CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

CHEMICAL EQUILIBRIUM

STRAIGHT OBJECTIVE

1. In a reversible reaction $A \underset{K_2}{\overset{K_1}{\Longleftrightarrow}} B$ the initial concentration of A and B are a and b in moles per litre and the equilibrium concentrations are (a-x) and (b+x) respectively, Express x in terms of K_1, K_2, a and b.

A. $\dfrac{K_1a - K_2b}{K_1 + K_2}$

B. $\dfrac{K_1a - K_2b}{K_1 - K_2}$

C. $\dfrac{K_1a - K_2b}{K_1K_2}$

D. $\dfrac{K_1a + K_2b}{K_1 + K_2}$

Answer: A

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2. 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. 5.22×10^{-4}

B. 7.34×10^{-4}

C. 3.2×10^{-3}

D. 5.43×10^{-5}

Answer: A

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

The equilibrium constant of the reaction $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$ 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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4. log $\frac{K_p}{K_c}$ +log RT=0 is a relationship for the reaction :

A. $PCl_5 \Leftrightarrow PCl_3 + Cl_2$

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

C. $H_2 + I_2 \Leftrightarrow 2HI$

D. $N_2 + 3H_2 \Leftrightarrow 2NH_2$

Answer: B

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5. When ethyl alcohol $(C_2H_5OH(l))$ and acetic acid $(CH_3COOH(l))$ are mixed together in equimolar ratio at $27^\circ C$, 33% of each is converted into ester.Then the K_C for the equilibrium, $C_2H_5OH(l)) + CH_3CHOOH(l) \Leftrightarrow CH_3COOC_2H_5(l) + H_2O(l)$

A. 4

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

C. 9

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

Answer: B

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6. Sulphide ion in alkaline solution reacts with solid sulphur to form polysulphide ions having formulae $S_2^{2-}, S_3^{2-}, S_4^{2-}$ and so on. The equilibrium constant for the formation of S_3^{2-} is 132 (K_2) , both from S and S^{2-} What is the equilibrium constant for the formation of S_3^{2-} from S_2^{2-} and S ?

A. 11

B. 12

C. 132

D. None of these

Answer: A

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7. Equilibrium constant for the reactions :

$2NO + O_2 \Leftrightarrow 2NO_2$ is K_{C_1}

$NO_2 + SO_2 \Leftrightarrow SO_3 + NO$ is K_{C_2}

$2SO_3 + 2SO_2 \Leftrightarrow O_2$ is K_{C_3}

Then correct relation is :

A. $K_{C_3} = K_{C_1} \times K_{C_2}$

B. $K_{C_3} \times K_{C_1} \times K_{C_2}^2 = 1$

C. $K_{C_3} \times K_{C_1} \times K_{C_2} = 1$

D. $K_{C_3} = K_{C_1}^2 \times K_{C_2} = 1$

Answer: B

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8. The reaction $A + B \Leftrightarrow C + D$ is studied in a one litre vessel at $250^\circ C$. The initial concentration of A was 3n and that of B was n. When equilibrium was attained, equilibrium concentration of C was found to the equal to the equilibrium concentration of B. What is the concentration of D at equilibrium ?

A. $\frac{n}{2}$

B. $3n - \frac{1}{2}$

C. $n - \frac{n}{3}$

D. n

Answer: A

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9. $$\begin{array}{ll} Ag^{+} + NH_3 \Leftrightarrow [Ag(NH_3)]^{+} & K_1 = 3.5 \times 10^{-3} \\ [Ag(NH_3)]^{+} + NH_3 \Leftrightarrow [Ag(NH_3)_2]^{+} & K_2 = 1.8 \times 10^{-3} \end{array}$$

then, the overall formation constant of $[Ag(NH_3)_2]^{+}$ is :

A. $6.3 \times 10^{-6} M$

B. $6.3 \times 10^{6} M$

C. $6.3 \times 10^{-9} M$

D. None of these

Answer: A

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10. $X_2(g) + Y_2(g) \Leftrightarrow 2XY(g)$ reaction was studied at a certain temperature.In the beginning, 1 mole of X_2 was taken in a one litre flask and 2 moles of Y_2 was taken in another 2 litre flask and both these containers are connected so that equilibrium can e established.What s the equilibrium concentration of X_2 and Y_2? Given Equilibrium concentration of [XY]=0.6 moles/litre.

A. $\left(\frac{1}{3} - 0.3\right), \left(\frac{2}{3} - 0.3\right)$

B. $\left(\frac{1}{3} - 0.6\right), \left(\frac{2}{3} - 0.6\right)$

C. (1-0.3),(2-0.3)

D. (1-0.6),(2-0.6)

Answer: A

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11. For the reaction , $A+2B \Leftrightarrow 2C$, the rate constant for the forward and the backward reactions are 1×10^{-4} and 2.5×10^{-2} respectively.The value of equilibrium constant, K, for the reaction would be :

A. 1×10^{-4}

B. 2.5×10^{-2}

C. 4×10^{-3}

D. 2.5×10^{2}

Answer: C

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12. An equilibrium system for the reaction between hydrogen and iodine to give hydrogen iodide at 765 K in a 5 litre volume contains 0.4 mole of hydrogen, 0.4 mole of iodine and 2.4 moles of hydrogen iodide, The equilibrium constant for the reaction is :

$H_2 + I_2 \Leftrightarrow 2HI$, is :

A. 36.0

B. 15.0

C. 0.067

D. 0.28

Answer: A

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13. For a gasous reaction, $2A + B \Leftrightarrow 2C$, the partial pressures of A,B and C at equilibrium are 0.3 atm, 0.4 atm and 0.6 atm respectively. The value of K_P for the reaction would be :

A. 10atm^{-1}

B. $\frac{1}{10} \text{atm}^{-1}$

C. 0.2atm^{-1}

D. 5atm^{-1}

Answer: A

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14. The equilibrium constant for the reaction

$A_2(g) + B_2(g) \Leftrightarrow 2AB(g)$

is 20 at $500K$. The equilibrium constant for the reaction $2AB(g) \Leftrightarrow A_2(g) + B_2(g)$ would be

A. 20

B. 0.5

C. 0.05

D. 10

Answer: C

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15. A reaction has a forward rate constant of $2.3 \times 10^6 s^{-1}$ and an equilibrium constant of 4.0×10^8 .What is the rate constant for the reverse reaction ?

A. $1.1 \times 10^{-15} s^{-1}$

B. $5.8 \times 10^{-3} s^{-1}$

C. $1.7 \times 10^2 s^{-1}$

D. $9.2 \times 10^{14} s^{-1}$

Answer: D

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16. For the reaction $N_2O_4 \Leftrightarrow 2NO_2$, at 350 K, the value of $K_c = 0.4$ .The value of K_p for the reaction at the same temperature would be :

A. 11.48 atm

B. 1.148 atm

C. 1.4×10^{-2} atm

D. 1.4×10^{-3} atm

Answer: A

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17. For an elementary gaseous phase reaction :

$2NO + O_2 \Leftrightarrow 2NO_2$ at $27^\circ C$

Rate of the forward reaction is given by rate $= 2 \times 10^3 [NO]^2 [O_2]$ and rate of reverse reaction at is given by rate $= 20[NO_2]^2$

Hence, equilibrium constant for reaction

$$NO_2 \Leftrightarrow NO + \frac{1}{2}\text{at}27^\circ C$$

A. 100

B. 0.01

C. 0.1

D. 10

Answer: C

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18. The value of K_p for the reaction, $A(g) + 2B(g) \Leftrightarrow C(g)$ is $25atm^{-2}$ at a certain temperature. The value of K_p for the reaction, $\frac{1}{2}C(g) \Leftrightarrow \frac{1}{2}A(g) + B(g)$ at the same temperature would be :

A. 25atm^{-1}

B. $\frac{1}{25}\text{atm}^{-1}$

C. $\frac{1}{5}\text{atm}^{-1}$

D. 5 atm

Answer: C

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19. For which of the following equilibria, is $K_p = K_c$?

A. $2H_2(g) + O_2(g) \Leftrightarrow 2H_2O(g)$

B. $CH_4(g) + H_2O(g) \Leftrightarrow CO(g) + 3H_2(g)$

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

D. $COCl_2(g) \Leftrightarrow CO(g) + Cl_2(g)$

Answer: C

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20. For a reaction, $H_2 + I_2 \Leftrightarrow 2HI$ at 721 K , the value of equilibrium constant is 50. If 0.5 moles each of H_2 and I_2 is added to the system the value of equilibrium constant will be :

A. 0.02

B. 0.2

C. 50

D. 25

Answer: C

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21. In a reaction $A + 2B \Leftrightarrow 2C$, 2.0 mole of 'A' , 3.0 mole of 'B' and 1 mole of 'C' are placed in a 2.0 L flask and the equilibrium concentration of 'C' is 1.0 mole/L.The equilibrium constant (K) for the reaction is :

A. 0.33

B. 1.33

C. 1.66

D. 0.66

Answer: B

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22. The theoretically computed equilibrium constant for the polymerisation of formaldehyde to glucose in aqueous solution :

$6HCHO \Leftrightarrow C_6H_{12}O_6$ is 1.0×10^{24} If 1 M-solution of glucose was taken, what should be the equilibrium concentration of formaldehyde ?

A. $6.0 \times 10^{-4}M$

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

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

D. $\left(\frac{1}{6}\right)^{1/6} \times 10^{-4}M$

Answer: B

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23. For the equilibrium :

$NH_2COONH_4(s) \Leftrightarrow N_2(g) + 3H_2(g) + CO(g) + \frac{1}{2}O_2(g)$ the value of K_p is $27 \times 2^{\lambda/2} \text{atm}^{11/2}$ at 800 K and the equilibrium pressure of 22 atm. The value of λ is :

A. 11

B. 21

C. 5.5

D. 10.5

Answer: B

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24. For the homogeneous reaction: $4NH_3 + 5O_2 \Leftrightarrow 4NO + 6H_2O$

The equilibrium constant K_c has the units of :

A. $(Conc.\,)^{-10}$

B. $(Conc.\,)^{1}$

C. $(Conc.\,)^{-1}$

D. It is dimensionless

Answer: B

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25. An example of a reversible reaction is

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

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

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

D. $KNO_3(aq) + NaCl(aq) \Leftrightarrow KCl(aq) + NaNO_3(aq)$

Answer: D

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26. Determine the value of equilibrium constant for this reaction : $2NOCl(g) + O_2(g) \Leftrightarrow 2NO_2(g) + Cl_2(g)$ from the K_p values for these reactions.

$$2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g) \quad K_{P_1} = 1.7 \times 10^{-2}$$
$$2NO_2(g) \Leftrightarrow 2NO(g) + O_2(g) \quad K_{P_2} = 5.9 \times 10^{-5}$$

A. 1.0×10^{-6}

B. 1.0×10^{-3}

C. 3.5×10^{-3}

D. 2.9×10^{2}

Answer: D

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27. What is the equilibrium expression for this reaction ?

