CHEMISTRY

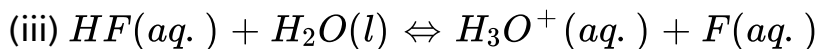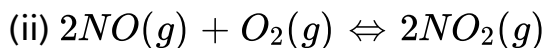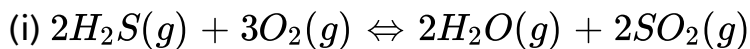## BOOKS - R SHARMA CHEMISTRY (HINGLISH)

EQUILIBRIUM

Examples

**1.** Write the expressions for K_p and K_e (whichever is applicable) for the following reversible reactions at equilibrium:

(i) $2H_2S(g) + 3O_2(g) \Leftrightarrow 2H_2O(g) + 2SO_2(g)$

(ii) $2NO(g) + O_2(g) \Leftrightarrow 2NO_2(g)$

(iii) $HF(aq.) + H_2O(l) \Leftrightarrow H_3O^+(aq.) + F(aq.)$

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2. Calculating K_c: Some nitrogen and hydrogen gas are placed in an empty $2.50L$ container at $500°C$. When equilibrium is established, 1.51 mol of N_2, 1.05 mol of H_2, and 0.283 mol of NH_3 are present. Calculate K_c for the following reaction at $500°C$:

$$N_2(g) + 3H_2(g) \Leftrightarrow NH_3(g)$$
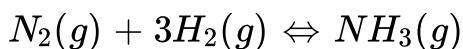
3. Calculating K_p: In an equilibrium mixture at $500°C$, we find that $P_{NH_3} = 0.076$ atm, $P_{N_2} = 3.00$ atm, and $P_{H_2} = 1.85$ atm. Calculate K_p at $500°C$ for the following reaction

$$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$$
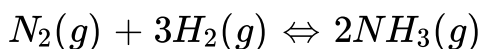
4. Calculate K_p from K_c: The equilibrium constant, K_c, for the reaction

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

is 3.64×10^{-3} at $25°C$. What is the value of K_p at this temperature?

5. K_c and K_p for heterogeneous equilibrium:

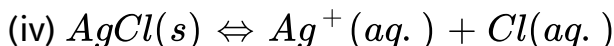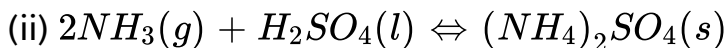Write the equilibrium constant expressions K_c and K_p, if applicable, for each of the following heterogeneous system:

(i) $S(s) + H_2SO_3(aq.\ ) \Leftrightarrow H_2SO_3(aq.\ )$

(ii) $2NH_3(g) + H_2SO_4(l) \Leftrightarrow (NH_4)_2SO_4(s)$

(iii) $P_4(s) + 6Cl_2(g) \Leftrightarrow 4PCl_3(l)$

(iv) $AgCl(s) \Leftrightarrow Ag^+(aq.\ ) + Cl(aq.\ )$

(v) $(NH_4)Se(s) \Leftrightarrow 2NH_3(g) + H_2Se(g)$
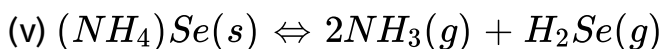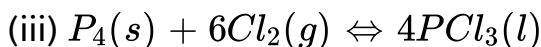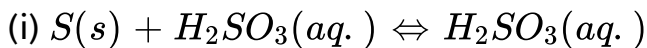
6. Reaction quotient: At a very high temperature, $K_c = 65.0$ for the following reversible reaction:

$$2HI(g) \Leftrightarrow H_2(g) + I_2(g)$$
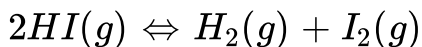
The following concentrations were detected in a mixture.
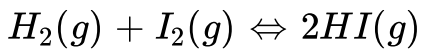
$C_{HI} = 0.50M, C_{H_2} = 2.80M$, and $C_{I_2} = 3.40M$

Is the system at equilibrium ? If not, in which direction must the reaction proceed for equilibrium to be established?

7. Finding equilibrium concentrations: A mixture of 0.50 mol H_2 and 0.50 mol I_2 is placed in a $1.00L$ stainless steel container at $400°C$. The equilibrium constant K_c for the reaction

$$H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$$

is 54.3 at this temperature. Calculate the equilibrium concentrations of H_2, I_2, and HI.

8. The equilibrium constant K_c for the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is 54.3 at $400°C$. If the initial concentrations of H_2, I_2 and HI are $0.00623M$, $0.00414M$, and $0.0224M$, respectively, calculate the concentrations of these species at equilibrium.

9. Changes in concentration: Some hydrogen and iodine are mixed at $229°C$ in a 1.00-liter container. When equilibrium is

estabilished, the following concentrations are present: $C_{H_2} = 0.080M$, $C_{I_2} = 0.060M$, and $C_{HI} = 0.490M$. If an additional 0.300 mol of HI is then added, what concentrations will be present when the new equilibrium is established?

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10. An equilibrium mixture at $300K$ contains N_2O_4 and NO_2 at 0.28 and $1.1atm$, respectively. If the volume of container is doubles, calculate the new equilibrium pressure of two gases.

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11. Write the conjugate bases for the following Brddotonsted acids

(a) HF (b) H_2SO_4 (c) $HCO_3^{\ominus}$

12. Wirte the conjugate acids for the following Brdddotosted

bases:

a. $\overset{\ominus}{N}H_2$ b. NH_3 c. $HCOO^{\ominus}$

13. Classify the following species into Lewis acids and bases and

show how these act as such:

(i) BCl_3 (ii) H^+ (iii) F^- (iv) HO^-

14. Calculate the degree of ionization of pure water at $25°C$.

15. The ionization constant of HF is 3.2×10^{-4}. Calculate the degree of ionization of HF in its $0.02M$ solution. Calculate the concentration of all species present in the solution and its pH.

16. Calculate the percent ionization of $0.10M$ acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$.

17. The pH of $0.004M$ hydrazine $(NH_2. NH_2)$ solution is 9.7. Calculate its ionisation constant K_b and pK_b.

18. Calculate the concentration of all species present in $0.010M H_2SO_4$ solution. $\left(K_{a_2} = 1.3 \times 10^{-2}\right)$

19. Calculate the concentration of H_3O^+ of a mixture (solution) that is $0.010M$ in CH_3COOH and $0.20M$ in $NaCH_3 {}_- COO$. $\left(K_a = 1.8 \times 10^{-5}\right)$

Follow Up Test 1

1. When a volatile liquid is introduced into an evacuated closed vessel at a particular temperature, both evaporation and condensation take place simultaneously. The system reaches equilibrium state when

A. the liquid is completely transformed into the corresponding vapor

B. equal amounts of liquid and vapor are present in the system

C. the rate of evaporation becomes equal to the rate of condensation

D. liquid cannot be converted into vapor and vice versa.

Answer: C

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2. Which of the following equilibrium is dynamic?

A. Solid $\Leftrightarrow$ Liquid

B. Liquid $\Leftrightarrow$ Vapor

C. Solid $\Leftrightarrow$ Vapor

D. All of these

Answer: D

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3. Which of the following is not true for solid-liquid equilibrium?

A. It can be established at any given temperature.

B. The mass of solid does not change with time.

C. The mass of liquid does not change with time.

D. There is no exchange of heat between the system and its

surroundings.

Answer: A

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4. The vapor pressures of water, acetone, and ethanol at $293K$ are $2.34, 12.36,$ and $5.85kPa,$ respectively. Which of the following statements is correct?

A. Acetone has the lowest boiling point.

B. Water has the highest boiling point.

C. Water evaporates the least in a sealed container at $293K$ before equilibrium is established.

D. All of these

Answer: D

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5. Which of the following substances can be placed in a closed vessel to establish solid $\Leftrightarrow$ vapor equilibrium?

A. Ammonium chloride

B. Camphor

C. Iodine

D. All of these

Answer: D

6. Which of the following solutions kept in contact with undisolved solute is an example of solid-solution equilibrium?

    A. Aqueous solution

    B. Saturated solution

    C. Unsaturated solution

    D. Nonaqueous solution

Answer: B

7. $0.200g$ of iodine is stirred in $100mL$ of water at $298K$ till equilibrium is reached:

$[I_2(aq.\ )]_{\text{Equilibrium}} = 0.0011molL^{-1}$ at $298K$

What will be the mass of iodine found in solution?

A. $0.028g$

B. $0.28g$

C. $0.0028g$

D. $2.8g$

Answer: A

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8. $0.200g$ of iodine is stirred in $100mL$ of water. After equilibrium is reached, we add $150mL$ of water to the system.

How much iodine will be left undissolved?

A. $1.3g$

B. $0.130g$

C. $0.013g$

D. $13g$

Answer: B

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9. What will be the concentration of iodine in solution?

A. $1.1M$

B. $0.011M$

C. $0.0011M$

D. $0.11M$

Answer: C

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10. Which of the following is correct regarding the gas-solution

equilibrium?

A. The solubility of the dissolved gas increases with the

increase of pressure and decreases with the increase of

temperature.

B. The solubility of the dissolved gas increases with the

increase of pressure as well as temperature.

C. The solubility of the dissolved gas decreases with the increase of pressure and increases with the increase of temperature.

D. The solubility of the dissolved gas decrease with the increase of pressure as well as temperature.

Answer: A

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Follow Up Test 2

1. A reversible chemical reaction is said to be at equilibrium when

A. equal amounts of reactants and products are present

B. reactants are completely converted into products

C. the rates of the forward and backward reactions become

equal

D. products cannot be converted into reactants and vice

versa.

Answer: C

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2. Chemical equilibrium is a dynamic equilibrium because

A. the rate of forward reaction in nonzero

B. the rate of backward in nonzero

C. concentrations of reactants and products always keep changing

D. Both forward and backward reactions occur simultaneously at the rate which is nonzero.

Answer: D

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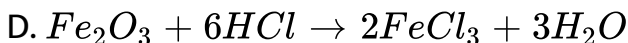
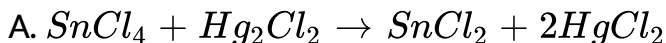**3.** An example of a reversible reaction is

A. $2Na(s) + H_2O(l) \rightarrow 2NaOH(aq.) + H_2(g)$

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

C.

$KNO_3(aq.) + NaCl(aq.) \rightarrow KCl(aq.) + NaNO_3(aq.)$

D.

$$Pb(NO_3)_2(aq.) + 2NaI(aq.) \rightarrow PbI_2(s) + 2NaNO_3(aq.)$$
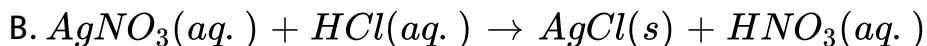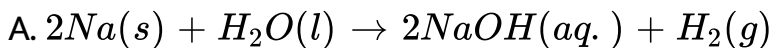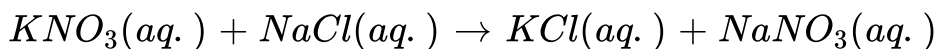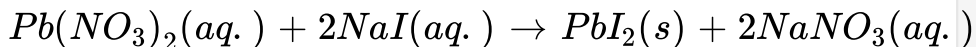
Answer: C

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4. The reaction which proceeds in the forward direction is.

