CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

CHEMICAL EQUILIBRIUM

Equilibrium Constant K P And K C

1. For which of the following K_p is less than K_c ?

A. $N_2O_4 \Leftrightarrow 2NO_2$

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

C. $H_2 + I_2 \Leftrightarrow 2HI$

D. $CO + H_2O \Leftrightarrow CO_2 + H_2$

Answer: B

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2. In which of the following reaction, the value of K_p will be equal to K_c ?

A. $H_2 + I_2 \Leftrightarrow 2Hl$

B. $PCI_5 \Leftrightarrow PCI_3 + CI_2$

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

D. $2SO_2 + O_2 \Leftrightarrow 2SO_3$

Answer: A

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3. For homogeneous gas reaction $4NH_3 + 5O_2 \Leftrightarrow 4NO + 6H_2O$. The equilibrium constant K_c has the unit of

A. $(\text{concentration})^1$

B. $(\text{concentration})^{-1}$

C. $(\text{concentration})^{9}$

D. $(\text{concentration})^{10}$

Answer: A

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4. The reaction, $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$ is carried out in a 1 dm^3 and $2dm^3$ vessel separately. The ratio of the reaction velocity will be

A. $1:8$

B. $1:4$

C. $4:1$

D. $8:1$

Answer: D

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5. K_1 and K_2 are equilibrium constants for reaction (i) and (ii)

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

$NO(g) \Leftrightarrow 1/2N_2(g) + 1/2O_2(g)$ ...(ii)

then,

A. $K_2 = \frac{1}{K_1}$

B. $K_2 = K_1^2$

C. $K_2 = \frac{K_1}{2}$

D. $K_2 = \frac{1}{K_1^2}$

Answer: D

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6. K_p for the following reaction at 700 K is $1.3 \times 10^{-3} atm^{-1}$. The K_c at same temperature for the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ will be

A. 1.1×10^{-2}

B. 3.1×10^{-2}

C. 5.2×10^{-2}

D. 7.4×10^{-2}

Answer: D

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7. The equilibrium constant expression for the equilibrium $2NH_3(g) + 2O_2(g) \Leftrightarrow N_2O(g) + 3H_2O(g)$ is

A. $K_C = \frac{[N_2O][H_2O]^3}{[NH_3][O_2]}$

B. $K_C = \frac{[H_2O]^3[N_2O]}{[NH_3]^2[O_2]^2}$

C. $K_C = \frac{[NH_3]^2}{[N_2O][H_2O]^3}$

D. $K_C = \frac{[NH_3][O_2]}{[N_2O][H_2O]}$

Answer: B

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8. For the system $3A + 2B \Leftrightarrow$ C, the expression for equilibrium constant is

A. $\frac{[3A][2B]}{C}$

B. $\frac{[C]}{[3A][2B]}$

C. $\frac{[A]^3[B]^2}{[C]}$

D. $\frac{[C]}{[A]^3[B]^2}$

Answer: D

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9. For reaction,

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

the value of K_c at $250^\circ C$ is 26. The value of K_p at this temperature will be .

A. 0.61

B. 0.57

C. 0.83

D. 0.46

Answer: A

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10. At $700K$, the equilibrium constant K_p for the reaction

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

is $1.80 \times 10^{-3} kPa$. What is the numerical value of K_c in moles per litre for this reaction at the same temperature?

A. 3.09×10^{-7} mol-litre

B. 5.07×10^{-8} mol-litre

C. 8.18×10^{-9} mol-liter

D. 9.24×10^{-10} mol-litre

Answer: A

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11. The equilibrium constant for the reaction

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

at temperature T is 4×10^{-4}.

The value of K_c for the reaction

$NO(g) \Leftrightarrow \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$

at the same temperature is

A. 4×10^{-4}

B. 50

C. 2.5×10^2

D. 0.02

Answer: B

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12. An equilibrium system for the reaction between hydrogen and iodien to give hydrogen iodide at 765 K in a 5 litre volume contains 0.4 mole of hydrogen iodide. The equilibrium constant for the reaction $H_2 + I_2 \Leftrightarrow 2HI$ is

A. 36.0

B. 15.0

C. 0.067

D. 0.028

Answer: A

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13. If β_1, β_2 and β_3 are stepwise formation constants of MC1, $MC1_2$, $MC1_3$ and K is the overall formation constant of $MC1_3$, then

A. $K = \beta_1 + \beta_2 + \beta_3$

B. $\frac{1}{K} = \frac{1}{\beta_1} + \frac{1}{\beta_2} + \frac{1}{\beta_3}$

C. $\log K = \log \beta_1 + \log \beta_2 + \log \beta_3$

D. $pK = \log \beta_1 + \log \beta_2 + \log \beta_3$

Answer: B

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14. One mole of a compound AB reacts with 1 mole of a compound CD according to the equation $AB + CD \Leftrightarrow AD + CB$.

When equilibrium had been established it was found that $\frac{3}{4}$ mole each of reactant AB and CD has been converted to AD and CB. There is no change in volume. The equilibrium constant for the reaction is

A. $\frac{9}{16}$

B. $\frac{1}{9}$

C. $\frac{16}{9}$

D. 9

Answer: D

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15. K_p and K_c are inter related as

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

Answer the following questions:

In which of the following equilibria K_p is less than K_c?

A. $H_2 + I_2 \Leftrightarrow 2HI$

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

C. $N_2 + O_2 \Leftrightarrow 2NO$

D. $CO + H_2O \Leftrightarrow CO_2 + H_2$

Answer: B

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16. In the reversible reaction A + B $\Leftrightarrow$ C + D, the concentration of each C and D at equilobrium was 0.8 mole/litre, then the equilibrium constant K_c will be

A. 6.4

B. 0.64

C. 1.6

D. 16.0

Answer: D

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17. The K_c for $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_g$ is 64. If the volume of the container is reduced to one-half of its original volume, the value of the equilibrium constant will be

A. $+28$

B. 64

C. 32

D. 16

Answer: B

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18. For the reaction $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$, the partial pressure of CO_2 and CO is 2.0 and 4.0 atm, respectively, at equilibrium. The K_p of the reaction is

A. 0.5

B. 4.0

C. 8.0

D. 32.0

Answer: C

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19. What is the equilibrium expression for the reaction $P_4(s) + 50_2(g) \Leftrightarrow P_4O_{10}(s)$

A. $K_c = [O_2]^5$

B. $K_c = [P_4O_{10}] / 5[P_4][O_2]$

C. $K_c = [P_4O_{10}] / [P_4][O_2]^5$

D. $K_c = 1 / [O_2]^5$

Answer: D

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20. K_p and K_c are inter related as

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Answer the following questions:

In which of the following equilibria K_p is less than K_c?

A. $N_2O_4 \Leftrightarrow 2NO_2$

B. $2HI \Leftrightarrow H_2 + I_2$

C. $2SO_2 + O_2 \Leftrightarrow 2SO_3$

D. $N_2 + O_2 \Leftrightarrow 2NO$

Answer: C

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21. If for $H_{2(g)}+\frac{1}{2}S_{2(g)}$ and $H_{2(g)}+Br_{2(g)} \Leftrightarrow 2HBr_g$

The equilibrium constants are K_1 and K_2 respectively, the reaction $Br_{2(g)}+H_2S_g \Leftrightarrow 2HBr_g+\frac{1}{2}S_{2(g)}$ would have equilibrium constant

A. $K_1 \times K_2$

B. K_1 / K_2

C. K_2 / K_1

D. K_2^2 / K_1

Answer: C

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22. For homogeneous gas reaction $4NH_3 + 5O_2 \Leftrightarrow 4NO + 6H_2O$.

The equilibrium constant K_c has the unit of

A. $(Conc^n)^{-1}$

B. $(Conc^n)^{+1}$

C. $(Conc^n)^{+10}$

D. Have no unit

Answer: B

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23. Which of the following conditions represaents an equilibrium ?

A. Freezing of ice an open vessel, temperature of ice is constant

B. Few drops of water is present along with air in a balloon, temperature of balloon is constant

C. Water is boiling in an open vessel over stove, temperature of water is constant

D. All the statements (a), (b) and (c) are correct for the equilibrium

Answer: C

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24. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ at 721 K the value of equilibrium constant (K_c) is 50. When the equilibrium concentration of both is 0.5 M, the value of K_p under the same condtions will be

A. 0.002

B. 0.2

C. 50.0

D. $50/RT$

Answer: C

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25. When rate of forward reaction becomes equal to backward reaction, this state is termed as

A. Chemical equilibrium

B. Reversible state

C. Equilibrium

D. All of these

Answer: D

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26. The K_c for $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_g$ is 64. If the volume of the container is reduced to one-half of its original volume, the value of the equilibrium constant will be

A. 16

B. 32

C. 64

D. 128

Answer: C

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27. Pure ammonia is placed in a vessel at a temperature where its dissociation constant (α) is appreciable. At equilibrium,

A. K_p does not change significantly with pressure

B. α does not change with pressure

C. Concrntration of NH_3 dose not change with pressure

D. Concentration of H_2 is less than that of N_2

Answer: A

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28. For the reaction $PCI_3(g) + CI_2 \Leftrightarrow PCI_5(g)$ the position of equilibrium can be shifted to the right by

A. Increasing the temperature

B. Doubling the volume

C. Addition of CI_2 at constant volume

D. Addition of equimolar quantities of PCI_3 and PCI_5

Answer: B

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29. For the reaction: $2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g)$, K_c at $427^\circ C$ is $3 \times 10^{-6} Lmol^{-1}$. The value of K_p is

A. 7.50×10^{-5}

B. 2.50×10^{-5}

C. 2.50×10^{-4}

D. 1.72×10^{-4}

Answer: D

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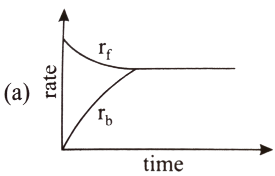
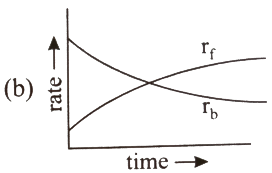
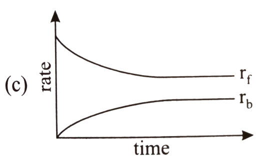
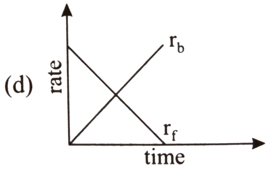
30. Rate of reaction curve for equilibrium can be like: [r_f = forward rate, r_b = backward rate]

A. 

B. 

C. 

D. 

Answer: A

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31. For the reaction

$N_2 + 3H_2 \Leftrightarrow 2NH_3$

and $\frac{1}{2}N_2 + \frac{3}{2}H_2 \Leftrightarrow NH_3$

write down the expression for equilibrium constants K_c and K_c'. How is K_c related to K_c'?

