CHEMISTRY

BOOKS - MAXIMUM PUBLICATION

CHEMICAL EQUILIBRIUM

Example

---

1. Fill in the blank

Equilibrium in a system having more than one phase is called_____.

▶ **Watch Video Solution**

---

2. Addition of a catalyst to a chemical system at equilibrium would result in

A. Increase in the rate of forward reaction

B. Increase in the rate of reverse reaction

C. A new reaction path

D. Increase in the amount of heat evolved in the reaction

Answer: C

▶ **Watch Video Solution**

3. with increase in temperature, equilibrium constant of a reaction

A. Always increases

B. Always decreases

C. May increase or decreas depending upon the number of reactants

and products

D. May increase or decrease depending upon whether reaction is
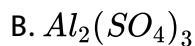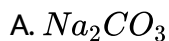
exothemic or endothermic

Answer: D

4. Fill in the blank

Water is a conjugate base of_____

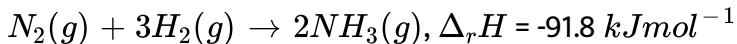**5.** Which of the following subtances on dissolving in water will give a basic solution?

A. Na_2CO_3

B. $Al_2(SO_4)_3$

C. NH_4Cl

D. KNO_3

Answer: A

6. Choose the correct answer for the reaction,

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g), \Delta_r H$ = -91.8 $kJmol^{-1}$

The concentration of H_2(g) at equilibrium can be increased by

    A. Lowering the temperature

    B. Increase the volueme of the system

    C. Adding N_2 at constant volume.

    D. Adding H_2 at constant volume

Answer: A::B::D

▶ **View Text Solution**

7. conjugate base of a strong acid is a

▶ **Watch Video Solution**

8. The expression for ostwald dilution law is

9. The hydroxyl ion concentration in a solution having $pH = 4$ will be

10. A mono protic acid in 1M solution is 0.01% ionized the dissociation constant of this acid is

11. A centain buffer solution contains equal concentrationof x and Hx. The Ka for Hx is $10_{-6}p_H$ of buffer is

12. In the equillibrium reaction

$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ the equilibrium constant is given by----

-

13. Fill in the blank

Congugate base of a strong acid is a_____

A. Strong base

B. strong acid

C. Weak acid

D. weak base

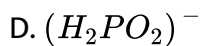**Answer: D**

14. Fill in the blank

The species acting both as bronsted acid and base is____

   A. $(PO_4)^{-3}$

   B. $(HSO_4)^{-}$

   C. O^{-2}

   D. $(H_2PO_2)^{-}$

Answer: B

▶ **Watch Video Solution**

---

15. Fill in the biank

P_H of .01 M KOH solution will be____

▶ **Watch Video Solution**

16. "High pressur and low temperature favours the formation of ammonia in Haber's processs". Analyse the statement and illustrate the conditions using Le-Chatliers principle?

▶ Watch Video Solution

17. "chemical equilibrium is dynamic in nature". Analyse the statement and justify your answer.

▶ Watch Video Solution

18. Pressure has no influence in the following equilibrium:

$N_2(g) + O_2(g) \leftrightarrow 2NO_g$. Do you agree with this?

▶ Watch Video Solution

19. Pressure has no influence in the following equilibrium:

$N_2(g) + O_2(g) \leftrightarrow 2NO_g$. What is the reason for this?

▶ **Watch Video Solution**

20. During a class room discussing a student is of the view that value of equilibrium constant can be influenced by catalyst. Do you agree with the statement?

▶ **Watch Video Solution**

21. During a class room discussing a student is of the view that value of equilibrium constant can be influenced by catalyst. Justify the role of catayst in an equilibrium reaction?

▶ **Watch Video Solution**

22. What is the equilibrium constant(K) in the following case? Reaction is reversed

▶ **Watch Video Solution**

23. What is the equilibrium constant(K) in the following cases? Reaction is divide by 2

▶ **Watch Video Solution**

24. What is the equilibrium constant(K) in the following cases? Reaction is multiplied by 2.

▶ **Watch Video Solution**

25. What is the equilibrium constant(K) in the following case? Reaction is splitted into two.

26. What is homogeneous equilibrium?

27. Suggest an example for homogeneous equilibrium.

28. The equilibrium constants for two rections are given.In which case the yield of product will be the maximum?

For first reaction: $K_1 = 3.2 \times 10^{-6}$

for second reaction: $K_2 = 7.4 \times 10_{-6}$

29. Write an expression for equilibrium constant, K_{cf} or $the reaction$,

4NH_3(g)+5O_2(g)harr 4NO(g)+6H_2O(g)

▶ Watch Video Solution

30. State Henry's law.

▶ Watch Video Solution

31. Suggest an example for a gas in liquid equilibrium.

▶ Watch Video Solution

32. what is heterogeneous equilibrium?

