \Leftrightarrow Ca^{2+}_{(aq)} + 2OH^{-}_{(aq)}$

(iii)$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

(iv)$CH_3COOC_2H_{5(l)} + H_2O_{(l)} \Leftrightarrow CH_3COOH_{(l)} + C_2H_5OH_{(l)}$

(v)$Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \Leftrightarrow [Fe(SCN)]^{2+}_{(aq)}$

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45. What is the difference between unit of K_p and K_c of any one reaction equilibrium ?

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46. Prediction of amount of products and reactants on the base of vale of equilibrium constant of the following reactions at constant temperature.

(a)$H_{2(g)} \Leftrightarrow 2HI_{(g)}, K_c$=57.0

(b)$N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}, K_c = 4.64 \times 10^{-3}$

(c)$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}, K_c = 4.8 \times 10^{-31}$

(d) $H_{2(g)} + Cl_{2(g)} \Leftrightarrow 2HCl_{(g)}, K_c = 4.0 \times 10^{31}$

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47. (a) Give relation of value of K and amount of products Reactants. (b) Give relation of value of $\Delta n_{(g)}$ and value of K_p and K_c.

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48. Write relation of value of Q_c and K_c and direction of reaction.

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49. How can the spontaneity of reaction determine by the value of ΔG^0 ?

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50. Give expression of equilibrium constant of following reactions.

(i)$2Ag_{(s)} + Cu^{2+}_{(aq)} \Leftrightarrow Cu_{(s)} + 2Ag^{+}_{(g)}$

(ii)$O_{2(g)} + 4HCl_{(g)} \Leftrightarrow 2H_2O_{(g)} + 2Cl_{2(g)}$

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51. Give units of equilibrium constant of following reactions.

(i)$2Ag_{(s)} + Cu^{2+}_{(aq)} \Leftrightarrow Cu_{(s)} + 2Ag^{+}_{(g)}$

(ii)$O_{2(g)} + 4HCl_{(g)} \Leftrightarrow 2H_2O_{(g)} + 2Cl_{2(g)}$

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52. In close vessel the reaction $A_{(s)} \Leftrightarrow 4B_{(g)} + 3C_{(g)}$ is in equilibrium. If the partial pressure of C is double then what will be the partial pressure of B?

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53. The hydrolysis reaction of ethyl acetate

$CH_3COOC_2H_{5(l)} + H_2O_{(l)} \Leftrightarrow CH_3COOH_{(l)} + C_2H_5OH_{(l)}$

Is this reaction get equilibrium in open vessel ?

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54. Is this decomposition reaction of $CaCO_3$ get equilibrium in open vessel ?

$CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

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55. Write equilibrium constants of following reactions.

(1)$2PCl_{3(g)} + O_{2(g)} \Leftrightarrow 2POCl_{3(g)}$

(2)$2SO_{3(g)} \Leftrightarrow 2SO_{2(g)} + O_{2(g)}$

(3) $H_2O_{(g)} + Cl_2O_{(g)} \Leftrightarrow 2HOCl_{(g)}$

(4) $CuSO_{4(s)} + 5H_2O_{(s)} \Leftrightarrow CuSO_{4(s)} + 5H_2O_{(g)}$

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56. Arrange following reaction in decreasing order on its completion.

(i)$H_{2(g)} + Br_{2(g)} \Leftrightarrow 2HBr_{(g)} \quad K_c = 2 \times 10^9$

(ii)$2CH_{4(g)} \Leftrightarrow C_2H_{6(g)} + H_{2(g)} \quad K_c = 8.5 \times 10^{-12}$

(iii)$CH_3OH_{(g)} + H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)} \quad K_c = 2.6 \times 10^{21}$

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57. Which of the following reaction will be least forward ?

(i)$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}, K_c = 4.8 \times 10^{-31}$ at 298 K

(ii)$Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \Leftrightarrow [Fe(SCN)]^{2-}, K_c = 140$ at 298 K

(iii)$H_{2(g)} + Cl_{2(g)} \Leftrightarrow 2HCl_{(g)}, K_c = 5 \times 10^{31}$ at 298 K

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58. At 673 K temperature for reaction $SO_{2(g)} + NO_{2(g)} \Leftrightarrow NO_{(g)} + SO_{3(g)}, K_c = 85$ and $Q_c = 1\ 14.8$, then to get equilibrium the reaction occurs in which direction ?

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59. At 298 K for the reaction $H_{2(g)} + J_{2(g)} \Leftrightarrow 2HJ_{(g)}$ the K_c is 50.0. And for this reaction at any one state Q_c is 8.4 then reaction moves in which direction.

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60. What is the importance of Le-chatelier's principle ?

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61. Write annual production and uses of ammonia in the world ?

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62. Which factors are affect and not affected to equilibrium ?

View Text Solution

63. In $H_{2(g)} + I_{2(g)}$ (violet) $\Leftrightarrow 2HI_{(g)}$ if H_2 is added than at new equilibrium concentration and colour will be ....

View Text Solution

64. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI$ in this equilibrium if H_2 is added than state the direction of reaction and explain it with help of Q_c.

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65. In the production of ammonia to complete the reaction (increase production) what should be done ?

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66. CaO is important in construction. It is obtained by heat in, $CaCO_3$. To get CO_2 why CO_2 is contentiously removed ?

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67. 0.002 M potassium thiocyanate added to 1 mL 0.2 M Fe (III) nitrate than what happen ?

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68. The oxalic acid is added in test tube and this reaction $Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \Leftrightarrow [Fe(SCN)]^{2+}_{(g)}$ equilibrium, steered and remain the solution than what will the change in colour of solution ?

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69. What is the reaction to increase the intensity of red colour by adding $HgCl_2$ positive in equilibrium of red colour by adding $HgCl_2$ positive in equilibrium of

$Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \Leftrightarrow [Fe(SCN)]^{2+}_{(aq)}$

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70. What will be the effect on concentration by decrease the volume of vessel containing $CO_{(g)} + 3H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)}$?

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71. In the equilibrium $CO(g) + 3H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)}$ if the volume made half than what is the effect on K ? Why ?

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72. Explain the effect on value of Q_c by decrease the volume of $CO_{(g)} + 3H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)}$ reaction vessel.

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73. What changes in pressure is sufficient to increase the products of this $C_{(s)} + CO_{2(g)} \Leftrightarrow 2CO_{(g)}$ reaction ?

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74. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ If argon introduce in this reaction than what happen ?

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75. $\left[Co\left(H_2O\right)_6\right]^{3+}_{(aq)} + 4Cl^-_{(aq)} \Leftrightarrow \left[CoCl_4\right]^{2-}_{(aq)} + 6H_2O$ this reaction is endothermic and if blue colour is due to $CoCl^{2-}_{4(aq)}$. If this mixture kept in ice than what happen ?

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76. $\left[Co\left(H_2O\right)_6\right]^{3+}_{(aq)} + 4Cl^-_{(aq)} \Leftrightarrow \left[CoCl_4\right]^{2-}_{(aq)} + 6H_2O$ this reaction is endothermic and if blue colour is due to $CoCl^{2-}_{4(aq)}$. If this mixture kept in ice than What happened when reaction vessel of is kept in $80^\circ C$ containing water ?

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77. $N_{2(s)} + 3H_{2(g)} \Leftrightarrow 2NH_3$ state the condition for industrial production of ammonia.

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78. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}, \Delta H = -92.38 \text{kJ mol}^{-1}$ the reaction is exothermic. So at lower temperature more product is obtained still why the reaction is carried out at high temperature ?

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79. What is the effect of catalyst on composition of system and the value of K ?

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80. $2NO_{2(g)}$ (brown) $\Leftrightarrow N_2O_{4(g)}$, ΔH=57.2 kJ mol^{-1} if the reaction vessel kept in ice and hot water than what is the change in colour ?

View Text Solution

81. $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$, $\Delta_r H^{\ominus}$=180 kJ .To increase the temperature of this reaction, what is the effect on products and value of K?

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82. If the saturated solution of NH_4Cl is heated than what happen ? This solution is endothermic.

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83. What happen if the saturated solution of $CaCl_2$ is heated ? The process is exothermic.

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84. Solid NaOH dissolve in water and if solution is stirred than temperature of solution increases. Now the heating of this solution is suitable ?

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85. At definate temperature. The reaction, $SO_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow SO_{3(g)} \Delta H$ =-94.7 kJ is in closed vessel. The equilibrium will be go in which direction by following changes ?

(i) Increase temperature (ii) Addition of catalyst (iii) addition of SO_2 gas (iv) To decrease total pressure (v) If volume of vessel will increase (vi) Addition He gas at constant volume (vii) addition He gas at constant pressure.

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86. Which temperature and pressure will be to obtain more products in the following reaction ? Explain by Le-Chatelier principle.

(i)$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}, \Delta H = -93.8 \text{kJ mol}^{-1}$

(ii)$H_{2(g)} + CO_{2(g)} \Leftrightarrow CO_{(g)} + H_2O_{(g)}, \Delta H = +41 \text{kJ mol}^{-1}$

(iii)$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}, \Delta H$=175 kJ

(iv)$CO_{(g)} + 2H_{2(g)} \Leftrightarrow CH_3OH_{(g)}, \Delta H = -92.0 \text{kJ mol}^{-1}$

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87. (i)$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$

(ii)$2NO_{(g)} \Leftrightarrow N_{2(g)} + O_2$ In these , the equilibrium constant are K_1 and K_2 at definate temperature then give relation if K_1 and K_2 ?

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88. In the reaction $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$, the equilibrium is established by to take first Cl_2 then decomposition of PCl_5 will be increase or decrease ?

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89. What is electrolyte ? Give examples.

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90. What is non-electrolyte ?

View Text Solution

91. Give classification of substances according to Faraday.

View Text Solution

92. Classify following substances in non electrolyte, strong electrolytes and weak electrolytes.

(i)NaCl , (ii) Sugar , (iii) Glucose , (iv)CH_3COOH , (v)CH_3COONa , (vi)HCl , (vii)HNO_3 , (viii)NH_3 , (ix)NaOH

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93. What is strong electrolyte ? Give examples.