A. $K = K'$

B. $K' = \sqrt{K}$

C. $K = \sqrt{K'}$

D. $K \times K' = 1$

Answer: B

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32. For a reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$, the value of K_c does not depend upon :

(A) Initial concentration of the reactants

(B) Pressure

(C) Temperature

(D) catalyst

A. Only C

B. A, B, C

C. A, B, D

D. A, B, C, D

Answer: C

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33. $2NO_2 \Leftrightarrow 2NO + O_2, K = 1.6 \times 10^{-2}$,

$NO + (1).(2)O_2 \Leftrightarrow NO_2, K' = ?$

A. $K' = (1).(K^2)$

B. $K' = \frac{1}{K}$

C. $K' = \frac{1}{\sqrt{K}}$

D. None of these

Answer: C

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34. At 1000 K, the value of K_p for the reaction: $A(g) + 2B(g) \Leftrightarrow 3C(g) + D(g)$ is 0.05 atmosphere. The value of K_c in terms of R would be:

A. 20000 R

B. $0.02R$

C. $5 \times 10^{-5} R$

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

Answer: D

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35. In a reversible reaction, if the concentration of reactants are doubles, the equilibrium constant K will:

A. Also be doubled

B. Be halved

C. Become one-fourth

D. Remain the same

Answer: D

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36. In a chemical equilibrium, the rate constant for the backward reaction is 7.5×10^{-4} and the equilibrium constant is 1.5 the rate constant for the forward reaction is :

A. 2×10^{-3}

B. 5×10^{-4}

C. 1.12×10^{-3}

D. 9.0×10^{-4}

Answer: C

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37. A reversible reaction is one which

A. Proceeds in one direction

B. Proceeds in both directions

C. Proceeds spontaneously

D. All the statement are wrong

Answer: B

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38. The equilibrium constant in a reversible reaction at given temperature

A. Depends on the initial concentration of the reactants

B. Depends on the concentration of the products at equilibrium

C. Does not depend on the initial concetrations

D. It is not characteristic of the reaction

Answer: C

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39. For the system $A(g) + 2B(g) \Leftrightarrow C(g)$ the equilibrium concentration is

$A = 0.06 mol L^{-1}, B = 0.12 mol L^{-1}$

$C = 0.216 mol L^{-1}$ The K_{eq} for the reaction is

A. 250

B. 416

C. 4×10^{-3}

D. 125

Answer: A

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40. A chemical reaction is at equilibrium when

A. Reactants are completely transformed into products

B. The rates of forward and backward reactions are equal

C. Formation of products is minimised

D. Equal amounts of reactants and products are present

Answer: B

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41. Partial pressure of A, B, C, and D on the basis of gaseous system $A + 2B \Leftrightarrow$ C + 3D are $A = 0.02, B = 0.10, C = 0.30$ and $D = 0.05$ atm. The numerical value of equilibrium constant is

A. 11.25

B. 18.75

C. 5

D. 3.75

Answer: B

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42. Molar concentration of 96 g of O_2 contained in a 2 L vessel is:

A. $16 mol / L$

B. $1.5 mol / L$

C. $4 mol / L$

D. $24 mol / L$

Answer: B

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43. An equilibrium mixture of the reaction

$$2H_2S(g) \frac{\text{number of moles of} O_2}{\text{volume(in litre)}} = \frac{96}{32} \times \frac{1}{2} = 1.5 mol / L 2H_2(g) + S_2(g)$$

had 0.5 mole H_2S, 0.10 mole H_2 and 0.4 mole S_2 in one litre vessel. The value of equilibrium constant (K) in mole litre^{-1} is

A. 0.004

B. 0.008

C. 0.016

D. 0.160

Answer: C

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44. According to law of mass action rate of a chemical reaction is proportional to

A. Concentration of reactants

B. Molar concentration of reactants

C. Concentration of products

D. Molar concentration of products

Answer: B

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45. The equilibrium constant, K_p foe the reaction $2SO_2(g) + O_2K = \frac{H_2^2[S_2]}{[H_2S]^2} = \frac{[0.10]^2[0.4]}{[0.5]^2} = 0.0162SO_3(g)$ is $4.0atm^{-1}$ at 1000 K. What be the partial pressure of O_2 if at equilibrium the amount of SO_2 and SO_3 is the same ?

A. 16.00 atm

B. 0.25 atm

C. 1 atm

D. 0.75 atm

Answer: B

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46. At 3000 K the equilibrium pressures of CO_2 CO and O_2 are 0.6, 0.4 and 0.2 atmospheres respectively. K_p fot the reaction, $2CO_2 \Leftrightarrow 2CO + O_2$ is

A. 0.089

B. 0.0533

C. 0.133

D. 0.177

Answer: A

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47. The equilibrium constant of the reaction $SO_2(g) + 1/2O_2(g) \Leftrightarrow SO_3(g)$ is $4 \times 10^3 atm^{-1/2}$. The equilibrium constant of the reaction $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2$ would be:

A. 250 atm

B. 4×10^3 atm

C. 0.25×10^4 atm

D. 6.25×10^4 atm

Answer: D

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48. The rate constant for forward and backward reactions of hydrolysis of ester are 1.1×10^{-2} and 1.5×10^{-3} per minute respectively. Equilibrium constant for the reaction is

A. 4.33

B. 5.33

C. 6.33

D. 7.33

Answer: D

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49. A liquid is in equilibrium with its vapour at its boiling point. On average, the molecules in the two phases have equal

A. intermolecular forces

B. potential energy

C. kinetic energy

D. None of these

Answer: D

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50. On a given condition, the equilibrium concentration of H, H_2 and I_2 are 0.80 , 0.10 and 0.10 mole/litre. The equilibrium constant for the reaction $H_2 + I_2 \Leftrightarrow 2HI$ will be

A. 64

B. 12

C. 8

D. 0.8

Answer: A

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Calculation Of Equilibrium Constant

1. The active mass of $64g$ of HI in a $2-L$ flask would be

A. 2

B. 1

C. 5

D. 0.25

Answer: D

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2. In the reaction $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$ the following amounts of sbstance were formed in 0.2 litre flask $CO_2 = 0.06$ mole. The equilibrium constant is

A. 0.208

B. 4.10

C. 0.30

D. 0.416

Answer: A

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3. At a certain temp. $2HI \Leftrightarrow H_2 + I_2$. Only $50\,\%$ HI is dissociated at equilibrium. The equilibrium constant is

A. 0.25

B. 1.0

C. 3.0

D. 0.50

Answer: A

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4. In a chemical equilibrium, the rate constant for the backward reaction is 7.5×10^{-4} and the equilibrium constant is 1.5 the rate constant for the forward reaction is:

A. 5×10^{-4}

B. 2×10^{-3}

C. 1.125×10^{-3}

D. 9.0×10^{-4}

Answer: C

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5. The value of K_p fot the reaction $2H_2O(g) + 2CI_2(g) \Leftrightarrow 4HCI(g) + O_2(g)$ is 0.03 and at $427^{\circ} C$, when the partial pressure are expressed in atmosphere then the value of K_c for the same reaction is:

A. 5.23×10^{-4}

B. 7.34×10^{-4}

C. 3.2×10^{-3}

D. 5.43×10^{-5}

Answer: A

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6. For the reaction $PCI_3(g) + CI_2(g) \Leftrightarrow PCI_5(g)$, the value of K_p at 250° C is $0.61\ atm^{-1}$. The value of K_c at this temperature will be

A. 15 $(mol/I)^{-1}$

B. 26 $(mol/I)^{-1}$

C. 35 $(mol/I)^{-1}$

D. 52 $(mol/I)^{-1}$

Answer: B

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7. Unit of equilibrium constant for the reversible reaction $H_2 + I_2 \Leftrightarrow 2HI$ is

A. mol^{-1} litre

B. mol^{-2} litre

C. mol $litre^{-1}$

D. None of these

Answer: D

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8. For the decomposition reaction $NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$ The value of K_c at this temperature will be

A. 0.0194 atm

B. 0.0388 atm

C. 0.0582 atm

D. 0.0766 atm

Answer: C

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9. K_p / K_c for the reaction

$CO(g) + \frac{1}{2}O_2(g) \Leftrightarrow CO_2(g)$ is

A. RT

B. $(RT)^{-1}$

C. $(RT)^{-1/2}$

D. $(RT)^{1/2}$

Answer: C

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10. A mixture of 0.3 mole of H_2 and 0.3 mole of I_2 is allowed to react in a 10 litre evacuated flask at 500°C. The reaction is $H_2 + I_2 \Leftrightarrow 2H$, the K is found to be 64. The amount of undreacted I_2 at equilibrium is

A. 0.15 mole

B. 0.06 mole

C. 0.03 mole

D. 0.2 mole

Answer: B

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11. For which of the following reaction does the equilibrium constant depend on the units of concentration?

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

B. $Zn_s + Cu^{2+}_{(aq)} \Leftrightarrow Cu_{(s)} + Zn^{2+}_{(aq)}$

C.

$C_2H_2OH_{(l)} + CH_3COOH_{(l)} \Leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$

(Reaction carried in an inert solvent)

D. $COCI_{2(g)} \Leftrightarrow (CO_{(g)} + CI_{2(g)}$

Answer: D

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12. The decomposition of N_2O_4 to NO_2 is carried out at $280^{\circ}C$ in chloroform. When equilibrium is reached, 0.2 mol of N_2O_4 and 2×10^{-3} mol of NO_2 are present in a $2L$ solution. The equilibrium constant for the reaction

$N_2O_4 \Leftrightarrow 2NO_2$ is

A. 1×10^{-2}

B. 2×10^{-3}

C. 1×10^{-5}

D. 2×10^{-5}

Answer: C

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13. For the reaction equilibrium, $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$, the concentration of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and 1.2×10^{-2} mol/L respectively. The value of K_c for the reaction is:

A. 3×10^{-3}M

B. 3×10^{3}M

C. 3.3×10^{2}M

D. 3×10^{-1}M

Answer: A

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14. Given

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), K_1$

$N_2(g) + O_2(g) \Leftrightarrow 2NO(g), K_2$

$H_2(g) + \frac{1}{2}O_2 \Leftrightarrow H_2O(g), K_3$

The equilibrium constant for

$2NH_3(g) + \frac{5}{2}O_2(g) \Leftrightarrow 2NO(g) + 3H_2O(g)$

will be

A. $\frac{K_1K_2}{K_3}$

B. $\frac{K_1K_3^2}{K_2}$

C. $\frac{K_2K_3^3}{K_1}$

D. $K_1K_2K_3$

Answer: C

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15. What is the equilibrium expression for the reaction