A. $SnCl_4 + Hg_2Cl_2 \rightarrow SnCl_2 + 2HgCl_2$

B. $2C \underline{+} I_+ 4K^+ \rightarrow 2Cu^{2+} + 4Kl$

C. $NH_3 + H_2O + NaCl \rightarrow NH_4Cl + NaOH$

D. $Fe_2O_3 + 6HCl \rightarrow 2FeCl_3 + 3H_2O$
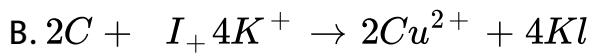
Answer: D

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5. Which of the following correctly depicts the attainment of equilibrium for the reaction:

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$
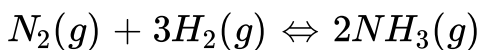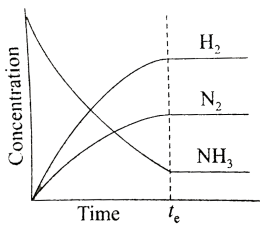
beginning with stoichiometric amounts of $N_2(g)$ and $H_2(g)$ and no $NH_3(g)$.
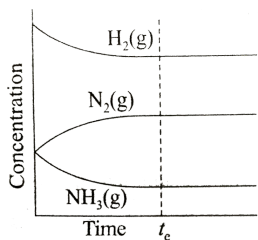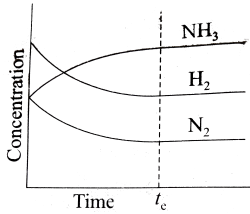

A.
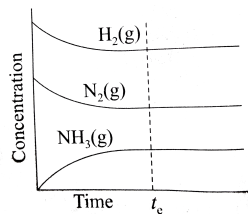
B.

C.

D.

Answer: B

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6. Equilibrium mixture (I) consists of N_2, H_2, and NH_3. Equilibrium mixture (II) consists of N_2, D_2, and ND_3. Which of the following observations is correct if both the mixtures (I and II) are mixed together and left for a while?

A. The concentration of NH_3 is just the same as before.

B. Ammonia and all deuerium-containing forms of ammonia

   $(NH_2D, NHD_2,$ and $ND_3)$ are present.

C. Dihydrogen and all deutrated forms $(HD$ and $D_2)$ are

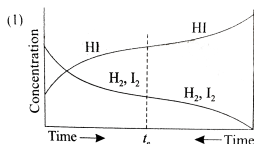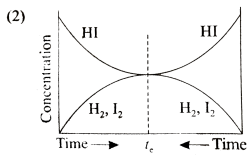   present.
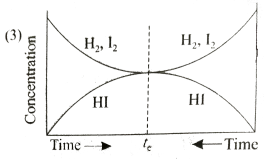
D. All of these

Answer: D

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7. Which of the following correctly depicts the fact that

identical chemical equilibrium can be attained through

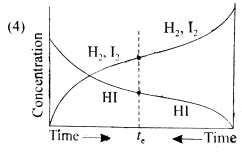reversible reaction $H_2 + I_2 = 2HI$ from either direction?

A.

(2)

B.

(3)

C.

(4)

D.

Answer: A

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Follow Up Test 3

1. According to the law of mass action, the rate of an elementary reaction is directly proportional to the_____of the

reactants.

A. mole fractions

B. molalities

C. normalities

D. molarities

Answer: D

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2. According to the law of chemical equilibrium,

A. the rate of forward reaction becomes equal to the rate of

backward reaction when the chemical system attains

equilibrium

B. a system can achieve the equilibrium state through forward as well as backward reaction

C. both (1) and (2)

D. the equilibrium constant K_{eq} is defined as the product of the equilibrium active masses of the products, each raised to the power that corresponds to its coefficient in the balanced equation, divided by the product of the equilibrium active masses of reactants, each raised to the power that corresponds to its coefficient in the balanced equation

Answer: D

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3. K_f and K_b are the velocity constants of forward and backward reactions. The equilibrium constant K_{eq} of the reversible reaction will be

A. K_b / K_f

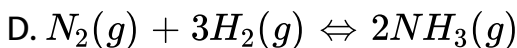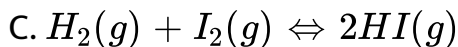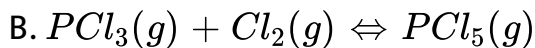B. $K_f \times K_b$

C. K_f / K_b

D. $K_f - K_b$

Answer: C

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4. In which of the following equilibrium equation, $K_p > K_c$?

A. $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$

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

C. $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$

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

Answer: A

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5. For the equilibrium equation

$2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$
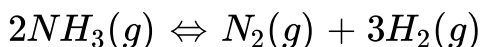
the units of K_p will be

A. $(atm)^{-2}$

B. $(atm)^2$

C. $(atm)^3$

D. atm

Answer: B

6. The equilibrium constant of the equilibrium equation

$$H_2O(g) + CO(g) \Leftrightarrow H_2(g) + CO_2(g)$$
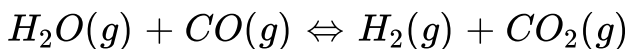
is 0.44 at $1259K$. The value of equilibrium constant for the

equilibrium equation

$$H_2(g) + 2CO_2(g) \Leftrightarrow H_2O(g) + CO(g)$$
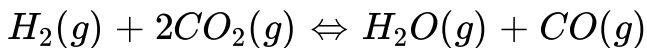
will be

A. -0.44

B. $-1/0.44$

C. $1/0.44$

D. 0.44

Answer: C

7. For the reversible reaction

$$H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$$
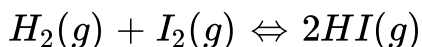
the value of the equilibrium constant depends on the

    A. pressure of the system

    B. volume of the reaction vessel

    C. initial concentration of H_2 and I_2

    D. `temperature of the system

Answer: C

8. If the equilibrium constant of the reversible reaction

$HI(g) \Leftrightarrow 1/2H_2(g) + 1/2I_2(g)$ is 7.4, the equilibrium

constant for the reversible reaction $2HI(g) \Leftrightarrow H_2(g) + I_2(g)$

will be

A. $\sqrt{7.4}$

B. 54.76

C. 14.8

D. 7.4

Answer: B

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9. $1.7g$ of $NH_3(g)$ is present in a $2 - L$ flask. The active mass of

$NH_3(g)$ is

A. $0.1M$

B. $0.02M$

C. $0.05M$

D. $0.5M$

Answer: C

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10. The active mass for any pure liquid or pure solid

A. is always taken as 1

B. is always infinity

C. is always zero

D. would depend on the nature of the solid

Answer: A

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11. The relation between K_p and K_x is

A. $K_p = K_x \left(\dfrac{P}{\sum n} \right)$

B. $K_p = K_x (P)^{-\Delta n}$

C. $K_p = K_x (P)^{\Delta n}$
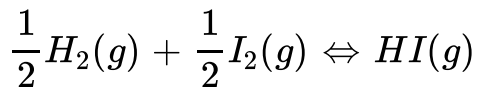
D. $K_p = K_x (RT)^{\Delta n}$

Answer: C

12. If the equilibrium constant of the reaction

$2HI(g) \Leftrightarrow H_2(g) + I_2(g)$ is 0.25, the equilibrium constant of

the reaction

$$\frac{1}{2}H_2(g) + \frac{1}{2}I_2(g) \Leftrightarrow HI(g)$$

will be

A. 2.0

B. 4.0

C. 1.0

D. 3.0

Answer: A

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13. If $CoO(s) + H_2(g) \Leftrightarrow Co(s) + H_2O(g)$, $K_1 = 60$

$CoO(s) + CO(g) \Leftrightarrow Co(s) + CO_2(g)$, $K_2 = 180$

then the equilibrium constant of the reaction

$CO_2(g) + H_2(g) \Leftrightarrow CO(g) + H_2O(g)$

will be

A. 0.44

B. 0.11

C. 0.22

D. 0.33

Answer: D

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Follow Up Test 4

1. Equilibrium concentrations of A, B and C in a reversible reaction

$3A + B \Leftrightarrow 2C + D$

are 0.03, 0.01, and $0.008 mol L^{-1}$. Calculate the initial concentration of A?

A. 0.014

B. 0.042

C. 0.084

D. 0.343

Answer: B

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2. At $250°C$, K_c for $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ is 0.04. How many moles of PCl_5 must be added to a $3 - L$ flask to obtain $0.15 M Cl_2$ at equilibrium?

A. $2.1 mol$

B. $1.7 mol$

C. $0.9 mol$

D. $3.5 mol$

Answer: A

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3. A large value of equilibrium constant shows that

A. the reaction is taking place at high temperature

B. the reaction is very little in the forward as well as backward direction

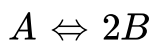C. the reaction is less in the forward direction and more in the backward direction

D. the forward reaction occurs to a greater extent than the reverse reaction

Answer: D

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4. The equilibrium constant K_p for the reaction

$$A \Leftrightarrow 2B$$

is related to the degree of dissociation (α) of A and total pressure P as

A. $\dfrac{4\alpha^2 P}{1-\alpha}$

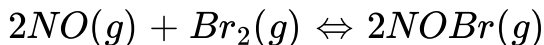B. $\dfrac{4\alpha^2 P^2}{1-\alpha}$

C. $\dfrac{4\alpha^2 P}{1-\alpha^2}$

D. $\dfrac{4\alpha^2 P^2}{1-\alpha^2}$

Answer: C

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5. The partial pressures of NO, Br_2, and $NOBr$ in a flask at $25°C$ are 0.01, 0.1, and $0.04 atm$, respectively. If the equilibrium constant at $25°C$ for the reaction

$$2NO(g) + Br_2(g) \Leftrightarrow 2NOBr(g)$$

is equal to $160 atm^{-1}$, then we can say that

A. the partial pressure of $NOBr$ finally will be $0.05 atm$

B. there is equilibrium in the flask

C. the reaction will proceed in the forward direction

D. the reaction will proceed in the backward direction

Answer: B

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6. The equilibrium for the formation of SO_3 was established at a certain temperature starting with one mole of O_2 and two moles of SO_2. If V is the volume of the vessel and $2x$ is the number of moles of SO_3 present at equilbrium, then equilibrium constant will be

A. $\dfrac{(1-x)^3}{2V}$

B. $\dfrac{4x^2}{(2-x)(1-x)}$

C. $\dfrac{x^2}{(2-x)(1-x)}$

D. $\dfrac{x^2 V}{(1-x)^3}$

Answer: D

7. The dissociation of ammonium hydrogen sulphide in a closed container produces a pressure of $10 atm$ at $200°C$. The value of K_p is

A. 25

B. 50

C. 100

D. 75

Answer: A

8. If $1:3$ (molar ratio) mixture of N_2 and H_2 yields 20% (by volume) of NH_3 at $30atm$, then the moles of N_2 converted into the product at equilibrium will be

A. 0.66

B. 0.22

C. 0.33

D. 0.44

Answer: C

9. The equilibrium pressure necessary to obtain 50% dissociation of PCl_5 at $250°C$ is numerically_____of K_p.

    A. six times

    B. four times

    C. five times

    D. three times

Answer: D

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10. $2mol$ each of A and B are taken in a container to carry out the following reaction:

$$2A(g) + B(g) \Leftrightarrow 2C(g) + 2D(g)$$
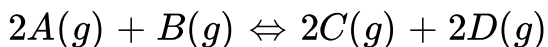
When the system attains equilibrium, we have