Suggest an example for this

▶ Watch Video Solution

33. For the equilibrium $2SO_3(g) \rightarrow 2So_2(g) + O_2(g)$, K_c at 47^0C

3.25xx10_-9 $molperliter. W\widehat{w}illbethevalueof$K_p

$atthistemperature(R = $ 8.314 JK_1mol_1`)

▶ Watch Video Solution

---

34. The pH of a sample of vinegar is 3.76. Calculate the concentration of hydrogen ions in it.

▶ Watch Video Solution

---

35. The equilibrium constant can be expressed in terms of partial pressur as well as concentration. Give the relation K_p and K_c.

▶ Watch Video Solution

36. The equilibrium constant can be expressed in terms of partial pressure as well as concentration. What is the relation between K_p and K_c for the reaction, `N_2(g)+O_2(g) gives 2NO(g)?

▶ Watch Video Solution

37. Explain Arrhenius concept of acids and bases with suitable examples.

▶ Watch Video Solution

38. How proton exists in aqueous solution? Give reason.

▶ Watch Video Solution

39. What is an acidic buffer?

▶ Watch Video Solution

40. Suggest an example for an acidic buffer

▶ **Watch Video Solution**

41. What is a basic buffer?

▶ **Watch Video Solution**

42. Suggest an example for basic buffer.

▶ **Watch Video Solution**

43. When equilibrium is reached in a chemical reaction?

▶ **Watch Video Solution**

44. What is the influence of molar concentration in a reaction at equilibrium?

45. Write the expression for equilibrium constant for the decomposition of NH_4Cl by the reaction.

`NH_4Cl gives NH_3+HCl

46. What is meant by K_p?

47. How K_p is related to K_c?

48. What do you mean by equilibrium constant?

49. Write any two characteristics of equilibrium constant.

50. Write an expression for equilibrium constant of the reaction,

`2SO_2(g) + O_2(g) gives 2SO_3(g).

51. $2NO_2(g) \leftrightarrow N_2O_4(g) : \Delta H = -52.7 kJmol_1$

What change will happen if we increase the temperature?

52. $2NO_2(g) \leftrightarrow N_2O_4(g): \Delta H = -52.7 kJmol_1$ What is the effect of increase in pressure in the above equilibrium?

▶ **Watch Video Solution**

53. $2NO_2(g) \leftrightarrow N_2O_4(g): \Delta H = -52.7 kJmol_1$ What happens when N_2O_4 is removed from the reaction medium?
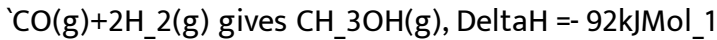
▶ **Watch Video Solution**

54. Consider this reaction:

`CO(g)+2H_2(g)harr CH_3OH(g), Delta_rH =- 92kJMol_1

Explain the influence of the following on the basis of Le Chatelier,s principle.Decrease in pressure.

▶ **Watch Video Solution**

55. Consider this reaction:

`CO(g)+2H_2(g) gives CH_3OH(g), DeltaH =- 92kJMol_1

Explain the influence of the following on the basis of Le Chatelier‚s principle.increase in temperature.

56. Consider this reaction:

$CO(g) + 2H_2(g) \leftrightarrow CH_3OH(g)$, ΔrH =- 92kJ/Mol

Explain the influence of the following on the basis of Le Chateliers principle. Increase in the pressure

57. The equilibrium showing dissociation of phosgene gas is given below:
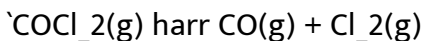
`COCl_2(g) harr CO(g) + Cl_2(g)
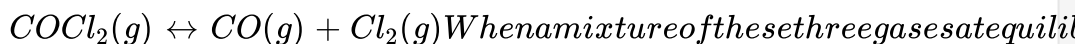
When a mixture of these three gases at equilibrium is compressed at

constant temperature, what happens to

The amount of CO in mixture?