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

A. $K_c = \frac{1}{[O_2]^5}$

B. $K_c = \frac{[P_4O_{10}]}{5[P_4][O_2]}$

C. $K_c = [O_2]^5$

D. $K_c = \frac{[P_4O_{10}]}{[P_4][O_2]^5}$

Answer: D

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16. In the gas phase reaction, $C_{2H_5} + H_2 \Leftrightarrow C_2H_6$, the equilibrioum constant can be expressessed in units of

A. $\text{litre}^{-1}\text{mole}^{-1}$

B. litre mole^{-1}

C. $\text{mole}^2\text{litre}^{-2}$

D. mole litre^{-1}

Answer: B

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17. For the reaction, $2NO_{2(g)} \Leftrightarrow 2NO_{(g)} + O_{2(g)} K_c = 1.0 \times 10^{-6}$ at $184^\circ C$ and $R = 0.083 jK^{-1} \text{mol}^{-1}$. When K_p and K_c are compared at $184^\circ C$, it is found that:

A. $K_p > K_c$

B. $K_p < K_c$

C. $K_p = K_c$

D. $K_p \times K_c$ depends upon pressure of gases

Answer: A

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18. The rate of forward reaction is two times that of reverse reaction at a given temperature and identical concentration. $K_{equilibrium}$ is

A. 2.5

B. 2.0

C. 0.5

D. 1.5

Answer: B

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19. In a reaction $A+B \Leftrightarrow C+D$, the concentration of A, B, C and D (in moles/litre) are $0.5, 0.8, 0.4$ and 1.0 respectively. The equilibrium constant is

A. 0.1

B. 1.0

C. 10

D. ∞

Answer: B

Watch Video Solution

20. 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. $K_1\sqrt{K_2} = K_3$

B. $K_2K_3 = K_1$

C. $K_3 = K_1K_2$

D. $K_3 = K_2^3K_1^2$

Answer: C

Watch Video Solution

Application Of Equllibrium Constant K

1. In a chemical reaction equilibrium is established when

A. Opposing reaction ceases

B. Concentration of reactants and products are equal

C. Velocity of opposing reaction is the same as that of forward reaction

D. Reaction ceases to generate heat

Answer: C

Watch Video Solution

2. The equilibrium constant (K_c) for the reaction HA + B $\Leftrightarrow BH^+ + A^-$ is 100. If the rate constant for the forward reaction is

10^5, then constant for the backward reaction is

A. 10^7

B. 10^3

C. 10^{-3}

D. 10^{-5}

Answer: B

Watch Video Solution

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

A. 1

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

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

D. 1

Answer: B

Watch Video Solution

4. A quantity of PCI_5 was heated in a 10 llitre vessel at $250^\circ C$, $PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$. At equilibrium the vessel contains 0.1 mole of PCI_5, 0.20 mole of PCI_3 and 0.2 mole of CI_2. The equilibrium constant of the reaction is

A. 0.02

B. 0.05

C. 0.04

D. 0.025

Answer: C

Watch Video Solution

5. 4 moles of A are mixed with 4 moles of B, when 2 moles of C are formed at equilibrium according to the reaction $A + B \Leftrightarrow C + D$.

The value of equilibrium constant is

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

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

C. 1

D. 4

Answer: C

Watch Video Solution

6. In a reaction $PCI_5 \Leftrightarrow PCI_3 + CI_2$ degree of dissociation is 30% . If initial moles of PCI_3 is one then total moles at equilibrium is

A. 1.3

B. 0.7

C. 1.6

D. 1.0

Answer: A

Watch Video Solution

7. When 3 moles of A and 1 mole of B are mixed in 1 litre vessel, the following reaction takes place $A_{(g)} + B_{(g)} \Leftrightarrow 2C_{(g)}$. 1.5 moles of C are formed. The equilibrium constant for the reaction is

A. 0.12

B. 0.25

C. 0.50

D. 4.0

Answer: D

Watch Video Solution

8. 9.2 grams of $N_2O_{4(g)}$ is taken in a closed one litre vessel and heated till the following equilibrium is reached $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$. At equilibrium, $50\% \; N_2O_{4(g)}$ is dissociated. What is the equilibrium constant (in mol $litre^{-1}$) (Moleculatr weight of $N_2O_4 = 92$) ?

A. 0.1

B. 0.4

C. 0.01

D. 2

Answer: C

Watch Video Solution

9. $CH_3COOH_{(l)} + C_2H_5OH_{(l)} \Leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$ In the above reaction, one mole of each of acetic acid and alcohol are heated in the presence of little cone. H_2SO_4. On equilibriumbeing attained

A. 1 mole of ethyl acetate is formed

B. 2 mole of ethyl acetate are formed

C. $1/2$ moles of ethyl acetate is formed

D. $2/3$ moles of ethyl acetate is formed

Answer: D

View Text Solution

10. For the equilibrium $2NOBr(g) \Leftrightarrow 2NO + Br_2(g)$, calculate the ratio $\frac{K_p}{P}$, where P is the total pressure and $P_{Br_2} = \frac{P}{9}$ at a certain temperature

A. $\frac{1}{9}$

B. $\frac{1}{81}$

C. $\frac{1}{27}$

D. $\frac{1}{3}$

Answer: B

Watch Video Solution

11. In which of the follolwing, the reaction proceeds towards completion

A. $K = 10^3$

B. $K = 10^{-2}$

C. $K = 10$

D. $K = 1$

Answer: A

Watch Video Solution

Watch Video Solution

12. Two moles of NH_3 when put into a proviously evacuated vessel (one litre) pertially dissociate into N_2 and H_2. If at equilibrium one mole of NH_3 is present, the equilibrium constant is

A. $3/4mol^2litre^{-2}$

B. $27/64mol^2litre^{-2}$

C. $27/32mol^2litre^{-2}$

D. $27/1mol^2litre^{-2}$

Answer: D

Watch Video Solution

13. For the reaction $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$, the value of K_c at $800^\circ C$ is 0.1. When the equilibrium concentrations of both the reactants is 0.5 mol, what is the value of K_p at the same temperature

A. 0.5

B. 0.1

C. 0.01

D. 0.025

Answer: B

Watch Video Solution

14. 28 g of N_2 and 6 g of H_2 were mixed. At equilibrium 17 g NH_3 was produced. The weight of N_2 and H_2 at equilibrium are respectively

A. 11 g, 0 g

B. 1 g, 3 g

C. 14 g, 3 g

D. 11 g, 3 g

Answer: C

Watch Video Solution

15. $2SO_3 \Leftrightarrow 2SO_2 + O_2$. If $K_c = 100$, $\alpha = 1$, half of the reaction is completed, the concentration of SO_3 and SO_2 are equal, the concentration of O_2 is

A. 0.001M

B. $\frac{1}{2}SO_2$

C. 2 times of SO_2

D. Data incomplete

Answer: D

Watch Video Solution

16. 2 mol of N_2 is mixed with 6 mol of H_2 in a closed vessel of one litre capacity. If $50\,\%$ N_2 is converted into NH_3 at equilibrium, the value of

K_c for the reaction

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

A. $4/27$

B. $27/4$

C. $1/27$

D. 24

Answer: A

Watch Video Solution

17. For reaction HI $\Leftrightarrow 1/2H_2 + 1/2I_2$ value of K_c is $1/8$, then value of K_c for $H_2 + I_2 \Leftrightarrow 2HI$.

A. $\frac{1}{64}$

B. 64

C. $\frac{1}{8}$

D. 8

Answer: B

Watch Video Solution

18. 2 moles of PCI_5 was heated in a closed vessel of 2 litre capacity. At equilibrium, 40% of PCI_5 is dissociated it PCI_3 and CI_2. The value of equilibrium constant is

A. 0.266

B. 0.53

C. 2.66

D. 5.3

Answer: A

Watch Video Solution

19. 0.1 mole of $N_{2O_4(g)}$ was sealed in a tude under one atmospheric conditions at $25^\circ C$ Calculate the number of moles of $NO_2(g)$ preesent , if the equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)(K_P = 0.14)$ is reached after some time :

A. 1.8×10^2

B. 2.8×10^2

C. 0.034

D. 2.8×10^{-2}

Answer: C

Watch Video Solution

20. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ at 721 K the value of equilibrium constant (K_c) is 50. When the equilibrium concentration of both is 0.5 M, the value of K_p under the same condtions will be

A. 40

B. 60

C. 50

D. 30

Answer: C

Watch Video Solution

21. A 1 M solution of glucose reaches dissociation equilibrium according to equation given below 6HCHO $\Leftrightarrow C_{16}H_{12}O_6$. What is the concentration of HCHO at equilibrium constant is 6×10^{22}

A. 1.6×10^8M

B. 3.2×10^6M

C. 3.2×10^{-4}M

D. 1.6×10^{-4}M

Answer: D

View Text Solution

22. In Haber process 30 litre of dihydrogen and 30 litres of dinitrogen were taken for reaction which yielded only 50% of the expected product. What will be the composition of gaseous mixture under the aforesaid condition in the end ?

A. 20 litres ammonia, 25 litres nitrogen, 15 litres hydrogen

B. 20 litres ammonia, 20 litres nitrogen, 15 litres hydrogen

C. 10 litres ammonia, 25 litres nitrogen, 15 litrers hydrogen

D. 20 litres ammoina, 10 litres nitrogen, 30 litres hydrogen

Answer: C

Watch Video Solution

23. According to law of mass action rate of a chemical reaction is proportional to

A. Concentration of reactants

B. Molar concentration of reactants

C. Concentration of products

D. Molar concentration of products

Answer: C

Watch Video Solution

24. 28 g of N_2 and 6 g of H_2 were kept at $400^\circ C$ in 1 litre vessel, the equilibrium mixture contained 27.54 g of NH_3. The approximate value of K_c for the above reaction can be $\left(\text{in mole}^{-2}\text{litre}^2\right)$

A. 75

B. 50

C. 25

D. 100

Answer: A

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25. In a reaction the rate of reaction is proportional to its active mass, this statement is known as

A. Law of mass action

B. Le-Chatelier principle

C. Faraday's law of electrolysis

D. Law of constant proportion

Answer: B

Watch Video Solution

26. For the reaction, $H_2(g) + CO_2(g) \Leftrightarrow CO(g) + H_2O(g)$, if the initial concentration of $[H_2] = [CO_2]$ and x mol L^{-1} of H_2 is consumed at equilibrium, the correct expression of K_p is:

A. $\frac{x^2}{(1-x)^2}$

B. $\frac{(1+x)^2}{(1-x)^2}$

C. $\frac{x^2}{(2+x)^2}$

D. $\frac{x^2}{1-x^2}$

Answer: A

Watch Video Solution

27. In a chemical equilibrium $A + B \Leftrightarrow$ C + D, when one mole each of the two reactants are mixed, 0.6 mole each of the products are formed. The equilibrium constant calculated is

A. 1

B. 0.36

C. 2.25

D. $4/9$

Answer: C

Watch Video Solution

28. At constant temperature, the equilibrium constant (K_p) for the decomopsition reaction $N_2O_4 \Leftrightarrow 2NO_2$ is expressed by $K_p = \frac{(4x^2P)}{(1-x^2)}$, where P = pressure, x = extent of decomposition. Which one of the following statement is true ?