$2HgO(s) \Leftrightarrow 2Hg(l) + O_2(g)$

A. $K = \frac{[Hg][O_2]}{[HgO]}$

B. $K = \frac{[Hg]^2[O_2]}{[HgO]^2}$

C. $K = [Hg]^2[O_2]$

D. $K = [O_2]$

Answer: D

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28. For the reaction , $A + B \Leftrightarrow 3C$, if 'a' mol/litre of each 'A' and 'B' are taken initially then at equilibrium the incorrect relation is :

A. [A]-[B]=0

B. 3[B]+[C]=3a

C. 3[A]+[C]=3a

D. [A]+[B]=3[C]

Answer: D

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29. The average person can see the red colour imparted by the complex $[Fe(SCN)]^{2+}$ to an aqueous solution if the concentration of the complex is 6×10^{-6} M or greater.What minimum concentration of KSCN would be required to make it possible to detect 1 ppm (part per million) of Fe(III) in a natural water sample ? The instability constant for

$Fe(SCN)^{2+} \Leftrightarrow Fe^{3+} + SCN^{-} \text{is} 7.142 \times 10^{-3}$

A. $0.0036M$

B. $0.0037M$

C. $0.0035M$

D. None of these

Answer: A

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30. 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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31. 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

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32. For a reaction : $A(g) + 2B(g) \Leftrightarrow C(g) + D(g) + E(g), K_{eq} = 2$

Calculate equilibrium concentration of B if initially 10 moles of A are mixed with 20 moles of b in a 2 litre rigid container.

A. $\frac{20}{3}$M

B. $\frac{10}{3}M$

C. $\frac{40}{3}M$

D. $\frac{4}{3}M$

Answer: B

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33. An equilibrium is established SO_2, O_2 and SO_3 as $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$ starting with 2 moles SO_2 and 1.5 moles O_2 in 5 litre flask.The equilibrium mixture required 0.4 moles of $KMnO_4$ in acidic medium.The value of K_C° is :

A. 5

B. $\sqrt{5}$

C. 25

D. 0.2

Answer: B

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34. In the following reaction started only with $A_B, 2A_B(g) \Leftrightarrow 3A_2(g) + A_4(g)$ mole fraction of A_2 is found to 0.36 at a total pressure of $100 atm$ at equilibrium. The mole fraction of $A_B(g)$ at equlibrium is :

A. 0.28

B. 0.72

C. 0.18

D. None of these

Answer: A

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35. For the reversible reaction

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

at $500^{\circ}C$, the value of K_p is 1.44×10^{-5} when the partial pressure is measured in atmosphere. The corresponding value of K_c with concentration in mol L^{-1} is

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

B. $\dfrac{1.44 \times 10^{-5}}{(8.314 \times 773)^{-2}}$

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

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

Answer: D

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36. What is the equilibrium expression for the reaction

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

A. $K_C = \frac{[P_4O_{10}]}{[P_4][O_2]^5}$

B. $K_C = \frac{1}{([O_2])^5}$

C. $K_C = [O_2]^5$

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

Answer: B

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37. For the reaction , $CO(g) + Cl(g) \Leftrightarrow COCl_2(g)$ then K_p / K_c is equal to :

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

B. 1.0

C. $\sqrt{RT}$

D. RT

Answer: A

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38. 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. 2.5×10^2

B. 0.02

C. 4×10^{-4}

D. 50

Answer: D

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39. For the reaction,

$2NO_2(g) \Leftrightarrow 2NO(g) + O_2(g)\left(K_c = 1.8 \times 10^{-6} \text{at} 184^\circ C\right)$

$\left(R = 0.0831 L \text{atmmol}^{-1} K^{-1}\right)$

When K_P and K_c are compared at $184^\circ C$ it is found that

A. Whether K_P is greater than, less then or equal to K_c depends upon the total gas pressure

B. $K_P = K_C$

C. K_P is less than K_C

D. K_P is greater than K_C

Answer: D

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40. Select the reaction for which the equilibrium constant is written as

$[MX_3]^2 = K_{eq}[MX_2]^2[X_2]$

A. $MX_3 \Leftrightarrow MX_2 + \frac{1}{2}X_2$

B. $2MX_3 \Leftrightarrow 2MX_2 + X_2$

C. $2MX_2 + X_2 \Leftrightarrow 2MX_3$

D. $MX_2 + \frac{1}{2}X_2 \Leftrightarrow MX_3$

Answer: C

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41. For the following gaseous equilibrium, $N_2O_4(g) \Leftrightarrow 2NO_2(g)$

K_P is found to be equal to K_c This is attained when temperature is :

A. $0^{\circ}C$

B. 273 K

C. 1 K

D. 12.19 K

Answer: D

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42. For the reaction $3A(g) + B(g) \Leftrightarrow 2C(g)$ at a given temperature , $K_c = 9.0$.What must be the volume of the flask, if a mixture of 2.0 mol each of A, B and C exist in equilibrium ?

A. 6 L

B. 9 L

C. 36 L

D. None of these

Answer: A

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43. N_2 and H_2 are taken in 1:3 molar ratio in a closed vessel to attained the following equilibrium , $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

Find K_p for reaction at total pressure of 2P if P_{N_2} at equilibrium is $\frac{P}{3}$:

A. $\frac{1}{3P^2}$

B. $\frac{4}{3P^2}$

C. $\frac{4P^2}{3}$

D. None of these

Answer: B

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44. What is the minimum mass of $CaCO_3(s)$, below which it decomposes completely, required to establish equilibrium in a 6.50 litre container for the reaction :

$CaCO_3(g) \Leftrightarrow CaO(g) + CO_2(g), K_c = 0.05$

A. 32.5 g

B. 24.5 g

C. 40.9 g

D. 8.0 g

Answer: A

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45. Which of the following is correct for the equilibrium of the reaction ?

$$C(s) + H_2O(g) \Leftrightarrow CO(g) + H_2(g)$$

A. $p_{H_2} \propto p_{H_2O}$

B. $p_{H_2} \propto \sqrt{p_{H_2O}}$

C. $p_{H_2} \propto p^2_{H_2O}$

D. $p_{H_2} \propto \frac{p^2_{H_2O}}{p_{CO}}$

Answer: B

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46. A sample of pure NO_2 gas heated to 1000 K decomposes :

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

The equilibrium constant K_P is 100 atm. Analysis shows that the partial pressure of O_2 is 0.25 atm. At equilibrium.The partial pressure of NO_2 at equilibrium is:

A. 0.03

B. 0.25

C. 0.025

D. 0.04

Answer: C

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47. The equilibrium constant for the reaction,

$SO_3(g) \Leftrightarrow SO_2(g) + \frac{1}{2}O_2(g)$ is $K_C = 4.9 \times 10^{-2}$. The value of K_C for the reaction $2SO_2(g) + O_2 \Leftrightarrow 2SO_3(g)$ will be :

A. 416

B. 2.40×10^{-3}

C. 9.8×10^{-2}

D. 4.9×10^{-2}

Answer: A

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48. The equilibrium constant for the reaction a,b and c equilibrium constants are given :

$$(A) CO(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g) \qquad K_1$$
$$(B) CH_4(g) + H_2O(g) \Leftrightarrow CO(g) + 3H_2(g) \qquad K_2$$
$$(C) CH_4(g) + 2H_2O(g) \Leftrightarrow CO_2(g) + 4H_2(g) \qquad K_3$$

Which of the following relations is correct ?

A. $K_2K_3 = K_1$

B. $K_3 = K_1K_2$

C. $K_3K_2^3 = K_1^2$

D. $K_1 = \sqrt{K}_2 = K_3$

Answer: B

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49. If $10^{-4}dm^3$ of water is introduced into a $1.0dm^3$ flask to $300K$ how many moles of water are in the vapour phase when equilibrium is established ? (Given vapour pressure of H_2O at $300K$ is $3170PaR = 8.314JK^{-1}mol^{-1}$) .

A. $5.56 \times 10^{-3}mol$

B. $1.53 \times 10^{-2}mol$

C. $4.46 \times 10^{-2}mol$

D. $1.27 \times 10^{-3} mol$

Answer: D

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50. For the reaction equilibrium , $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ the concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and $1.2 \times 10^{-2} mol L^{-1}$ respectively.The value of K_C for the reaction is :

A. $3.3 \times 10^2 \text{mol} L^{-1}$

B. $3 \times 10^{-1} \text{mol} L^{-1}$

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

D. $3 \times 10^3 \text{mol} L^{-1}$

Answer: C

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51. An amount of solid NH_4HS is placed in a flask already containing ammonia gas at a certain temperature and 0.50 atm pressure.Ammonium hydrogen sulphide decomposes to yield NH_3 and H_2S gases in the flask.When the decomposition reaction reaches equilibrium, the total pressure in the flask rises to 0.84 atm ? The equilibrium constant for NH_4HS decomposition at this temperature is :

A. 0.11

B. 0.17

C. 0.18

D. 0.30

Answer: A

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52. $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$.This is a gaseous phase reaction taking place in 1 L flask at $127^\circ C$.Starting with 1 mole of N_2 and 3 mole of H_2, the equilibrium mixture obtanied is such that if it is titrated requires 500 mL of 1.0 M H_2SO_4 for neutralisation. Which of the following is the most appropritate K_C?

A. 0.03

B. 0.59

C. 0.27

D. 0.11

Answer: B

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53. What is the value of K_p for the following reaction

$N_2(g) + 2O_2(g) \Leftrightarrow N_2O_4(g)$

Reaction	K_p
$\frac{1}{2}N_2O_4(g) \Leftrightarrow NO_2(g)$	x
$\frac{1}{2}N_2(g) + O_2(g) \Leftrightarrow NO_2(g)$	y

A. $\frac{y}{x}$

B. $\frac{y^2}{x^2}$

C. $\frac{x^2}{y^2}$

D. xy^2

Answer: B

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54. What is the ratio K_c / K_p for the following reaction at $723^\circ C$?

$O_2(g) + 3UO_2Cl_2(g) \Leftrightarrow U_3O_8(s) + 3Cl_2(s)$

A. 0.0122

B. 1.00

C. 59.4

D. 81.8

Answer: D

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55. At $527^\circ C$ the reaction :

$NH_3(g) \Leftrightarrow \frac{1}{2}N_2(g) \text{has} K_c = 4$

What is K_p for the reaction :

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

A. $16 \times (800R)^2$

B. $\left(\frac{800R}{4}\right)^{-2}$

C. $\left(\frac{527R}{4}\right)^2$

D. None of these

Answer: D

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56. Ammonium hydrogen sulphide dissociates according to the equation :

$NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$

The total pressure at equilibrium at 400 K is found to be 1 atm.The equilibrium constant K_p of the reaction is :

A. $1atm^2$

B. $0.25atm^2$

C. 0.5 atm

D. 0.25 atm

Answer: B

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57. N_2 and O_2 combine at a given temperature to produce NO. At equilibrium the yield of NO is 'x' precent by volume. If $x = \sqrt{Ka.\,b} - \frac{K(a+b)}{4}$, where K is the equilibrium constant of the given reaction at the given temperature and a and b are the volume percentage of N_2 and O_2, respectively, in the initial state. Report. Report the maximum value of K at which X is maximum

A. K=1

B. K=2

C. K=4

D. K=16

Answer: C

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58. The K_p for following reaction is $2.25 \times 10^{-2} atm^2$

$NH_4CN(s) \Leftrightarrow NH_3(g) + HCN(g)$

The value of equilibrium pressure (in atm) above $NH_4CN(s)$ is :

A. 0.15

B. 0.3

C. 15

D. 30

Answer: B

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59. Calculate K_c for the reaction $KI + I_2 \Leftrightarrow KI_3$. Given that initial weight of KI is $1.326g$ weight of KI_3 is $0.105g$ and number of moles of free I_2 is 0.0025 at equilibrium the volume of solution is $1 - L$.