View Text Solution

94. What is weak electrolyte ? Give examples.

View Text Solution

95. What is ionic equilibrium ?

View Text Solution

96. Which are the source of the following acid or present in our body ?

(i) Hydrochloric acid (ii) Acetic acid (iii) Ascorbic acid (iv) cytric acid (v) Tartaric acid

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97. Give examples of salts which obtain from nature.

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98. Classify following in acid, base and salt.

HCl, NaOH, NH_3, Na_2CO_3, CH_3COOH, HCOOH, NaCl , KOH, $BaSO_4$, $NaNO_3$, HF, H_2SO_4, $HClO_4$, Calcium hydroxide , orange juice , nitrous acid , HCN, NaCN , NH_4OH , $C_6H_5NH_2$, CH_3NH_2, $CO\left(NH_2\right)_2$, Sucrose CH_3COONa, NH_4Cl, CH_3COONH_4, $Zn_3\left(PO_4\right)_2$, H_3PO_4 etc.

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99. Explain distance of Acid and Base on the base of primary properties.

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100. Degree of ionization depends on which factor.

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101. Give difference of disscriation and ionization.

View Text Solution

102. Give information about universal solvent.

View Text Solution

103. When NaCl dissolve in water than what change observe in electrostatic force ? Why ?

View Text Solution

104. Give similarity and difference of dissociation of Hydrochloric acid and acetic acid in water.

View Text Solution

105. According to Arrhenius, what is acid and base ?

View Text Solution

106. Give limitations of Arrhenious acid-base concept.

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107. What is Bronsted Lowry base ?

View Text Solution

108. Give conjugate Acid and conjugate base of following:

(i)NH_3, (ii)H_2O , (iii)HCO_3^- , (iv)HSO_4^- (v)CH_3COOH, (vi)C_6H_5OH , (vii) HPO_4^{2-} , (viii)$C_6H_5NH_2$, (ix)NH_2NH_2 ,(x)$HC_2O_4^-$

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109. Which of the followings are Lewis acids ?

H_2O, BF_3, H^+, NH_4^+

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110. What will be the conjugate base for the Bronsted acids : HF, H_2SO_4 and HCO_3^-

View Text Solution

View Text Solution

111. Write the conjugate acids for the bronsted bases. NH_2^-, NH_3 and $HCOO^-$

View Text Solution

112. The species H_2O, HCO_3^-, HSO_4^- and NH_3 can act both as Bronsted acids an bases. For each ase give the corresponding conjugate acid and base.

View Text Solution

113. What is conjugate acid and conjugate base ? Give example.

View Text Solution

114. According to lewis what is acid and base ?

View Text Solution

115. Identify Lewis acid and Lewis base in the following

$NH_3, BF_3, N^+O_2, Co^{3+}, Mg^{2+}, H_2O, OH^-, Cl^-, C_6H_5NH_2, AlCl_3, FeCl_3, BCl_3, C$

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116. Write self ionization reaction and ionic product of water.

View Text Solution

117. What is effect of temperature on value of K_w and pH ?

View Text Solution

118. What is the relation of pH and pOH ?

View Text Solution

119. Which is the pH of 10^{-8} M HCl from 8.0, 7.0, 6.95 ? Why ?

View Text Solution

120. Which is the pH of 10^{-8} M NaOH from 8.0, 6.0 and 7.05 ? Why ?

View Text Solution

121. In which range the value of pH and pOH of aqueous solution.

View Text Solution

122. What is the pH of 1M HCl ?

View Text Solution

123. Which are the methods for measurement of pH ?

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124. If the change in pH value is 2 unit then what is the change in concentration of H^+ ?

View Text Solution

125. What is the concentration of pure water and ions ?

View Text Solution

126. In self ionization of water the equilibrium is in which direction ?

View Text Solution

127. Indicators HIn weak acids, Give expression of its equilibrium reaction in water and equilibrium constant.

View Text Solution

128. Which of the following bases are strong or weak than water ?

$ClO_4^-, Cl^-, Br^-, I^-, NO_3^-, HSO_4^-$

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129. $NO_2^-, F^-, H^-, CH_3COO^-$ like weak acid's strength of their conjugate base is more than water or less than water ?

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130. Classify following in strong and weak acid.

$HClO_4, HCN, HI, HBr, CH_3COOH, H_2S, H_3PO_4, HNO_3, HNO_2$

View Text Solution

131. Classify following in strong and weak base.

$NaOH, KOH, Mg(OH)_2, Cu(OH)_2, Al(OH)_3, CsOH, Ba(OH)_2, Ca(OH)_2$

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132. Classify the following pH containing solution in Acid, Base and Neutral.

(a) 7.0 (b) 7.9 (c) 9.0 (d) 2.0 (e) 6.9

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133. Which type of value are $\left[H^+\right]$, $\left[OH^-\right]$, pH and pOH in acidic solution ?

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134. Give value of $\left[H^{+}\right]$, $\left[OH^{-}\right]$, pH and pOH of neutral solution.

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135. At 298 K temperature, there are acids and its K_a value are as under.

$HF\left(3.5 \times 10^{-4}\right)$, $CH_3COOH\left(1.74 \times 10^{-5}\right)$, $HClO\left(3.0 \times 10^{-8}\right)$, $C_6H_5OH\left(1.3 \times 1\right.$

Arrange these acids in decreasing order of their acidic strength.

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136. What indicate the value of K_a ? What is its dimension ?

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137. What is indicated by the value of K_a ?

View Text Solution

138. If the degree of ionization (dissociation) of weak acid is α , then write the equation of ionization constat.

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139. What is pK_a, pK_b and pK_w ? Give its relation.

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140. What is the [HF] in 0.02 M HF solution ?

View Text Solution

141. In 0.1 M HA the $\left[H^+\right] = 3.16 \times 10^{-5}$ M, then what is [HA] and $\left[A^-\right]$?

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142. For one solution, $K_a = 1.0 \times 10^{-8}$ then what is the pK_a and PK_b of the solution ?

View Text Solution

143. Give equation of percentage of dissociation of weak acid.

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144. $\left[H^+\right] = 1.41 \times 10^{-3}$ M in 0.08 M solution of HOCl . Then what is the percentage of dissociation of it ?

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145. Write equation of ionization constant of weak base MOH.

View Text Solution

146. What is the derivatives of ammonia ? Give example.

View Text Solution

147. Give ionic equilibrium of aqueous solution of weak base NH_2NH_2 and pyridine C_6H_5N.

View Text Solution

148. Write ionic equilibrium reactions of aqueous solution of weak acid HNO_2 and HClO.

View Text Solution

149. If $\left[H^+\right] = 1.67 \times 10^{-10}$ M in solution than calculate $\left[OH^-\right]$.

View Text Solution

150. Weak base $K_b = 8.96 \times 10^{-7}$ than what is the pK_b ?

View Text Solution

151. Give reaction between K_a and K_b

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152. Which is the conjugate acid of weak base NH_3 ?

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153. (i)$NH_4^+ + H_2O \Leftrightarrow NH_3 + H_3O^+$ equilibrium constant = K_1

(ii)$NH_3 + H_2O \Leftrightarrow NH_4^+ + OH^-$ equilibrium constant = K_2

Than write reaction and equilibrium constant obtain by addition of these two reaction.

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154. The equilibrium constant of one reaction = K(1) and equilibrium constant of one reaction =K(2) then what is the equilibrium constant of reaction (3) obtain by addition of these two reaction ?

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155. K_a of NH_4^+ acid is 1.77×10^{-5}. Then give the equation and ionization constant of its conjugate base.

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156. There is a $K_a(1)$ and $K_2(2)$ of sulphuric acid and H_2SO_3 are 1.7×10^{-2} and 6.4×10^{-8} respectively then calculate ionization constant of complete ionization of H_2SO_3.

View Text Solution

157. The ionization constant of weak acid H_3PO_4 in three step are respectively $K_a(1), K_a(2)$ and $K_a(3)$. Give increasing order of these constant. Give reason.

View Text Solution

158. What is the increasing order of acidic strength of the following acid ? Give reason

HI, HCl, HF, HBr.

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159. Explain the increasing order of acidic strength of following acids. HF, NH_3, H_2O and CH_4.

View Text Solution

160. Which is the less strong acid from H_2S and H_2O ? Why?

View Text Solution

161. Give factors acidic affects the strength of acids.

View Text Solution

162. Explain concentration of HA, CH_3COO^-, H^+, Na^+ when 0.05 M sodium acetate is added in 0.05 M acetic acid.

View Text Solution

163. 0.01 M NH_3 and (0.01 M of 50 mL NH_3) + (0.01 M, 25 mL H) from these two solution which has pH more ?

View Text Solution

164. Classify the following salt solution in acid, base and neutral.

$NaCl, KNO_3, FeCl_3, CuSO_4, CH_3COONa, HCOOK, CH_3COONH_4, CrCl_3, K_2SO_4$

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165. Which positive and negative ion containing solution are acidic (pH < 7) ?

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166. The salts of which +ve and -ve ions are basic ?

View Text Solution

167. The salts of which ions always neutral ? (pH = 7)

View Text Solution

168. Write equation for calculate of pH of weak acid and weak base salt solution.

View Text Solution

169. What is the reaction of concentration of solution and degree of hydrolysis ?

View Text Solution

170. Why the pH of blood is definate ?

View Text Solution

171. Give reason : "Why the pH of a buffer solution does not change on dilution ?

View Text Solution

172. What is the pH of acidic buffer ? How it is formed ?

View Text Solution

173. What is the pH of basic buffer ? How it is prepared ?

View Text Solution

174. Write equation $\left[H^{+}\right]$ and p^{Ka} of acid buffer.

View Text Solution

175. Write the equation of Henderson Hassel balch.

View Text Solution

176. What indicate the $\frac{[A^-]}{[HA]}$

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177. The solution of $(CH_3COOH + CH_3COONa)$ will be acidic, basic or neutral ? Give the equation to calculate its pH.