58. The equilibrium showing dissociation of phosgene gas is given below:

$$COCl_2(g) \leftrightarrow CO(g) + Cl_2(g) When a mixture of these three gases at equilibi$$

COCl_2`?

59. The equilibrium showing dissociation of phosgene gas is given below:
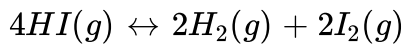
`COCl_2(g) harr CO(g) + Cl_2(g)

When a mixture of these three gases at equilibrium is compressed at

constant temperature, what happens to

the equilibrium constant for the reaction?

60. The equilibrium constant of the reaction $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$ is 57 at 700 K. Now, give the equilibrium constants for the following reaction at the same temperature:

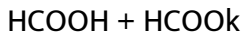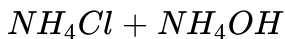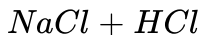$4HI(g) \leftrightarrow 2H_2(g) + 2I_2(g)$

▶ Watch Video Solution

61. The equilibrium constant of the reaction $H_2(g) + I_2 \leftrightarrow 2HI(g)$ is 57 at 700 K. Now, give the equilibrium constants for the following reaction at the same temperature : $HI(g) \leftrightarrow 1/2H_2(g) + 1/2 I_2(g).$ `

▶ Watch Video Solution
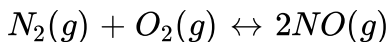
62. what is buffer solutions?

▶ Watch Video Solution

63. Which of the followings are buffer solutions?

$NaCl + HCl$

$NH_4Cl + NH_4OH$

HCOOH + HCOOk

▶ Watch Video Solution

---

64. What is the effect of pressur on thr following equilibria?

$Ice \leftrightarrow Water$

$N_2(g) + O_2(g) \leftrightarrow 2NO(g)$
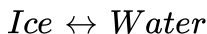
▶ Watch Video Solution

---

65. The aqueous solution of the compounds NaCl, NH_4Cl` and CH_3COONa show different pH. Identify the acidic, basic and neutral solution among them.

▶ Watch Video Solution

66. The concentration of hydrogen ion in a soft drink is 4×10^{-4}. What is its pH?

▶ **Watch Video Solution**

67. What is pH? What is its significance?
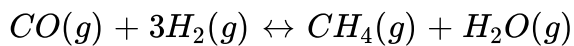
▶ **Watch Video Solution**

68. The concentration of hydrogen ion in a soft drink is 3.8×10^{-3}. What is its pH?

▶ **Watch Video Solution**

69. State the Le-Chatelier's principle.

▶ **Watch Video Solution**

70. Apply the Le- Chatelier principle in the following equilibrium and predict the effect of pressure

$$CO(g) + 3H_2(g) \leftrightarrow CH_4(g) + H_2O(g)$$

▶ Watch Video Solution

71. Explain Lewis Concept of acids and bases.

▶ Watch Video Solution

72. Why does `BF_3' act as a lewis acid?

▶ Watch Video Solution

73. How the value of ΔG influence the direction of an equilibrium process?

▶ Watch Video Solution

74. The equilibrium constant for a reaction is 8. What will be the value of $\Delta G_\ominus$ at `27 degree C?

▶ Watch Video Solution

75. What is common ion effect?

▶ Watch Video Solution

76. Suggest an example for common ion effect.

▶ Watch Video Solution

77. Predict whether an aqueous solution of `(NH_4)_2SO_4 is acidic, basic or neutral?

▶ Watch Video Solution

78. What are sparingly soluble salts? Suggest an example.

> ▶ Watch Video Solution

79. Define solubility product constant, K_sp.

> ▶ Watch Video Solution

80. Obtain the relation between solubility product constant (K_{sp}) and solubility(S), of a solid salt of general formula $M_x^{+p} N_y^{-q}$

> ▶ Watch Video Solution

81. Does the Le Chatelier's principal is applicable to physical and chemical equilibria?

> ▶ Watch Video Solution

82. Explain the factors affecting the chemical equilibrium on the basis of Le Chatelier's principle taking Haber's process for the manufacture of ammonia as an example.

> ▶ Watch Video Solution

83. Soda water is prepared by dissolving CO_2 in water under high pressure. What is the priniciple involved in this process?