A. $[A] < [B]$

B. $[A] > [B]$

C. $[A] = [B]$

D. $[A] = [B] = [C] = [D]$

Answer: A

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Follow Up Test 5

1. Which of the following expressions is correct?

A. $\Delta G = \Delta G^{\ominus} + RT1nQ$

B. $\Delta G^{\ominus} = - RT1nK_{eq}$
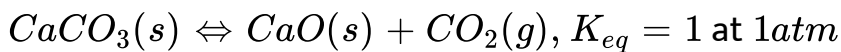
C. $K_{eq} = e^{-\Delta G^{\ominus}/RT}$

D. All of these

Answer: D

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2. If for heterogeneous equilibrium,

$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g), K_{eq} = 1$ at $1 atm$

pressure, the corresponding temperature is given by

A. $T = \dfrac{\Delta G^{\ominus}}{\Delta H^{\ominus}}$

B. $T = \dfrac{\Delta G^{\ominus}}{R}$

C. $T = \dfrac{\Delta S^{\ominus}}{\Delta H}$

D. $T = \dfrac{\Delta H^{\ominus}}{\Delta S^{\ominus}}$

Answer: D

3. If for homogeneous equilibrium,

$H_2(g) + I_2(g) \Leftrightarrow 2HI(g), K_{eq} = 1$, then

    A. the reaction is spontaneous in the forward direction

    B. the reaction is spontaneous in the backward direction

    C. the reaction is spontaneous in both the directions

    D. the reaction is neither spontaneous in the forward

       direction nor spontaneous in the backward direction

Answer: D

1. Le Chatlier's principle is applicable when

(i) $Fe(s)$ and $S(s)$ react to form $FeS(s)$

(ii) $PCl_5(g)$ decomposes to form $PCl_3(g)$ and $Cl_2(g)$

(iii) $N_2(g)$ and $H_2(g)$ react to form $NH_3(g)$

(iv) $H_2(g)$ and $I_2(g)$ react to form $HI(g)$

    A. (i), (ii), (iii), (iv)

    B. (i), (ii), (iii)

    C. (ii), (iii), (iv)

    D. (i), (iii), (iv)

Answer: C

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2. Iron (III) thiocyanate $[Fe(SCN)_3]$ dissolves readily in water to give a red solution. The red color of the solution deepens when_____is added.

(i) oxalic acid $(H_2C_2O_4)$

(ii) sodium thiocyanate $(NaSCN)$

(iii) iron (III) nitrate $[Fe(NO_3)_3]$

(iv) mercuric chloride $(HgCl_2)$

    A. (i), (ii), (iii)

    B. (i), (iv)

    C. (i), (iii), (iv)

    D. (i), (ii), (iii), (iv)

Answer: A

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3. For a physical equilibrium

$$H_2O(s) \Leftrightarrow H_2O(l)$$
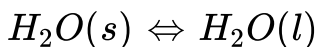
which of the following is true?

A. At low pressure, the nature of equilibrium changes to

$$H_2O(s) \Leftrightarrow H_2(g) + 1/2O_2(g)$$
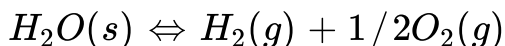
B. More of liquid freezes if the pressure on the system is

increased.
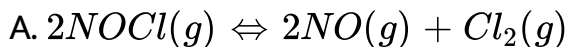
C. The pressure change does not affect the equilibrium.

D. More of ice melts if the pressure on the system is

increased.

Answer: D

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4. Which of the following equilibria remains unaffected by a change in pressure (or volume)?
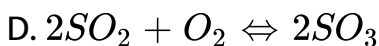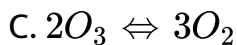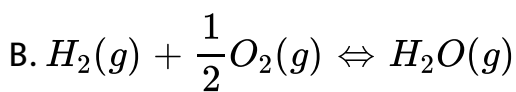
A. $2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g)$

B. $H_2(g) + CO_2(g) \Leftrightarrow H_2O(g) + CO(g)$

C. $2PbS(s) + 3O_2(g) \Leftrightarrow 2PbO(s) + 2SO_2(g)$

D. $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$
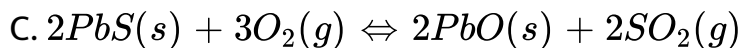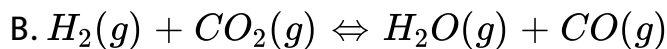
Answer: B

5. Which of the following equilibrium is favored by a temperature increase?

A. C (graphite) $\Leftrightarrow$ C (diamond)

B. $H_2(g) + \dfrac{1}{2}O_2(g) \Leftrightarrow H_2O(g)$

C. $2O_3 \Leftrightarrow 3O_2$

D. $2SO_2 + O_2 \Leftrightarrow 2SO_3$
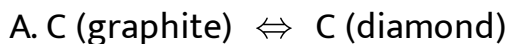
Answer: A

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6. Consider the following equilibrium system:

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$
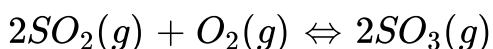
Some inert gas is added to the above system at constant volume. Predict which of the following is true?

A. More of SO_3 is produced.
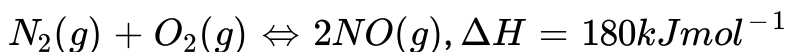
B. Less SO_2 is produced.

C. Addition of inert gas does not affect equilibrium.

D. System moves to new equilibrium position which can not

be predicted theoretically.

Answer: C

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7. Which of the following is not true for the equilibrium

reaction

$$N_2(g) + O_2(g) \Leftrightarrow 2NO(g), \Delta H = 180kJmol^{-1}$$

A. The formation of NO is increased at higher temperature.

B. The volume change at constant pressure does not affect

the equilibrium.

C. The pressure change at constant volume does not affect

the equilibrium.

D. The formation of NO is decreased at higher temperature.

Answer: D

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

    A. increased temperature favors forward reaction

    B. addition of $NaNO_2$ favors reverse reaction

    C. increased pressure favors forward reaction

    D. adding of $NaNO_2$ favors forward reaction

Answer: A

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9. Adding a catalyst to a reaction at equilibrium

    A. changes Q

    B. changes K_{eq}

    C. changes both Q and K_{eq}

    D. changes neither Q nor K_{eq}

Answer: D

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10. Consider the following equilibrium system:

$$SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$$
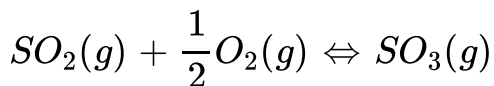
set up in a cylinder fitted with a piston. Some inert gas is added

and the piston is moved outwards to keep the total gaseous pressure constant. Predict which of the following is true?

A. Addition of inert gas does not affect the equilibrium.

B. Less $SO_3(g)$ is product.

C. More $SO_3(g)$ is produced.

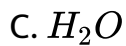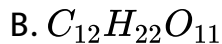D. The system moves to new equilibrium position which cannot be predicted theoretically.
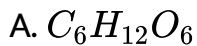
Answer: B

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Follow Up Test 7

1. Which of the following is an electrolyte ?

A. $C_6H_{12}O_6$

B. $C_{12}H_{22}O_{11}$

C. H_2O

D. K_2CrO_4
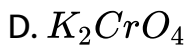
Answer: D

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2. Which of the following is a nonelectrolyte ?

A. Urea

B. Methanol

C. Ethanol

D. All of these

Answer: D

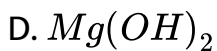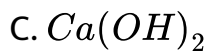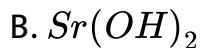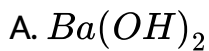**3.** Which of the following is a weak electrolyte ?

A. HF

B. HCI

C. HBr

D. HI

Answer: A

4. Which of the following is a strong electrolyte ?
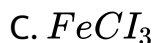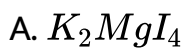
A. $Ba(OH)_2$

B. $Sr(OH)_2$

C. $Ca(OH)_2$

D. $Mg(OH)_2$

Answer: D

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5. Which of the following gives the maximum number of ions per mole when dissolved in water ?

A. K_2MgI_4

B. $CuSO_4$

C. $FeCI_3$

D. KI_3

Answer: C

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6. Which of the following is the best conductor of electricity ?

A. $1MH_3PO_4$

B. $1MH_2SO_4$

C. $1MH_2CO_3$

D. $1MHCI$

Answer: B

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1. Hydrochloric acid present in the gastric juice is secreted by the lining of our stomach in a significant amount of _____ L day^{-1} .

    A. $1.2 - 1.5$

    B. $0.5 - 1.0$

    C. $1.5 - 2.0$

    D. $1.0 - 2.0$

Answer: A

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2. Which of the following acids is known to be the main component of vinegar ?

A. Hydrocyanic acid

B. Formic acid

C. Butyric acid

D. Acetic acid

Answer: D

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3. Lemon and orange juices contain

A. citric acid

B. ascorbic acid

C. tartaric acid

D. both (1) and (2)

Answer: D

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4. Which of the following acids is not completely ionized in aqueous solution ?

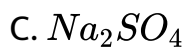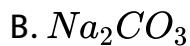A. Hydrochloric acid
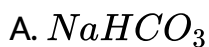
B. Sulphuric acid

C. Acetic acid

D. Nitric acid

Answer: C

5. Which of the following salts is a base and is used for washing purposes ?

A. $NaHCO_3$

B. Na_2CO_3

C. Na_2SO_4

D. $NaCI$

Answer: B

Follow Up Test 9

1. Which of the following is not a typical Arrhenius acid ?
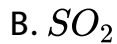
A. CO_2

B. SO_2

C. SO_3

D. All of these

Answer: D

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2. Which of the following is not a typical Arrhenius base ?

A. NH_3

B. Na_2CO_3

C. CaO

D. All of these

Answer: D

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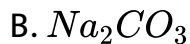
3. Which of the following is a Bronsted acid ?

(i) HCN , (ii) $H_2PO_4^-$

(iii) NH_4^+ , (iv) HCI

    A. (i), (iii)

    B. (i), (ii), (iii), (iv)

    C. (ii), (iii)

    D. (i), (iii), (iv)

Answer: B

4. Which of the following is a Bronsted base ?

(i) NH_3 , (ii) CH_3NH_2

(iii) HCO_3^- , (iv) SO_4^{2-}

    A. (i), (ii), (iii), (iv)

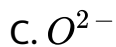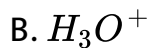   B. (i), (ii)

    C. (i), (ii), (iv)

    D. (ii), (iii), (iv)

Answer: A

5. The conjugate base of hydroxide ion is

A. H_2O

B. H_3O^+

C. O^{2-}

D. O_2
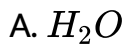
Answer: C

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

A. N_2H_4

B. NH_2OH

C. NH_4^+

D. NH_3
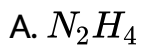
Answer: D

7. Which of the following can acct both as a Bronsted acid as well as a Bronsted base ?

A. H_2SO_4

B. HCO_3^-

C. O^{2-}

D. NH_4^+
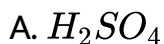
Answer: B

8. Which of the following acid-base reactions cannot be explained by the Bronsted theory ?

A. $CO_2 + CaO \rightarrow CaCO_3$

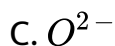B. $BF_3 + NH_3 \rightarrow \overline{B}F_3\overset{+}{N}H_3$

C. $Ni + 4CO \rightarrow Ni(CO)_4$
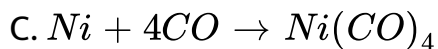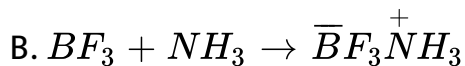
D. All of these

Answer: D

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9. Which of the following Bronsted acids has the wekest conjugate base ?

A. H_2O

B. HCN

C. $HCOOH$

D. HF

Answer: D

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10. Which of the following is a Lewis acid ?