A. K_p increases with increase of P

B. K_p increases with increase of x

C. K_p increases with decreases of x

D. K_p remains constant with change in P and x

Answer: D

Watch Video Solution

29. 2 moles each of SO_3, CO, SO_2 and CO_2 is taken in a 1 L vessel. If K_C for $SO_3 + CO \Leftrightarrow SO_2 + CO_2$ is $1/9$ then:

A. total no. of moles at equilibrium are less than 8

B. $n(SO_3) + n(CO_2) = 4$

C. $[n(SO_2)/n(CO)] < 1$

D. both (b) and (c).

Answer: D

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30. In the reaction $A + 2B \Leftrightarrow 2C$, if 2 moles of A, 3.0 moles of B and 2.0 moles of C are placed in a 2.0 L flask and equilibrium constant (K_c)

for the reaction is

A. 0.073

B. 0.147

C. 0.05

D. 0.026

Answer: C

View Text Solution

31. Under a given set of experiemental condition, with increase in the concentration of the reactants, the reate of a chemical reaction

A. Decreases

B. Increases

C. Remains unaltered

D. First decreases and then increases

Answer: C

Watch Video Solution

32. $A + B \Leftrightarrow C + D$. Initially the concentrations of A and B are both equal but at equilibrium, concentration of C 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

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33. Theory of 'active mass' indicates that the rate of a chemical reaction is directly proportional to the

A. Equilibrium constant

B. Properties of reactants

C. Volume of apparatus

D. Concentration of reactants

Answer: D

Watch Video Solution

34. 56 g of nitrogen and 8 g hydrogen gas are heated in a closed vessel. At equilibrium 34 g of ammnia are present. The equilibrium number of moles of nitrogen, hdregen and ammonia are respectively

A. 1,2,2

B. 2,2,1

C. 1,1,2

D. 2,1,2

Answer: C

Watch Video Solution

35. In the reaction, $A + B \Leftrightarrow 2C$, at equilibrium, the concentration of A and B is 0.20 mol L^{-1} each and that of C was found to be 0.60 mol L^{-1}. The equilibrium constant of the reaction is

A. 2.4

B. 18

C. 4.8

D. 9

Answer: D

Watch Video Solution

36. At 298 K equilibrium constant K_1 and K_2 of following reaction

$SO_2(g) + 1/2O_2(g) \Leftrightarrow SO_3(g)....(1)$

$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$ -------(2)

The relation between K_1 and K_2 is

A. $K_1 = K_2$

B. $K_2 = K_1^2$

C. $K_2 = 1/K_1^2$

D. $K_2 = 1/K_1$

Answer: C

Watch Video Solution

37. The rate at which a substance reacts, depends on its:

A. Atomic weight

B. Molecular weight

C. Equivalent weight

D. Active mass

Answer: C

Watch Video Solution

38. For the reaction $A+B \Leftrightarrow C+D$, the initial concentrations of A and B are equal. The equilibrium concentration of C is two times the equilibrium concentration of A. The value of equilibrium constant is ....

A. 4

B. 2

C. $1/4$

D. $1/2$

Answer: A

Watch Video Solution

39. Which of the following statements is false ?

A. The greater the concentration of the substances involved in a reaction, the lower the speed of the reaction

B. The point of dynamic equilibrium is reached when the reaction rate in one direction just balances the reaction rate in the opposite direction

C. The dissociation of weak electrolyte is a reversible reaction

D. The presence of free ions facilitates chemical changes

Answer: B

Watch Video Solution

40. If in the reaction $N_2O_4 = 2N_2$, α is that part of N_2O_4 which dissociates, then the number of moles at equilibrium will be

A. 3

B. 1

C. $(1-\alpha)^2$

D. $(1+\alpha)$

Answer: D

Watch Video Solution

41. 4.5 moles each of hydrogen and iodine heated in a sealed 10 litrevesel. At equilibrium, 3 moles of HI was foun. The equilibrium constant for $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is

A. 1

B. 10

C. 5

D. 0.33

Answer: A

Watch Video Solution

42. 1.50 moles each of hydrogen and iodine is p[laced in a sealed 10 litre container maintained at 717 K. At equilibrium 1.25 moles each of hydrogen and iodine were left behind. The equilibrium constant K_c for the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g) at 717$ K is

A. 0.4

B. 0.16

C. 25

D. 50

Answer: B

Watch Video Solution

43. In a 0.25 L tube dissociation of 4 mol of NO is taking place. If its degree of dissociation is 10%. The value of KP for the reaction $2NO_{(g)} \rightarrow N_{2(g)} + O_{2(g)}$ is :-

A. $\frac{1}{(18)^2}$

B. $\frac{1}{(8)^2}$

C. $\frac{1}{16}$

D. $\frac{1}{32}$

Answer: A

Watch Video Solution

44. On decomposition of NH_4HS , the following equilibrium is estabilished: $NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ If the total pressure is

P atm, then the equilibrium constant K_p is equal to

A. P atm

B. $P^2 atm^2$

C. $P^2 / 4atm^2$

D. 2P atm

Answer: C

Watch Video Solution

45. 15 moles of H_2 and 5.2 moles of I_2 are mixed are allowed to attain equilibrium at $500^\circ C$. At equilibrium the concentration of HI is found to be 10 moles. The equilibrium constant for the formation of HI is

A. 50

B. 15

C. 100

D. 25

Answer: A

Watch Video Solution

46. 1.1 mole of A mixed with 2.2 mole of B and the mixture is kept in a 1 litre at the equilibrium 0.2 mole of C is formed, then the value of K_c will be:

A. 0.005

B. 0.001

C. 0.01

D. 0.0001

Answer: B

Watch Video Solution

47. An equilibrium mixture in a vessel of capacity 100 litre contain 1 mol N_2 , 2 mol O_2 and 3 mol NO. NO. of mole of O_2 to be added so that new equilibrium the conc. Of

A. $(101/18)$

B. $101/9)$

C. $(202/9)$

D. None of these

Answer: A

View Text Solution

48. The reaction, $PC1_5 \Leftrightarrow PC1_3 + C1_2$ is started in a 5 litre container by taking one mole of $PC1_5$. If 0.3 mole of $PC1_5$ is there at equilibrium, concentration of $PC1_3$ and K_c will respectively be:

A. 0.14, 0.326

B. $0.12, 0.120$

C. $0.07, 0.150$

D. $20, 0.010$

Answer: A

Watch Video Solution

49. Some gaseous equilibrium are given below:

$CO + H_2O \Leftrightarrow CO_2 + H_2$

$2CO + O_2 \Leftrightarrow 2CO_2$

$2H_2 + O_2 \Leftrightarrow 2H_2O$

find out the realation between equilibrium constants:

A. $K = K_1K_2$

B. $K = (K_1K_2)^2$

C. $K = (K_1K_2)^{-1/2}$

D. $K = (K_1K_2)^{1/2}$

Answer: D

Watch Video Solution

50. In a container equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ is attained at $25^\circ C$. The total equilibrium pressure in container is 380 torr. If equilibrium constant of above equilibrium is 0.667 atm, then degree of dissociation of N_2O_4 at this temperature will be:

A. $\frac{1}{3}$

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

C. $\frac{2}{3}$

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

Answer: B

Watch Video Solution

51. Ammonia gas at 15 atm is introduced in a rigid vessel at 300 K. At equilibrium the total pressure of the vessel is found to be 40.11 atm at $300^\circ C$.The degree of dissociation of NH_3 will be :

A. 0.6

B. 0.4

C. unpredictable

D. None of these

Answer: B

Watch Video Solution

52. $K_c = 9$ for the reaction, $A + B \Leftrightarrow C + D$. If A and B are taken in equal amounts, then amount of C in equilibrium is:

A. 1

B. 0.25

C. 0.75

D. None of these

Answer: C

Watch Video Solution

53. For the reaction $A_2(g) + 2B_2 \Leftrightarrow 2C_2(g)$ the partial pressure of A_2 and B_2 at equilibrium are 0.80 atm and 0.40 atm respectively.The pressure of the system is 2.80 atm. The equilibrium constant K_p will be

A. 20

B. 5.0

C. 0.02

D. 0.2

Answer: A

Watch Video Solution

54. In the reaction $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$, the equilibrium pressure is 12 atm. If 50% of CO_2 reacts, calculate K_p.

A. 12 atm

B. 16 atm

C. 20 atm

D. 24 atm

Answer: B

Watch Video Solution

55. The degree of dissociation of SO_3 at equilibrium pressure is: K_p for $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$

A. $\left[\left(P_0\alpha^3\right)/2(1-\alpha)^3\right]$

B. $\left[\left(P_0\alpha^3\right)/(2+\alpha)(1-\alpha)^2\right]$

C. $\left[\left(P_0\alpha^2\right)/2(1-\alpha)^2\right]$

D. None of these

Answer: B

Watch Video Solution

56. The equilibrium $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$ is established in a reaction vessel of 2.5 L capacity. The amounts of N_2 and O_2 taken at the start were respectively 2 moles and 4 moles. Half a mole of nitrogen has been used up at equilibrium. The molar concentration of nitric oxide is:

A. 0.2

B. 0.4

C. 0.6

D. 0.1

Answer: B

Watch Video Solution

57. For the following gases equilibrium, $N_2O_4(g) \Leftrightarrow 2N_2(g)$, K_p is found to be equal to K_c. This is attained when:

A. $0^\circ C$

B. 273 K

C. 1 K

D. $12.19K$

Answer: D

Watch Video Solution

58. consider the following reversible gaseous reaction (at 298 K):

$(A) N_2O_4 \Leftrightarrow$ (B) $2SO_2 + O_2 \Leftrightarrow 2SO_3$

(C) $2HI \Leftrightarrow H_2 + I_2$ (D) $X + Y \Leftrightarrow 4Z$

Highest and lowest value of $\frac{K_p}{K_c}$ will be shown by the equiliberium

A. D, B

B. A, C

C. A, B

D. B, C

Answer: A

Watch Video Solution

59. At a certain temperature T, a compound $AB_4(g)$ dissociates as

$2AB_4(g) \Leftrightarrow A_2(g) + 4B_2(g)$

with a degree of dissociation α, which compared to unity. The expressio

of K_P in terms of α and total pressure P is:

A. $8P^3x^5$

B. $256P^3x^5$

C. $4Px^2$

D. None of these

Answer: A

Watch Video Solution

60. For the reaction A + 2B hArr 2C at equilibrium $[C]=1.4M, [A]_o=1M, [B]_o=2M, [C]_o=3M$. The value of K_c is

A. 0.084

B. 8.4

C. 84

D. 840

Answer: A

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61. In an aqueous solution of volume 500 ml, the the reaction of $2Ag^{+}+Cu \Leftrightarrow Cu^{2+}+2Ag$ reached equilibrium the $\left[Cu^{2+}\right]$ was x M. When 500 ml of water is further added, at the equilibrium $\left[Cu^{2+}\right]$ will be

A. $2xM$

B. xM

C. between x M and $x/2M$

D. less than $x/2M$

Answer: D

View Text Solution

62. A definite amount of solid NH_4HS is placed in a flask aleady containing ammoina gas at a certain temperature and 0.50 atm pressure. NH_4HS decomposes to give NH_3 and H_2S and at equilibrium total pressure in flask is 0.84 atm. The equilibrium constant for the reaction is:

A. 0.30

B. 0.18

C. 0.17

D. 0.11

Answer: D

Watch Video Solution

63. Phosphorus pentachloride dissociates as follows, ina closed reaction vessel, $PC1_{5(g)} \Leftrightarrow PC1_{3(g)} + C1_{2(g)}$ If total pressure at equilibrium of the reaction mixture is P and degree of dissociation of $PC1_5$ is x, the partial pressure of $PC1_3$ will be:

A. $\left(\frac{x}{1-x}\right)P$

B. $\left(\frac{x}{x+1}\right)P$

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

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

Answer: B

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64. A vessel at $1000K$ contains carbon dioxide with a pressure of $0.5atm$. Some of the carbon dioxide is converted to carbon monoxide on addition of graphite. Calculate the value of K_p if total pressure at equilibrium is $0.8atm$.

A. 1.8 atm

B. 3 atm

C. 0.3 atm

D. 0.18 atm

Answer: A

Watch Video Solution

65. The reaction $A(g)+B(g)\Leftrightarrow 2C(g)$ is occurred by mixing of 3 moles of A and 1 mole of B in one litre container. If a of B is $\frac{1}{3}$, then K_c for this reaction is:

A. 0.12

B. 0.25

C. 0.50

D. 0.75

Answer: B

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Degree Of Dissociation Vapour Density And Simultaneous Equilibria

1. The degree of dissociation of $PC1_5$ (α) obeying the equilibrium, $PC1_5 \Leftrightarrow PC1_3 + C1_2$, is approximately related to the pressure at equilibrium by (given $\alpha < \ < 1$) :

A. $\alpha \propto P$

B. $\alpha \propto \frac{1}{\sqrt{P}}$

C. $\alpha \propto \frac{1}{P^2}$

D. $\alpha \propto \frac{1}{P^4}$

Answer: B

Watch Video Solution

2. If dissociation for reaction, $PC1_5 \Leftrightarrow PC1_3 + C1_2$ is 20% at 1 atm pressure. Calculate K_c.

A. 0.04

B. 0.05

C. 0.07

D. 0.06

Answer: B

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3. 3.2 moles of hydrogemn iodide was heted in a sealed bulb at $444^{\circ} C$ till the equilibrium state was reached. Its degree of dissociation sat this temperature was found to be 22%. The number of moles of hydrogen iodide present at equilibrium is

A. 2.496

B. 1.87

C. 2

D. 4

Answer: A

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4. The vapour density of completely dissociated NH_4C1 would be

A. Slight less than half that NH_4C1

B. Half that of NH_4C1

C. Double that of NH_4C1

D. Determined by the amount of solid NH_4C1 in the experiment

Answer: B

View Text Solution

5. Ammonia under a pressure of $15atm$, at $27^{\circ}C$ is heated to $327^{\circ}C$ in a vessel in the pressure of catalyst. Under these conditions, NH_3 partially decomposes to H_2 and N_2. The vessel is such that the volume remains effectively constant, whereas the pressure increases to $50 atm$.

Calculate the precentage of NH_3 actually decomposed.

A. 65%

B. 61.3%

C. 62.5%

D. 64%

Answer: B

Watch Video Solution

6. Ammoina dissociates into N_2 and H_2 such that degree of dissociation α is very less than 1 and equilibrium pressure is P_0 then the value of α is [if K_p for $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g) + 3H_2(g)$ is $27 \times 10^{-8} P_0^2]$:

A. 10^{-4}

B. 4×10^{-4}

C. 0.02

D. can't be calculated

Answer: C

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7. Ammoina carbonate when heated to $200^{\circ} C$ 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

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8. At $727^{\circ}C$ and $1.2atm$ of total equilibrium pressure, SO_3 is partially dissociated into SO_2 and O_2 as:

$$SO_3(g) \Leftrightarrow SO_2(g) + \frac{1}{2}O_2(g)$$

The density of equilibrium mixture is $0.9g/L$. The degree of dissociation is:, $[UseR = 0.08atmLmol^{-1}K^{-1}]$

A. $1/3$

B. $2/3$

C. $1/4$

D. $1/5$

Answer: B

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9. The vapour density of Pcl_5 is 104.16 but when heated to $230^{\circ}C$, its vapour density is reduced to 62. The degree of dissociation of PCl_5 at $230^{\circ}C$ is ....

A. 6.8%

B. 68%

C. 46%

D. 64%

Answer: B

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10. The equilibrium constants K_{p1} and K_{p2} for the reactions X $\Leftrightarrow$ 2Y and Z $\Leftrightarrow$ P + Q, respectively, are in the ratio of $1:9$. If the degree of dissures at these equilibria is:

A. $1:36$

B. $1:1$

C. $1:3$

D. $1:9$

Answer: A

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

1mole N_2 and 3 moles H_2 are present at start in 1 L flask. At equilibrium NH_3 formed required 100 mL of 5 M HC1 for neutralisation hence K_c is

A. $\frac{(0.5)^2}{(0.75)(2.25)^3}$

B. $\frac{(0.5)^2}{(0.5)(2.5)^3}$

C. $\frac{(0.5)L}{(0.75)(2.5)^3}$

D. none of these

Answer: A

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12. Equilibrium constant can also be expressed in terms of K_x , when concentrations of the species are taken in mole fraction

$$F_2(g) \Leftrightarrow 2F(g), K_x = \frac{X_F^2}{X_{F_2}}$$

For the above equilibrium mixture, aberage molar mass at 1000 K was 36.74 g mol^{-1} . Thus, K_x is

A. 14.08

B. 2.124×10^2

C. 7.1×10^{-2}

D. 4.708×10^{-3}

Answer: D

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13. Given for the following equilibrium taking place in 1 L flask at 300 K.

$PC1_5(g) \Leftrightarrow PC1_3(g) + C1_2(g)$, $K_c = 4$ Thus, degree of dissociations of $PC1_5$ (g) is

A. $2\left[\sqrt{2}-1\right]$

B. $\left(2\sqrt{2}-1\right)$

C. $2\left[\sqrt{2}+1\right]$

D. $-2\left[\sqrt{2}+1\right]$

Answer: A

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14. The formation constant of $Ni(NH_3)_6^{2+}$ is 6×10^8 at $25^\circ C$.If 50 ml of 2.0 M NH_3 is added to 50 ml of 0.20 M solution of Ni^{2+} , the concentration of Ni^{2+} ion will be nearly equal to :

A. 3×10^{-10} mole $litre^{-1}$

B. 2×10^{-10} mole $litre^{-1}$

C. 2×10^{-9} mole $litre^{-1}$

D. 4×10^{-8} mole $litre^{-1}$

Answer: D

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15. $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ When 46 g of I_2 and 1 g of H_2 gas heated at equilibrium at $450^\circ C$, the equilibrium mixture contained 1.9 g of I_2 . How many moles of I_2 and HI are present at equilibrium ?

A. 0.0075 and 0.147 moles

B. 0.005 and 0.147 moles

C. 0.0075 and 0.347 moles

D. 0.0052 and 0.347 moles

Answer: C

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16. The vapour density of the equilibrium mixture of the reaction:

$SO_2Cl_2(g) \Leftrightarrow SO_2(g) + Cl_2(g)$

is 50. The percent dissociation of SO_2Cl_2 is

A. $33.33\ \%$

B. $66.67\ \%$

C. $30.0\ \%$

D. $35.0\ \%$

Answer: D

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17. The vapour density of N_2O_4 at a certain temperature is 30. Calculate the percentage dissociation of N_2O_4 this temperature.

A. $53.3\ \%$

B. $106.6\ \%$

C. $26.7\ \%$

D. None of these

Answer: A

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18. For the equilibrium

$CuSO_4 \times 5H_2O(s) \Leftrightarrow CuSO_4 \times 3H_2O(s) + 2H_2O(g)$

$K_p = 2.25 \times 10^{-4} atm^2$ and vapour pressure of water is 22.8 torr at 298 K. $CuSO_4 . 5H_2O(s)$ is efflorescent (i.e., losses water) when relative humidity is :

A. less than $63.3\ \%$

B. less than $50\ \%$

C. less than $66.6\ \%$

D. above 66.6%

Answer: B

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19. Equilibrium constant for the following equilibrium is given at $)^{\circ} C$.

$Na_2HPO_4 \quad . \quad 12H_2O(s) \Leftrightarrow Na_2HPO_4 \quad . \quad 7H_2O(s) + 5H_2O(g)$

$K_p = 31.25 \times 10^{-13}$. At equilibrium what will be partial pressure of water vapour:

A. $\frac{1}{5} \times 10^{-3}$ atm

B. 0.5×10^{-3} atm

C. 5×10^{-2} atm

D. 5×10^{-3} atm

Answer: D

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20. For the following mechanism, $P + Q \underset{K_B}{\overset{K_A}{\Longleftrightarrow}} PQ \underset{K_D}{\overset{K_C}{\Longleftrightarrow}}$ R at equilibrium $\frac{[R]}{[P][Q]}$ is: [K represents rate constant]

A. $\frac{K_A . K_B}{K_C . K_D}$

B. $\frac{K_A . K_D}{K_B . K_C}$

C. $\frac{K_B . K_D}{K_A . K_C}$

D. $\frac{K_A . K_C}{K_B . K_D}$

Answer: D

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Section B Assertion Reasoning

1. Assertion: Recent convention to represent K_p is dimensionless.

Reason: The statement state of pure gas is 1 bar and the partial pressure of reactants and products measured with respect to this standerd are determine K_p for the equilibrium.

$A(g) + 2B(g) \rightarrow C(g)$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion: A reaction $2SO_2 + O_2 \Leftrightarrow 2SO_3$, has K_p at 298 K and 500 K as 4.0×10^{24} and 8.5×10^{10} respectively.