> ▶ Watch Video Solution

84. At 1000K, equilibrium constant K_c for the reaction $2SO_3(g) \leftrightarrow 2SO_2(g) + O_2(g)$ is 0.027. What is the value of K_p at this temperature?

> ▶ Watch Video Solution

85. For the reaction

$$PCl_5 \leftrightarrow PCl_3 + Cl_2$$

Write the expression of `Kc'

> ▶ Watch Video Solution

86. write the conjugate acid and base of the following species:

H_2O

HCO_3^-

> ▶ Watch Video Solution

87. Name the phenomenon involved in the preparation of soap by adding

NaCl.

> ▶ Watch Video Solution

88. The pH of black coffee is 5.0. Calculate the hydrogen ion concentration.

89. The Ksp of barium sulphate is 1.5×10^{-9}. Calculate the solubility of barium sulphate in pure water.

90. What is conjugate acid-base pair?

91. What are the applications of equilibrium constant?

92. What is meant by reaction quotient, Q_c?

93. predict the direction of net reaction in the following cases:

$Qc < Kc$

$Qc > Kc$

Qc = Kc`

94. Solubility product helps to predict the precipitation of salts from solution. Find the relation between solubility (S) and solubility product(Ksp) of calcium fluoride and zirconium phosphate.

95. The solubility product of two sparingly soluble salts XY_2 and AB are 4×10^{-15} and 1.2×10^{-16} respectively. Which Sali is more soluble? Explain.

▶ Watch Video Solution

96. How common ion effect can influence the solubility of ionic salts?

▶ Watch Video Solution

97. what is the application of commom ion effect in gravimetric estimation?

▶ Watch Video Solution

98. calculate the $[H^+]$ in the following biological fluid whose pH are given in brackets. Human muscle fluid(6.83)

99. calculate the$[H^+]$ in the following biological fluid whose pH are given in bracket. Human stomach fluid(1.22)

100. calculate the$[H^+]$ in the following biological fluids whose pH are given in bracketrs.Human blood(7.38)

101. calculate the$[H^+]$ in the following biological fluids whose pH are given in bracketrs. Human saliva(6.4)

102. The ph value of a solution determines whether it is acidic, basic or neutral.the concentration of hydrogen ion in the sample of a soft drink is 3.8×10^{-3} mol/l. calculate its pH. Also predict whether the above solution is acidic, basic or neutral.

▶ **Watch Video Solution**

103. the dissociation constants of formic acid(HCOOH) AND ACETIC ACID (CH_3COOH)are1.8xx10^-4 and 1.8xx10^-5` respectively. Which is relatively more acidic? Justify your answer.

▶ **Watch Video Solution**

104. Write the expression for henderson- Hasselbatch equation for an acidic buffer and a basic buffer.

▶ **Watch Video Solution**

105. calculate the pH of a solution which is 0.1 m in CH_3COOH and .5 M in CH_3COONa. k_a for CH_3COOH is 1.8×10^{-6}.

106. A liquid is in equilibrium with its vapour in a sealed container at a fixed temoperature. The volume of the container is suddenly increased. What is the initial effect of the change on vapour pressyre?

107. A liquid is in equilibrium with its vapour in a sealed container at a fixed temperature. The volume of the container is suddenly increased. How do rates of evaporation and condensation change inititally?

108. A liquid is in equilibrium with its vapour in a sealed container at a fixed temperature. The volume of the container is suddenly increased. What happens when equilibrium is restored finally and what will be the final vapour pressure?

▶ Watch Video Solution

109. the concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3}M. what is its ph?

▶ Watch Video Solution

110. The pH of a sample of vinegar is 3.76. Calculate the concentration of hydrogen ions in it.

A. 2g

B.

C.

D.

Answer:

> ▶ Watch Video Solution

---

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

> ▶ Watch Video Solution

---

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

> ▶ Watch Video Solution

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

▶ Watch Video Solution

114. the water solutions of the ionic compounds NaCl, CH_3COONa and NH_4Cl show different pH. Identify the acidic, basic and neutral solution among these.

▶ Watch Video Solution

115. the water solutions of the ionic compounds NaCl, CH_3COONa and NH_4Cl show different pH. Justify your answer.

▶ Watch Video Solution

116. When some sodium acetate is added to a solution of acetic acid, the concentration of unionized acetic acid increases. What is the phenomenon involved? Substantiate.