A. 0.032

B. 0.024

C. 0.064

D. 0.012

Answer: A

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60. 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

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61. 0.5 moles of N_2 gas is mixed with 0.72 moles of O_2 gas in a 2 litre tank at 2000 K. The two gases react as : $N_2(g) + O_2(g) \Leftrightarrow 2NO(g), K_p = 4.9 \times 10^{-5}$ at 2000 K. The equilibrium concentration of NO(g) will be :

A. $4.2 \times 10^{-3}M$

B. $6.3 \times 10^{-3}M$

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

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

Answer: C

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62. For the reaction,

$C_2H_6(g) \Leftrightarrow C_2H_6(g) + H_2(g)$. K_p is 0.05 at 900 K. If an initial mixture comprising 20 mol of C_2H_6 and 80 mol of inert gas is passed over a dehydrogenation catalyst at 900 K, what is the equilibrium mole percentage of C_2H_6 in the gas mixture ? The total pressure is kept at 0.5 bar :

A. 4.3

B. 9.67

C. 8.76

D. 72.5

Answer: C

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63. At a certain temperature the following equilibrium is established

$CO(g) + NO_2(g) \Leftrightarrow CO_2(g) + NO(g)$

One mole of each of the four gases is mixed in one litre container and the reaction is allowed to reach equilibrium state.When excess of baryta water $[Ba(OH_2)]$ is added to the equilibrium mixture, the weight of white precipitate obtained is 236.4 gm.The equilibrium constant K_c of the following reaction is:

A. 1.2

B. 2.25

C. 2.1

D. 3.6

Answer: B

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64. For a system in equilibrium, the rate constant for the forward reaction is represented by K_f and the rate constant for the reverse reaction is represented by K_r.Which equation represents the equilibrium constant for this reaction in the forward direction ?

A. $K_{eq} = K_f . K_r$

B. $K_{eq} = \frac{K_f}{K_r}$

C. $K_{eq} = \frac{K_r}{K_f}$

D. $K_{eq} = \frac{1}{K_f . K_r}$

Answer: B

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65. $C_6H_5OH(aq) + CN^-(aq) \Leftrightarrow HCN(aq) + C_6H_5O^-(aq)$

The equilibrium constant for this reaction is less than 1. What is the strongest base in this system ?

A. $C_6H_5OH(aq)$

B. $CN^-(aq)$

C. HCN(aq)

D. $C_6H_5O^-(aq)$

Answer: D

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66. 1.00 g of water is introduced into a 5.00 L evacuated flask at $50^\circ C$.

Vapour	Pressure at $50^\circ C$
H_2O	$92.5 mmHg$

What mass of water is present as liquid when equilibrium is established ?

A. 0.083 g

B. 0.41 g

C. 0.59 g

D. 0.91 g

Answer: C

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67. For the reaction

$2CCl_4(g) + O_2(g) \Leftrightarrow 2COCl_2(g) + 2Cl_2(g)$

What is the equilibrium expression , K_c ?

A. $K_c = \frac{[COCl_2][Cl_2]}{[CCl_4][O_2]}$

B. $K_c = \frac{2[COCl_2][Cl_2]}{[CCl_4][O_2]}$

C. $K_c = \frac{[COCl_2][Cl_2]^2}{[CCl_4][O_2]}$

D. $K_c = \frac{[COCl_2]^2[Cl_2]^2}{[CCl_4]^2[O_2]}$

Answer: D

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68. Based on the equilibrium constant for the reaction below :

$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g) \quad K = 1.8 \times 10^{-5}$

What is the equilibrium constant for the reaction

$SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g) \quad K = ?$

A. 2.1×10^{-3}

B. 4.2×10^{-3}

C. 2.4×10^{2}

D. 5.6×10^{4}

Answer: D

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69. $CO(g) + Cl_2(g) \Leftrightarrow COCl(g) + Cl(g) K_{eq} = 1.5 \times 10^{-39}$

If the rate constant , K, for the forward reaction is

$1.4 \times 10^{-28} Lmol^{-1} \sec^{-1}$ what is K (in L $mol^{-1} \sec^{-1}$) for the backward reaction ?

A. 2.1×10^{-67}

B. 1.0×10^{-11}

C. 9.3×10^{10}

D. 7.1×10^{27}

Answer: C

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70. Which statement is true for a reaction at equilibrium ?

A. All reaction ceases

B. The reaction has gone to completion

C. The rates of the forward and reverse reactions are equal

D. The amount of product equals the amount of reactant.

Answer: C

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71. For the hypothetical reaction, $2A(s) + B(g) \Leftrightarrow 3C(g)$

What is the equilibrium expression ?

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

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

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

D. $K = \frac{[C]^3}{[B]}$

Answer: D

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72. Equilibrium const.

$$H_2S(aq) \Leftrightarrow H^+(aq) + HS^-(aq) \qquad K_1 = 9.5 \times 10^{-8}$$
$$HS^-(aq) \Leftrightarrow H^+(aq) + S^{2-}(aq) \qquad K_2 = 1.0 \times 10^{-19}$$

What is the equilibrium constant for the reaction ?

$$S^{2-}(aq) + 2H^+(aq) \Leftrightarrow H_2S(aq) \quad K = ?$$

A. 9.5×10^{-27}

B. 9.7×10^{-14}

C. 9.5×10^{11}

D. 1.0×10^{26}

Answer: D

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73. What is the equilibrium expression for this reaction ?

$$2ZnS(s) + 3O_2(g) \Leftrightarrow 2ZnO(s) + 2SO_2(g)$$

A. $K = \frac{2[SO_2]}{3[O_2]}$

B. $K = \frac{[SO_2]^2}{[O_2]^3}$

C. $K = \frac{2[ZnO][SO_2]}{3[ZnS][O_2]}$

D. $K = \frac{[ZnO]^2[SO_2]^2}{[ZnS]^2[O_2]}$

Answer: B

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74. For the hypothetical equilibrium reactions ,

$A \Leftrightarrow B, K_1 = 2.0, B \Leftrightarrow C, K_2 = 0.010$.What is the value of K for the reaction , $2C \rightarrow 2A$?

A. 2500

B. 50

C. 25

D. 4.0×10^{-4}

Answer: A

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75. For which reaction is $K_p = K_c$?

(P)$2Na_2(g) + O_2(g) \rightarrow 2N_2O(g)$

(Q)$C(s) + O_2(g) \rightarrow CO_2(g)$

(R)$N_2O_4(g) \rightarrow 2NO_2(g)$

A. Q only

B. R only

C. P and R only

D. Q and R only

Answer: A

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76. $2NO_2(g) + 7H_2(g) \Leftrightarrow 2NH_3(g) + 4H_2O(l)$

What is the correct equilibrium expression for this reaction ?

A. $K_C = \frac{[NH_3]^2}{[NO_2]^2[H_2]^7}$

B. $K_C = \frac{[NO_2]^2[H_2]^7}{[NO_3]^2}$

C. $K_C = \frac{[NH_3]^2[H_2O]^4}{[NO_2]^2[H_2]^7}$

D. $K_C = \frac{[NH_3]^2[H_2O]^4}{[NO_2]^2}$

Answer: A

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77. For which reaction does $K_p = K_c$?

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

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

C. $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

D. $H_2(g) + I_2(g) \rightarrow 2HI(g)$

Answer: D

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78. Which statement is correct about a system at equilibrium ?

A. The forward and reverse reactions occur at identical rates

B. The concentrations of reacants must equal the concentrations of the products.

C. The concentrations of reactants and products can be changed by adding a catalyst

D. The concentrations of reactants and products are not affected by a change in terperature.

Answer: A

79. When 2.00 mol each of $H_2(g)$ and $I_2(g)$ are reacted in a 1.00 L container at a certain temperature , 3.50 mol of HI is present at equilibrium.Calculate the value of the equilibrium constant , K_c for the reaction :

$H_2 + I_2 \Leftrightarrow 2HI$

A. 3.7

B. 14

C. 56

D. 2.0×10^2

Answer: D

80. What is the K_{eq} expression for the reaction, $C(s) + CO_2(g) \to 2CO(g)$?

A. $K_{eq} = \frac{2[CO]}{[CO_2]}$

B. $K_{eq} = \frac{2[CO][CO]}{[CO_2]}$

C. $K_{eq} = \frac{[CO]^2}{[CO_2]}$

D. $K_{eq} = \frac{[C][CO]^2}{[CO_2]}$

Answer: C

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81. The equilibrium system, $N_2O_4(s) \Leftrightarrow 2NO_2(g)$, has $K_p = 11$.For which equilibrium system is $K_p = 0.091$?

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

B. $NO_2(g) \Leftrightarrow \frac{1}{2}N_2O_4(g)$

C. $2N_2O_4(g) \Leftrightarrow 4NO_2(g)$

D. $\frac{1}{2}N_2O_4(g) \Leftrightarrow NO_2(g)$

Answer: A

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82. A 1.0 L evacualated tank is charged with HI(g) to a pressure of 1.0 atm at 793 K. Some of the HI(g) forms $H_2(g)$ and $I_2(g)$ according to the equilibrium :

$2HI(g) \Leftrightarrow H_2(g) + I_2(g) \quad K_p = 0.016$

What is the pressure (in atm) of HI at equilibrium ?

A. 0.11

B. 0.13

C. 0.80

D. 1.6

Answer: C

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83. What is the equilibrium expression K_c, for the reaction :

$2S(s) + 3O_2(g) \Leftrightarrow 3SO_3(g)$?

A. $K_c = \frac{2[SO_3]}{(2[S] + 3[O_2])}$

B. $K_c = \frac{2[SO_3]}{3[O_2]}$

C. $K_c = \frac{2[SO_3]^2}{[S]^2 + [O_2]^3}$

D. $K_c = \frac{[SO_3]^2}{[O_2]^3}$

Answer: D

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84. A 2.0 L container is charged with a mixture of 6.0 moles of CO(g) and 6.0 moles of $H_2O(g)$ and the following reaction takes place :

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

When equilibrium is reached the $[CO_2]$=2.4 M.What is the value of K_c for the reaction ?

A. 16

B. 4.0

C. 0.25

D. 0.063

Answer: A

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85. For the equilibrium system :

$CO(g) + 2H_2(g) \Leftrightarrow CH_3OH(l)$ what is K_c?

A. $K_c = \dfrac{[CH_3OH]}{2[CO][H_2]}$

B. $K_c = \dfrac{[CH_3OH]}{[CO][H_2]^2}$

C. $K_c = \dfrac{1}{2[CO][H_2]}$

D. $K_c = \dfrac{1}{[CO][H_2]^2}$

Answer: D

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86. Consider the reaction carried out at constant volume :

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

For initial concentrations of SO_2 and O_2 of 2.0 M and 1.5 M, respectively, the equilibrium O_2 concentrations is 0.80 M. What is the value of K_c for this reactions ?

A. 6.8

B. 2.9

C. 0.34

D. 0.15

Answer: A

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87. For the synthesis of ammonia, K_c is 1.2 at $375^\circ C, N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

What is K_p at this temperature ?

A. 4.1×10^{-8}

B. 4.2×10^{-4}

C. 1.3×10^{-3}

D. 3.4×10^{3}

Answer: B

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88. Consider these reactions and their corresponding K_s.

$\frac{1}{2}N_2 + O_2 \rightarrow NO_2 \qquad K_1$

$2NO_2 \rightarrow 2NO + O_2 \qquad K_2$

$NOBr \rightarrow NO + \frac{1}{2}Br_2 \quad K_3$

Express the K value for the reaction below in terms of K_1, K_2 and K_3

$$\frac{1}{2}N_2 + \frac{1}{2}O_2 + \frac{1}{2}Br_2 \rightarrow NOBrK = ?$$

A. $K_1 + \frac{K_2}{2} - K_3$

B. $K_1 + (K_2)^{1/2} - K_3$

C. $\frac{K_1K_2}{2K_3}$

D. $K_1(K_2)^{1/2}/K_3$

Answer: D

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89. Which statement characterize a chemical system at equilibrium ?

(P)the rate of the forward reaction is equal to the rate of the reverse reaction

(Q)The concentrations of the reactants and products are equal.

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: A

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90. For which reaction will K_p be larger than K_c at $25^\circ C$?