View Text Solution

178. What is the pH of mix solution of ammonia and ammonium chloride ? Give equation.

View Text Solution

179. For acidic buffer pH and pK_a an same? Why ?

View Text Solution

180. What is the value of pH and pK_b of mix solution of ammonium hydroxide and ammonium chloride ? Why ?

View Text Solution

181. Write ionization reaction of diprotic acid in aqueous solution.

View Text Solution

182. OH^- ions are in acidic solution and H_3O^+ ions an in basic solution available is it true ? Explain.

View Text Solution

183. What is the value of $\left[H_3O^+\right]$ and $\left[OH^-\right]$ of pure water at 298 K temp. ?

View Text Solution

184. What is the difference in pH when adding of common ion (conjugate base) in weak acid ?

View Text Solution

185. In pH increase of decrease by adding solution of conjugate acid in silute solution of weak base ?

View Text Solution

186. The salt solution NH_4OH and HCl is acidic basic or neutral ?

View Text Solution

187. Write the equation for calculation of hydrolyses constant of salt of weak acid weak base solution.

View Text Solution

188. If $K_h = \frac{\left[H_3O^+\right]^2}{C}$ then write the type of salt.

View Text Solution

189. Which will be hydrolyse of the following in aqueous solution ?

$Cl^-, CH_3COO^-, NO_3^-, Cu^{2+}, CN^-, CH_3NH_3^+, SO_4^{2-}, Na^+, K^+, Mg^{2+}, PO_4^{3-}$

View Text Solution

190. Two different acid HA and HX have same pH than their concentration is same ? Why ?

View Text Solution

191. Explain : 'Sodium carbonate solution is basic.'

View Text Solution

192. The self ionization of water is endothermic. While increase the temp. than what is the effect on pH and value of K_w ?

View Text Solution

193. Which of the following are not hydrolysed ?

$MgCl_2, CuCl_2, HCl, CCl_4, AlCl_3, PCl_5$

View Text Solution

194. Classify the following salts on the base of solubility.

View Text Solution

195. What are hydrogroscopic substance ? Give example

View Text Solution

196. Which factors the solubility of substance is depends on ?

View Text Solution

197. What is the solubility product $\left(K_{sp}\right)$?

View Text Solution

198. Write ionic equilibrium and equation of solubility product of concentrated solution of Barium sulphate $\left(BaSO_4\right)$.

View Text Solution

199. The solubility of $BaSO_4$ is 5 mol L^{-1} then what is the solubility product ?

View Text Solution

200. Derive the equation of relation of solubility (S) of zirconium phosphate $Zr_3\left(PO_4\right)_4$ and K_{sp} solubility product.

View Text Solution

201. The solubility product of $BaSO_4$ is 1.1×10^{-10} at 298 K temp. calculate its water solubility.

View Text Solution

202. When Q_{sp} is used ?

View Text Solution

203. If $K_{sp} = Q_{sp}$ than what it indicate ?

View Text Solution

204. What indicate if $Q_{sp} \neq K_{sp}$?

View Text Solution

205. What happen if HCl gas passed in NaCl solution ?

View Text Solution

206. Give use of common ion effect in quantitative analysis.

View Text Solution

207. In preparation of $Fe(OH)_3$ from $FeCl_3$ first NH_4Cl is added and than NH_4OH is added ? Why ?

View Text Solution

208. What is the ionic product Q_{sp} ? Explain by example.

View Text Solution

209. AgCl is sparingly soluble salt ? If NaCl or KCl is added into it ? What happen ?

View Text Solution

210. For metal sulphide K_{sp} of CuS, CdS, ZnS and MnS respectively $1 \times 10^{-44}, 1 \times 10^{-28}, 1 \times 10^{-22}$ and 1×10^{-14} one mixture of solution of Cu^{2+}, Cd^{2+} and Mn^{2+}. In this solution H_2S gas passed than which one precipitate last.

View Text Solution

211. In qualitative analysis Cu^{2+}, Cd^{2+} and Pb^{2+} ions are precipate out as sulphide of 2nd group an Ni^{2+}, Zn^{2+}, Mn^{2+} are precipate out as sulphide group and of 3rd B group. In this analysis the reactant HCl + H_2S and $NH_4Cl + NH_4OH + H_2O$ successively added. What is the reason for that ?

View Text Solution

212. If $NH_4Cl + NH_4OH + \left(NH_4\right)_2CO_3$ Successively added than the solution is acidic or basic ?

View Text Solution

213. Give equilibrium and equilibrium constant of aqueous solution of H_2S which used in analysis ?

View Text Solution

214. The K_{sp} of $PbSO_4$ is 1.44×10^{-8} then calculate concentration of Pb^{2+}.

View Text Solution

215. In saturated solution at definite temperature how the ions are arrange ?

View Text Solution

216. If the KCN and HCN are present in aqueous solution then write equation of equilibrium constant.

View Text Solution

217. Give equation of Hydrolysis constant of NH_4Cl and CH_3COONa.

View Text Solution

218. Which Q_{sp} will be high from 0.0001 M $BaCrO_4$ and 0.0001 M Ag_2CrO_4 ?

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219. The K_{sp} of $BaSO_4$ is 1.0×10^{-9} .Then What is the solubility of it in 0.1 M $MgSO_4$ and 0.01 M $BaCl_2$?

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220. K_{sp} of PbI_2 is 1×10^{-8} .Then what is the solubility of PbI_2 in 0.1 M KI ?

View Text Solution

221. Between Cl^- and OH^- which is stronger base ?

View Text Solution

222. Which ion will be hydrolyse in NH_4Cl solution ?

View Text Solution

223. What is the reason, why the degree of hydrolysis is not present in CH_3COONH_4 solution ?

View Text Solution

224. The concentration of $Ag_2Cr_2O_7$ is 6.5×10^{-5} M in concentrated solution of $Cr_2O_7^{2-}$ at a temp. then calculate $K_2Cr_2O_7$

View Text Solution

225. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$, The K_p of this reaction is 35 at 500 K temp. Calculate K_p of following reaction at this temp.

(i)$4NH_{3(g)} \Leftrightarrow 2N_{2(g)} + 6H_{2(g)}$

(ii)$\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \Leftrightarrow NH_{3(g)}$

View Text Solution

226. Explain : BF_3 is Lewis acid but not Bronsted Lawry acid.

View Text Solution

227. NH_3 is not as Lewis and Bronsted-Lawry Base. Explain.

View Text Solution

228. At 60° temperature $H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$. What is the value of equilibrium constant K_p of reaction ? At 60° temperature vapour pressure of water is 0.185 bar.

View Text Solution

229. At definite temperature if the volume of system decrease then what will be change in concentration of CO ?

$2CO_{(g)} + O_{2(g)} \Leftrightarrow 2CO_{(g)}$

View Text Solution

230. Give relation between K_{sp} of $Ca_3\left(PO_4\right)_2$ and S .

View Text Solution

231. Equal concentration possessing solution $CH_3COONa, HNO_3, NH_4Cl, KI$ arrange in decreasing order of pH.

View Text Solution

232. What is the shape of H_3O^+ ?

View Text Solution

233. If the solubility of As_2S_3 is S then what is the K_{sp} ?

View Text Solution

234. Which are the colour of $\left[CoCl_4\right]^{2-}$ and $\left[Co\left(H_2O\right)_6\right]^{2+}$ complex ion ?

View Text Solution

235. Which is the colour of $[Fe(SCN)]^{2+}$ complex ion ?

View Text Solution

236. What is the pH of 0.005 M H_2SO_4 solution ?

View Text Solution

237. What is the pH of 0.005 M $Ba(OH)_2$?

View Text Solution

238. What is the active mass of water ?

View Text Solution

239. The solution which has constant pH, is known as ?

View Text Solution

240. NH_3 is act as Lewis base in it. Which atom is electron pair donor ?

View Text Solution

241. What is the pH of $10^{-8} \text{mol L}^{-1}$ HCl form 8, 6.5 and 7.5 ? Why ?

View Text Solution

242. Why the pH $\neq 2.0$ of 1×10^{-2} acidic acid ?

View Text Solution

243. The solubility of AgCl in water and 0.1 NaCl, in which one it is more ?

View Text Solution

244. What are the uses of solubility product ?

View Text Solution

245. What is the pH of 0.02 M HCl ?

View Text Solution

246. The K for the reaction A + B ⇔ C + D is at $25^\circ C$ temperature is 2×10^{-23} and At $50^\circ C$ temperature 2×10^{-12} this reaction will be endothermic or exothermic ?

View Text Solution

247. What is the difference between ionic product and solubility product ?

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Section C Mcqs Darpan S Exam Oriented Mcqs