Reason: The E_a for the forward reaction is lesser than E_b for the backward reaction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion: K_c , K_p and K_x are the equilibrium constants of a reaction in terms of concentration, pressure and mole fraction respectively.

Reason: The value of K_c or K_p or K_x charge with temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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4. Assertion: A dynamic equilibrium means a balance between the tendency towards minimum and mazimum ethalpies.

Reason: The reaction having $\Delta H = -ve$ occurs form high ethalpy side to low enthalpy side and the reaction $\Delta H = +ve$ occurs form low enthalpy side to high enthalpy side.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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5. Assertion: Melting of ice at $10^\circ C$ is a reversible process.

Reason: Evaportation of water at $100^\circ C$ and 1 atm pressure is a reversible priocess.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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6. Assertion: The m.pt. of ice is lowered on increasing the pressure, whereas m.pt. of solids other than ice is raised upon increasing pressure.

Reason: Ice shows H-bonding and leads to three dimensional solid of more volume.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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7. Assertion: Water boils at higher temperature in pressure cooker.

Reason: Increase in pressure leads to an increase in boiling temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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8. Assertion: The equilibrium in physical system is also dynamic in nature.

Reason: The equilibrium ice $\Leftrightarrow$ water is static is static in nature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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9. Assertion: The melting point of solid (except ice) increases with increase in pressure.

Reason: An increasion in pressure favours the change where volume decreases.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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10. Assertion: Association of an inert gas at constant pressure to dissociation equilibrium of $PC1_5 \Leftrightarrow PC1_3 + C1_2$ favours forward reaction.

Reason: $K_c = \frac{\alpha^2}{V(1-\alpha)}$ for the dissociation equilibrium of $PC1_5$ where α is degree of dissociation of $PC1_5$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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11. Assertion: $\Delta G = \Delta G^{\circ}$ + 2.303 RT log Q, where Q is reaction quotient.

Reason: Q may be greater or lesser than K_c but equal to K_c if $\Delta G = 0$

.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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12. Assertion: The equilibrium constant may show higher or lower values with increase in temperature.

Reason: The change depends on the heat of reaction at equilibrium.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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13. Assertion: The dissociation of $PC1_5$ decreases on increase.

Reason: An increase in pressure favours the forward reaction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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14. Assertion: No term in the concentration of a pure solid or a pure liquid apperas in an equilibrium constant expression.

Reason: Each pure solid or pure liquid is in a phase by itself and has a constant concentration at constant temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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15. Assertion: The reaction quotient, Q has the same form as the equilibrium constant K_{eq}, and is evaluated using any given concentrations of the species involved in the reaction, and not necessarily equilibrium constrations.

Reason: If the numerical value of Q is not the same as the value of equilibrium constant, a reaction will occur.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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16. Assertion: The dissociation of $CaCO_3$ can be represented as, $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$. Some solid $CaCO_3$ is placed in an evacuated vessel enclosed by a piston and heated so that the volume of the vessel is doubled, while the temperature is held constant, the number of moles of CO_2 in the vessel increase.

Reason: The pressure ofv CO_2 in the vessel will remain the same.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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17. Assertion (A) : A catalyst does not influences the values of equilibrium constant

Reason (R) : Catalyst influences the rate of both forward and backward reactions equally.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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18. Assertion (A) : For $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$, if more Cl_2 is added the equilibrium will shift in backward direction. Hence, equilibrium constant will decrease.

Reason (R) : Addition of inert gas to the equilibrium mixture at constant volume does not alter the equilibrium.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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Neet Aipmt Questions

1. Reaction $2BaO_2(s) \Leftrightarrow 2BaO(s) + O_2(g), \Delta H = +ve.$ At equilibrium condition, pressure of O_2 is depended on:

A. increased mass of BaO_2

B. increased mass of BaO

C. increased temperature of equilibrium

D. increased mass of BaO_2 and BaO both

Answer: C

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2. The reaction quotient (Q) for the reaction $N_2(g)+3H_2(g) \Leftrightarrow 2NH_2(g)$ is given by Q $=\frac{[NH_3]^2}{[N_2][H_2]^3}$. The reaction will proceed towards right side if

where K_c is the equilibrium constant.

A. $Q > K_c$

B. $Q = 0$

C. $Q = K_c$

D. $Q < K_c$

Answer: A

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3. Equilibirum constants K_1 and K_2 for the following equilibria

$NO(g) + \frac{1}{2}O_2 \Leftrightarrow NO_2(g)$ and $2NO_2(g) \Leftrightarrow$

$2NO(g) + O_2(g)$ are related as

A. $K_2 = \frac{1}{K_1^2}$

B. $K_2 = \frac{1}{K_1}$

C. $K_2 = K_1^2$

D. $K_2 = \frac{K_1}{2}$

Answer: A

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4. For the reaction $CH_{4(g)} + 2O_{2(g)} \Leftrightarrow CO_{2(g)} + 2H_2O_l$:

$(\Delta H = -170.8 kJ mol^{-1})$. Which of the following statement 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 $H_2O(l)$ 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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5. Given

$$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), K_1$$

$$N_2(g) + O_2(g) \Leftrightarrow 2NO(g), K_2$$

$$H_2(g) + \frac{1}{2}O_2 \Leftrightarrow H_2O(g), K_3$$

The equilibrium constant for

$$2NH_3(g) + \frac{5}{2}O_2(g) \Leftrightarrow 2NO(g) + 3H_2O(g)$$

will be

A. $K = \frac{K_2 \times K_3^2}{K_1}$

B. $K = \frac{K_2^2 \times K_3}{K_1}$

C. $K = \frac{K_1 \times K_2}{K_3}$

D. $K = \frac{K_2 \times K_3^3}{K_1}$

Answer: D

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6. At temperature T, a compound $AB_2(g)$ dissociates according to the reaction

$2AB_2(g) \Leftrightarrow 2AB(g) + B_2(g)$

with degree of dissociation α, which is small compared with unity. The expression for K_p in terms of α and the total pressure P_T is

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

B. $(2K_p / P\hat{} (1/2)$

C. (K_p / P)

D. $(2K_p / P)$

Answer: A

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7. 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. 16 times

B. 64 times

C. 4 times

D. 8 times

Answer: B

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8. The value of equilibrium constant of the reaction, $H(g) \Leftrightarrow \frac{1}{2}H_2(g)$ is 0.8 . The equilibrium constant of the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ will be

A. $\frac{1}{64}$

B. 16

C. $\frac{1}{18}$

D. $\frac{1}{16}$

Answer: A

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

A. 3.0×10^{5}

B. 3.0×10^{-5}

C. 3.0×10^{-4}

D. 3.0×10^{4}

Answer: D

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10. For which reaction $K_p \neq K_c$?

A. $2NO_2(g) \Leftrightarrow N_2(g) + O_2(g)$

B. $SO_2(g) + NO_2(g) \Leftrightarrow SO_3(g) + NO(g)$

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

D. $2C(s) + O_2(g) \rightarrow 2CO(g)$

Answer: D

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11. The reaction,

$2A(g) + B(g) \Leftrightarrow 3C(g) + D(g)$

is begun with the concentration of A and B both at an intial value of 1.00 M. When equilibrium is reached, the concentration of D is measured and found to be 0.25 M. The value for the equilibrium constant for this reaction is given by the expression:

A. $\frac{\left[(0.75)^3(0.25)\right]}{\left[(1.00)^2(1.00)\right]}$

B. $\frac{\left[(0.75)^3(0.25)\right]}{\left[(0.50)^2(0.75)\right]}$

C. $\frac{\left[(0.75)^3(0.25)\right]}{\left[(0.50)^2(0.25)\right]}$

D. $\frac{\left[(0.75)^3(0.25)\right]}{\left[(0.75)^2(0.25)\right]}$

Answer: B

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12. For the reaction $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$, the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction

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

What is K for the reaction

$$NO_2(g) \Leftrightarrow \frac{1}{2}N_2(g) + O_2(g)?$$

A. $\frac{1}{(K_1K_2)}$

B. $\frac{1}{(2K_1K_2)}$

C. $\frac{1}{(4K_1K_2)}$

D. $\left(\frac{1}{(K_1K_2)}\right)^{1/2}$

Answer: D

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13. Given that equilibrium constant for the reaction $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$ has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?

$$SO_3(g) \Leftrightarrow SO_2(g) + \frac{1}{2}O_2(g)$$

A. 1.8×10^{-3}

B. 3.6×10^{-3}

C. 6.0×10^{-2}

D. 1.3×10^{-5}

Answer: C

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14. Given the reaction between 2 gases represented by A_2 and B_2 to given the compound AB(g). $A_2(g) + B_2(g) \Leftrightarrow 2AB(g)$

At equilibrium, the concentrtation

of $A_2 = 3.0 \times 10^{-3} M$

of $B_2 = 4.2 \times 10^{-3} M$

of $AB = 2.8 \times 10^{-3} M$

If the reaction takes place in a sealed vessel at $527^\circ C$. then the value of K_c will be

A. 2.0

B. 1.9

C. 0.62

D. 4.5

Answer: C

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15. For the reversible reaction

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) + \quad \text{Heat}$

The equilibrium shifts in forward direction

A. By increasing the concentration of $NH_3(g)$

B. By decreasing the pressure

C. By decreasing concentration of $N_2(g)$ and $H_2(g)$

D. By increasing pressure and decreasing temperature

Answer: D

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16. For a given exothermic reaction, K_p and K_p are the equilibirum constants at temperature T_1 and T_2 respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that

A. $K_p > K'_p$

B. $K_p < K'_p$

C. $K_p = K'_p$

D. $K_p = \frac{1}{K_p}$

Answer: A

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17. Which of the following statements is correct for a reversible process in a state of equilibrium ?

A. $\Delta G^{\circ} = -2.30$ RT log K

B. $\Delta G^{\circ} = -2.30$ RT log K

C. $\Delta G = -2.30$ RT log K

D. $\Delta G = 2.30$ RT log K

Answer: A

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18. If the value of equilibrium constant for a particular reaction is 1.6×10^{12} , then art equilibrium the system will contain

A. mostly products

B. similar amounts of reactions and products

C. all reactions

D. mostly reactants

Answer: A

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19. In the equilibrium constant for $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$ is K, the equilibrium constant for $\frac{1}{2}N_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow NO(g)$ will be:

A. K

B. K^2

C. $K^{1/2}$

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

Answer: C

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20. MY and NY_3 two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be true in rearged to MY and NY_3 ?