A. $CO_2(g) + C(s) \rightarrow 2CO(g)$

B. $2NO_2(g) \rightarrow N_2O_4(g)$

C. $H_2(g) + F_2(g) \rightarrow 2HF(g)$

D. $O_3(g) + NO(g) \rightarrow NO_2(g) + O_2(g)$

Answer: A

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91. For the reaction , $O_2(g) + 2F_2(g) \rightarrow 2OF_2(g), K_p = 4.1$

If $P_{O_2}(g) = 0.116$ atm and $P_{F_2}(g) = 0.0461$ atm at equilibrium , what is the pressure of $OF_2(g)$?

A. 0.101 atm

B. 0.032 atm

C. 0.760 atm

D. 166 atm

Answer: B

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92. For the reaction, $2HI(g) \rightarrow H_2(g) + I_2(g)$

What is the relationship between K_c and K_p at $25^\circ C$?

A. $K_c = K_p$

B. $K_c > K_p$

C. $K_c < K_p$

D. The relationship varies depending on the pressure.

Answer: A

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93. In order to prepare 25.92 gm of HBr in 20 litre container by following reactions what minimum mass of equimolar mixture of H_2 and Br_2 should be taken ?

Given : $H_2(g) + Br_2(g) \Leftrightarrow 2HBr(g), K_{eq} = 64$

[H=1,Br=80]

A. 64 g

B. 32.4 g

C. 80 g

D. 80.4 g

Answer: B

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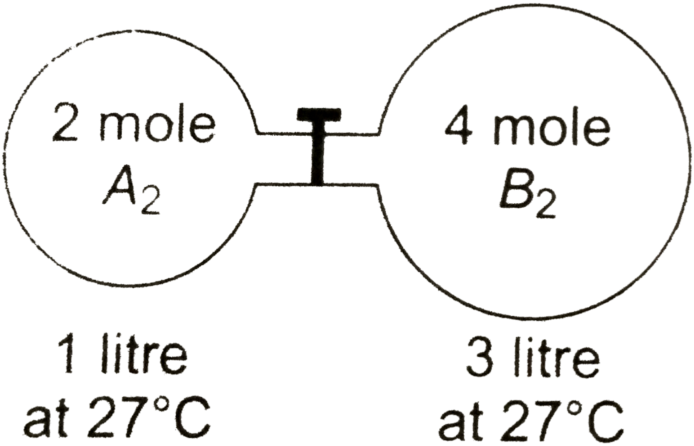

94.

The gas A_2 in the left flask allowed to react with gas B_2 present in right flask as $A_2(g) + B_2(g) \Leftrightarrow 2AB(g), K_c = 4$ at $27^\circ C$. What is the concentration of AB when equilibrium is established ?

A. 1.33 M

B. 0.66 M

C. 0.33 M

D. 2.66 M

Answer: D

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Reaction Quotient

1. 2 Moles each of SO_3, CO, SO_2 and CO_2 is taken in a one lit. vessel. If K_C for the reaction,

$SO_3(g) + CO(g) \Leftrightarrow SO_2(g) + CO_2(g)$is $\frac{1}{9}$ 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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2. The reaction quotient Q for :

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$ is given by $Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$ The reaction will proceed in backward direction, when :

A. $Q = K_c$

B. $Q < K_c$

C. $Q > K_c$

D. Q=0

Answer: C

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3. 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. $3 \times 10^{-10} \text{molelitre}^{-1}$

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

C. $2 \times 10^{-9} \text{molelitre}^{-1}$

D. $4 \times 10^{-8} \text{molelitre}^{-1}$

Answer: D

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4. A 10 litre box contains O_3 and O_2 at equilibrium at 2000 K. $K_p = 4 \times 10^{14}$ atm for $2O_3(g) \Leftrightarrow 3O_2(g)$

Assume that $P_{O_2} > \ > P_{O_3}$ and if total pressure is 8 atm, then partial pressure of O_3 will be :

A. 8×10^{-5} atm

B. 11.3×10^{-7} atm

C. 9.71×10^{-6} atm

D. 9.71×10^{-2} atm

Answer: B

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

A. is zero

B. decreases with time

C. is independent of time

D. increases with time

Answer: D

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6. For the reactions $2A(g) + 2B(g) = 3C(g)$ at a certain temperature, K is 2.5×10^{-2}.For which conditions will the reaction proceed to the right at the same temperature ?

A.

$[A]$,M	$[B]$,M	$[C]$,M
0.10	0.10	0.10

B.

$[A]$,M	$[B]$,M	$[C]$,M
1.0	1.0	1.0

C.

$[A]$,M	$[B]$,M	$[C]$,M
1.0	0.10	0.10

D.

$[A]$,M	$[B]$,M	$[C]$,M
1.0	1.0	0.10

Answer: D

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7. Equilibrium concentration of B if initial moles of 'A','B' and 'C'are 8,16 and 16 respectively in 1 litre container, is :

Given : $A(g) + 3B(g) \Leftrightarrow C(g) \quad K_C = 10^9 M^{-3}$

A. $\left(\frac{8}{27}\right) \times 10^{-3} M$

B. $\left(\frac{2}{27}\right) \times 10^{-3} M$

C. 2×10^{3} M

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

Answer: D

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8. For the reaction $A(aq) \Leftrightarrow B(aq) + 2C(aq) K_C$ at 25° is 4×10^{-19} Concentration of B in a solution that had originally C and B concentration of 0.1 M and 0.03 M respectively is :

A. 0.03 M

B. $7.5 \times 10^{-12} M$

C. $7.5 \times 10^{-15} M$

D. $7.5 \times 10^{-18} M$

Answer: D

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9. For the reaction $2A(g) + B(g) \Leftrightarrow C(g) + D(g), K_c = 10^{12}$.if initially 4,2,6,2 moles of A,B,C,D respectively are taken in a 1 litre vessel, then the equilibrium concentration of A is :

A. 10^{-4}

B. 8×10^{-4}

C. 4×10^{-4}

D. 2×10^{-4}

Answer: C

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10. NO_2 is involved in the information of smog and acid rain.a reaction that is improtant in the formation of NO_2 is

$O_3(g) + NO(g) \Leftrightarrow O_2(g) + NO_2(g), K_c = 6 \times 10^{34}$, if the air over KOTA contained $1 \times 10^{-6} M O_3, 1 \times 10^{-5} M NO, 2.5 \times 10^{-4} M NO_2$ and $8.2 \times 10^{-3} M O_2$, what can we conclude ?

A. There will be a tendency to form more NO and O_3

B. There will be a tendency to form more NO_2 and O_2

C. There will be a tendency to form more NO_2 and O_3

D. There will be no tendency for change because the reaction is at equilibrium

Answer: B

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Degree of Dissociation

1. The degree of dissociation of SO_3 at equilibrium pressure is alpha :

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

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

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

C. $\left[\frac{(P_0\alpha^3)}{2(1-\alpha)^2}\right]$

D. None of these

Answer: B

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2. 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

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3. 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. $a \propto \frac{1}{P^2}$

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

Answer: B

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4. For the reaction $N_2O_4 \Leftrightarrow 2NO_2(g)$, if percentage dissociation of N_2O_4 are 20%, 45%, 65%, 80% then the sequence of observed vapour densities wil be :

A. $d_{20} > d_{45} > d_{65} > d_{80}$

B. $d_{80} > d_{65} > d_{45} > d_{20}$

C. $d_{20} = d_{45} = d_{65} = d_{80}$

D. $(d_{20} = d_{45}) > (d_{65} = d_{80})$

Answer: A

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5. $N_3 + 3H_2 \Leftrightarrow 2NH_3$ Starting with one mole of nitrogen and 3 moles of hydrogen, at equiliibrium 50% of each had reacted. If the equilibrium pressure is P, the partial pressure of hydrogen at equilibrium would be

A. $\frac{P}{2}$

B. $\frac{P}{3}$

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

D. $\frac{P}{6}$

Answer: A

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6. 2.56 g of $S_8(s)$ is taken which vapourises and when equilibrium gets established between $S_8(s)$ and S(g) then the vapours were found to occupy 960 ml at 1 atm and 273 K.The fraction of $S_8(s)$ undissociated is given by :

A. 0.4

B. 0.6

C. 0.54

D. 0.46

Answer: D

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7. At temperature ,T, a compound $AB_2(g)$ dissociates according to the reaction $2AB_2(g) < \Rightarrow 2AB(g) + B_2(g)$ with a degree of dissociation, x, which is small compared with unity.Deduce the expression for K_P, in terms of x and the total pressure , P.

A. $\frac{Px^3}{2}$

B. $\frac{Px^2}{3}$

C. $\frac{Px^3}{3}$

D. $\frac{Px^2}{2}$

Answer: A

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8. For a reaction,

$4A \Leftrightarrow 5B$

degree of dissociation is 10% at a pressure of 2 atm and 300 K.what will be approx degree of dissociation at 0.04 atm pressure and 300 K.

A. 8%

B. 20%

C. 5%

D. 10%

Answer: B

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9. The equilibrium constant for the decomposition of water $H_2O(g) \Leftrightarrow H_2(g) + \frac{1}{2}O_2(g)$ is given by : (α=degree of dissociation of H_2O (g) p=Total equilibrium pressure)

A. $K_p = \dfrac{a^2 p^{1/2}}{(1+\alpha)(2-\alpha)^{1/2}}$

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

C. $K_p = \dfrac{\alpha^3 p^{1/2}}{\sqrt{2}}$

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

Answer: B

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10. For which of the following reactions average molecular mass at equilibrium cannot be 60 g/mole.

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

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

C. $Cl_2(g) \Leftrightarrow 2Cl(g)$

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

Answer: D

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11. Phosphorus pentachloride dissociates as follows in a closed reaction vessel.

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

If total pressure at equilibrium of the reactions mixture is P and degree of dissociation of PCl_5 is x, the partial pressure of PCl_3 will be:

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

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

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

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

Answer: A

Watch Video Solution

12. $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$

If degree of dissociation of ammonia at equilibrium is 0.7 then observed molecular weight of reaction mixture at equilibrium :

A. 12

B. 10

C. 15

D. 17

Answer: B

View Text Solution

13. For the given reaction at constant pressure,

	$nA(g) \Leftrightarrow$	$A_n(g)$
Initial moles	1	0
Final moles	$1-\alpha$	$\frac{\alpha}{n}$

Then the correct relation between initial density (d_i) and final density (d_f) of the system is :

A. $\left[\frac{n-1}{n}\right]\left[\frac{d_f-d_i}{d_f}\right]=\alpha$

B. $\left[\frac{n}{n-1}\right]\left[\frac{d_f-d_i}{d_f}\right]=\alpha$

C. $\left[\frac{n-1}{n}\right]\left[\frac{d_i-d_f}{d_i}\right]=\alpha$

D. $\frac{1}{(n-1)}\left[\frac{d_i-d_f}{d_i}\right]=\alpha$

Answer: B

Watch Video Solution

14. 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

Watch Video Solution

15. 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

16. A solid A dissociates to give B and C gases as shown,

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

At equilibrium some B(g) is introduced keeping volume constant so that pressure of B of new equilibrium becomes equal to $\frac{8}{5\sqrt{2}}$ times original total pressure calculate ratio of initial equilibrium pressure of C to that of its final pressure

A. $1:2$

B. $2:1$

C. $8:\sqrt{2}$

D. $\sqrt{2}:8$

Answer: D

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17. Two moles of HI were heated in a sealed tube at $440^{\circ}C$ till the equilibrium was reached. HI was found to be 22% decomposed.The equilibrium constant for disssociation is :