A. BF_3

B. $SnCI_4$

C. CO_2

D. All of these

Answer: D

11. Which of the following is not a Lewis base ?

A. CH_4

B. CN^-

C. ROH

D. NH_3

Answer: A

12. Which of the following is correct according to the Lewis acid-

base concept ?

A. All positively chages ions are bases.

B. All negatively charged ions are acids.

C. A molecule in which the central atom has vacant d-orbitals avaliable acts as an acid.

D. Species in which the central atom has complete octet cannot act as acid.

Answer: C

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13. Which of the following ions can act as Lewis acids ?

A. Alkali metal ions

B. Transition metal ions

C. Alkaline earth metal ions

D. All metal ions

Answer: B

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14. Which of the following is correct regarding the Lewis concept of acids and bases ?

A. It cannot explain the cases when a species is donating as

well as accepting electron pairs.

B. It cannot explain the acidic chaacter of protonic acids.

C. It cannot explain quantiatively the strength of acids as

well as bases.

D. All of these

Answer:

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Follow Up Test 10

1. The concentration of OH^- ions in a $0.050M HNO_3$ solution is

A. 2.0×10^{-13}

B. 1.0×10^{-13}

C. 0.5×10^{-13}

D. 1.5×10^{13}

Answer: A

---

2. The pH of a $0.005 M H_2 SO_4$ solution is

A. 3.3

B. 5.0

C. 2.0

D. 4.0

Answer: C

---

3. Which of the following has the minimum pH ?

A. Blood

B. Gastric juice

C. Saliva

D. Milk

Answer: B

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4. The pH of a solution is 1.30. The number of signuficant figure

is

A. three

B. one

C. zero

D. two

Answer: D

---

5. The pH of an aqueous solution containing $0.1 M HCI$ will be

A. small than $0.1 M H_2SO_4$

B. smaller than $0.1 M$ acetic acid solution

C. greater than $0.1 M$ acetic acid solution

D. equal to $0.1 M$ acetic acid solution.

Answer: B

6. Which of the following has $pK_w = 13.36$ at $50°C$, the pH of pure water will be

   A. H_2O

   B. NH_3

   C. HF

   D. All of these

Answer: D

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7. If a neutral solution has $pK_w = 13.36$ at $50°C$, then pH of the solution is

   A. 6.63

B. 7.0

C. 7.13

D. 6.0

Answer: A

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8. How many hydrogen ions are present in $1ml$ of a solution of $pH = 13$?

A. 10^{-16}

B. 6.022×10^{13}

C. 6.022×10^{7}

D. 6.022×10^{23}

Answer: C

9. What will be the change in the pH of water if 10^{-3} mol of

NaOH is added to 1.0 L of water ?

    A. Decreased by 4

    B. Increased by 4

    C. Increased by 3

    D. Decreased by 4

Answer: B

10. If pH of A, B,C and D are 9.5, 2.5, 3.5 and 5.5 respectively, then strongest acid is

A. D

B. C

C. A

D. B

Answer: D

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11. On dilution, the pH of a basic solution

A. increases

B. remains the same

C. decreases

D. may increase ordecrease depending upon the nature of

the solution

Answer: C

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12. Give $pK_w(H_2O) = 6.77$ at $40°C$, predict the nature of the

solution having $pH = 7$ at $40°C$?

A. Basic

B. Acidic

C. Neutral

D. Cannot be predicted

Answer: A

---

13. With decrease of temperature, ionic product of water

A. increases

B. decreases

C. remains the same

D. may increase or decrease

Answer: B

14. $10^{-5} MHCI$ solution at $25°C$ is dilluted 1000 times. The pH of the diluted solution will

    A. be equal to 8

    B. remain unchanged

    C. lie between 5 and 6

    D. lie between 6 and 7

Answer: D

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15. pH of a 100 cc solution is 2. It will not change if

    A. 100 cc of 0.1 M HCl is added to it

    B. 100 cc of water is added to it

C. 100 cc of 0.01 N HCl is added to it

D. 1 cc of 0.1 M HCl is added to it

Answer: C

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Follow Up Test 11

1. Calculate the concentration of the formate ion present in 0.100 M formic acid $(HCOOH)$ solution at equilibrium $(K_a = 1.7 \times 10^{-4})$.

    A. $4.1 \times 10^{-3} M$

    B. $3.1 \times 10^{-3} M$

    C. $2.1 \times 10^{-3} M$

D. $5.1 \times 10^{-3} M$

Answer: A

2. Which of the following is the weakest acid ?

    A. Phenol $\left(K_a = 1.3 \times 10^{10} \right)$

    B. Hydrocyanic acid $\left(K_a = 4.9 \times 10^{-10} \right)$

    C. Acetic acid $\left(K_a = 1.8 \times 10^{-5} \right)$

    D. Benzoic acid $\left(K_a = 6.5 \times 10^{-5} \right)$

Answer: A

3. The correct experssion for Ostwald's dilution law is

A. $K_a = \alpha^2 V$

B. $K_a = \dfrac{\alpha^2}{V}$

C. $K_a = \dfrac{\alpha^2}{(1-\alpha)V}$

D. $K_a = \dfrac{\alpha^2}{(1-\alpha)C}$

Answer: B

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4. The pH of 0.1 M monobasic acid is 4.50. The acidity constant (K_a) of the monobasic acid is

A. 1.0×10^{-7}

B. 1.0×10^{-5}

C. 1.0×10^{-4}

D. 1.0×10^{-8}

Answer: D

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5. If the concentration of the weak monoprotic acid HA is C mmol L^{-1} and its ionization constant is K_a, then
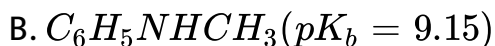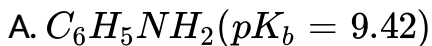
A. $C_H^+ = C/2$

B. $C_H^+ = \sqrt{C}$

C. $C_H^+ = \sqrt{K_a C}$

D. $C_H^+ = C/C_a$

Answer: C

6. Which of the following is the strongest base ?

A. $C_6H_5NH_2(pK_b = 9.42)$

B. $C_6H_5NHCH_3(pK_b = 9.15)$

C. $C_6H_5N(CH_3)_2(pK_b = 8.94)$

D. $C_6H_5NHC_2H_5(pK_b = 8.89)$
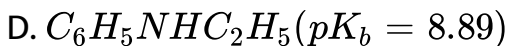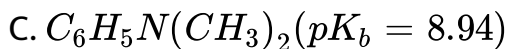
Answer: D

7. The pK_b of NH_3 is 4.75. Calculate the concentration of H^+ ions in solution formed by mixing $0.2MNH_4CI$ and $0.1MNH_3$

.

A. 0.88×10^{-5}

B. 1.12×10^{-9}

C. 1.12×10^{-5}

D. 0.88×10^{-9}

Answer: B

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8. K_a for a weak monobasic acid is 1.0×10^{-6}. The pK_b of its conjugate base base is

A. 8.0

B. 1.0×10^{-8}

C. 1.0×10^{-4}

D. 6.0

Answer: A

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9. If the dissociation constants of two weak acids HA_1 and HA_2 are K_1 and K_2, then the relative strengths of HA_1 and HA_2 are given by

A. $\sqrt{K_2/K_1}$

B. $\sqrt{K_1/K_2}$

C. K_2/K_1

D. K_1/K_2

Answer: B

10. Which of the following is arranged in the order of increseing ionization constants of H_3PO_4 ?

A. $K_3 < K_1 < K_2$

B. $K_1 < K_2 < K_3$

C. $K_2 < K_1 < K_3$

D. $K_3 < K_2 < K_1$

Answer: D

11. Oxoacids are _____ acids.

A. binary

B. ternary

C. quatenary

D. secondary

Answer: B

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12. Which of the following is correct for a compound of the type

ZOH ?

A. It is an hydroxide.

B. It is an oxoacid.

C. It is either a hydroxide nor an oxoacid.

D. It is neither a hydroxide nor an oxoacid.

Answer: C

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13. Which of the following oxocids is the strongest acid ?

A. HCIO

B. HBrO

C. HIO

D. All are equally strong

Answer: A

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14. Which of the following oxoacids is the weakest acid ?

A. $HCIO_4$
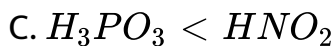
B. $HCIO_3$

C. $HCIO_2$

D. $HCIO$

Answer: D

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15. Which of the following order of acidic strengths is incorrect

?

A. $H_3PO_4 < HNO_3$

B. $H_2SeO_3 < H_2SO_3$

C. $H_3PO_3 < HNO_2$

D. $H_2SO_3 < H_2SO_4$
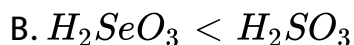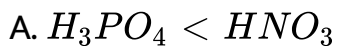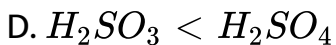
Answer: C

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16. Which of the following is the strongest acid ?

A. H_3PO_4

B. H_3PO_3

C. H_3PO_2
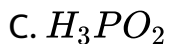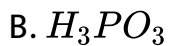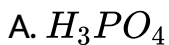
D. All are equally strong

Answer: C

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1. The pH of a solution containing $0.20 M CH_3COOH$ and $0.30 M CH_3COONa$ is

    A. 2.89

    B. 4.92

    C. 5.04

    D. 3.89

Answer: B

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2. When CH_3COONa is added to an aqueous solution of CH_3COOH

    A. pH value becomes zero

    B. pH value remains unchanged

    C. pH value decreases

    D. pH value increases

Answer: D

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3. The pK_a of acteylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about $2 - 3$ and the pH in the small intestine is about 8. Aspirin will be:

A. completely ionizzed in the small intestine and in the

   stomach

B. ionized in the small intestine and almost uniozed in the

   stomch

C. ionized in the stomach and almost unionized in the small

   intestine

D. unionized in the small intestine and in the stomach

Answer: B

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4. 50.0 mL of 0.10 M ammonia solution is treated with 25.0 mL

of $0.10 MHCI$. If $K_b(NH_3) = 1.77 \times 10^{-5}$, the pH of the

resulting solution will be

A. 11.12

B. 8.75

C. 10.34

D. 9.24

Answer: D

5. Which of the following cations is not hydrolyzed in aqueous

solution ?

(i) Ba^{2+} , (ii) Ca^{2+}

(iii) Na^+ , (iv) K^+

A. (i), (ii)

B. (iii), (iv)

C. (i), (ii), (iii), (iv)

D. (i), (ii), (iii)

Answer: C

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6. Which of the anions is not hydrolyzed in aqueous solution ?

CI^- , (ii) NO_3^-

(iii) Br^- , (iv) CIO_4^-

A. (i), (ii), (iii), (iv)

B. (ii), (iii), (iv)

C. (i), (ii), (iii)

D. (ii), (iv)

Answer: A

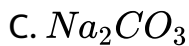**7.** Which of the following salts does not undergo hydrolysis ?

A. KCN

B. KCI

C. NH_4NO_3

D. $FeCI_3.6H_2O$

Answer: B

---
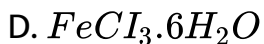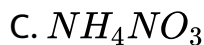
8. Which of the following salts undergoes anionic hydrolysis ?