1. Which is a homogeneous equilibrium of the following ?

A. $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$

B. $H_2O_{(s)} \Leftrightarrow H_2O_{(l)}$

C. $SO_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow SO_{3(g)}$

D. $H_2O_{(l)} \Leftrightarrow H_2O_{(s)}$

Answer: C

View Text Solution

2. Which is a Lewis acid of the following ?

A. NH_3

B. C_6H_5COOH

C. H_2O

D. $BeCl_2$

Answer: D

View Text Solution

3. According to which theory, NH_3 is not a base ?

A. Lewis

B. Arrhenius

C. Bronsted-Lowry

D. Ionization

Answer: B

View Text Solution

4. In the following which situation precipitation will be occurs ?

A. $Q_{sp} = K_{sp}$

B. $Q_{sp} > K_{sp}$

C. $Q_{sp} < K_{sp}$

D. None of these

Answer: B

View Text Solution

5. What is the effect of catalyst on equilibrium constant ?

A. Increase

B. Decrease

C. No effect

D. Increase and decrease

Answer: C

View Text Solution

6. What is the value of K_p for decomposition of NH_4HS ? P = Total pressure

A. $K_p = P$

B. $K_p = \frac{P}{2}$

C. $\frac{P}{4}$

D. $\frac{P^2}{4}$

Answer: D

View Text Solution

7. Which is the equation showing the relation between K_p and K_c ?

A. $K_p = K_c(RT)^{\Delta n}$

B. $K_p = K_c R^n$

C. $K_p = K_c(PT)^{\Delta n}$

D. $K_p = K_c(RT)^{-\Delta n}$

Answer: A

View Text Solution

8. Which of the following reaction has $K_p = K_c$?

A. $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$

B. $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

C. $CH_3COOC_2H_{5(l)} + H_2O_{(l)} \Leftrightarrow CH_3COOH_{(l)} + C_2H_5OH_{(l)}$

D. $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$

Answer: A

View Text Solution

9. For spontaneous reaction what is the value of ΔG ?

A. For spontaneous reaction what is the value of

B. Negative

C. Zero

D. Any

Answer: B

View Text Solution

10. If the $\Delta G^\circ < 0$, then what is the value of $-\Delta G^\circ / RT$?

A. Zero

B. Positive

C. Negative

D. All

Answer: B

View Text Solution

11. Which is the conjugate acid of H_2SO_4 ?

A. HSO_4^-

B. H_3O^+

C. $H_3SO_4^+$

D. SO_4^{2-}

Answer: C

View Text Solution

12. Which of the following reaction occurs during Lewis acid-base reaction ?

A. Exchange of proton

B. Exchange of electron

C. Exchange of electron pair

D. Exchange of OH^-

Answer: C

View Text Solution

13. What is the pH value of human blood ?

A. 7.4

B. 8

C. 6.4

D. 8.4

Answer: A

View Text Solution

14. The acurate value of pH is measure by which instrument ?

A. Ameter

B. 2

C. pH paper

D. Calary meter

Answer: C

View Text Solution

15. The solution of salt of $\left(HCl + NH_4OH\right)$ is ____

A. Acidic

B. Basic

C. Neutral

D. Protic

Answer: A

View Text Solution

16. Which of the following is the pH of hydrogen ?

A. 7

B. More than 7

C. Less than 7

D. p^4

Answer: C

View Text Solution

17. Which is the conjugate base of $H_2PO_4^-$?

A. PO_4^{3-}

B. HPO_4^{2-}

C. H_3PO_4

D. H_4PO_4

Answer: B

View Text Solution

18. Which of the following is right for CO_2 ?

A. It is a Lewis acid.

B. It is a Lewise base.

C. It is a Bronsted acid.

D. It is a Bronsted base.

Answer: A

View Text Solution

19. Which of the following is not Lewis acid ?

A. $AlCl_3$

B. $SnCl_4$

C. BCl_3

D. $BeCl_2$

Answer: B

View Text Solution

20. In reaction $H_2 + I_2 \Leftrightarrow 2HI$, at equilibrium the concentration of products is double than reactants then what is the value of K_c ?

A. 2

B. 4

C. $\frac{1}{4}$

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

Answer: B

View Text Solution

21. Which type of mix solution $Ba(OH)_2$ of 20 ml 0.01 M H_2SO_4 and 20 ml 0.01 M ?

A. Neutral

B. Acidic

C. pH < 7

D. Basic

Answer: A

View Text Solution

22. At 298 K temperature, the sugar is added in open cup and stirred the solution then some amount of sugar remain undissolved then which type of equilibrium is it ?

A. Physical equilibrium

B. Chemical equilibrium

C. Homogeneous cquilibrium

D. Hetrogeneous equilibrium

Answer: A::D

View Text Solution

23. In close vessel at 298 K temperature, the water vapour pressure is 25 mm. Then which equilibrium is it ?

A. Homogeneous equilibrium

B. Hetrogeneous equilibrium

C. Chemical equilibrium

D. Ionic equilibrium

Answer: B

View Text Solution

24. Which of the following use for mesurement of mass of D_2 and ND_3 ?

A. Ferometer

B. pH meter

C. Spectrometer

D. Ameter

Answer: C

View Text Solution

25. If $K_c = \left[CO_2\right]$ then which is the following equilibrium ?

A. $C_{(s)} + O_{2(g)} \Leftrightarrow CO_{2(g)}$

B. $CO_{(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow CO_{2(g)}$

C. $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}$

D. $CaO_{(s)} + CO_{2(g)} \Leftrightarrow CaCO_{3(s)}$

Answer: C

View Text Solution

26. Which of the following expression for equilibrium constant of the reaction $2N_2O_{(g)} + O_{2(g)} \Leftrightarrow 4NO_{(g)}$?

A. $\frac{[N_2][O_2]}{[NO]^4}$

B. $\frac{[NO]^4}{[N_2O]^2[O_2]}$

C. $\frac{[N_2O]^2[O_2]}{[NO]^4}$

D. $\frac{[NO]^4}{[N_2O]}$

Answer: B

View Text Solution

27. In reaction $X_{(s)} \Leftrightarrow 4Y_{(g)} + 3Z_{(g)}$, If in this equilibrium do the partial pressure of Z double then partial pressure of Y is....

A. $2\sqrt{2}$ times of actual pressure.

B. $\frac{1}{2}$ times of initial pressure.

C. 2 times of initial pressure.

D. $\frac{1}{2\sqrt{2}}$ times of initial pressure.

Answer: D

View Text Solution

28. The K_{sp} of AgBr is 1×10^{-10} at $25^{\circ}C$ temperature then what is the value of $\left[Ag^{1}\right]$ In saturated solution ?

A. 10^{-4}

B. 10^{-5}

C. 10^{-6}

D. 10^{-10}

Answer: B

View Text Solution

29. Which of the following when reaction occur in present of catalyst ?

A. Activation energy decreases.

B. Activation energy increases.

C. Equilibrium constant increase.

D. Equilibrium constant decrease.

Answer: A

View Text Solution

30. For $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$, the equilibrium constant is K then which of the following is equilibrium constant of this reaction $nH_{2(g)} + nI_{2(g)} \Leftrightarrow 2nHI_{(g)}$?

A. nK

B. K^n

C. $\frac{1}{n}K$

D. $(K)^{\frac{1}{n}}$

Answer: B

View Text Solution

31. In the given reaction which of the following is the relation of between K_p and K_c ?

$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

A. $K_p = K_c$

B. $K_p > K_c$

C. $K_p < K_c$

D. K_p/K_c= Zero

Answer: C

View Text Solution

32. Which of the relation of K_p and K_c at equilibrium in $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$?

A. $K_p = K_c$

B. $K_p < K_c$

C. $K_p > K_c$

D. $\frac{K_p}{K_c} = 6$

Answer: C

View Text Solution

33. Which of the following is the unit of equilibrium constant of given reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$?

A. mol L^{-1}

B. $L^2 \text{mol}^{-2}$

C. bar

D. $\left(\text{mol L}^{-1}\right)^3$

Answer: B

View Text Solution

34. If the reaction is not occur in forward or reverse then .....

A. $\Delta G = 0$

B. $\Delta G < 0$

C. $\Delta G > 0$

D. ΔG not change

Answer: A

View Text Solution

35. Which of the following exponential equation of ΔG° = - RT lnK ?

A. $K = e^{\Delta G/RT}$

B. $K = e^{\Delta G^\circ/RT}$

C. $K = e^{-\Delta G^\circ/RT}$

D. $K = e^{-\Delta G/RT}$

Answer: C

View Text Solution

36. If K $>$ 1 then what is the value of ΔG ?

A. Positive

B. Negative

C. Zero

D. None of these

Answer: B

View Text Solution

37. Acid acept electron pair in reaction, this according to which principle ?

A. Arrhenious

B. Bronsted-Lowary

C. Lewis

D. Ge-lusace

Answer: C

View Text Solution

38. The 4.0 pH containing solution, concentration of $\left[H^{+}\right]$ is increased 5 times then what is the pH of resulting solution ?

A. 5.0

B. 3.3

C. 4.5

D. 2.5

Answer: B

View Text Solution

39. Which of the following acid is important for digestion in human stomach ?

A. CH_3COOH

B. HCl

C. H_2SO_4

D. Cytric acid

Answer: B

View Text Solution

40. What is the solubility of speringly soluble salt ?

A. More than 0.1

B. More than 0.01 M

C. Less then 0.01

D. More then 1 M

Answer: C

View Text Solution

41. Which is the symbol for equilibrium of speringly soluble salt ?

A. K_a

B. K_b

C. K_h

D. K_{sp}

Answer: D

View Text Solution

42. The some amount of $CH_3COONa_{(s)}$ is added in CH_2COOH solution then....

A. pH increase

B. pH decrease

C. pH = Zero

D. pH remain constant

Answer: A

View Text Solution

43. The solubility of $Al(OH)_3$ is S mol L^{-1} then what will be the K_{sp} ?

A. 108 S^4

B. 27 S^4

C. 27 S^3

D. S^2

Answer: B

View Text Solution

44. What is the pH of 0.001 HNO_3 ?

A. 1

B. 2

C. 3

D. -2

Answer: C

View Text Solution

45. The equilibrium of decomposition of NH_4COONH_2 is following.

$NH_4COONH_{2(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)}$, At equilibrium total pressure = P, then what is the relation of K_p and P ?

A. P

B. $\frac{P^2}{4}$

C. $\frac{4}{27}P^3$

D. P^2

Answer: C

View Text Solution

46. What is the effect on solubility of AgCl, when saturated solution of AgCl is added in different solution of 0.1 $AgNO_3$ and 0.1 NaCl ?

A. Solubility in $AgNO_3$ > Solubility in NaCl

B. Solubility in $AgNO_3$ < Solubility in NaCl

C. Solubility in $AgNO_3$ = Solubility in NaCl

D. Solubility in $AgNO_3$+ Solubility in NaCl = $2K_{sp}$

Answer: C

View Text Solution

47. The solubility of Ag_2CrO_4 is S mol L^{-1} then what is the equation of K_{sp} ?

A. S^2

B. $4S^3$

C. S^3

D. $\frac{S^2}{4}$

Answer: B

View Text Solution

48. What happened when more solution of $CdCl_2$ is added in saturated solution of CdS and starred?

A. No effect.

B. Increase the ppts of CdS.

C. Dissolution of precipitate of CdS in solution.

D. Formation of precipitate of $CdCl_2$.

Answer: C

View Text Solution

49. $N_2 + 3H_2 \Leftrightarrow 2NH_3$ + Energy, in this equilibrium reaction what is the following when increase the total pressure ?