A. The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.

B. The molar soulbities of MY and NY_3 in water are identical.

C. The molar solubility of MY in water is less than that of NY_3 .

D. The salts MY and NY_3 are more solble in 0.5 M KY than in pure water.

Answer: C

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Aiims Questions

1. Given

$$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), K_1$$

$$N_2(g) + O_2(g) \Leftrightarrow 2NO(g), K_2$$

$$H_2(g) + \frac{1}{2}O_2 \Leftrightarrow H_2O(g), K_3$$

The equilibrium constant for

$$2NH_3(g) + \frac{5}{2}O_2(g) \Leftrightarrow 2NO(g) + 3H_2O(g)$$

will be

A. $K_2K_3^3 / K_1$

B. K_2K_3 / K_1

C. $K_2^3K_3 / K_1$

D. $K_1K_3^3 / K_2$

Answer: A

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2. Which one of the following statements is not corrrect ?

A. The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equiliberium

B. Enzymes catalyse mainly bio-chemical reactions

C. Coenzymes increase the catalytic activity of enzyme

D. Catalyst does not intiate any reaction

Answer: A

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3. Following solutions were prepared by mixing different volume of NaOH and HC1 of different concetrations:

(1) 60 mL $\frac{M}{10}$ HC1 + 40 mL $\frac{M}{10}$ NaOH

(2) 55 mL $\frac{M}{10}$ HC1 + 45 mL $\frac{M}{10}$ NaOH

(3) 75 mL $\frac{M}{5}$ HC1 + 25 mL $\frac{M}{5}$ NaOH

100 mL $\frac{M}{10}$ HC1 + 100 mL $\frac{M}{10}$ NaOH

pH of which one of them will be equal to 1 ?

A. 1

B. 2

C. 4

D. 3

Answer: D

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4. Which one of the following condition will favour maximum formation of the product in the reaction. $A_2(g) + B_2(g) \Leftrightarrow X_2(g) \Delta_r H = -X$ kJ ?

A. Low temperature and high pressure

B. Low temperature and low pressure

C. High temperature and high pressure

D. High temperature and low pressure

Answer: A

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5. Which of the following is a characterisstic of a reversible reaction ?

A. Number of moles of reactants and products are equal

B. It can be influenced by a catalyst

C. It can never proceed to completion

D. None of the above

Answer: C

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6. According to law of mass action rate of a chemical reaction is proportional to

A. Concentration of reactants

B. Molar concentration of reactants

C. Concentration of products

D. Molar concentration of products

Answer: B

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7. The equilibrium constant in a reversible reaction at a given temperature which

A. Depends on the initial concentration of the reactants

B. Depends on the concentration of the products at equilibrium

C. Does not depend on the initial concetrations

D. It is not characteristic of the reaction

Answer: C

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8. For which of the following reaction does the equilibrium constant depend on the units of concentration

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

B. $Zn_{(s)} + Cu^{2+}_{(aq)} \Leftrightarrow Cu_{(s)} + Zn^{2+}_{(aq)}$

C.

$C_2H_2OH_{(l)} + CH_3COOH_{(l)} \Leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$

(Reaction carried in an inert solvent)

D. $COCI_{2(g)} \Leftrightarrow (CO_{(g)} + CI_{2(g)}$

Answer: D

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9. The decomposition of N_2O_4 to NO_2 is carried out at $280^\circ C$ in chloroform. When equilibrium is reached, 0.2 mol of N_2O_4 and 2×10^{-3} mol of NO_2 are present in a $2L$ solution. The equilibrium constant for the reaction

$N_2O_4 \Leftrightarrow 2NO_2$ is

A. 1×10^{-2}

B. 2×10^{-3}

C. 1×10^{-5}

D. 2×10^{-5}

Answer: C

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10. An equilibrium mixture of the reaction $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$ had 0.5 mole H_2S, 0.10 mole H_2 and 0.4 mole S_2 in one litre vessel. The value of equilibrium constants (K) in mole $litre^{-1}$ is

A. 0.004

B. 0.008

C. 0.016

D. 0.160

Answer: C

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11. The rate constant for forward and backward reactions of hydrolysis of ester are 1.1×10^{-2} and 1.5×10^{-3} per minute respectively. Equilibrium constant for the reaction is

A. 4.33

B. 5.33

C. 6.33

D. 7.33

Answer: D

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12. For which of the following reactions $K_p = K_c$

A. $2NOC1(g) \Leftrightarrow 2NO(g) + C1_2(g)$

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

C. $H_2(g) + C1_2(g) \Leftrightarrow 2HC1(g)$

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

Answer: C

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13. In which of the following reaction $K_p > K_c$

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

B. $H_2 + I_2 \Leftrightarrow 2HI$

C. $PC1_3 + C1_2 \Leftrightarrow PC1_5$

D. $2SO_3 \Leftrightarrow O_2 + 2SO_2$

Answer: D

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14. For reacrtion $2NOC1(g) \Leftrightarrow 2NO(g) + C1_2(g)$, K_c at $427^\circ C$ is 3×10^{-6} L mol^{-1}. The value of K_p is nearly

A. 7.50×10^{-5}

B. 2.50×10^{-5}

C. 2.50×10^{-4}

D. 1.75×10^{-4}

Answer: D

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15. The value of K_p for the following reaction $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$ is 1.2×10^{-2} at $10.6.5^\circ C$. The value of K_c for this reaction is

A. 1.2×10^{-2}

B. $< 1.2 \times 10^{-2}$

C. 83

D. $> 1.2 \times 10^{-2}$

Answer: B

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16. A chemical reaction is catalyst X. Hence X

A. reduce ethalpy of the reaction

B. decreases rate constant of the reaction

C. increases activeation energy of the reaction

D. does not affect equilibrium constant of reaction

Answer: D

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17. In which of the following case K_p is less than K_c

A. $H_2 + C1_2 \Leftrightarrow 2HC1$

B. $2SO_2 + O_2 \Leftrightarrow 2SO_3$

C. $N_2 + O_2 \Leftrightarrow 2NO$

D. $PC1_5 \Leftrightarrow PC1_3 + C1_2$

Answer: B

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18. Which of the following change will shift the reaction in forward direction?

$I_2(g) \Leftrightarrow 2I(g), \Delta H^{\ominus} = +150kJ$

A. Increase in concentration of I_2

B. Decrease in concenrtation of I_2

C. Increase in temperature

D. Increase in total pressure

Answer: C

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19. The standard state Gibbs's energy change for the isomerisation reaction $cis - 2 - pentence \Leftrightarrow trans - 2 - pentence$ is $-3.67 kJmol^{-1}$ at $400K$. If more $trans - 2 - pentence$ is added to the reaction vessel, then:

A. more cis -2- pentene is formed

B. Equilibrium is shifted in the forward direction

C. Equilibrium remains unaffected

D. Additional trans-2-pentene is formed

Answer: A

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20. Which of the following factors will favour the reverse reaction in a chemical equilibrium?

A. Increase in the concentration of one of the reactants

B. Removal of at least one of the products at regular times intervals

C. Increase in the concentration of one or more products

D. None of these

Answer: C

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21. Manufacture of ammonia from the elements is represented by

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) + 22.4kcal$

The maximum yield of ammonia will be obtained when the process is made to take place

A. High temperature, high pressure and high coccentration of the reactions

B. High temperature, low pressure and low concentrations of the reactants

C. Low temperature and high pressure

D. Low temperature, low pressure and low concentration of H_2

Answer: C

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22. In which of the following system, doubling the volume of the container causes a shift to the right

A. $H_2(g) + C1_2(g) = 2HC1(g)$

B. $2CO(g) + O_2(g) = 2CO_2(g)$

C. $N_2(g) + 3H_2(g) = 2NH_3(g)$

D. $PC1_5(g) \Leftrightarrow PC1_3(g) + C1_2(g)$

Answer: D

Watch Video Solution

23. For the reaction: $A + B + Q \Leftrightarrow C + D$, if the temperature is increased, then concentration of the products will

A. increase

B. decrease

C. remains same

D. Become zero

Answer: A

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24. K_p for the following reaction at 700 K is $1.3 \times 10^{-3} atm^{-1}$. The K_c at same temperature for the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ will be

A. 1.1×10^{-2}

B. 3.1×10^{-2}

C. 5.2×10^{-2}

D. 7.4×10^{-2}

Answer: D

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25. At $700K$, the equilibrium constant K_p for the reaction

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

is $1.80 \times 10^{-3} kPa$. What is the numerical value of K_c in moles per litre for this reaction at the same temperature?

A. $3.09 \times 10^{-7} mol / L$

B. $5.07 \times 10^{-8} mol / L$

C. $8.18 \times 10^{-9} mol / L$

D. $9.24 \times 10^{-10} mol / L$

Answer: A

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26. For the reaction, $H_2 + I_2 \Leftrightarrow 2HI, K = 47.6$. If the initial number of moles of each reactant and product is 1 mole then at equilibrium

A. $[I_2] = [H_2], [I_2] > [HI]$

B. $[I_2] = [H_2], [I_2] < [HI]$

C. $[I_2] < [H_2], [I_2] = [HI]$

D. $[I_2] > [H_2], [I_2] = [HI]$

Answer: B

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27. $2IC1 \rightarrow I_2 + C1_2\ K_C = 0.14$

Intitial concentration of IC1 is 0.6 M then equilibrium concentration of I_2 is:

A. 0.37 M

B. 0.128 M

C. 0.224 M

D. 0.748 M

Answer: B

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Assertion Reasoning Questions

1. Assertion: Snow does not melt eaasily at mountains.

Reason: A decrease in pressure leads to an increase in freezing point.

A. If both assertion and reason are true and the reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correst explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion: The solubility of gases always increases with increase in pressure.

Reason: High pressure favours the change where volume decreases.

A. If both assertion and reason are true and the reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correst explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion: Association of an inert gas at constant pressure to dissociation equilibrium of $PC1_5 \Leftrightarrow PC1_3 + C1_2$ favours forward reaction.

Reason: $K_c = \frac{\alpha^2}{V(1-\alpha)}$ for the dissociation equilibrium of $PC1_5$ where α is degree of dissociation of $PC1_5$.

A. If both assertion and reason are true and the reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correst explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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4. Assertion: The equilibrium constant may show higher or lower values with increase in temperature.

Reason: The change depends on the heat of reaction at equilibrium.

A. If both assertion and reason are true and the reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correst explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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5. Assertion: The dissociation of $PC1_5$ decreases on increasing pressure.

Reason: An increase in pressure favours the forward reaction.

A. If both assertion and reason are true and the reason is the true explanation of the assertion.

B. If both the assertion and reason are true but the reason is not the correst explanation of assertion.

C. If the assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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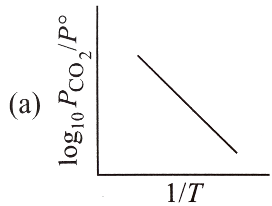
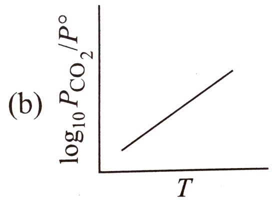
Section D Chapter End Test

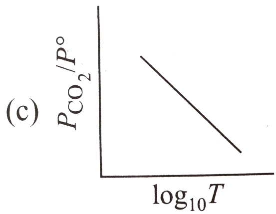
1. For the chemical equilibrium,

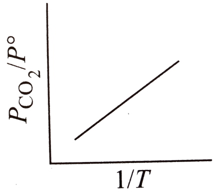
$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$

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

A. 