A. $AICI_3$

B. $CuSO_4$

C. Na_2CO_3

D. NH_4CI
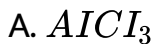
Answer: C

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9. The aqueous solution of aluminium chloride is acidic due to the

A. formation of $AI(OH)_3$
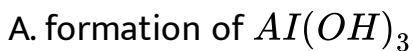
B. hydrolysis of cation and anion

C. hydrolysis of anion

D. hydrolysis of cation

Answer: D

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10. Which of the following relations is correct during the hydrolysis of salts of weak acid and strong bases ?

A. $K_h = \dfrac{K_w}{K_a}$

B. $K_h = \dfrac{K_w}{K_a K_b}$

C. $K_h = \dfrac{K_w}{K_b}$

D. $K_h = \dfrac{K_a}{K_w}$

Answer: A

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11. For the aqueous solution of a salt of a weak acid abd a weak base,

A. $K_h = \dfrac{\sqrt{h}}{1-h}$

B. $\sqrt{K_h} = \dfrac{h^2}{1-h}$

C. $\sqrt{K_h} = \dfrac{h}{1-h}$

D. $K_h = \dfrac{h}{1-h}$

Answer: C

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12. For cationic hydrolysis, pH given by

A. $pH = \dfrac{1}{2}pK_w + \dfrac{1}{2}pK_a + \dfrac{1}{2}\log C$

B. $pH = \dfrac{1}{2}pK_w - \dfrac{1}{2}pK_a - \dfrac{1}{2}\log C$

C. $pH = \dfrac{1}{2}pK_w + \dfrac{1}{2}pK_a - \dfrac{1}{2}pK_b$

D. $pH = \dfrac{1}{2}pK_w + \dfrac{1}{2}pK_b + \dfrac{1}{2}\log C$

Answer: B

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13. Which of the following salts is neutral in water ?

A. NH_4CH_3COO

B. NH_4NO_3

C. NH_4CN

D. NH_4F

Answer: A

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Follow Up Test 13

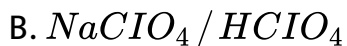**1.** A buffer solution is one which has

A. reserved acid

B. reserved base

C. reserved acid and reserved base

D. pH equal to 7

Answer: C

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2. Which of the following solutions cannot act as buffer system ?

A. KH_2PO_4 / H_3PO_4

B. $NaCIO_4 / HCIO_4$

C. C_5H_5N / C_5H_5NHHCI

D. $Na_2CO_3 / NaHCO_3$
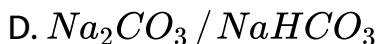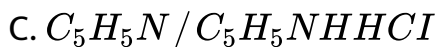
Answer: B

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3. An acidic buffer solution can be prepared by mixing equimolar amounts of

A. $B(OH)_3$ and $Na_2B_4O_7.10H_2O$

B. NH_3 and NH_4CI

C. HCI and $NaCI$

D. CH_3COOH and CH_3COONa

Answer: D

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4. Which of the following salts solution will act as a buffer ?

A. $NH_4CH_3COO(aq.)$

B. $NH_4CI(aq.)$

C. $NaCH_3COO(aq.)$

D. $NaCI(aq.)$

Answer: A

5. Which of the following expression tepresents the Henderson

equation for an acidic buffer ?

A. $pH = \dfrac{1}{2}pK_a - \dfrac{1}{2}\log C$

B. $pH = pK_a - \log\dfrac{[\text{Conjugate base}]}{[\text{Acid}]}$

C. $pH = pK_a + \log\dfrac{[\text{Conjugate base}]}{[\text{Acid}]}$

D. $pH = pK_a$

Answer: C

6. A buffer solution contains 0.1 mol each of $NaCH_3COO$ and CH_3COOH. On diluting the solution to double its volume, the pH of the solution

A. will because half

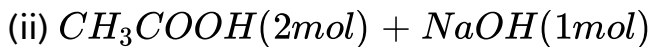B. will remain unchanged

C. will be doubled

D. cannot be predicted

Answer: B

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7. Which of the following combinations will make a buffer solution ?

(i) $CH_3COONa(2mol) + HCI(1mol)$

(ii) $CH_3COOH(2mol) + NaOH(1mol)$

(iii) $CH_3COOH(1mol) + CH_3COONa(1mol)$
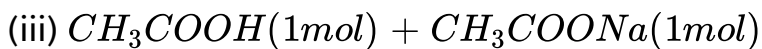
A. (iii)

B. (i),(ii)

C. (ii), (iii)

D. (i), (ii), (iii)

Answer: D

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8. Which of the following conditions will make the buffer most efficient?

A. $pH = pK_a$

B. $pH = pH_a \pm 1$

C. $pH = pK_a + 1$

D. $pH = pH_a - 1$

Answer: A

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9. The range of pH for acidic and basic buffer is where K_a and K_b are the acid base dissociation constants, respectively.

A. form $pH = pK_a \pm 2 \rightarrow pH = pK_b \pm 2$

B. from $pH = pK_a + 1 \rightarrow pH = pK_b + 1$

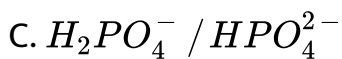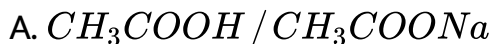C. from $pH = pK_a \pm 1 \rightarrow pH = pK_b \pm 1$

D. from $pH = pK_a + 1 \rightarrow pH = pK_b - 1$

Answer: C

10. The pH of blood circulating in a human body is maintained

around. 7.4 by the action of the buffer system

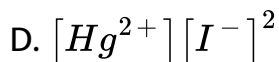A. CH_3COOH/CH_3COONa
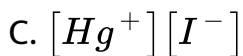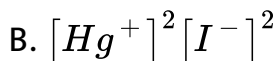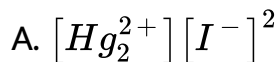
B. NH_4CI/NH_3

C. $H_2PO_4^-/HPO_4^{2-}$

D. CO_2/HCO_3^-
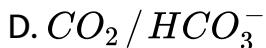
Answer: D

1. Which of the following is the correct representation of the solubility product expression for mercurous iodide (HgI_2) ?

A. $\left[Hg_2^{2+}\right]\left[I^-\right]^2$

B. $\left[Hg^+\right]^2\left[I^-\right]^2$

C. $\left[Hg^+\right]\left[I^-\right]$

D. $\left[Hg^{2+}\right]\left[I^-\right]^2$

Answer: A

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2. The units of solubility product of silver chromate $(AgCrO_4)$ will be

A. $mol^2 L^{-2}$

B. $mol^3 L^{-3}$

C. $mol L^{-1}$

D. $mol^{-1} L$

Answer: B

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3. Which of the following quantities refers to a saturated solution ?

A. Mol solubility

B. Solubility

C. Solubility product

D. All of these

Answer: D

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4. At a certain temperature, the solubility of the salt $A_x B_y$ is S moles per litre. The general expression for the solubility product will be

A. $K_{sp} = X^y Y^x S^{x+y}$

B. $K_{sp} = (XY)^{x+y} S^{x+y}$

C. $K_{sp} = (X^x Y^y) S^{x+y}$

D. $K_{sp} = X^y Y^x S^{xy}$

Answer: C

5. The molar solubility of silver sulphate is $1.5 \times 10^{-2} mol L^{-1}$. The solubility product of the salt will be
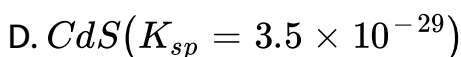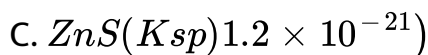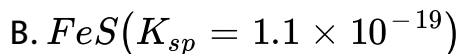
A. 2.25×10^{-4}

B. 1.4×10^{-5}

C. 1.7×10^{-6}

D. 3.0×10^{-3}

Answer: B

6. Which of the following metal sulphide solutions will have the maximum concentration of cation ?

A. $MnS\left(K_{sp} = 6.0 \times 10^{-16}\right)$

B. $FeS\left(K_{sp} = 1.1 \times 10^{-19}\right)$

C. $ZnS(Ksp)1.2 \times 10^{-21}\right)$

D. $CdS\left(K_{sp} = 3.5 \times 10^{-29}\right)$
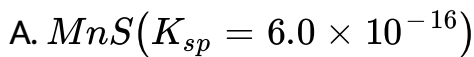
Answer: A

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7. The ionic product of an ionic solid

A. can be equal to or less than K_{sp}

B. is always equal to K_{sp}

C. is always less than K_{sp}

D. can be less than, equal to, or greater than K_{sp}

Answer: D

8. The pH an aqueous solution of $Ba(OH)_2$ is 10.0. If the K_{sp} of $Ba(OH)_2$ is 1.0×10^{-9}, the concetration of Ba^{2+} ions in the solution is

A. $1.0 \times 10^{-5} M$

B. $1.0 \times 10^{-1} M$

C. $1.0 \times 10^{-4} M$

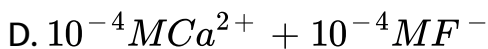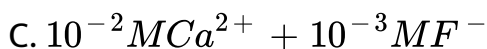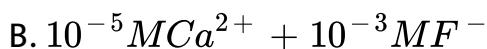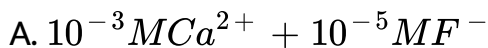D. $1.0 \times 10^{-2} M$

Answer: B

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

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

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

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

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

Answer: C

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10. If S_0, S_1, S_2, and S_3 are the solubility of AgCl in water, $0.01MCaCl_2$, $0.01MNaCl1$, and $0.5MAgNO_3$ solutions, respectively, then which of the following is true ?

A. $S_0 > S_2 > S_1 > S_3$

B. $S_0 = S_2 = S_1 = S_3$

C. $S_3 > S_1 > S_2 > S_0$

D. $S_0 > S_2 > S_3 > S_1$

Answer: A

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11. The solubility of calcium sulphate is $0.67 g L^{-1}$. The value of

K_{sp} for calcium sulphate will be

A. 1.7×10^{-6}

B. 3.5×10^{-4}

C. 2.4×10^{-5}

D. 9.3×10^{-8}

Answer: C

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12. Given $K_{sp}(AgI) = 8.5 \times 10^{-17}$. The solubility of AgI in

$0.1MKI$ solution is

A. $0.1M$

B. $8.5 \times 10^{-16}M$

C. $8.5 \times 10^{-17}M$

D. $8.5 \times 10^{-18}M$

Answer: B

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

A. $-1/2$

B. -1

C. $1/2$

D. 1

Answer: A

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2. At $90^\circ C$, pure water has $[H_3O^+]$ as 10^{-6} mol L^{-1}. What is the value of K_w at $90^\circ C$?
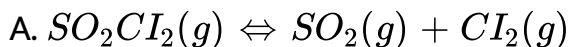
A. 10^{-14}

B. 10^{-6}

C. 10^{-12}

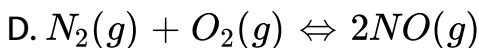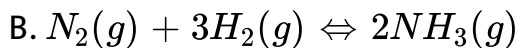D. 10^{-8}

Answer: C

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3. In which of the following equilibrium, does the change in the volume of the system not alter the number of moles ?
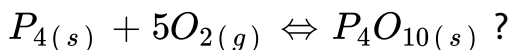
A. $SO_2CI_2(g) \Leftrightarrow SO_2(g) + CI_2(g)$

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

C. $PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$

D. $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$

Answer: D

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4. What is the equilibrium expression for the reaction

$P_{4(s)} + 5O_{2(g)} \Leftrightarrow P_4O_{10(s)}$?