A. 0.282

B. 0.0796

C. 0.0199

D. 1.99

Answer: C

Watch Video Solution

18. In an evacuated closed isolated chamber at $250^{\circ}C$, 0.02 mole PCl_5 and 0.1 mole Cl_2 are mixed. $(PCl_5 < \Rightarrow PCl_3 + Cl_2)$.At equilibrium density of mixture was 2.48 g/L and pressure was 1 atm. The number of total moles of equilibrium will be approximately :

A. 0.012

B. 0.022

C. 0.039

D. 0.045

Answer: C

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

A. $1:1$

B. $1:3$

C. $1:9$

D. $1:36$

Answer: D

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20. 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 x, which is very small as compared to unity. The expression of K_p interms of x and total equilibrium pressure p is-

A. $8P^3x^5$

B. $256P^3x^5$

C. $4Px^2$

D. None of these

Answer: A

Watch Video Solution

21. At $727^{\circ}C$ and $1.2 atm$ 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 $0.9 g / L$. The degree of dissociation is:, $\left[Use R = 0.08 atm L mol^{-1} K^{-1}\right]$

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

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

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

D. $\frac{1}{5}$

Answer: A

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22. If for $2A_2B(g) \Leftrightarrow 2A_2(g) + B_2(g), K_p$=TOTAL PRESSURE (at equilibrium) and starting the dissociation from 4 mol of A_2B then:

A. degree of dissociation of A_2B will be (2/3)

B. total no of moles at equilibrium will be (14/3)

C. at equilibrium the no of moles of A_2B are not equal to the no of moles of B_2

D. at equilibrium the no of moles of A_2B are equal to the no of moles of A_2

Answer: A

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23. 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

24. At constant temperature, the equilibrium constant K_p for by $K_p = \frac{4x^2p}{(1-x^2)}$, where $p =$ pressure $x =$ extent of decomposition. Which one of the following statement is true?

A. K_P increases with increase of P

B. K_P increases with increase of x

C. K_P increases with decrease of x

D. K_P remains constant with change in P and x

Answer: D

Watch Video Solution

25. Consider the following equilibrium in a closed container:

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

At a fixed temperature, the volume of the reaction container is halved. For this change which of the following statements holds true regarding the equilibrium constant (K_p) and the degree of dissociation (α)?

A. Neither K_P nor α changes

B. Both K_P and α change

C. K_P changes, but α does not change

D. K_P does not change but α changes

Answer: D

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26. $A(g) + 2B(s) \Leftrightarrow 2C(g)$

Initially 2 mole A (g), 4 mole of B(s) and 1 mole of an inert gas are present in a closed container. After equilibrium has established, total pressure of container becomes 9 atm.If A(g) is 50% consumed at equilibrium, then , calculate K_p for the :

A. 9 atm

B. $\frac{36}{5}$ atm

C. 12 atm

D. $\frac{2}{3}$ atm

Answer: A

Watch Video Solution

27. Gaseous N_2O_4 dissociates into gaseous NO_2 according to the reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ .At 300 K and 1 atm pressure, the degree of dissociation of N_2O_4 is 0.2 If one mole of N_2O_4 gas is contained in a vessel, then the density of the equilibrium mixture is :

A. 3.11 g/L

B. 6.22 g/L

C. 1.56 g/L

D. 4.56 g/L

Answer: A

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28. NH_3 is heated at 15 at, from $25^\circ C$ to $347^\circ C$ assuming volume constant. The new pressure becomes 50 atm at equilibrium of the reaction $2NH_3 \Leftrightarrow N_2 + 3H_2$. Calculate $\%$ moles of NH_3 actually decomposed.

A. $59\ \%$

B. $71\ \%$

C. $61.3\ \%$

D. $80.5\ \%$

Answer: C

Watch Video Solution

29. What percent of CO_2 in air is just sufficient to prevent loss in weight when $CaCO_3$ is heated at $100^\circ C$?

(Equilibrium contant K for $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$ is 0.0095 atm at $100^\circ C$)

A. $0.95\ \%$

B. $0.29\ \%$

C. $0.05\ \%$

D. $0.71\ \%$

Answer: A

Watch Video Solution

30. At some temperature N_2O_4 is dissociated to 40% and 50% at total pressure P_1 and P_2 atm respectively in NO_2 .Then the ratio of P_1 and P_2 is :

A. $\frac{4}{5}$

B. $\frac{7}{4}$

C. $\frac{4}{7}$

D. None of these

Answer: B

Watch Video Solution

31. PCl_5 decomposes as $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$.If at equilibrium , total pressure is P and density of gaseous mixture is d at temperature T then degree of dissociation (α) is :

(Molecular wt. of $PCl_5 = M$)

A. $\alpha = 1 - \frac{PM}{dRT}$

B. $\alpha = 1 - \frac{dRT}{PM}$

C. $\alpha = \frac{PM}{dRT} - 1$

D. $\alpha = \frac{dRT}{PM} - 1$

Answer: C

Watch Video Solution

32. In an experiment carried out at 1377 K, HI was found to be 25% dissociated.The K_C for the dissociation $2HI(g) \Leftrightarrow H_2(g) + I_2(g)$ is :

A. $\frac{9}{4}$

B. 9

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

D. $\frac{1}{36}$

Answer: D

Watch Video Solution

33. 1 mole of nitrogen is mixed with 3 moles of hydrogen in a $\sqrt{3}$ litre container where 66.67% of nitrogen is converted into ammonia by the following reaction : $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$,Then the value of

K_C for the reaction

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

A. 2 M

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

C. 4 M

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

Answer: D

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34. 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. concentration of NH_3 does not change with pressure .

D. concentration of hydrogen is less than that of nitrogen

Answer: A

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35. $2AB_2(g) \Leftrightarrow 2AB(g) + B_2(g)$

Degree of dissociation of AB_2 is x. What will be equation for x in terms of K_p and equilibrium pressure P ?

A. $K_p = \frac{x^3}{(2+x)(1-x)^2} \times P$

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

C. $x = \sqrt{\frac{2K_p}{P}}$

D. $K_p = \frac{x^2}{(2+x)(1-x)} \times P$

Answer: A

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36. In a gaseous reaction at equilibrium , 'n' mole of reactant 'A' decompose to give 1 mole each of C and D.It has been found that degree of dissociation of A at equilibrium is independent of total pressure.Value of 'n' is :

A. 1

B. 3

C. 0

D. 2

Answer: D

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37. $Fe_2O_3(s)$ may be converted to Fe by reaction :

$Fe_2O_3(s) + 3H_2(g) \Leftrightarrow 2Fe(s) + 3H_2O(g)$

For which $K_c = 8$ at temperature 800 K. What percentage of H_2 remains unreacted at equilibrium ?

A. $50\ \%$

B. $66.6\ \%$

C. $33.3\ \%$

D. $78\ \%$

Answer: C

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38. $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$

When $SO_3(g)$ is added to a sealed bulb at a pressure of 2.0 atm, it undergoes the reaction above.At equilibrium , 76% of the $SO_3(g)$ has reacted.What is the value of K_p at this temperature ?

A. 15

B. 7.6

C. 3.8

D. 2.4

Answer: B

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39. For the reaction : $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g), K_p = 1.6$ atm at $800^\circ C$.if 20 g of $CaCO_3$ were kept in a 10 litre vessel at $800^\circ C$, the amount of $CaCO_3$ that remained at equilibrium is :

A. 34%

B. 64%

C. 46%

D. None of these

Answer: D

Watch Video Solution

D.Le Chateliera principle

1. For the reaction $CO(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g)$ at a given temperature the equilibrium amount of CO_2(g) can be increased by :

A. adding a suitable catalyst

B. adding an inert gas

C. decreasing the volume of container

D. increasing the amount of CO(g)

Answer: B

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2. Given the following reaction at equilibium.

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

Some inert gas at constant pressure is added to the system.Predict which of the following facts will be correct ?

A. More $NH_3(g)$ is produced

B. Less $NH_3(g)$ is produced

C. No effect on the equilibrium

D. K_p of the reaction is decreased

Answer: B

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3. For an equilibrium $H_2O(s) \Leftrightarrow H_2O(l)$which of the following statements is true ?

A. The pressure changes do not effect the equilibrium.

B. More of ice melts if pressure on the system is increased.

C. More of liquid freezes if pressure on the system is increased.

D. The pressure changes may increase or decrease the degree of advancement of the reaction depending upon the temperature of the system.

Answer: B

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4. When a bottle of cold drink is opened, the gas comes out with a fizzle due to:

A. decrease in temperature

B. increase in pressure

C. decrease in pressure suddenly which results in decrease of solubility of CO_2 gas in water

D. none of above

Answer: C

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

A. Concentrations of $SO_2, Cl_2 \text{ and } SO_2Cl_2$ are changed

B. No effect on equilibrium

C. Concentrations of SO_2 is reduced

D. K_p of reaction is increasing

Answer: B

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6. An equilibrium mixture in a vessel of capacity 100 litre contains 1 mol N_2 , 2mol O_2 and 3 mol NO. Number of moles of O_2 to be added so that at new equilibrium the concentration of NO is found to be 0.04 mol/lit :

A. $\left(\frac{101}{18}\right)$

B. $\left(\frac{101}{9}\right)$

C. $\left(\frac{202}{9}\right)$

D. None of these

Answer: A

View Text Solution

7. The following two reactions:

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

(ii) $COCl_2(g) \Leftrightarrow CO(g) + Cl_2(g)$

are simultaneously in equilibrium in a container at constant volume. A few moles of $CO(g)$ are later introduced into the vessel. After some time, the new equilibrium concentration of

A. PCl_5 will remain unchanged

B. Cl_2 will be greater

C. PCl_5 will become less

D. PCl_5 will become greater

Answer: C

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8. For the reaction, $4NH_3(g) + 5O_2(g) \Leftrightarrow 4NO(g) + 6 H_2O(l), \Delta H =$ positive. At equilibrium the factor that will not affect the concentration of NH_3 is:

A. change in pressure

B. change in volume

C. catalyst

D. None of these

Answer: C

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9. For the reaction

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

The equilibrium constant K_p changes with

A. total pressure

B. catalyst

C. the amounts of H_2 and I_2 present

D. temperature

Answer: D

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10. To the system,

$LaCl_3(s) + H_2O(g) \Leftrightarrow LaClO(s) + 2HCL(g) - \text{Heat}$ already at equilibrium, more water vapour is added without altering temperature or volume of the system. When equilibrium is re-established, the pressure of water vapour is doubled. The pressure of HCl present in the system increases by a factor of

A. 2

B. $\sqrt{2}$

C. $\sqrt{3}$

D. $\sqrt{5}$

Answer: B

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11. In the Haber process for the industrial manufacturing of ammonia involving the reaction, $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$ at 200 atm pressure in the presence of a catalyst, a temperature of about $500^\circ C$ is used. This considered as optimum temperature for the process because :

A. yield is maximum at this temperature

B. catalyst is active only at this temperature

C. energy needed for the reaction is easily obtained at this temperature .

D. rate of the catalytic reaction is fast enough while the yield is also appreciable for this exothermic reaction at this temperature

Answer: D

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12. For the reaction $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$, the pressure of CO_2 (g) depends on :

A. the mass of $CaCO_3(s)$

B. the mass of CaO(s)

C. the masses of both $CaCO_3(s)$ and CaO(s)

D. temperature of the system

Answer: D

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13. Which of the following will not shift the equilibrium , $N_2 + 3H_2 \Leftrightarrow 2NH_3$ towards product side ?