A. Concentration of N_2 increase

B. Concentration of H_2 increase

C. Concentration of H_2 decrease

D. None of these

Answer: D

View Text Solution

50. What is the following when Ne gas pass through this vessel ?

$N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ (Red)

A. Red color become dark.

B. Red color become light.

C. The intencity of red color is remain constant.

D. None of these

Answer: C

View Text Solution

Section C Mcqs Mcqs Asked In Competitive Exam

1. Which one has highest pH from the following ?

A. $NaNO_3$

B. CH_3COOK

C. NH_4Cl

D. Na_2CO_3

Answer: D

View Text Solution

2. The solution containing $Mn^{2+}, Fe^{2+}, Zn^{2+}$ and Hg^{2+} concentration is 10^{-3} M. If K_{sp} of Mns, FeS, ZnS an HgS are respectively $10^{-15}, 10^{-2}, 10^{-4}, 10^{-54}$ than which one is the first precipitate by H_2S ?

A. FeS

B. HgS

C. MnS

D. ZnS

Answer: B

View Text Solution

3. Which one is buffer solution ?

A. NaOH and NaCl

B. HCl and KCl

C. HNO_3 and HNO_2

D. HNO_2 and $NaNO_2$

Answer: D

View Text Solution

4. $K_w = 1 \times 10^{-14}$ calculate the concentration of $\left[H_3O^+\right]$ in 10^{-8}M HCl.

A. 1.0×10^{-8} M

B. 1.0525×10^{-7} M

C. 1.0×10^{-6} M

D. 9.525×10^{-8} M

Answer: B

View Text Solution

5. Weak Acid HA K_a is 1.0×10^{-5} in 1 litre 0.100 mole Acid is solubic. At equilibrium dissociation is .....

A. $1.00\ \%$

B. $99.0\ \%$

C. $0.100\ \%$

D. $99.9\ \%$

Answer: C

View Text Solution

6. 0.01 M solution is given it's pH is ..... $\left(K_a = 6.6 \times 10^{-4}\right)$

A. 7.6

B. 8

C. 2.6

D. 5.0

Answer: C

View Text Solution

7. In mutarotation of α-D Glucose $\Leftrightarrow$ β-D Glucose equilibrium constant is 1.8. At equilibrium what will be the percentage of α-D Glucose ?

A. 35.8

B. 64.3

C. 55.6

D. 44.4

Answer: A

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8. If K_{sp} of $CaSO_4 . 5H_2O$ is 9×10^{-6} . Find the volume of 1 gm $CaSO_4$. (M.M = 136u)

A. 2.45 litre

B. 5.1 litre

C. 4.52 litre

D. 3.2 litre

Answer: A

View Text Solution

9. If 25 ml 0.2 M $Ca(OH)_2$ is neutralized by 10 ml, 1 M HCl than the pH of solution is .....

A. 1.37

B. 9

C. 12

D. 7

Answer: D

View Text Solution

10. 0.1 M HQ acid has pH=3 then find its ionization constant.

A. 3×10^{-1}

B. 1×10^{-3}

C. 1×10^{-5}

D. 1×10^{-7}

Answer: C

View Text Solution

Section C Mcqs Mcqs Asked In Jee Neet Aieee

1. Calculate the pOH of a solution at $25\,^{\circ}C$ 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

Answer: A

View Text Solution

2. If the concentration of OH^- ions in the reaction $Fe(OH)_{3(s)} \Leftrightarrow Fe^{3+}_{(aq)} + 3OH^-_{(aq)}$ 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

Answer: C

View Text Solution

3. Equimolar solutions of the following were prepared in water separately. Which one of the solutions will record the highest pH ?

A. $SrCl_2$

B. $BaCl_2$

C. $MgCl_2$

D. $CaCl_2$

Answer: B

View Text Solution

4. Which of the following molecules acts as a Lewis acid ?

A. $\left(CH_3\right)_2O$

B. $\left(CH_3\right)_3P$

C. $\left(CH_3\right)_3N$

D. $\left(CH_3\right)_3B$

Answer: D

View Text Solution

5. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is :

A. 6.5×10^{-12}

B. 5.65×10^{-13}

C. 5.65×10^{-12}

D. 5.65×10^{-10}

Answer: D

View Text Solution

6. If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its $K_{(Sp)}$ is :

A. $4.0 \times 10^{-6} M^3$

B. $4.0 \times 10^{-7} M^3$

C. $5.0 \times 10^{-6} M^3$

D. $5.0 \times 10^{-7} M^3$

Answer: D

View Text Solution

7. In which of the following equilibrium K_c and K_p are not equal ?

A. $2NO_{(g)} \Leftrightarrow N_{2(g)} + O_{2(g)}$

B. $SO_{2(g)} + NO_{2(g)} \Leftrightarrow SO_{3(g)} + NO_{(g)}$

C. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

D. $2C_{(s)} + O_{2(g)} \Leftrightarrow 2CO_{2(g)}$

Answer: D

View Text Solution

8. Which one of the following molecular hydrides acts as a Lewis acid ?

A. NH_3

B. H_2O

C. B_2H_6

D. CH_4

Answer: C

View Text Solution

9. Which of the following is least likely to behave as Lewis base ?

A. H_2O

B. NH_3

C. BF_3

D. OH^-

Answer: C

View Text Solution

10. 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 ? (K_{sp} for AgCl = 1.8×10^{-10}, K_{sp} for $PbCl_2$ = 1.7×10^{-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

Answer: C

View Text Solution

11. The first and second dissociation constants of an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} respectively. The overall dissociation constant of the acid will be

A. 0.2×10^{5}

B. 5.0×10^{-5}

C. 5.0×10^{15}

D. 5.0×10^{-15}

Answer: D

View Text Solution

12. The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA in which 50 % of the acid is ionized is

A. 7.0

B. 4.5

C. 2.5

D. 9.5

Answer: D

View Text Solution

13. In a saturated solution of the sparingly soluble strong electrolyte $AgIO_3$ (molecular mass = 283), the equilibrium which sets in is

$AgIO_{3(s)} \Leftrightarrow Ag^{+}_{(aq)} + IO^{-}_{3(aq)}$

If the solubillity product constant K_{sp} of $AglO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ contained in 100 ml of its saturated solution?

A. 1.0×10^{-4} g

B. 28.3×10^{-2} g

C. 2.83×10^{-3} g

D. 1.0×10^{-7} g

Answer: C

View Text Solution

14. For the following three reactions (i), (ii) and (iii) equilibrium constants are given

(i)$CO_{(g)} + H_2O_{(g)} \Leftrightarrow CO_{2(g)} + H_{2(g)}, K_1$

(ii)$CO_{4(g)} + H_2O_{(g)} \Leftrightarrow CO_{(g)} + 3H_{2(g)}, K_2$

(iii)$CO_{4(g)} + 2H_2O_{(g)} \Leftrightarrow CO_{2(g)} + 4H_{2(g)}, K_3$

Which of the following relation is correct ?

A. $K_3 . K_2^3 = K_1^2$

B. $K_1\sqrt{K_2} = K_3$

C. $K_2K_3 = K_1$

D. $K_3 = K_1K_2$

Answer: D

View Text Solution

15. The pK_a of a weak acid, HA, is 4.80. The pK_b of a weak base, BOH is 4.78. The pH of an aqueous solution of the corresponding salt BA, will be

A. 9.22

B. 9.58

C. 4.79

D. 7.01

Answer: D

View Text Solution

16. Four species are listed below:

(i) HCO_3^- (ii) H_3O^+ (iii)HSO_4^- (iv)HSO_3F

Which one of the following is the correct sequence of their acid strength ?

A. $iii < I < iv < ii$

B. $iv < ii < iii < i$

C. $ii < iii < I < iv$

D. $I < iii < ii < iv$

Answer: D

View Text Solution

17. The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionization constant, K_a of this acid is

A. 1×10^{-3}

B. 1×10^{-5}

C. 1×10^{-7}

D. 3×10^{-1}

Answer: B

View Text Solution

18. The equilibrium constant $\left(K_c\right)$ for the reaction $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$ at temperature T is 4×10^{-4}. The value of K_c for the reaction , $NO_{(g)} + \frac{1}{2}N_{2(g)} + \frac{1}{2}O_{2(g)}$ at the same temperature is ....

A. 2.5×10^{2}

B. 4×10^{-4}

C. 50.0

D. 0.02

Answer: C

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

B. 1

C. -1

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

Answer: D

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20. At 300 K and 1 atm, 15 mL of a gaseous hydrocarbon requires 375 ml air containing 20% O_2 by volume for complete combustion. After combustion the gases occupy 330 ml. Assuming that the water formed is in liquid form and the volumes were measured at the same temperature and pressure, the formula of the hydrocarbon is :

A. C_4H_{10}

B. C_3H_6

C. C_3H_8

D. C_4H_8

Answer: C

View Text Solution

21. The equilibrium constant at 298 K for a reaction A + B ⇔ C + D is 100. If the initial concentration of all the four species were 1M each, then equilibrium concentration of D (in mol L^{-1}) will be:

A. 1.182

B. 0.182

C. 0.818

D. 1.818

Answer: D

View Text Solution

22. The K_{sp} of $Ag_2CrO_4, AgCl, AgBr$ and AgI are respectively, $1.1 \times 10^{-12}, 1.8 \times 10^{-10}, 5.0 \times 10^{-13}, 8.3 \times 10^{-17}$, Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr, NaI and Na_2CrO_4 ?

A. AgI

B. AgCl

C. AgBr

D. Ag_2CrO_4

Answer: D

View Text Solution

23. If the value of an equilibrium constant for a particular reaction is 1.6×10^{12}, then at equilibrium the system will contain:

A. all reactants.

B. mostly reactants.

C. mostly products.

D. similar amounts of reactants and products

Answer: C

View Text Solution

24. Which of the following statements is correct for a reversible process in a state of equilibrium ?

A. ΔG=-2.30 RT log K

B. ΔG =2.30 RT log K

C. ΔG° =-2.30 RT log K

D. ΔG° =2.30 RT log K

Answer: C

View Text Solution

25. If the equilibrium constant for $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$ is K, the equilibrium constant for $\frac{1}{2}N_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow NO_{(g)}$ will be :

A. K

B. K^2

C. $K^{1/2}$

D. $\frac{1}{2}K$

Answer: C

View Text Solution

26. Which one of the following pairs of solution is not an acidic buffer ?

A. H_2CO_3 and Na_2CO_3

B. H_3PO_4 and Na_3PO_4

C. $HClO_4$ and $NaClO_4$

D. CH_3COOH and CH_3COONa

Answer: C

View Text Solution

27. Aqueous solution of which of the following compounds is the best conductor of electric current ?

A. Ammonia, NH_3

B. Fructose, $C_6H_{12}O_6$

C. Acetic acid, $C_2H_4O_2$

D. Hydrochloric acid, HCl

Answer: D

View Text Solution

28. What is the mole fraction of the solute in a 1.00m aqueous solution ?

A. 0.0354

B. 0.0177

C. 0.177

D. 1.77

Answer: B

View Text Solution

29. What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed ?

A. 7.0

B. 1.04

C. 12.65

D. 2.0

Answer: C

View Text Solution

30. The addition of a catalyst during a chemical reaction alters which of the following quantities?

A. Internal energy

B. Enthalpy

C. Activation energy

D. Entropy

Answer: C

View Text Solution

31. MY and NY_3 two nearly insoluble salts, have the same K_{SP} values of 6.2×10^{-13} at room temperature. Which statement would be true in regard to MY and NY_3 ?