A. $K_{eq} = [O_2]^5$

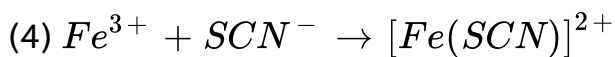B. $K_{eq} = \dfrac{1}{5} \dfrac{[P_4O_{10}]}{[P_4][O_2]}$
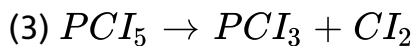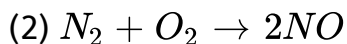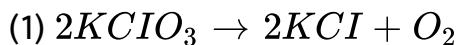
C. $K_{eq} = \dfrac{1}{[O_2]^5}$

D. $K_{eq} = \dfrac{[P_4O_{10}]}{[P_4][O_2]^5}$

Answer: C

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5. Which of the following reactions carried out in closed vessels are reversible ?

(1) $2KCIO_3 \rightarrow 2KCI + O_2$

(2) $N_2 + O_2 \rightarrow 2NO$

(3) $PCI_5 \rightarrow PCI_3 + CI_2$

(4) $Fe^{3+} + SCN^- \rightarrow [Fe(SCN)]^{2+}$

    A. (i), (ii), (iii), (iv)

    B. (ii), (iii), (iv)

    C. (i), (ii), (iii)

    D. (i), (iii), (iv)

Answer: B

6. Which of the following is not the characteristic of chemical equilibrium ?

A. At equilibrium, the concentration of each of the reactants and the products becomes constant.

B. At equilibrium, the rate of forward reaction becomes equal to the rate of backward reaction, and hence, the equilibrium is dynamic in mature.

C. A chemical equilibrium can be estabilised only if none of the products is allowed to escape out separate out as a solid.

D. Chemical equilibrium for the reversible reaction

$$N_2 + 3H_2 \Leftrightarrow 2NH_3$$ can be attained from forward

direction only.

Answer: D

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7. How many litres of water must be added to $1L$ of an aqueous

solution of HCl with a pH of 1 to create an aqueous solution

with pH of 2?

A. $0.9L$

B. $2.0L$

C. $9.0L$

D. $0.1L$

Answer: C

---

8. The K_{sp} of $AgCrO_4$ is 1.1×10^{-12} at $298K$. The solubility (in mol L^{-1}) of Ag_2CrO_4 in a $0.1M AgNO_3$ solution is

A. 1.1×10^{-10}

B. 1.1×10^{-11}

C. 1.1×10^{-12}

D. 1.1×10^{-9}

Answer: A

9. Solide $Ba(NO_3)_2$ is hradually dissolved in a $1.0 \times 10^{-4} M Na_2CO_3$ solution. At what concentration of Ba^{2+} will a precipitate being to from ? (K_{sp} for $BaCO_3 = 5.1 \times 10^{-9}$)

A. $8.1 \times 10^{-7} M$

B. $8.1 \times 10^{-5} M$

C. $5.1 \times 10^{-5} M$

D. $4.1 \times 10^{-5} M$

Answer: C

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10. In the case of gaseous homogeneous reaction, the active mass of the reaction is obtained by the expression.

A. $\dfrac{n}{v}RT$
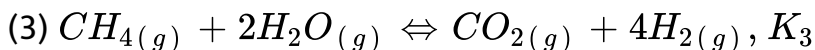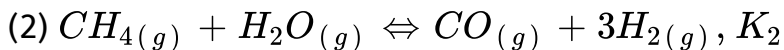
B. $\dfrac{P}{RT}$

C. $\dfrac{RT}{P}$

D. $\dfrac{PV}{RT}$

Answer: B

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11. For the following three reaction 1, 2 and 3, equilibrium constants are given:

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

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

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

Which of the following relations is correct ?

A. $K_2K_3 = K_1$

B. $K_1\sqrt{K_2} = K_1$

C. $K_3 = K_1K_2$

D. $K_2K_3 = K_1$

Answer: C

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12. Phosphorous pentachloride dissociates as follows (in a closed reaction vessel):

$PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$

If the total pressure at equilibrium on the reaction mixture is P and the degree of dissociation of PCI_5 is x, the partial pressure of PCI_3 will be

A. $\left(\dfrac{x}{x+1}\right)P$

B. $\left(\dfrac{x}{1-x}\right)P$

C. $\left(\dfrac{2x}{1-x}\right)P$

D. $\left(\dfrac{x}{x-1}\right)P$

Answer: A

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13. The dissociation constant of a substitude benzoic acid at $25°C$ is 1.0×10^{-4}. The pH of a $0.01M$ solution of its sodium salt is
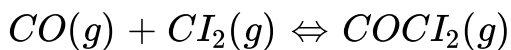
A. 10

B. 8

C. 9

D. 7

Answer: B

14. For the reaction

$$CO(g) + CI_2(g) \Leftrightarrow COCI_2(g)$$

K_p / K_c is equal to

A. 1.0

B. RT

C. $\sqrt{RT}$

D. $1/RT$

Answer: D

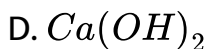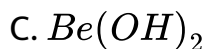**15.** Which of the following acids has the smallest dissociation constant?

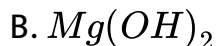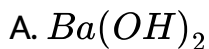A. $BrCH_2CH_2COOH$

B. $CH_3CHBrCOOH$

C. FCH_2CH_2COOH

D. $CH_3CHFCOOH$

Answer: A

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

A. $Ba(OH)_2$

B. $Mg(OH)_2$

C. $Be(OH)_2$

D. $Ca(OH)_2$

Answer: C

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17. The initial rate of hydrolysis of methyl acetate (1M) by a weak

acid $(HA, 1M)$ is $1/100th$ of that of a strong acid $(HX, 1M)$,

at $25° C$. The $K_a(HA)$ is

A. 1×10^{-3}

B. 1×10^{-4}

C. 1×10^{-5}

D. 1×10^{-6}

Answer: B

18. The thermal dissociation equilibrium of $CaCO_3(s)$ is strudied under different conditions

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

For this equilibrium, the correct statements are

(i) K is dependent on the pressure of CO_2 at a given T.

(ii) ΔH is dependent on T.

(iii) ΔH is independent of the catalyst, if any.

(iv) K is independent of the inintial amount of $CaCO_3$.

A. (i), (ii), (iii), (iv)

B. (i), (ii), (iii)

C. (ii), (iii), (iv)

D. (i), (ii), (iv)

Answer: C

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19. Which of the following will decrease the pH of a 50 ml solution of $0.01 M HCI$?

A. Addition of Mg

B. Addition of 50 ml $0.002 M HCI$

C. Addition of 50 ml $0.01 M HCI$

D. Addition of 5 ml 1 M HCl

Answer: D

20. 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:
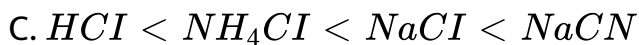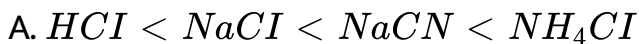
A. 4.5

B. 7.0

C. 9.5

D. 2.5

Answer: C

21. The pH of $0.1M$ solution of the following salts increases in the order

A. $HCI < NaCI < NaCN < NH_4CI$

B. $NaCN < NH_4CI < NaCI < HCl$

C. $HCI < NH_4CI < NaCI < NaCN$

D. $NaCI < NH_4CI < NaCN < HCI$

Answer: C

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22. Chemical equiluibrium fir the reaction

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

can be achived in _____ different ways.

A. two

B. three

C. four

D. just one

Answer: B

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23. A solution of $CoCI_2.6H_2O$ in isopropyl alcohol and water is purple. The color change to blue when we add

A. concentrated HCl

B. `AgNO_(3)(aq.)

C. both (1) and (2)

D. none of these

Answer: A

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24. 2.5 mL of $2/5$ M weak monoacidic base $\left(K_b = 1 \times 10^{-12}\right.$ at $25^\circ C)$ is titrated with $2/15$ M HCl in water at $25^\circ C$. The concentration of H^+ at equivalence point is $\left(K_w = 1 \times 10^{-14}\right.$ at $25^\circ C)$

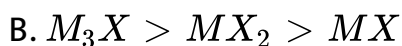   A. $2.7 \times 10^{-2} M$

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

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

    D. $2.7 \times 10^{-13} M$

Answer: A

---

25. Solubilirty product constants (K_{sp}) of salts of types $MX, MX_2,$ and M_3X at temperature T are $4.0 \times 10^{-8}, 3.2 \times 10^{-14}$, and salts of temperature T is in the order

A. $MX_2 > M_3X > MX$

B. $M_3X > MX_2 > MX$

C. $MX > M_3X > MX_2$

D. $MX > MX_2 > M_3X$
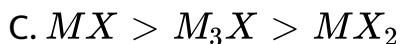
Answer: C

26. 0.1 mole of $CH_3NH_2\left(K_b = 5 \times 10^{-4}\right)$ is mixed with 0.08 mole of HCl and diluted to one litre. The $\left[H^+\right]$ in solution is

A. $8 \times 10^{-11} M$

B. $8 \times 10^{-2} M$
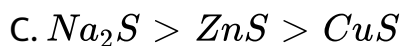
C. $1.6 \times 10^{-11} M$

D. $8 \times 10^{-5} M$

Answer: A

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Archives
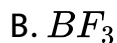
1. Indentify the correct order of solubility in aqueous medium

A. $ZnS > Na_2S > CuS$

B. $Na_2S > CuS > ZnS$

C. $Na_2S > ZnS > CuS$

D. $CuS > ZnS > Na_2S$
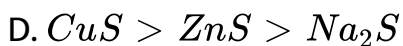
Answer: C

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2. Which of these is least likely to act as Lewis base?

A. F^-

B. BF_3

C. PF_3

D. CO

Answer: B

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3. Which is the strongest acid in the following ?

A. $HCIO_3$

B. $HCIO_4$

C. H_2SO_3

D. H_2SO_4

Answer: B

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4. The dissociation constants for acetic acid and HCN at $25°C$ are 1.5×10^{-5} and 4.5×10^{-10} , respectively. The equilibrium constant for the equilibirum $CN^- + CH_3COOH \Leftrightarrow HCN + CH_3COO^-$ would be

    A. 3.0×10^{-5}

    B. 3.0×10^{-4}

    C. 3.0×10^4

    D. 3.0×10^5

Answer: C

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5. What is the $[OH^-]$ in the final solution prepared by mixing $20.0mL$ of $0.050MHCl$ with $30.0mL$ of $0.10MBa(OH)_2$?

    A. $0.40M$

    B. $0.050M$

    C. $0.12M$

    D. $0.10M$

Answer: D

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

A. 6.50×10^{-12}

B. 5.65×10^{-13}

C. 5.65×10^{-12}

D. 5.65×10^{-10}

Answer: D

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

A. $(CH_3)_2O$

B. $(CH_3)_3P$

C. $(CH_3)_3N$

D. $(CH_3)_3B$

Answer: B

8. Equimolar concentrations of H_2 and I_2 are heated to equilibrium in a 2 L flask. At equilibrium, the forward and backward rate constants arer found to be equal. What percentage of initial concentration of H_2 has reached at equilibrium ?