A. Cooling

B. Addition of reactants

C. Addition of catalyst

D. Increasing pressure

Answer: C

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14. One mole of helium (He) gas is added to the equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ set up in cylinder fitted with piston in such a way that the piston is moved outwards to keep the total equilibrium pressure constant:

A. The equilibrium will remains unchanged

B. The equilibrium will shift in the forward direction

C. The equilibrium will shift in the backward direction

D. None of the above

Answer: B

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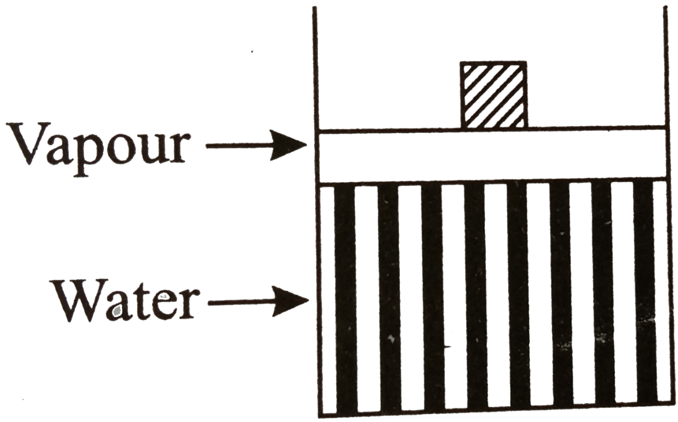
15. Some quantity of water is contained in a container as shown in figure. As neon is added to this system at constant pressure, the amount of liquid water in the vessel



A. increases

B. decreases

C. remains same

D. changes unpredictably

Answer: B

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16. 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 33.3%

B. less than 50%

C. less than 66.6%

D. above 66.6 %

Answer: B

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Others

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

B. $0.5 \times 10^{-3}\text{atm}$

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

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

Answer: D

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2. For the equilibrium, $SrCl_2.6H_2O(s) \Leftrightarrow SrCl_2.2H_2O(s) + 4H_2O(g)$ the equilibrium constant $K_P = 16 \times 10^{-12}\text{atm}^4$ at $1^{\circ}C$.If one litre of air saturated with water vapour at $1^\circ C$ is exposed to a large quantity of $SrCl_2.2H_2O(s)$, what weight of water vapour will be absorbed? Saturated vapour pressure of water at $1^\circ C = 7.6$ torr.

A. 6.4 mg

B. 3.25 mg

C. 2.3 mg

D. 8.5 mg

Answer: A

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3. For the chemical reaction

$3X(g) + Y(g) \Leftrightarrow X_3Y(g)$,

the amount of X_3Y at equilibrium is affected by

A. temperature and pressure

B. temperature only

C. pressure only

D. temperature, pressure and catalyst

Answer: A

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4. In which of the following equilibrium, change in the volume of the system does not alter the number of moles?

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

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

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

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

Answer: A

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5. In which of following reactions, increase in the volume at constant temperature does not affect the number of moles of at equilibrium?

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

B. $C(g) + \frac{1}{2}O_2(g) \Leftrightarrow CO(g)$

C. $H_2(g) + O_2(g) \Leftrightarrow H_2O_2(l)$

D. None of the above

Answer: D

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6. Which of the following is not favourble for SO_3 formation ?

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$, $\delta H = -45.0$ kcal

A. High pressure

B. High temperature

C. Decreasing SO_3 concentration

D. Increasing reactant concentration

Answer: B

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7. Consider the reaction equilibrium, $2SO_{2(g)} + O_{2(g)} \Leftrightarrow , \Delta H^\circ = -198kJ$. On the basis of Le-Chatelier's principle, the condition favourable for the forward reaction is

A. lowering of temperature as well as pressure

B. increasing temperature as well as pressure

C. lowering the temperature and increasing the pressure

D. any value of temperature and pressure

Answer: C

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8. Introduction of inert gas (at the same temperature) will affect the equilibrium if :

A. volume is constant and $\Delta n_g \neq 0$

B. pressure is constant and $\Delta n_g \neq 0$

C. volume is constant and $\Delta n_g = 0$

D. pressure is constant and $\Delta n_g = 0$

Answer: B

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9. Densities of diamond and graphite are $\frac{3.5g}{mL}$ and $\frac{2.3g}{mL}$.

$\Delta_7 H = -1.9 \frac{kJ}{\text{mole}}$

Favourable conditions for formation of diamond are:

A. high pressure and low temperature

B. low pressure and high temperture

C. high pressure and high temperature

D. low pressure and low temperature

Answer: C

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10. In a reversible chemical reaction having two reactants in equilibrium, if the concentration of the reactants are doubled then the equilibrium constant will :

A. also be double

B. be halved

C. become one-fourth

D. remain the same

Answer: D

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11. In order to increase the forward rate of the reaction: $2A + 3B \Leftrightarrow$ Product, 32 times, it is necessary to :

A. make the concentration of A and B three times

B. make the concentration of A and B two times

C. make the concentration of A and B half

D. make the concentration of A and B four times

Answer: B

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12. For the reaction A(g) + B(g) $\Leftrightarrow$ C(g) at equilibrium the partial pressure of the species are $P_A = 0.15\text{atm}, P_C = P_B = 0.30\text{atm}$. If the capacity of reaction vessel is reduced, the equilibrium is re-established. In the new situation partial pressure A and B become twice. What is the partial pressure of C?

A. 0.30

B. 0.60

C. 1.20

D. 1.80

Answer: C

13. On mixing 1 dm^3 of 3M ethanol with 1 dm^3 of 2 M ethanoic acid, an ester is formed.

$C_2H_5OH + CH_3COOH \rightarrow CH_3COOC_2H_5 + H_2O$

If each solution is diluted with an equal volume of water , the decrease in the initial rate would be

A. 4 times

B. 2 times

C. 0.5 times

D. 0.25 times

Answer: D

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14. The exothermic formation of ClF_3 is represented by thr equation:

$Cl_2(g) + 3F_2(g) \Leftrightarrow 2ClF_3(g), \Delta H = -329kJ$

Which of the following will increase the quantity of ClF_3 in an equilibrium mixture of Cl_2, F_2, and ClF_3?

A. Adding F_2

B. Increasing the volume of container

C. Removing Cl_2

D. Increasing the temperature

Answer: A

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15. When 1 mole of carbon is converted into 1 mole of CO_2, the heat liberated is same :

A. irrespective of whether the volume is kept constant or pressure is kept constant

B. irrespective of the temperature at which there reaction is carried out

C. whether the carbon is in the form of diamond or graphite

D. whether the carbon is in gaseous state or solid state.

Answer: A

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

In given equilibrium reaction, volume of container is increased by mixing inert gas at constant temperature :

A. equilibrium will shift in forward direction and concentration of $Cl_2(g)$ will decrease

B. equilibrium will shift in forward direction and concentration of $Cl_2(g)$ will increase

C. equilibrium will shift in backward direction and concentration of $Cl_2(g)$ will decrease

D. equilibrium will whift in backward direction and concentration of $Cl_2(g)$ will increase

Answer: A

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17. The increase of pressure on ice water system at constant temperature will lead to :

A. a shift of the equilibrium in the forward direction

B. a decrease in the entropy of the system

C. an increase in the Gibbs energy of the systed no effect on the equilibrium

D. no effect on the equilibrium

Answer: A

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18. An equilibrium mixture of $NO_2(g)$ and $N_2O_4(g)$ is present in a closed container at 300 K with pressures 0.4 atm and 0.2 atm respectively. On doubling the volume of container, the pressure oif $NO_2(g)$ at new equilibrium at 300 K will be :

A. 0.19 atm

B. 0.35 atm

C. 0.2 atm

D. 0.25 atm

Answer: D

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19. In the equilibrium reaction,

$AgCl(s) + 2NH_3(aq) \Leftrightarrow Ag(NH_3)_2^+(aq) + Cl^-(aq)$

Increase in the concentration of $Cl^-(aq)$ causes :

A. AgCl(s) to decompose

B. AgCl(s) to precipitate

C. $Ag(NH_3)_2^+$ (aq) ato form

D. the $NH_3(aq)$ concentration to decrease

Answer: B

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20. In a closed system: $A(s) \Leftrightarrow 2B(g) + 3C(g)$, if the partial pressure of C is doubled at equillibrium, then partial pressure of B will be :

A. two times the original value

B. one-half of its original value

C. $\frac{1}{2\sqrt{2}}$ times the original value

D. $2\sqrt{2}$ times the original value

Answer: C

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21. For reaction,$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$ which statements are correct?

(P) $K_c = [SO_2][O_2] / [SO_3]$

(Q) Addition of $O_2(g)$ to the system at contant temperature and valume would decrease the value of K_c.

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: D

View Text Solution

22. For the exothermic reaction : $4NH_3(g) + 7O_2(g) \Leftrightarrow 4NO_2(g) + 6H_2O(l)$ Which change will increase the quantity of NO_2 in the mixture?

A. Increasing temperature

B. Decreasing container volume

C. Adding Ne(g)

D. Adding $H_2O(g)$

Answer: B

View Text Solution

23. The rate of a stoichiometric reaction between a solid and gas in a container may be increased by increasing all of the following factors EXCEPT the :

A. pressure of the gas.

B. temperature of the gas.

C. volume of the container.

D. surface area of the solid.

Answer: C

View Text Solution

24. $C(s) + H_2O(g) \Leftrightarrow CO(g) + H_2(g) \qquad \Delta H > 0$

For the system above at equilibrium, which changes will increase the amount of $H_2(g)$?

(P) Adding C(s)

(Q) Increasing the volume of container

(R) Increasing the temperature

A. P only

B. R only

C. Q and R only

D. P, Q and R

Answer: C

View Text Solution

25. Consider the system at equilibrium: $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$ for which $\Delta H < 0$. Which change(S) will increase the yield of $SO_3(g)$?

(P) Increasing the temperature

(Q) Increasing the volume of the container

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: D

View Text Solution

26. Consider the system at equilibrium:

$NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g) \quad \Delta H > 0$

Factors which favour the formation of more $H_2S(g)$ include which of the following?

(P) adding a small amount of $NH_4HS(s)$ at constant volume

(Q) increasing the pressure at constant temperature

(R) increasing the temperature at constant pressure

A. P only

B. R only

C. P and Q only

D. P and R only

Answer: B

View Text Solution

27. The equilibrium system $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ has $K_P = 11$ and $\Delta H = 57 \text{kJ.mol}^{-1}$ at $25^\circ C$. Which action will NOT cause a change in the position of the equilibrium?

A. Increasing the temperature

B. Adding $NO_2(g)$

C. Adding xenon gas to increase th pressure

D. Incrasing the container volume

Answer: C

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

The equilibrium reaction shown is endothermic as written. Which change will increase the amount of NO_2 at equilibrium?

A. Adding a catalyst

B. Decreasing the temperature

C. Increasing the volume of the container

D. Adding an inert gas to increase the pressure

Answer: C

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29. For the reaction,

$2NO_2(g) \Leftrightarrow N_2O_4(g)$ at 300 K

The value of K_P is 2 atm^{-1}. The total pressure at equilibrium is 10 atm. If volum of cantainer become two times of its original volume, what will be its equilibrium pressure at 300 K?

A. 6.4 atm

B. 4.51 atm

C. 6.0 atm

D. 5.19 atm

Answer: D

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30. $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$. If this system is at equilibrium, which change(s) will alter the value of K_P?

(P) Raising the temperature

(Q) Adding solid C

(R) Decreasing the pressure

A. P only

B. Q only

C. P and Q only

D. Q and R only

Answer: A

View Text Solution

31. $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g) \qquad \Delta H < 0$

Which change(s) will increase the quantity of $SO_3(g)$ at equilibrium?

(P) Increasing the temperature.

(Q) Reducing the volume of the container.