A. The molar solubility of MY in water is less than that of NY_3

B. The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.

C. The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.

D. The molar solubilities of MY and NY_3 in water are identical.

Answer: A

View Text Solution

32. Consider the following liquid - vapour equilibrium.

Liquid $\Leftrightarrow$ Vapour

Which of the following relations is correct ?

A. $\frac{d\ln P}{dT} = -\frac{\Delta H_V}{RT}$

B. $\frac{d\ln P}{dT^2} = -\frac{\Delta H_V}{T^2}$

C. $\frac{d\ln P}{dT} = \frac{\Delta H_V}{RT^2}$

D. $\frac{d\ln G}{dT^2} = \frac{\Delta H_V}{RT^2}$

Answer: C

View Text Solution

33. The percentage of pyridine $\left(C_5H_5N\right)$ that forms pyridinium ion $\left(C_5H_5N^+H\right)$ in a 0.1 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is

A. $0.77\ \%$

B. $1.6\ \%$

C. $0.006\ \%$

D. $0.013\ \%$

Answer: D

View Text Solution

34. The solubility of AgCl(s) with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be

A. 1.6×10^{-11} M

B. 0

C. 1.26×10^{-5} M

D. 1.6×10^{-9} M

Answer: D

View Text Solution

35. Which of the following fluoro-compounds is most likely to behave as a Lewis base ?

A. CF_4

B. SiF_4

C. BF_3

D. PF_3

Answer: D

View Text Solution

36. For the reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$, the standard equilibrium constant K_P is 5.8×10^5 at 298 K temperature . If the concentration of gases indicate by mol L^{-1} then find the value of standard equilibrium constant from the following.

(R=0.08314 L bar $K^{-1}\text{mol}^{-1}$)

A. 3.5×10^6

B. 3.8×10^7

C. $3.56 \times 10^{+8}$

D. 3.99×10^9

Answer: C

View Text Solution

37. Take the following reaction in consederation. In which enthalpy change is positive. $2A_{(g)} \Leftrightarrow C_{(g)} + D_{(g)}$. Which of the following will not affect on equilibrium ?

A. Change in concentration of reactants

B. Change in pressure

C. Change in temperature

D. Change in catalyst

Answer: D

View Text Solution

38. The $\frac{K_p}{K_c}$ is equal to which of the following in given reaction ? Reaction

$CO_{(g)} + Cl_{2(g)} \Leftrightarrow COCl_{2(g)}$

A. $\frac{1}{RT}$

B. RT

C. $\sqrt{RT}$

D. $(RT)^2$

Answer: A

View Text Solution

39. The pK_a and pK_b of one weak acid (HA) and weak base (BOH) are 3.2 and 3.4 respectively. Find pH of its salt AB.

A. 7.2

B. 6.9

C. 7.9

D. 1

Answer: B

View Text Solution

Section C Mcqs Mcqs Asked In Board Exam

1. Which mixture of solution will have pH $>$ 7 ?

A. HCl+NaOH

B. $NH_4OH + NH_4Cl$

C. $CH_3COOH + NH_4OH$

D. $CH_3COOH + CH_3COONa$

Answer: B

View Text Solution

2. For a equilibrium mixture in a closed vessel.

$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

the value of equilibrium on constant depends.

A. Temperature

B. Total pressure of the system

C. Initial concentration of N_2 and H_2

D. Volume of reaction vessel

Answer: A

View Text Solution

3. Which of the following is sparingly soluble salt ?

A. $BaSO_4$

B. CdS

C. PbS

D. NaCl

Answer: D

View Text Solution

4. If Hydrogen Chloride gas is passed through saturated solution of sodium chloride which precipitate will be obtained ?

A. HCl

B. NaCl

C. (A) and (B) Both

D. None of these

Answer: B

View Text Solution

5. For equilibrium mixture $PCl_{3(g)} + Cl_{2(g)} \Leftrightarrow PCl_{5(g)}$. The value of K_c at 250° C is 26. The value of K_p at this temperature is ____

A. 0.20

B. 0.50

C. 0.81

D. 0.61

Answer: D

View Text Solution

6. Mention conjugate base of acid $H_2PO_4^{1-}$

A. HPO_4^{1-}

B. HPO_4^{2-}

C. H_3PO_4

D. PO_4^{3-}

Answer: B

View Text Solution

7. For the given equation in closed vessel.

$$NH_4HS_{(s)} \overset{\text{dissociation}}{\rightarrow \leftarrow} NH_{3(g)} + H_2S_{(g)}$$

What will be the value of K_p ? (P=total pressure)

A. $\frac{P^3}{27}$

B. $\frac{P}{2}$

C. $\frac{P^2}{2}$

D. $\frac{P^2}{4}$

Answer: D

View Text Solution

8. What will be the molarity of 200 ml solution of sulphuric acid having pH = 1 ?

A. 0.5 M

B. 0.1 M

C. 0.05 M

D. 1 M

Answer: C

View Text Solution

9. The reagent NH_4Cl and aq. NH_3 will precipitate ions of group .....

A. Group III-A ions

B. Group III-B ions

C. Group I ions

D. Group II ions

Answer: A

View Text Solution

10. Which solutions, when mixed, forms acidic buffer ?

A. H_2SO_4 and Na_2SO_4

B. CH_3COOH and H_2SO_4

C. CH_3COONa and CH_3COOH

D. NH_4Cl and HCl

Answer: C

View Text Solution

11. Arrange the following acids in decreasing order of acidity :

(I)H_2SO_4 ,(II)H_3PO_4 , (III)$HClO_4$

A. $I > II > III$

B. $III > I > II$

C. $III > II > I$

D. $I > III > II$

Answer: B

View Text Solution

12. Which will show the highest pH ?

A. 0.1M NaOH

B. 1N NaOH

C. 1N HCl

D. 0.1M H_2SO_4

Answer: B

View Text Solution

13. The solubility of $PbCl_2$ will be given by the equation

A. $\left(K_{sp}\right)^{\frac{1}{3}}$

B. $\sqrt[3]{\frac{K_{sp}}{4}}$

C. $\left(8K_{sp}\right)^{\frac{1}{2}}$

D. $\sqrt{K_{sp}}$

Answer: B

View Text Solution

14. If at 550 K temperature, Hydrogen gas and Oxygen gas reacts to form water vapour in presence of catalyst, calculate the total pressure of vessel, if the partial pressure of Hydrogen gas is 2 bar and that of Oxygen gas is 1 bar at 550 K in a closed vessel.

A. 4 bar

B. Less than 3 bar

C. 5 bar

D. 3 bar

Answer: B

View Text Solution

15. $\left(NH_4\right)_2CO_{3(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)} + H_2O_{(g)}$

If the total pressure is P at equilibrium then what will be the volume of

equilibrium constant, K_p in a closed vessel ?

A. $\frac{P^4}{64}$

B. $\frac{P^3}{32}$

C. $\frac{4P^3}{27}$

D. $\frac{P^3}{64}$

Answer: A

View Text Solution

16. What will happen if the equilibrium system is kept in ice bath ?

$2NO_{2(g)}\text{brown} \Leftrightarrow N_2O_{4(g)}\text{colourless}, \Delta H = -ve$

A. Colour intensity increases.

B. Colour intensity does not change.

C. Colour intensity increases and than remains constant.

D. Colour intensity decreases.

Answer: D

View Text Solution

17. Which of the following is not a Lewis Acid ?

A. $AlCl_3$

B. $SnCl_4$

C. CCl_4

D. BCl_3

Answer: C

View Text Solution

18. In which of the following cases does reaction go the farthest for completion ?

A. $K = 10^{-2}$

B. K=10

C. K=1

D. $K = 10^{3}$

Answer: D

View Text Solution

19. Which oxide is acidic ?

A. K_2O

B. B_2O_3

C. Na_2O

D. Al_2O_3

Answer: B

View Text Solution

20. Equilibrium existing in the hydrolysis of an ester is .....

A. Gaseous homogeneous

B. Heterogeneous

C. Ionic homogeneous

D. Homogeneous

Answer: C

View Text Solution

21. The reaction $2NO_{(2)}g \Leftrightarrow N_2O_4(g)\Delta H$= negative occurring in a closed vessel attains equilibrium. If this vessel is kept in ice then which of the following change will be observed ?

A. Equilibrium state will remain constant.

B. Increase in brown colour intensity in vessel.

C. The decrease in the concentration of product.

D. Decrease in brown colour intensity in vessel.

Answer: D

View Text Solution

22. According to Arrhenius acid-base theory, the strength of acid and base depends on

A. magnitude of accepting electron.

B. magnitude of accepting proton.

C. magnitude of donating proton.

D. ionization in aqueous solution.

Answer: D

View Text Solution

23. AgCl is a sparingly soluble salt and .....

A. It is completely insoluble in water

B. Its solubility in water is 1M

C. Its solubility in water is less than 0.01M

D. Its solubility in water is greater than 0.1M

Answer: C

View Text Solution

24. For precipitation of sparingly soluble salt if, $I_p < K_{sp}$, then .....

A. nothing can be predicted

B. sparingly soluble salt will not get precipitated.

C. solution will remain in saturated state.

D. sparingly soluble salt gets precipitated.

Answer: B

View Text Solution

25. BF_3 and NH_3 are ..... In the reaction $BF_3 + NH_3 \rightarrow BF_3 \leftarrow NH_3$.

A. Conjugate Acid Base

B. Lewis Base - Lewis Acid

C. Acid conjugate Base

D. Lewis Acid Lewis Base

Answer: D

View Text Solution

26. Equation for K_{sp} and its unit for the sparingly soluble salt $Al(OH)_3$ are .....

A. $4S^4, M^3$

B. $4S^3, M^3$

C. $27S^4, M^4$

D. S^2, M^2

Answer: C

View Text Solution

27. Which is the correct increasing order of acidic strength from the following of Methan, Ammonia, Water and Hydrogen flouride.