A. 33 %

B. 66 %

C. 50 %

D. 40 %

Answer: C

9. The number of H^+ ions present in 250 ml of lemon juice of pH=3 is

    A. 1.506×10^{22}

    B. 1.506×10^{23}

    C. 1.506×10^{20}

    D. 3.012×10^{21}

Answer: C

10. The values of K_p and Kp_2 fot the reactions $X \Leftrightarrow Y + Z$,

(a)

and $A \Leftrightarrow 2B$, (b)

are in the ration of $9:1$. If the degree of dissociation of X and A is equal, then the total pressure at equilibriums (a) and (b) is in the ration

A. $3:1$

B. $1:9$

C. $36:1$

D. $1:1$

Answer: C

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11. The dissociation equilibrium of a gas AB_2 can be represented as

$$2AB_2(g) \Leftrightarrow 2AB(g) + B_2(g)$$
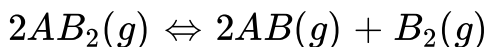
The degree of dissociation is x and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium contant K_p and total pressure p is

A. $(2K_p/P)$

B. $(2K_p/P)^{1/3}$

C. $(2K_p/P)^{1/2}$

D. (K_p/P)

Answer: B

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12. If the concentration of OH^- ions in the reaction

$$Fe(OH)_3(s) \Leftrightarrow Fe^{3+}(aq.) + 3OH^-(aq.)$$
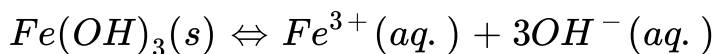
is decreased by $1/4$ times, then the equilibrium concentration

of Fe^{3+} will increase by

A. 8 times

B. 16 times

C. 64 times

D. 4 times

Answer:

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13. Equimolar solution of the following were prepared in water

separately. Which one of the solutions will record the highest

pH?

A. $SrCI_2$

B. $BaCI_2$

C. $MgCI_2$

D. $CaCI_2$
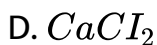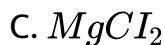
Answer: B

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14. Equal volumes of three acid solutions of pH 3, 4 and 5 are mixed in a vessel. What will be the H^+ ion concentration in the mixture?

A. $1.11 \times 10^{-4} M$

B. $3.7 \times 10^{-4} M$

C. $3.7 \times 10^{-3} M$

D. $1.11 \times 10^{-3} M$

Answer:

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15. The equilibrium constant (K_p) for the decomposition of

gaseous H_2O

$$H_2O(g) \Leftrightarrow H_2(g) + \frac{1}{2}O_2(g)$$
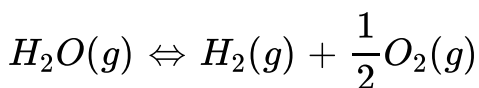
is related to the degree of dissociation α at a total pressure P

by

A. $K_p = \dfrac{\alpha^3 P^{1/2}}{(1+\alpha)(2+\alpha)^{1/2}}$

B. $K_p = \dfrac{\alpha^3 P^{3/2}}{(1-\alpha)(2+\alpha)^{1/2}}$

C. $K_p = \dfrac{\alpha^{3/2} P^2}{(1-\alpha)(2+\alpha)^{1/2}}$

D. $K_p = \dfrac{\alpha^{3/2} P^{1/2}}{(1-\alpha)(2+\alpha)^{1/2}}$

Answer: D

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16. The aqeous solutions of $HCOONa$, $C_6H_5NH_3CI$, and KCN are, respectively,

A. acidic, acidic, basic

B. acidic, basic, neutral

C. basic, neutral, neutral

D. basic, acidic, basic

Answer: D

17. Which one of the following ionic speeies has the greatest protonaffinity toi form stable compound ?

A. I^-

B. HS^-

C. NH_2^-

D. F^-
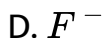
Answer:

18. A weak acid, HA, has a K_a of 1.00×10^{-5}. If 0.100 mol of the acid is dissolved in 1 L of water, the percentage of the acid dissociated at equilibrium is the closed to

A. $0.100\ \%$

B. $99.0\ \%$

C. $1.00\ \%$

D. $99.9\ \%$

Answer: C

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19. Calculate the pOH of solution at $25°C$ that contains $1 \times 10^{-10} M$ of hydronium ions, i.e., H_3O^+

A. 1.000

B. 7.000

C. 4.000

D. 9.000

Answer: C

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20. When hydrogen molecules decompose into its atoms, which conditions give the maximum yield of hydrogen atoms ?

A. High temperature and low pressure

B. Low temperature and high pressure

C. High temperature and high pressure

D. Low temperature and low pressure

Answer: A

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21. For the reaction

$$CH_4(g) + 2O_2(g) \Leftrightarrow CO_2(g) + 2H_2O(I)$$
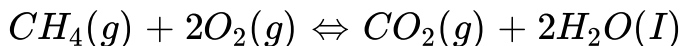
$$\Delta_r H = -170.8kJmol^{-1}$$

Which of the following statements is not true ?

A. Addition of $CH_4(g)$ or $O_2(g)$ at equilibrium will cause a

shift to the right.

B. The reaction is exothermic.

C. At equilibrium, the concentrations of $CO_2(g)$ and H_2O

are not equal.

D. The equilibrium constant for the reaction is given by

$$K_p = \frac{[CO_2]}{[CH_4][O_2]}$$

Answer: D

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22. Choose the correct order arranged in decreasing order of basicity

A. $CH \equiv C^- > CH_3O^- > OH^-$

B. $OH^- > CH_3O^- > CH \equiv C^-$

C. $CH_3O^- > OH^- > CH \equiv C^-$

D. $CH_3O^- > CH \equiv C^- > OH^-$
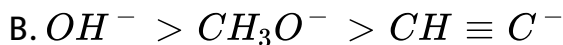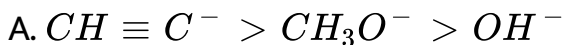
Answer: A

23. If at a given temperature, $pK_w = 13.68$, then pH is

A. 6.84

B. 7

C. 6.79

D. none of these

Answer: A

24. Which of the following is not a Lewis acid ?

A. $AICI_3 . 6H_2O$

B. $AICI_3$

C. $SnCI_4$

D. $FeCI_3$
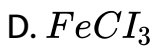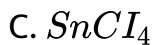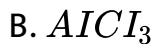
Answer: A

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25. The degree of dissociation of $0.1NCH_3COOH$ is $\left(K_a = 1 \times 10^{-5}\right)$

A. 10^{-5}

B. 10^{-4}

C. 10^{-3}

D. 10^{-2}

Answer: D

---

26. 40 ml of 0.1 M ammonia is mixed with 20 ml of $0.1MHCI$. What is the pH of the mixture ? (pK_b of ammonia solution is 4.74.)

A. 4.74

B. 2.26

C. 9.26

D. 5.00

Answer: C

27. Which of the following pairs consitutes buffer?

A. HNO_3 and NH_4NO_3

B. HCl and KCl

C. HNO_2 and $NaNO_2$

D. $NaOH$ and $NaCI$
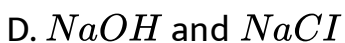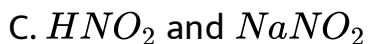
Answer: C

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28. The hydrogen ion concentration of a $10^{-8}MHCl$ aqueous soultion at $298K(K_w = 10^{-14})$ is

A. $9.525 \times 10^{-8}M$

B. $1.0 \times 10^{-8}M$
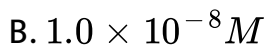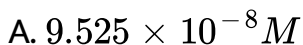
C. $1.0 \times 10^{-6} M$

D. $1.0525 \times 10^{-7} M$

Answer: D

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29. $NH_4COONH_2(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$ If equilibrium pressure is 3 atm for the above reaction, then K_p for the reaction is

A. 4

B. 27

C. $4/27$

D. $1/27$

Answer: A

30. $A + B \Leftrightarrow C + D$. If finally the concentrations of A an d B are both equal but at equilibrium concentration of D will be twice of that of A then what will be the equilibrium constant of reaction.

A. $4/9$

B. $9/4$

C. $1/9$

D. 4

Answer: D

31. For the chemical equilibrium,

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

$\Delta_r H^{\ominus}$ can be determined from which one of the following plots?

A.

B.

C.

D.
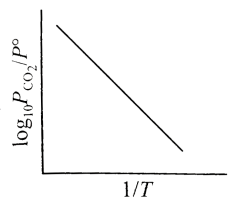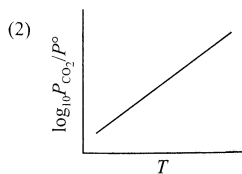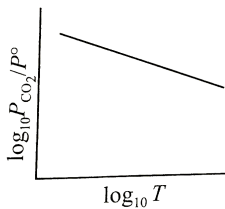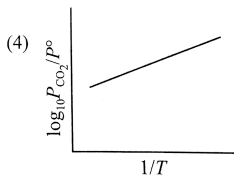
Answer: A

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32. Equilibirum constants K_1 and K_2 for the following equilibria

$NO(g) + \dfrac{1}{2}O_2 \Leftrightarrow NO_2(g)$ and $2NO_2(g) \Leftrightarrow$
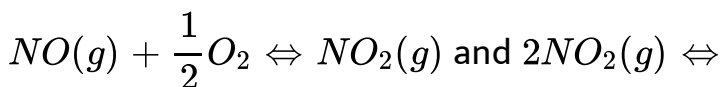
$2NO(g) + O_2(g)$ are related as

A. $K_2 = 1/K_1$

B. $K_2 = K_1/2$

C. $K_2 = 1/K_1^2$

D. $K_2 = K_1^2$

Answer: C

33. Which of the following anions is the weakest base ?

A. $C_2H_5O^-$

B. CN^-

C. CH_3COO^-

D. NO_3^-
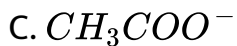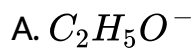
Answer: D

34. A solution has $pH = 5$, it is diluted 100 times, then it will become

    A. neutral

    B. basic

    C. unaffectes

    D. more acidic

Answer: A

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35. The K_{sp} of $Mg(OH)_2$ is 1×10^{-12}. $0.01MMg^{2+}$ will precipitate tate at the limiting pH of

    A. 1.3

B. 9

C. 3.5

D. 8

Answer: B

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36. At $25°C$, the dissociation constant of a base. BOH is 1.0×10^{-12}. The concentration of hydroxyl ions in 0.01M aqueous solution of the base would be

A. $1.0 \times 10^6 molL^{-1}$

B. $1.0 \times 10^{-7}molL^{-1}$

C. $2.0 \times 10^{-6}molL^{-1}$

D. $1.0 \times 10^{-5}molL^{-1}$

Answer:

37. When $10ml$ of $0.1M$ acitec acid $(pk_a = 5.0)$ is titrated against $10ml$ of $0.1M$ ammonia solution $(pk_b = 5.0)$,the equivalence point occurs at pH

A. 5.0

B. 6.0

C. 7.0

D. 9.0

Answer: C

38. H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group in qualitative analysis but not those belonging to the fourth group. It is because
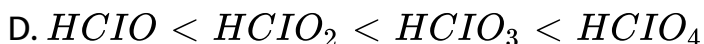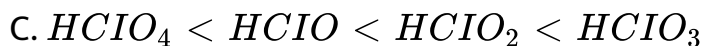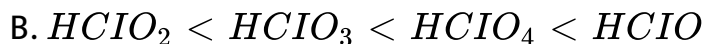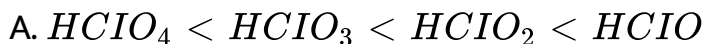
   A. presence of HCl decreases the sulphide ion sulphide ion

      concentration

   B. sulphides of group IV are unstable in HCl

   C. solubility product of group II sulphides is more than that

      of group IV sulphides

   D. pressence of HCI increases the sulphide ion concentration

Answer: A

39. The correct order of acid strength is

A. $HCIO_4 < HCIO_3 < HCIO_2 < HCIO$

B. $HCIO_2 < HCIO_3 < HCIO_4 < HCIO$

C. $HCIO_4 < HCIO < HCIO_2 < HCIO_3$
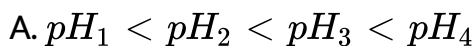
D. $HCIO < HCIO_2 < HCIO_3 < HCIO_4$

Answer: D

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40. What is the correct relationship between the pH of isomolar

solutions of sodium oxide (pH_1), sodium sulphide (pH_2),

sodium selenide (pH_3)~, and $sodiumtelluride$(pH_(4))`?