▶ Watch Video Solution

---

117. Consider the equilibrium,

$AgCl_s \leftrightarrow Ag^+ + Cl_-$ the solubility of AgCl is $1.06 \times 10^{-5} molL^{-1}$ at 298K. Find out its K_sp at this temperature.

A. 1 mole

B.

C.

D.

Answer:

▶ Watch Video Solution

118. what happens to the value of solubility and solubility product when HCl is passed through an AgCl solution?

▶ Watch Video Solution

119. Lowry Bronsted concept of acids and based on the exchange of H^+ during a reaction. Llustrate with an example of the conjugate acid-base pair.

▶ Watch Video Solution

120. explain the Lewis concept of acids and base.

▶ Watch Video Solution

121. According to Lewis theory classify the following into acids and bases:

$H_2O, NH_3, AlCl_3, OH^-$

122. Common ion effect is a phenomenon based on the Le-Chatelies principle.llustrate the common ion effect using an example.

123. if the concentration of the hydrogen ion in soft drink is 3×10^{-3}M, calculate its pH.

124. identify the Lewis acids from the following:

125. what is conjugate acid base pair? liustrate with an example.

126. Desine th pH scale.The pH of a soft drink is 2.42. give the nature of the solution.
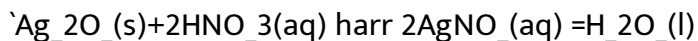
127. an aqueous solution of $CuSO_4$ is acidic while that of Na_2SO_4 is neutral. Explain.

128. write equation for rquilibrium constant in terms of concentration(K_c) for the equilibrium reaction given below.

`Ag_2O_(s)+2HNO_3(aq) harr 2AgNO_(aq) =H_2O_(l)

129. what are buffer solution? Given an example for a buffer solution.

130. The concentration of H^+ ion in a sample of soft drink is 3.8×10^{-3} M. determine its pH.

131. Le-chatelier's prinicle makes q qulitative prediction about the change in conditions on equilibrium. Sate the Le-Chateliers principle.

132. `N_2(g) + O_2(g) harr 2NO_(g)

what is the effect of pressur on the above equilibrium?

133. The species HCO_3^- and HSO_4^- can act both as Bronsted acids and bases. Write the corresponding conjugate acid and conjugate base of the above species.
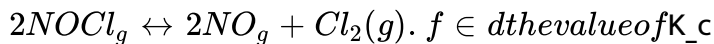
▶ Watch Video Solution

134. give the arrhenius concept about acids and bases.

▶ Watch Video Solution

135. Give one example each for arrhenius acid and base

▶ Watch Video Solution

136. Write the expression for equilibrium if the value of K_p for the following equilibrium.

$2NOCl_g \leftrightarrow 2NO_g + Cl_2(g).$ $f \in dthevalueofK\_c$

f or $aboveequilibrium$ if $thevalueofK_pis$1.8xx10^-2atmat600K.

R=0.0821L atm K_1 mol_1`

> ▶ Watch Video Solution

137. Equilibrium constant helps in predicting the direction helps in predicting the direction in which a given reaction wil proceed at any stage.In which one of the following conditions a chemical reaction proceeds in the forward direction?
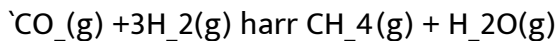
> ▶ Watch Video Solution

138. write whether the following statement is true or false.

" high value of equilibrium constant suggest high concentration of the reactants in the equilibrium mixture"

> ▶ Watch Video Solution

139. State the le-chatelier's principle.

applying this principle, explain the effect of pressure in the following equilibrium.

`CO_(g) +3H_2(g) harr CH_4(g) + H_2O(g)

140. Write the expression for equilibrium constant K_Θ for the following equilibrium.

$$CuSO_4.5H_2O_{(g)} \leftrightarrow CuSO_4.3H_2O_s + 2H_2O_g$$

A. $' \leftrightarrow '$

B.

C.

D.

Answer:

141. the solubility product of $Al(OH)_3$ is 1×10^{-36}. Calculate the solubility of `Al(OH)_3.

142. exlain the concept of Lewis acids and Lewis bases with Suitable examples.

143. write the Henderson-Hasslbalch equation for an acidic buffer, calculate the pH of an acidic buffer containing 0.1M CH_3COOH and 0.5M CH_3COONa $[Kaf$ or $CH_3COOHis1.8 \times 10^{-5}]$