A. $HF > > H_2O > > NH_3 > > CH_4$

B. $CH_4 < < NH_3 < < H_2O < < HF$

C. $HF < < H_2O < < NH_3 < < CH_4$

D. $CH_4 < < HF < < H_2O < < NH_3$

Answer: A

View Text Solution

28. Which of the following properties of the aqueous solution of $AlCl_3$?

A. Amphoteric

B. Basic

C. Neutral

D. Acidic

Answer: D

View Text Solution

29. What is the relation between the value of K_c for the forward reaction and value of K'_c for the reverse reaction in the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ at equilibrium ?

A. $K'_c = 2K_c$

B. $K_c = 2K'_c$

C. $Kc = K'_c$

D. $K'_c = \frac{1}{K_c}$

Answer: D

View Text Solution

30. For a reversible reaction at 298 K, if the concentration of reactants is doubled, the value of equilibrium constant will be .....

A. Doubled

B. One fourth

C. Same

D. Halved

Answer: C

View Text Solution

31. Which among the following is the strongest base ?

A. $C_2H_5NH_2 \quad K_b = 5.6 \times 10^{-4}$

B. $C_9H_7N \quad K_b = 6.3 \times 10^{-10}$

C. $C_6H_5NH_2 \quad K_b = 3.8 \times 10^{-10}$

D. $NH_4OH \quad K_b = 1.6 \times 10^{-5}$

Answer: A

View Text Solution

32. Which among the following factors decreases the activation energy of a chemical reaction ?

A. Pressure

B. Catalyst

C. Temperature

D. Concentration

Answer: B

View Text Solution

33. What will be the pH of a equimolar mixture of CH_3COOH and NaOH solution ?

A. pH = 7

B. pH = 0

C. pH $<$ 7

D. pH $>$ 7

Answer: D

View Text Solution

34. The equilibrium constant for the reaction $2A_{(g)} + B_{(g)} \rightarrow A_2B_{(g)}$ is 5.8×10^{-3} at 1000 K. In the presence of a catalyst, equilibrium is attained 10 times faster Therefore, the equilibrium constant at 1000 K in the presence of catalyst will be .....

A. 5.8×10^{-3}

B. 5.8×10^{-5}

C. 5.8×10^{-4}

D. 5.8×10^{-2}

Answer: A

View Text Solution

35. Which of the following statement is true ?

A. The conjugate base of HPO_4^{2-} is $H_2PO_4^-$

B. When H^+ ion concentration increases, its pH value decreases.

C. pH of 1.0×10^{-8} M HNO_3 is 8.

D. $AlCl_3$ is a Lewis base.

Answer: B

View Text Solution

36. The optimum pressure and temperature for the production of NH_3 by Haber's process is .....

A. 350 bar, 760 K

B. 350 bar, 773 K

C. 200 bar, 773 K

D. 800 bar, 773 K

Answer: C

View Text Solution

37. The solubility product of $CaCl_2$ in water is 4.2×10^{-12}. The concentration of Ca^{2+} in an aqueous solution of $CaCl_2$ is ..... M.

A. 1.01×10^{-4} M

B. 2.0×10^{-6} M

C. 4.0×10^{-10} M

D. 1.6×10^{-4} M

Answer: A

View Text Solution

Section D Ncert Exemplar Problems Mcqs

1. The relationship between K_c and K_p is $K_p = K_c(RT)^{\Delta n}$, What would be the value of Δn for the reaction ?

$NH_4Cl_{(s)} \Leftrightarrow NH_{3(g)} + HI_{(g)}$

A. 1

B. 0.5

C. 1.5

D. 2

Answer: D

View Text Solution

2. For the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$, the standard free energy is $\Delta G^{\ominus} > 0$. The equilibrium constant (K) would be

A. K=0

B. K $>$ 1

C. K=1

D. $K < 1$

Answer: D

View Text Solution

3. Which of the following is not a general characteristic of equilibria involving physical processes ?

A. Equilibrium is possible only in a closed system at a given temperature.

B. All measurable properties of the system remain constant.

C. All physical processes stop at equilibrium.

D. The opposing processes occur at the same rate and there is dynamic stable condition.

Answer: C

View Text Solution

4. PCl_5, PCl_3 and Cl_2 are at equilibrium at 500 K in a closed container and their concentrations are $0.8 \times 10^{-3} \text{mol L}^{-1}$, $1.2 \times 10^{-3} \text{mol L}^{-1}$ and

$1.2 \times 10 \text{mol L}^{-1}$, respectively. The value of K_c for the reaction $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$ will be

A. $1.8 \times 10^{3} \text{mol L}^{-1}$

B. 1.8×10^{-3}

C. $1.8 \times 10^{-3} \text{mol L}^{-1}$

D. 0.55×10^{4}

Answer: B

View Text Solution

5. 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 increased 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 with negative ΔH value decreases as temperature increases.

Answer: B

View Text Solution

6. When hydrochloric acid is added to cobalt nitrate solution at room temperature, the following reaction takes place and the reaction mixture becomes blue. On cooling the mixture it becomes pink. On the basis of this information, mark the correct answer.

$$\left[Co\left(H_2O_6\right)\right]^{3+}_{(aq)} + 4Cl^-_{(aq)} \Leftrightarrow \left[CoCl_4\right]^{2}_{(aq)}\text{(blue)} + 6H_2O_{(l)}\text{(pink)}$$

A. $\Delta H > 0$ for the reaction

B. $\Delta H < 0$ for the reaction

C. $\Delta H = 0$ for the reaction

D. The sign of ΔH cannot be predicted on the basis of this information.

Answer: A

View Text Solution

7. The pH of neutral water at $25^\circ C$ 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 $60^\circ C$?

A. Equal to 7.0

B. Greater than 7.0

C. Less than 7.0

D. Equal to zero

Answer: C

View Text Solution

8. 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 1.74×10^{-5}, 3.0×10^{-8} and 1.8×10^{-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

Answer: D

View Text Solution

9. K_{a_1}, K_{a_2} and K_{a_3}, are the respective ionisation constants for the following reactions.

$H_2S \Leftrightarrow H^+ + HS^-$

$HS^- \Leftrightarrow H^+ + S^{2-}$

$H_2S \Leftrightarrow 2H^+ + S^{2-}$

The correct relationship between $K_{a_1}, K_{a_2}, K_{a_3}$ is

A. $K_{a_3} = K_{a_1} \times K_{a_2}$

B. $K_{a_3} = K_{a_1} + K_{a_2}$

C. $K_{a_3} = K_{a_1} - K_{a_2}$

D. $K_{a_3} = K_{a_1} / K_{a_2}$

Answer: A

View Text Solution

10. Acidity 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.

Answer: C

View Text Solution

11. 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. 0.05 mol $dm^{-3} NH_4OH$ and 0.1 mol dm^{-3} HCl

C. 0.1 mol $dm^{-3} NH_4OH$ and 0.05 mol dm^{-3} HCl

D. 0.1 mol $dm^{-3} CH_4COONa$ and 0.1 mol dm^{-3} NaOH

Answer: C

View Text Solution

12. In which of following solvents is silver chloride most soluble ?

A. 0.1 mol $dm^{-3} AgNO_3$, solution

B. 0.1 mol dm^{-3} HCl solution

C. H_2O

D. Aqueous ammonia

Answer: D

View Text Solution

13. What will be the value of pH of 0.01 mol $dm^{-3} CH_3COOH$ ($K_a = 1.74 \times 10^{-5}$) ?

A. 3.4

B. 3.6

C. 3.9

D. 3.0

Answer: A

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14. K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5} . The pH of ammonium acetate will be

A. 7.005

B. 4.75

C. 7.0

D. Between 6 and 7

Answer: C

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15. Which of the following options will be correct for the stage of half completion of the reaction $A \Leftrightarrow B$.

A. $\Delta H^{\ominus} = 0$

B. $\Delta G^{\ominus} > 0$

C. $\Delta G^{\ominus} < 0$

D. $\Delta G^{\ominus}$=-RT ln K

Answer: A

View Text Solution

16. 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.

$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

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. K will increase

D. K will increase initially and decrease when pressure is very high

Answer: A

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17. What will be the correct order of vapour pressure of water, acetone and ether at $30^{\circ}C$. 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

Answer: B

View Text Solution

18. At 500 K, equilibrium constant, K_c for the following reaction is 5.

$$\frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)} \Leftrightarrow HI_{(g)}$$

What would be the equilibrium constant K_c for the reaction :

$$2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$$

A. 0.04

B. 0.4

C. 25

D. 2.5

Answer: A

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19. In which of the following reactions, the equilibrium remains unaffected on addition of small amount of argon at constant volume ?

A. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

B. $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

C. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

D. The equilibrium will remain unaffected in all the three cases.

Answer: D

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Section D Ncert Exemplar Problems Mcqs More Than One Options

1. For the reaction $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$, the value of K is 50 at 400 K and 1700 at 500 K. Which of the following options is/are correct ?

A. The reaction is endothermic

B. The reaction is exothermic

C. If $NO_{2(g)}$ and $N_2O_{4(g)}$ are mixed at 400 K at partial pressures 20 bar and 2 bar respectively, more $N_2O_{4(g)}$ will be formed.

D. The entropy of the system increases.

Answer: A::C::D

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2. At a particular temperature and atmospheric pressure, the solid and liquid phases of a pure substance can exist in equilibrium. Which of the following term defines this temperature ?