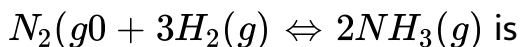A. $pH_1 < pH_2 < pH_3 < pH_4$

B. $pH_1 > pH_2 > pH_3 > pH_4$

C. $pH_1 < pH_2 < pH_3 \approx pH_4$

D. $pH_1 > pH_2 \approx pH_3 > pH_4$

Answer: B

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41. 2 mol of N_2 is mixed with 6 mol of H_2 in a closed vessel of 1L capacity. If 50% of N_2 is converted into NH_3 at equilibrium, the value of K_C for the reaction

$N_2(g0 + 3H_2(g) \Leftrightarrow 2NH_3(g)$ is

A. $4/27$

B. $27/4$

C. $1/27$

D. 27

Answer: A

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42. Ammoina carbonate when heated to $200° C$ gives a mixture

of NH_3 and CO_2 vapour with a density of 13.0 What is the

degree of dissociation of ammonium carbonate ?

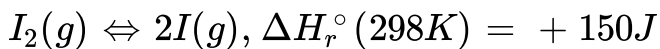A. $3/2$

B. $1/2$

C. 2

D. 1

Answer: D

43. A mixture of NO_2 and N_2O_4 has a vapor density of 38.3 at 300 K. What is the number of moles of NO_2 in 100 g of themixture ?

A. 0.43

B. 4.4

C. 0.437

D. 0.437

Answer:

44. Of the following, which change will shift the reaction towards the product ?

$$I_2(g) \Leftrightarrow 2I(g), \Delta H_r^{\circ}\,(298K) = +150J$$

A. Increases in concentration of I

B. Decrease in concentration of I_2

C. Increase in temperature

D. Increase in total pressure

Answer: C

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45. What will be the pH of 0.05M barium hydroxide solution ?

A. 8

B. 9

C. 7

D. 13

Answer:

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46. The only cations present in a slightly acidic are Fe^{3+}, Zn^{2+}, and Cu^{2+}. The reagent that when added in excess to this solution would identify and separate Fe^{3+} ions in one step is
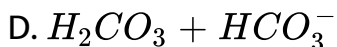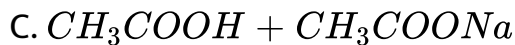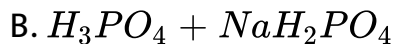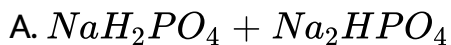
A. 2 M HCl

B. MNH_3

C. $6MNaOH$

D. H_2Sgas

Answer: B

---

47. The principal buffer present in human blood is

A. $NaH_2PO_4 + Na_2HPO_4$

B. $H_3PO_4 + NaH_2PO_4$

C. $CH_3COOH + CH_3COONa$

D. $H_2CO_3 + HCO_3^-$

Answer:

48. 40 mg of pure sodium hydroxide is dissolved in 10 L of distilled water. The pH of the solution is

A. 9.0

B. 10

C. 11

D. 12

Answer: B

49. The rapid change of pH near the stocichiometric point of an acid-base titration is the basis of indicator detrection. pH of the solution is related to the ratio of concentration of conjugate

acid (HIn) to the concentration of base (In^-) froms of the indicator by the expression

A. $\log \dfrac{[In^-]}{[HIn]} = pK_{In} - pH$

B. $\log \dfrac{[HIn]}{[In^-]} = pK_{In} - pH$

C. $\log \dfrac{[HIn]}{[In^-]} = pH - pK_{In}$

D. $\log \dfrac{[In^-]}{[HIn]} = pH - pK_{In}$

Answer: D

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50. What is the pH of $0.01M$ glycine solution? For glycine, $K_{a_1} = 4.5 \times 10^{-3}$ and $K_{a_2} = 1.7 \times 10^{-10}$ at $298K$

A. 3.0

B. 10.0

C. 6.1

D. 7.2

Answer: C

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51. In the reaction

$$PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$$

the equilibrium concentrations of PCI_3 and PCI_3 are 0.4 and $0.2 mol^{-1}$, respectively. If the value of K_c is 0.5, what id the concentration of CI_2 in moles per litre ?
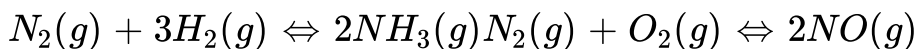
A. 2.0

B. 1.5

C. 1.0

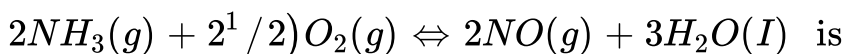D. 0.5

Answer: C

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52. The equilibrium constants for the following reactions

$$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) \quad N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$$

and $H_2(g) + 1/2O_2(g) \Leftrightarrow H_2O(Ig)$ are K_1, K_2 and K_3

respectively.

The equilibrium constant (K) for the reaction

$$2NH_3(g) + 2^1/2)O_2(g) \Leftrightarrow 2NO(g) + 3H_2O(I) \text{ is}$$

A. $K_1 K_2 / K_3$

B. $K_2 K_3^3 / K_1$

C. $K_2 K_3^2 / K_1$

D. $K_2 K_3 / K_1$

Answer: B

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53. The reaction quotient (Q) for thereaction

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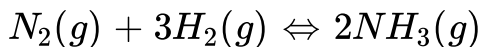
is given by

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

The reaction will proceed from right to left if where K_C is the equilibrium constant.

A. $Q = K_C$

B. $Q < K_C$

C. $Q > K_C$

D. $Q = 0$

Answer: C

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54. 1 mol of N_2 and 2 mol of H_2 are allowed to react in a 1 dm^3 vessel. At equilibrium, 0.8 mol of NH_3 is formed. The concentration of H_2 in the vessel is

A. 0.6 mol

B. 0.8 mol

C. 0.2 mol

D. 0.4 mol

Answer: B

55. 1 mol of hydrogen and 2 mol of iodine are taken initially in a 2L vessel. The number of moles of hydrogen at equilibrium is 0.2. Then the number of moles of iodine and hydrogen iodide at equilibrium are

A. 1.2, 1.6

B. 1.8, 1.0

C. 0.4, 2.4

D. 0.8, 2.0

Answer: A

56. The solubility of PbI_2 is 0.0013M. Then the solubility product of PbI_2 is

    A. 2.2×10^{-9}

    B. 8.8×10^{-9}

    C. 6.8×10^{-6}

    D. 0.8×10^{-6}

Answer: B

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57. The solubility product of AgI at $25°C$ is $1.0 \times 10^{-16} mol^2 L^{-2}$. The solubility of AgI in $10^{-4}N$ solution

of KI at $25°C$ is approximately (in $molL^{-1}$)

A. 1.0×10^{-16}

B. 1.0×10^{-12}

C. 1.0×10^{-10}

D. 1.0×10^{-8}

Answer: B

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58. At $18°C$, the solubility product of AgCl is 1.8×10^{-10}. In the solution, the value of Ag^+ is 4×10^{-3} mol L^{-1}. The value of $[Cl^-]$ to precipitate AgCl from this solution should be greater than

A. $4.5 \times 10^{-8} molL^{-1}$

B. $7.2 \times 10^{-12} mol L^{-1}$

C. $4.0 \times 10^{-3} mol L^{-1}$

D. $4.5 \times 10^{-7} mol L^{-1}$

Answer: A

59. The number of moles of $Ca(OH)_2$ required to prepare 250 ml of solution with pH 14 (assuming complete ionization) is
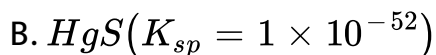
A. 0.25

B. 1.0

C. 0.125

D. 10.0

Answer:

60. The least soluble compound (salt) of the following is

A. $CsCI(K_{sp} = 10^{-12})$

B. $HgS(K_{sp} = 1 \times 10^{-52})$

C. $PbCI_2(K_{sp} = 1.7 \times 10^{-5})$

D. $ZnS(K_{sp} = 1.2 \times 10^{-23})$
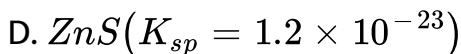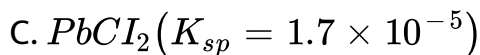
Answer: B

61. In which of the following acid-base titration, the pH is greater than 8 at the equivalence point ?

    A. Acetic acid versus ammonia

    B. Acetic acidversus sodium hydroxide

    C. Hydrohloric acid versus ammonia

    D. Hydrochloric acid versus sodium hydroxide.
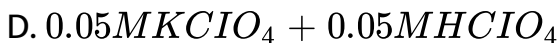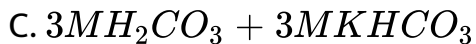
Answer:

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62. Which one of the following is not a buffer solution ?

    A. $0.8MH_2S + 0.8MKHS$

    B. $2MC_6H_5NH_2 + 2MC_6H_5\overset{+}{N}H_3Br^-$

C. $3MH_2CO_3 + 3MKHCO_3$

D. $0.05MKCIO_4 + 0.05MHCIO_4$
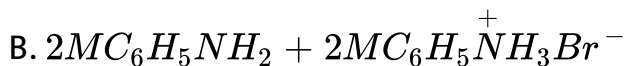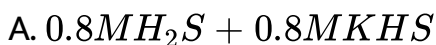
Answer: D

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63. A certain buffer solution sontains equal concentration of X^- and HX. The K_a for HX is 10^{-8}. The of the buffer is

A. 3

B. 8

C. 11

D. 14

Answer: B

64. Solution of $0.1NNH_4OH$ and $0.1NNH_4Cl$ has $pH9.25$, then find out K_b of NH_4OH.

A. 9.25

B. 4.75

C. 3.75

D. 8.25

Answer: B

65. The concentration of water molecules in pure water at 298 K is

A. $10^{-7}M$

B. $55.5M$

C. $5.55M$

D. $7.26M$

Answer: B

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66. A solution of an acid has $pH = 4.70$. Find out the concentration of OH^- ions $(pK_w = 14)$.

A. $5 \times 10^{-10}M$

B. $4 \times 10^{-10}M$

C. $2 \times 10^{-5}M$

D. $9 \times 10^{-10} M$

Answer: A

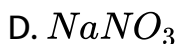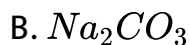▶ **Watch Video Solution**

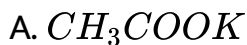
67. Among the following the weakest base is

A. H^-

B. CH_3^-

C. CH_3O^-

D. CI^-

Answer: D

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68. Which has the highest pH?

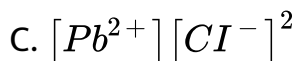A. CH_3COOK

B. Na_2CO_3

C. NH_4CI

D. $NaNO_3$

Answer:

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69. What is the value of K_{sp} for PbCI_(2)` ?

A. $[Pb^{2+}][2CI^-]$

B. $[Pb^{2+}][2CI^-]^2$

C. $[Pb^{2+}][CI^-]^2$

D. $\left[Pb^{2+}CI^{-}\right]^{2}s$

Answer: C

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