B. 

C. 

D. (d) 

Answer: A

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2. In which of the following equilibrium, the value of K_p is less than K_c

A. $H_2 + I_2 \Leftrightarrow 2HI$

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

C. $N_2 + O_2 \Leftrightarrow 2NO$

D. $CO + H_2O \Leftrightarrow CO_2 + H_2$

Answer: B

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3. At 298 K equilibrium constant K_1 and K_2 of following reaction

$SO_2(g) + 1/2O_2(g) \Leftrightarrow SO_3(g).....(1)$

$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$ -------(2)

The relation between K_1 and K_2 is

A. $K_1 = K_2$

B. $K_2 = K_1^2$

C. $K_2 = \frac{1}{K_1^2}$

D. $K_2 = \frac{1}{K_1}$

Answer: C

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4. If ΔG° for the reaction given below is $1.7kJ$, the equilibrium constant of the reaction,

$2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$ at $25^\circ C$ is :

A. 24.0

B. 3.9

C. 2.0

D. 0.5

Answer: D

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5. Calculate ΔG^{Θ} for the conversion of oxygen to ozone, $\left(\frac{3}{2}\right)O_2(g) \Leftrightarrow O_3(g) at 298K,$ of K_p for this conversion is 2.47×10^{-29}.

A. 163 kJ mol^{-1}

B. $2.4 \times 10^2 kJmol^{-1}$

C. 1.63 kJ mol^{-1}

D. $2.38 \times 10^6 kJmol^{-1}$

Answer: A

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6. Given reaction is $2X_{(gas)} + Y_{(gas)} \Leftrightarrow 2Z_{(gas)} + 80$ Kcal

Which combination of pressure and temperature gives the highest yield of Z at equilibrium ?

A. 1000 atm and $500^\circ C$

B. 500 atm and $500^\circ C$

C. 1000 atm and $100^\circ C$

D. 500 atm and $100^\circ C$

Answer: C

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7. Consider the reaction $HCN_{(aq)} \Leftrightarrow H^{+}_{(aq)} + CN^{-}_{(aq)}$. At equilibrium, the addition of $CN^{-}_{(aq)}$ would

A. Reduce $HCN_{(aq)}$ concentration

B. Decrease the $H^{+}_{(aq)}$ ion consideration

C. Increase the equiliberium constant

D. Decrease the equilibrium constant

Answer: B

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8. In which of the following equilibrium system the rate of the backward reaction is favoured by increase of pressure

A. $PC1_5 \Leftrightarrow PC1_3 + C1_2$

B. $2SO_2 + O_2 \Leftrightarrow 2SO_3$

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

D. $N_2 + O_2 \Leftrightarrow 2NO$

Answer: A

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9. For which of the following K_p may be equal to 0.5 atm

A. $2HI \Leftrightarrow H_2 + I_2$

B. $PC1_{5(g)} \Leftrightarrow PC1_3 + C1_2$

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

D. $2NO_2 \Leftrightarrow N_2O_4$

Answer: B

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10. The vapour density of undecomposed N_2O_4 is 46. When heated, vapour density decreases to 24.5 due to is dissociation to NO_2. The % dissociation of N_2O_4 at the final temperature is

A. 80

B. 60

C. 40

D. 70

Answer: A

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11. If pressure is applied to the following equilibrium, liquid $\Leftrightarrow$ vapours the boiling point of liquid

A. will increase

B. will decrease

C. may increase or decrease

D. will not change

Answer: A

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12. For the reaction, $A + B \Leftrightarrow 3C$, at $25^\circ C$, a $3 litre$ vessel contains 1, 2, $4 moles$ of A, B and C respectively. If K_c for the reaction is 10, the reaction will proceed in :

A. Forward direction

B. Backward direction

C. In either direction

D. In equilibrium

Answer: B

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13. The equilibrium constant for a reacton

$N_2(g) + O_2(g) = 2NO(g)$ is 4×10^{-4} at $2000K$. In the presence of catalyst, the equilibrium constant is attained 10 times faster. The equilibrium constant in the presence of catalyst, at $2000K$ is

A. 40×10^{-4}

B. 4×10^{-4}

C. 4×10^{-3}

D. can't be calculated

Answer: B

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14. In the system $A_{(s)} \Leftrightarrow 2B_{(g)} + 3C_{(g)}$, if the concentration of C at equilibrium is increased by a factor of 2, it will cause the equilibrium concentration of B to change to:

A. Two times of its original value

B. One half of its original value

C. $2\sqrt{2}$ time of its original value

D. $\frac{1}{2\sqrt{2}}$ times of its original value

Answer: D

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15. In a reaction at equilibrium, $'x'$ mole of reactant A decompose to give $1 molar$ of C and D. It has been found that the fraction of A decomposed at equilibrium is independent of initial concentration of A. Find the value of x.

A. 1

B. 3

C. 2

D. 4

Answer: C

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16. If $CuSO_4.5H_2O_{(s)} \Leftrightarrow CuSO_4.3H_2O_{(s)} + 2H_2O_{(l)} K_p = 1.086 \times 10^{-4} atm^2$ at $25^\circ C$. The efflorescent nature of $CuSO_4.5H_2O$ can be noticed when vapour pressure of H_2O in atmosphere is

A. > 7.29 mm

B. < 7.92 mm

C. ≥ 7.92 mm0

D. None

Answer: B

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17. In the system, $LaCI_{3(s)} + H_2O(g)$ + heat $\rightarrow$ LaClO(s) + 2HCl(g) , equililbrium is established. More water vapour is added to restablish the equilibrium. The pressure of water vapour is doubled. The factor by which pressure of HCl is changed is

A. 2

B. $\sqrt{2}$

C. $\sqrt{3}$

D. $\sqrt{5}$

Answer: B

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18. The equilibrium constant for the reaction $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$ is 4.0×10^{-4} at $2000K$. In the presence of a catalyst, the equilibrium is attained 10 times faster. Therefore, the equilibrium constant in presence of the catalyst at $2000K$ is

A. 4×10^{-3}

B. 4×10^{-4}

C. 4×10^{-5}

D. None

Answer: B

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19. For the decomposition reaction:

$NH_2COONH_{4(s)} \Leftrightarrow 2NH_{3(g)} + CO_{2(g)}$.

$(K_p = 2.9 \times 10^{-5} atm^2)$

The total pressure of gases at equilibrium when 1mole of $NH_2COONH_{4(s)}$ was taken to start with would be:

A. 0.0194 atm

B. 0.0388 atm

C. 0.0582 atm

D. 0.0766 atm

Answer: C

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20. For a reaction $A_{(g)} + B_{(g)} \Leftrightarrow C_{(g)} + D_{(g)}$ the intial concentration of A and B are equals but the equilibrium constant of C is twice that of equilibrium concentration of A. Then K is

A. 4

B. 9

C. $1/4$

D. $1/9$

Answer: A

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21. The partial pressure of $CH_3OH_{(g)}$, $CO_{(g)}$ and $H_{2(g)}$ in equilibrium mixture for the reaction, $CO_{(g)} + 2H_{2(g)} \Leftrightarrow CH_3OH_{(g)}$ are 2.0, 1.0 and 0.1 atm respectively at $427^\circ C$. The value of K_P for deomposition of CH_3OH to CO and H_2 is:

A. 10^2 atm

B. $2 \times 10^2 atm^{-1}$

C. $50 atm^2$

D. $5 \times 10^{-3} atm^2$

Answer: D

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22. For reaction $A(g) + B(g)$ we start with 2 moles of A and B each. At equilibrium 0.8 moles of AB is formed. Then how much of A changes to AB in $\%$ ------ will be

A. 20%

B. 40%

C. 60%

D. 4%

Answer: B

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23. In the reversible reaction A + B $\Leftrightarrow$ C + D, the concentration of each C and D at equilobrium was 0.8 mole/litre, then the equilibrium constant K_c will be

A. 6.4

B. 0.64

C. 1.6

D. 16.0

Answer: D

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24. 2 moles of PCl_5 was heated in a closed vessel of 2 litre capacity. At equilibrium, 40% of PCl_5 is dissociated it PCl_3 and Cl_2. The value of equilibrium constant is

A. 0.266

B. 0.53

C. 2.66

D. 5.3

Answer: A

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25. A mixture of 0.3 mole of H_2 and 0.3 mole of I_2 is allowed to react in a 10 litre evacuated flask at 500°C. The reaction is $H_2 + I_2 \Leftrightarrow 2HI$, the K is found to be 64. The amount of unreacted I_2 at equilibrium is

A. 0.15 mole

B. 0.06 mole

C. 0.03 mole

D. 0.2 mole

Answer: B

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

In the above reaction, one mole of each of acetic acid and alcohol are heated in the presence of little conc. H_2SO_4. On equilibrium being attained

A. 1 mole of ethyl acetate is formed

B. 2 mole of ethyl acetate are formed

C. $1/2$ mole of ethyl acetate is formed

D. $2/3$ moles of ethyl acetate is formed

Answer: D

View Text Solution

27. If the equilibrium constant of the reaction $2HI \Leftrightarrow H_2 + I_2$ is 0.25 , then the equilibrium constant of the reaction $H_2 + I_2 \Leftrightarrow 2HI$ would be

A. 1.0

B. 2.0

C. 3.0

D. 4.0

Answer: D

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28. Assertion : $K_p = K_c$ for all reaction.

Reason : At constant temperature, the pressure of the gas is proportional to its concentration.

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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29. Assertion : The equilibrium constant for the reaction $CaSO_4.5H_2O(s) \Leftrightarrow CaSO_4.3H_2O(s) + 2H_2O(g)$ is

$$K_C = \frac{[CaSO_4.3H_2O][H_2O]^2}{[CaSO_4.5H_2O]}$$

Reason : Equalibrium constant is the ration of the product of molar concentration of the substance produced to the product of the molar concentrations of reactants with each concentrations term raised to the power equal to the respective stoichiometric constant.

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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30. Assertion : On cooling a freezing mixture, color of the mixture turns to pink from deep blue for a reaction. $Co(H_2O)_6^{2+}\,_{-}(aq) + 4Ci^{-}\,_{-}(aq) \Leftrightarrow CoCI_4^{2-}(aq) + 6H_2O_{(l)}$.

Reason : Reaction is endothermic so on cooling, the reaction moves to backward direction.

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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