(R) Adding He to increase the pressure keeping volume

A. P only

B. Q only

C. P and Q only

D. Q and R only

Answer: B

View Text Solution

32. For the reaction,

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g) \qquad \Delta H^\circ < 0$

Which change(s) will increase the fraction of $SO_3(g)$ in the equilibrium mixture?

(P) Increasing the pressure

(Q) Increasing the temperature

(R) Adding a catalyst

A. P only

B. R only

C. P and R only

D. P, Q and R

Answer: A

View Text Solution

33. Consider this reaction.

$2NO(g) + Cl_2(g) \Leftrightarrow 2NOCl(g) \qquad \Delta H = -78.38\text{kJ}$

What conditions of temperature and pressure will produce the highest yield of NOCl at equilibrium?

A. $\begin{matrix} \text{T} & \text{P} \\ \text{high} & \text{high} \end{matrix}$

B. $\begin{matrix} \text{T} & \text{P} \\ \text{high} & \text{low} \end{matrix}$

C. $\begin{matrix} \text{T} & \text{P} \\ \text{low} & \text{high} \end{matrix}$

D. $\begin{matrix} \text{T} & \text{P} \\ \text{low} & \text{low} \end{matrix}$

Answer: C

View Text Solution

34. The triple point of CO_2 occurs at 5.1 atm and $-56^\circ C$. Its critical temperature is $31^\circ C$. Solid CO_2 is more dense than liquid CO_2. Under which combination of pressure and temperature is liquid CO_2 stable at equilibrium?

A. 10 atm and $-25^\circ C$

B. 5.1 atm and $-25^\circ C$

C. 10 atm $33^\circ C$

D. 5.1 atm and $-100^\circ C$

Answer: A

View Text Solution

35. Ammonium carbamate dissociates as :

$NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$, In a closed vessel containing ammonium carbamate, at equilibrium, CO_2 is added such that partial pressure of CO_2 now equals three times the original total pressure. Calculate the ratio of total pressure now to the original pressure :

A. $\frac{31}{27}$

B. $\frac{11}{9}$

C. $\frac{27}{31}$

D. $\frac{29}{9}$

Answer: D

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36. In which reaction at equilibrium will the amount kof reactants present increase with an increase in the container volume?

A. $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$

B. $H_2(g) + F_2(g) \Leftrightarrow 2HF(g)$

C. $CO(g) + NO_2(g) \Leftrightarrow CO_2(g) + NO(g)$

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

Answer: D

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37. For dissociation of NH_3 giving N_2 and H_2 gases, the partial pressures at equilibrium are 100,80,80 torr respectively. If som N_2 gas is removed and at new equilibrium partial pressure of H_2 becomes 128 torr then the partial pressure of N_2 remaining will be approx.

A. 9 torr

B. 71 torr

C. 8 torr

D. 72 torr

Answer: A

View Text Solution

38. For which reaction at equilibrium does a decrease in volume of the container cause a decrease in product(s), quantity at comstant temperature?

A. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

B. $2SO_2(g) + O_2 \rightarrow 2SO_3(g)$

C. $HCl(g) + H_2O(l) \rightarrow H_3O^+(aq) + Cl^-(aq)$

D. $SO_2(g) + NO_2(g) \rightarrow SO_3(g) + NO(g)$

Answer: A

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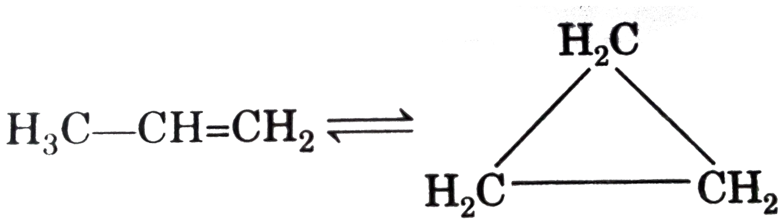
39. The gas phase reaction shown is endothermic as written. Which, change(s) will increase the quantity of $CH_3CH = CH_2$ at equilibrium?

(P) Increasing the temperature

(Q) Increasing the pressure

$H_3C - CH = CH_2 \Leftrightarrow$



A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: D

View Text Solution

40. For the dissociation of

$MgCO_3$ as $MgCO_3(s) \Leftrightarrow MgO(s) + CO_2(g)$.

Identify the correct option regarding extent of dissociation of $MgCO_3$.

A. As temperature is increased, extent of dissociation decreases.

B. Extent of dissociation at equilibrium will increase if equilibrium is attained at the same temperature in a container of lesser volume.

C. Extent of dissociation of $MgCO_3$ will increase if taken in a larger container.

D. Extent of dissociation will remain unchanged on changing volume of the container.

Answer: C

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41. In a closed container two reactions take place simultaneously

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

(ii) $CO(g) + Cl_2(g) \Leftrightarrow COCl_2(g)$

On adding more CO into the container, select the correct option :

(P) Degree of dissociation of $PCl_5(g)$ decreases.

(Q) Conc. of CO(g) at new equilibrium position is less than that of at initial equilibrium conc.

(R) Degree of dissociation of $PCl_5(g)$ increases.

A. Only (P)

B. Only (R)

C. Both (P) and (Q)

D. Both (Q) and (R)

Answer: B

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42. For which reaction at equilibrium will a decrease in volume at constant temperature cause a decrease in the amount of product?

A. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

B. $HCl(g) + H_2O(l) \rightarrow H_3O^+(aq) + Cl^-(aq)$

C. $Fe_3O_4(s) + 4H_2(g) \rightarrow 3Fe(S) + 4H_2O(g)$

D. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

Answer: D

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43. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g) K_c = 66.9$ at $350^\circ C$ and $K_c = 50.0$ at $448^\circ C$. The reaction has

A. $\Delta H = +ve$

B. $\Delta H = -ve$

C. $\Delta H = zero$

D. ΔH sign can not be determined

Answer: B

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44. Equilibrium constant (K_p) for $2H_2S_{(g)} \Leftrightarrow 2H_{2(g)} + S_{2(g)}$ is $0.0118 atm$ at $1065^\circ C$ and heat of dissociation is $42.4 kcal$. Find equilibrium constant at $1132^\circ C$.

A. 1.180×10^4

B. 11.8

C. 118

D. cannot be calculated from given data

Answer: A

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45. The efffect of temperature on equilibrium consatant is expressed as,

$$\log\left[\frac{K_2}{K_1}\right]=\frac{-\Delta H}{2.303}\left[\frac{1}{T_2}-\frac{1}{T_1}\right],(T_2>T_1)$$

For endothermic reaction false statement is :

(d) K_2K_1.

A. $(T_2>T_1)$ =positive

B. ΔH=positive

C. $\log K_2>\log K_1$

D. K_2K_1.

Answer: A

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46. If low pressure and low temperature are the favourable conditons for the reaction:

$aA + bB \Leftrightarrow cC + dD$

then the true statements will be :

A. (a+b) lt (c+d) and $\Delta H = +X$

B. $(a+b) > (c+d)$ and $\Delta H = +X$

C. $(a+b) < (c+d)$ and $\Delta H = -X$

D. no reaction between Δ and K_{eq}

Answer: C

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47. At room temperature, the equilibrium constant for the reaction P + Q $\Leftrightarrow$ R + S was calculated to be 4.32 . At $425^\circ C$ the equilibrium constant became 1.24×10^{-2} . This indicates that the reaction

A. is exothermic

B. is endothermic

C. is difficult to predict

D. no reaction between Δ and K

Answer: A

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

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

A. If N_2 is added at equilibrium condition, the beacause according to $I \in d$ law of thermodynamics the entrophy must increase in the direction of spontaneous reaction.

B. The condition for equilibrium is $2\Delta G_{NH_3} = 3\Delta G_{H_2} + \Delta G_{N_2}$ where G is Gibbs free energy per mole of the gaseous species measured at that partical pressure.

C. Addition of catalyst does not change K_P but changes ΔH

D. At 400K addition of catlyst will increase forward reaction by 2 times while reaverse reaction rate will be changed by 1.7 times.

Answer: B

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49. The value of $\log_{10} K$ for a reaction $A \Leftrightarrow B$ is (Given: $\Delta_f H^{\Theta}_{298K} = -54.07 kJ mol^{-1}$, $\Delta_r S^{\Theta}_{298K} = 10 JK^{=1} mol^{-1}$, and $R = 8.314 JK^{-1} mol^{-1}$

A. 5

B. 10

C. 95

D. 100

Answer: B

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50. The correct relationship between free energy change in a reaction and the coresponding equilibrium constant K is :

A. $-\Delta G^{\circ}$=RTInK

B. ΔG=RTInK

C. $-\Delta G$=RTInK

D. $-\Delta G^{\circ}$=RTInK

Answer: A

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51. For the following reaction, formation of the prodcuts is favoured by

:

$Ag(g) + 4B_2(g) \Leftrightarrow 2AB_4(g) \Delta H < 0$

A. low temperature and high pressure

B. high temperature and low pressre

C. low temperature and low pressure

D. high temperature and high pressure

Answer: A

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52. For a reaction $A(g) \Leftrightarrow B(g)$at equilibrium, the partical pressure of B is found to be one fourth of the paritcal pressure of A. The value of ΔG° of the reaction $A \Leftrightarrow B$ is :

A. RT In 4

B. $-RT$ In 4

C. RT log 4

D. $-RT\log 4$

Answer: A

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53. For the reaction :

$2SO_2(g)+O_2(g)\Leftrightarrow 2SO_3(g), \Delta H = ve.$

An increase in temperature shows:

A. more dissociation of SO_3 and a decreases in K_c

B. less dissociation of SO_3 and an increases in K_c

C. more dissociation of SO_3 and an increase in K_c

D. less dissociation of SO_3 and a decrease in K_c

Answer: A

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54. As ΔG° for a reaction changes form a large negative value to a large positive value, K for the reaction will change form :

A. a large positive value to a large negative value.

B. a large positive value to a small positive value.

C. a large negative value to a large positive value.

D. a large negative value to a small negative value.

Answer: B

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55. For a reaction at $25^{\circ}C, \Delta G = 12.7kJ$ when the reaction quotient Q=10.0. What is the value of ΔG° for this reaction?

A. $-12.1kJ$

B. $7.0kJ$

C. $18.4kJ$

D. $37.5kJ$

Answer: B

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56. For the reaction,

$H_2(g) \rightarrow 2HI(g)$

$K_2 = 50.0at721K$. What is the value of Δ° for this reaction (per mole of H_2) at 721K?

A. $-32.3kJ$

B. $-23.5kJ$

C. $-10.2kJ$

D. $-0.231kJ$

Answer: B

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57. Which range includes the value of the equilibrium constant, K_{eq}, for a system with ΔG° lt 0 ?

A. $-1 < K_{eq} < 0$

B. $0 < K_{eq} < 1$

C. $K_{eq} < -1$

D. $1 < K_{eq}$

Answer: D

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58. For the hypothetical reaction : $A + B \Leftrightarrow C + D$, the equilibrium constant,K, is less than 1.0 at $25^\circ C$ and decreased by $35\,\%$ on changing the temperature to $45^\circ C$. What must be ture according to this information?

A. The ΔH° for the reaction is negative .

B. The ΔS° for the reaction is positive.

C. The ΔG° for the reaction at $25^c ricC$ is negative.

D. The ΔG° for the reaction at $45^\circ C$ is zero.

Answer: A

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59. An endothermic reaction has a postive value for ΔS°. Which of the following is true about the equilibrium constant for this reaction?