A. Normal melting point

B. Equilibrium temperature

C. Boiling point

D. Freezing point

Answer: A::D

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Section D Ncert Exemplar Problems Short Answer

1. The ionisation of hydrochloric in water is given below: $HCl_{(aq)} + H_2O_{(l)} \Leftrightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$ Label two conjugate acid-base pairs in this ionisation.

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2. The aqueous solution of sugar does not conduct electricity. However, when sodium chloride is added to water, it conducts electricity. How will you explain this statement on the basis of ionisation and how is it affected by concentration of sodium chloride ?

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3. BF_3 does not have proton but still acts as an acid and reacts with NH_3 Why is it so ? What type of bond is formed between the two ?

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4. Ionisation constant of a weak base MOH, is given by the expression

$$K_b = \frac{[M^+][OH^-]}{[MOH]}$$

Values of ionisation constant of some weak bases at a particular temperature are given below:

Base	Dimethylamine	Urea	Pyridine	Ammonia
K_b	5.4×10^{-4}	1.3×10^{-14}	1.77×10^{-9}	1.77×10^{-5}

Arrange the bases in decreasing order of the extent of their ionisation at equilibrium. Which of the above base is the strongest ?

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5. Conjugate acid of a weak base is always stronger. What will be the decreasing order of basic strength of the following conjugate bases ?

$OH^-, RO^-, CH_3COO^-, Cl^-$

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6. Arrange the following in increasing order of pH.

$KNO_{3(aq)}, CH_3COONa_{(aq)}, NH_4Cl_{(aq)}, C_6H_5COONH_{4(aq)}$

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7. The value of K_c for the reaction

$2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$ is 1×10^{-4}

At a given time, the composition of reaction mixture is (HI] = 2×10^{-5} mol,

$\left[H_2\right] = 1 \times 10^{-5}$ mol and $\left[I_2\right] = 1 \times 10^{-5}$ mol

In which direction will the reaction proceed ?

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8. On the basis of this equation $pH = -\log\left[H^+\right]$, the pH of $10^{-8}\text{mol dm}^{-3}$ solution of HCl should be 8. However, it is observed to be less than 7.0. Explain the reason.

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9. pH of a solution of a strong acid is 5.0. What would be the pH of the solution obtained after diluting the given solution a 100 times ?

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10. A sparingly soluble salt gets precipitated only when the product of concentration of its ions in the solution $Q_{(sp)}$ becomes greater than its solubility product. If the solubility of $BaSO_4$ in water is $8 \times 10^{-4} \text{mol dm}^{-3}$. Calculate its solubility in 0.01 mol dm^{-3} of H_2SO_4.

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11. pH of 0.08 mol dm^{-3} HOCl solution is 2.85. Calculate its ionisation constant.

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12. Calculate the pH of a solution formed by mixing equal volumes of two solutions A and B of a strong acid having pH = 6 and pH =4 respectively.

View Text Solution

13. The solubility product of $Al(OH)_3$ is 2.7×10^{-11}. Calculate the solubility in g L^{-1} and also find pH of this solution. (Atomic mass of Al = 27 u).

View Text Solution

14. Calculate, volume of water required to dissolve 0.1 g lead (II) chloride to get a saturated solution. [K_{sp} of $PbCl_2 = 3.2 \times 10^{-8}$, atomic mass of Pb = 207 u).

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15. A reaction between ammonia and boron trifluoride is given below:

$$NH_3 + BF_3 \rightarrow H_3N:BF_3$$

Identify the acid and base in the given reaction. Which theory explains it?

What is the hybridisation of B and N in the reactants ?

View Text Solution

16. Following data is given for the reaction:

$$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$$

$$\Delta_f H^{\ominus}\left[CaO_{(s)}\right] = -635.1 \text{ kJ mol}^{-1}$$

$$\Delta_f H^{\ominus}\left[CO_{2(g)}\right] = -393.5 \text{kJ mol}^{-1}$$

$$\Delta_f H^{\ominus}\left[CaCO_{3(s)}\right] = -1206.9 \text{kJ mol}^{-1}$$

Predict the effect of temperature on the equilibrium constant of the above reaction.

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Section D Ncert Exemplar Problems Matching The Columns

1. Match the following equilibria with the corresponding condition

(A) Liquid $\rightleftharpoons$ Vapour	(1) Saturated solution
(B) Solid $\rightleftharpoons$ Liquid	(2) Boiling point
(D) Solid $\rightleftharpoons$ Vapour	(3) Sublimation point
(D) Solute(s) $\rightleftharpoons$ Solute (solution)	(4) Melting point
	(5) Unsaturated solution

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2. For the given reaction: $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

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

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

reactions with the corresponding equilibrium constant

Column-I (Reaction)	Column-II (Equilibrium constant)
(A) $2N_{2(g)} + 6H_{2(g)} \rightleftharpoons 4NH_{3(g)}$	(1) $2K_c$
(B) $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$	(2) $K_c^{1/2}$
(C) $\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \rightleftharpoons NH_{3(g)}$	(3) $\frac{1}{K_c}$
	(4) K_c^2

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

(A) $\Delta G^{\ominus} > 0$	(1) $K > 1$
(B) $\Delta G^{\ominus} < 0$	(2) $K = 1$
(C) $\Delta G^{\ominus} = 0$	(3) $K = 0$
	(4) $K < 1$

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4. Match the following species with the corresponding conjugate acid.

Species	Conjugate acid
(A) NH_3	(1) CO_2^{2-}
(B) HCO_3^-	(2) NH_4^+
(C) H_2O	(3) H_3O^+
(D) HSO_4^-	(4) H_2SO_4
	(5) H_2CO_3

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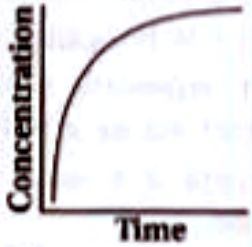
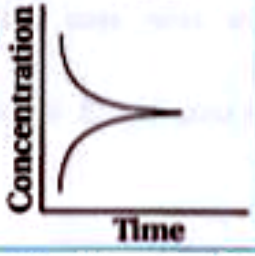
5. Match the following graphical variation with their description.

A	B
(A) 	(1) Variation in product concentration with time
(B) 	(2) Reaction at equilibrium
(C) 	(3) Variation in reactant concentration with time

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6. Match Column (I) with Column (II).

Column-I	Column-II
(A) Equilibrium	(1) $\Delta G > 0, K < 1$
(B) Spontaneous reaction	(2) $\Delta G = 0$
(C) Non spontaneous reaction	(3) $\Delta G^{\ominus} = 0$
	(4) $\Delta G < 0, K > 1$

View Text Solution

Section D Ncert Exemplar Problems Assertions And Reason

1. Assertion (A) : Increasing order of acidity of hydrogen halides is

HF < HCl < HBr < HI

Reason (R) : While comparing acids formed by the elements belonging to the same group of periodic table, H - A bond strength is a more important factor in determining acidity of an acid than the polar nature of the bond.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: A

View Text Solution

2. Assertion (A): A solution containing a mixture of acetic acid and sodium acetate maintains a constant value of pH on addition of small amounts of acid or alkali.

Reason (R) : A solution containing a mixture of acetic acid and sodium acetate acts as a buffer solution around pH 4.75.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: A

View Text Solution

3. Assertion (A) : The ionisation of hydrogen sulphide in water is low in the presence of hydrochloric acid.

Reason (R) : Hydrogen sulphide is a weak acid.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: B

View Text Solution

4. Assertion : For any chemical reaction at a particular temperature, the equilibrium constant is fixed and is a characteristic property.

(R) : Equilibrium constant is independent of temperature.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: C

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5. Assertion (A): Aqueous solution of ammonium carbonate is basic.

Reason (R) : Acidic/basic nature of a salt solution of a salt of weak acid and weak base depends on K_a and K_b value of the acid and the base forming it.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: A

View Text Solution

6. Assertion (A): An aqueous solution of ammonium acetate can act as a buffer.

Reason (R) : Acetic acid is a weak acid and NH_4OH is a weak base.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: B

View Text Solution

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

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

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

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

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Answer: C

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Section D Ncert Exemplar Problems Long Answer

1. How can you predict the following stages of a reaction by comparing the value of K_c and Q_c ? (i) Net reaction proceeds in the forward direction,

(ii) Net reaction proceeds in the backward direction,

(iii) No net reaction occurs.

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2. On basis of Le-Chatelier principle explain how can the temperature and pressure be adjusted to increase the yield of ammonia in the following reaction.

$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}, \Delta H = -92.38 \text{kJ mol}^{-1}$

What will be the effect of addition of argon to the above reaction mixture at constant volume ?

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3. A sparingly soluble salt having general formula $A_x^{p+} B_y^{q-}$ and molar solubility S is in equilibrium with its saturated solution. Derive a relationship between solubility and the solubility product for such salt.

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4. Write a relation between ΔG and Q and define the meaning of each term and answer the following:

(a)Why a reaction proceeds forward when Q $<$ K and no net reaction occurs when Q = K.

(b) Explain the effect of increase in pressure in terms of reaction quotient Q.

For the reaction :

$$CO_{(g)} + 3H_{2(g)} \Leftrightarrow CH_{4(g)} + H_2O_{(g)}$$

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Question Paper From Module

1. At 60° $H_2O_{(l)} \rightarrow \leftarrow H_2O_{(g)}$ in this equilibrium the value of K_p ? At $60^\circ C$ upper pressure of water is 0.185 bar.

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2. At definite temp if the volume of system decrease than what will be change in concentration of CO ?

$2CO_{(g)} + O_{2(g)} \rightarrow \leftarrow 2CO_{2(g)}$

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3. $3Fe_{(s)} + 4H_2O_{(g)} \rightarrow \leftarrow 3Fe_3O_{4(s)} + 4H_2O_{(g)}$ formula of K_P and K_C is .....

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4. For $Ca_3\left(PO_4\right)$ give formula of K_{sp} .

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5. Arrange according to increase order $pHCH_3COONa, KI, NH_4Cl, HNO_3$

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6. State conjugate base of $H_2PO_3^-$ and conjugate acid of HCO_3^-

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7. Weak Acid HA ($K_a = 1.4 \times 10^{-5}$) 0.1 M so in dissow in 2 lit. Find percentage of ionization and pH of solution.

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