A. It may be greater than 1 only at low temperatures.

B. It may be greater than 1 only at high temperatures.

C. It is greater than 1 at all temperatures.

D. It is less than 1 at all temperatures.

Answer: B

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60. Hydrolysis of phophodiester groups is the back bone of DNA, has $\Delta G^{\circ} = -5.5 kcal/mol$ at $27^{\circ} C$. Approximate equilibrium costant for the hydorysis reaction is :

A. 10^{9}

B. 10^{4}

C. 10

D. 10^{10}

Answer: B

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

$\Delta G_f^\circ [PCI_5(g)] = -74 kcal/mol$

$\Delta G_f^\circ [PCI_5(g)] = -60 kcal/mol$

The, calculate value of equilibrium constant for dissociation of $PCI_5(g) at 727^\circ C$ temperature.

(In2=0.7)

A. 2^{10}

B. 2^{-10}

C. 2^{-20}

D. 2^{+20}

Answer: B

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62. What is correct about the signs and magnitudes of the free energy, ΔG° and the equilibrium constant, K, for a thermodynamically spontaneous reaction under standard conditons?

A. $\Delta G^{\circ} < 0, K < 0$

B. $\Delta G^{\circ} = 0, K > 0$

C. $\Delta G^{\circ} < 0, K = 0$

D. $\Delta G^{\circ} < 0, K > 0$

Answer: D

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63. For the reaction, $ADP + \text{phosphate} \Leftrightarrow ATP, \Delta G^{\circ} = 30.50 kJmol^{-1}$. What is the value of a equilibrium constant, K for this process under physiological conditions of $37.5^{\circ}C$?.

A. 4.5×10^{-6}

B. 7.4×10^{-6}

C. 1.3×10^{5}

D. 2.2×10^{5}

Answer: B

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64. The two equilibrium $AB \Leftrightarrow A^{+} + B^{-}$ and $AB + B^{-} \Leftrightarrow AB_2^{-}$ are simultaneously maintained in a solution with equilibrium, constant K_1 and K_2 respectively, The ratio of A^{+} to AB_2^{-} in the solution is:

A. dirctly proportional to the concentration of $B^{-(aq)}$

B. inversely proportinal to the concentration of $B^{-(aq)}$

C. directly proportional to the squre of the concentration of $B^{-(aq)}$

D. inversely proportional to the squrare of the concentration of $B^{-(aq)}$

Answer: D

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65. In the preceding problem, if $[A^+]$ and $[AB_2^-]$ are y and x respectively under equilibrium produced by addings the substance AB to the solvents than K_1 / K_2 is equal to :

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

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

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

D. $\frac{y}{x}(x-y)$

Answer: A

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66. 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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67. Using given information in question provided calculate equilibrium constant of requried reaction. Calculate equilibrium constant of required reaction.

$A(g) + 2B(g) \Leftrightarrow 4C(g) \qquad K_{P_1} = X$

$C(g) \Leftrightarrow D(g) \qquad K_{P_2} = Y$

Value of K_p for reaction

$\frac{1}{2}A(g) + B(g) \Leftrightarrow 2D(g)$

A. $\sqrt{Y} \times X^2$

B. $\frac{\sqrt{X}}{Y^2}$

C. $\sqrt{X} \times Y^2$

D. $\frac{\sqrt{Y}}{X^2}$

Answer: C

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68. The equilibrium constant values for,

$HF \Leftrightarrow H^+ + F^-$ and $HF + F^-$

are respectvely 7×10^{-4} mol lit^{-1} and 0.2mol lit^{-1}.

The equilibrium constant values for

(P)$2HF \Leftrightarrow H^+ + HF_2^-$ and

(Q) $HF_2^- \Leftrightarrow H^+ + 2F^-$ respectively are:

A. 3.5×10^{-4} and 1.4×10^{-3}

B. 3.5×10^{-4} and 1.4×10^{-4}

C. 3.5×10^{-3} and 1.4×10^{-3}

D. 3.5×10^{-3} and 1.4×10^{-4}

Answer: D

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69. Two solid compounds X and Y dissociates at a certain temperature as follows

$X(s) \Leftrightarrow A(g) + 2B(g), K_{p1} = 9 \times 10^{-3} atm^3$

$Y(s) \Leftrightarrow 2B(g) + C(g), K_{p2} = 4.5 \times 10^{-3} atm^3$

The total pressure of gases over a mixture of X and Y is :

A. $4.5 atm$

B. $0.45 atm$

C. $0.6 atm$

D. none of these

Answer: B

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70. If two gases AB_2 and B_2C are mixed, following equilibria are readily established:

$AB_2(g) + B_2C(g) \rightarrow AB_3(g) + BC(g)$,

$BC(g) + B_2C(g) \rightarrow B_3C_2(g)$

If the reaction is started only with AB_2 with B_2C, then which of the following us necessarily true at equilibrium?

A. $[AB_3]_{eq} = [BC]_{eq}$

B. $[AB_2]_{eq} = [B_2C]_{eq}$

C. $[AB_3]_{eq} > [B_3C_2]_{eq}$

D. $[AB_3]_{eq} < [BC]_{eq}$

Answer: C

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71. For given two equilibria attained in a container which are correct if degree of dissociation of A and A' are α and α'.

$A(s) \Leftrightarrow 2B(g) + C(g), K_{p_1} = 8 \times 10^{-2}$

$A'(s) \Leftrightarrow 2B(g) + D(g), K_{P_2} = 2 \times 10^{-2}$

A. $\dfrac{K_{P_2}}{K_{P_1}} = \left(\dfrac{3\alpha' + 2\alpha}{3\alpha' + 2\alpha}\right)^3 \dfrac{\alpha}{\alpha'}$

B. $\dfrac{P'_C}{P'_D} = 4$

C. $P'_B = P'_C + P'_D$

D. $\alpha < \alpha'$

Answer: B

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72. At 1000K, solid carbon, CaOand $CaCO_3$ are mixed and allowed to atttain following equilibrium :

$CaCO_3 \Leftrightarrow CaO(s), \qquad K_P = 4 \times 10^{-2}$

$C(s) + CO_2(g) \Leftrightarrow 2CO(g), \qquad K_P = 2atm$

What is the pressure of CO at equilibrium (in atm)?

A. $0.04atm$

B. $5\sqrt{2}$

C. 50 atm

D. $\frac{\sqrt{2}}{5}atm$

Answer: D

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73. statement-1 : A reaction with $K_P = \frac{1}{1.005} atm^2$ is expected to be spobtaneous at standard conditions.

statement-2: Reactions with negative Δ° will be spontaneous at standard condition.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

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74. statement-1 : In dilute aqueous solution, water is present is such large excess such that its concentration remains essentially constant during any reaction involving water.

statement-2 : The term $[H_2O]$ does not appear in any equilibrium constant expression for a reaction taking place in dilute aqueous solution.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: B

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75. statement-1 : A net reaction can occur only if a system is not a equilibrium .

statement-2 : All reversible reactions occur to reach a state of equilibrium.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

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76. statement-1 : No tem in the concentration of a pure solid ora pure liquid appears in an equilibrium constant expression.

statement-2 : Each pure solid or pure liquid is in a phase by itself, and has a constant concentration at constant temperature.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

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77. statement-1 : The reaction quotient,Q has the same form as the equilibrium constant K_{eq}, and is evaluated using any given concentration of the species involved in the raction, and not necessarily equilibrium concentrations.

statement-2 : If the numerical value of Q is not the same as the value of equillibrium constant, a reaction will occur.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: B

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78. statement-1 : If the equation for a reaction is reversed, the equilibrium constant is inverted and if the equation is multiplied by 2, the equilibrium constant is squared.

statement-2 : The numerical value of an equilibrium constant depends on the way the equation for the reactions is written.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

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79. statement-1 : The dissociatiohn of $CaCO_3$ can be represented as, $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$. Some solid $CaCO_3$ is placed in an evacurted vessel enclosed by a piston and heated so that a portion of it decomposes. If the piston is moved so that the volume of the vessel is doubled, while the tempratuere is held constant, the number moles of CO_2 in the vessel increase.

statement-2 : The pressure of CO_2 in the vessel will remain the same.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

View Text Solution

80. statement-1 : A catalyst does not influence the values of equilibrium constant. statement-2 : Catalyst influence the rate of both forward and backward reactions equality.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: A

View Text Solution

81. statement-1 : For $PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$. If more CI_2 is added the equilibrium will shift in backward direction,hence, equilibrium constant will decrease. statement-2 : Addition of inert gas to the equilibrium mixture at constant volume,does not alter the equilibrium.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: D

View Text Solution

82. statement-1 : For every chemical reaction at equilibrium standard Gibbs energy of reaction is zero.

statement-2 : At constant temperature and pressure, chemical reactions are spontaneous in the direction of decreasing Gibbs energy.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

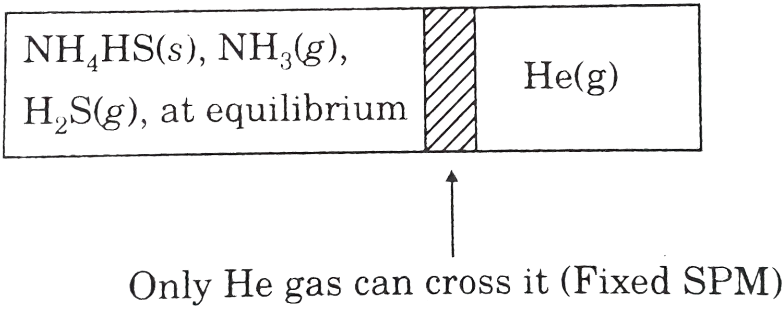
B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: D

View Text Solution



83.

Information : The entire system is at eqilibrium at 300 K. The volume of each chamber is 82.1.L.

Total pressure in left chamber is 4 atm and in right chamber is 2 atm.

$NH_3(g)$ and $H_2S(s)$ are obtained only form dissociation of $NH_4HS(s)$. Based on this information select the correct option :

statement-1 : The K_P value for the reaction:

$NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ is atm^2.

statement- 2 : The parrical pressure of He gas in the left chamber is 1 atm.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: C

View Text Solution

84. statement-1 : For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ if the volume of vessel is reduced to half of its original volume, equliibrium concentration of all gases will be doubled.

statement-2 :According to Le chatelier's principle, reaction shifts in a direction that tends to minimize the effect of the stress.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: B

View Text Solution

85. statement-1 : Consider a reaction

$A(g) \Leftrightarrow B(g)$

the equilibrium moles of A and B are respectively $\alpha$and β in 1 litre container.If 5 moles of 'A'and 3 moles of 'B' are added then reaction must move in forward direction. statement-2: If amount of reactant added to a system at equilibrium is more than amount of product added at same time than reation can move in any direction.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: D

View Text Solution

86. statement-1 : Total number of moles in a closed system at new equilibrium is less than the old equilibrium if some amount of a substace is removed form a system [consider a reaction $A(g) \Leftrightarrow B(g)$ at equilibrium. statement-2: The number of moles of the substance which if removed , is paritcally compensated as the system reached to new equilibrium.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: B

View Text Solution

87. statement-1 : Ammonia at a pressure of 10 atm and CO_2 at a pressure of 20atm are introduced into an evacuated chamber. If K_P for the reaction.

$NH_2COONH_4 \Leftrightarrow 2NH_3(g) + CO(g)$

is $2020 atm^3$ the total pressure after a long time is less than 30atm.

statement-2 : Equilibrium can be attained from both directions.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statment-2is True ,Statement-2is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True.

Answer: D

View Text Solution

88. For a homogeneous gaseous reaction,

$$2A(g) + 3B(g) \Leftrightarrow 4C(g) + D(g), K_{eq} = \frac{8}{(1.5)^3}$$

If in a 2 litre rigid container starting with 4 moles of A and 6 moles of B equilibrium was established then identify the options which is/are correct.

A. Concentration of B at equilibrium is 1.5M.

B. Concentration of D at equilibrium is 1M.

C. Concentration of A at equilibrium is 1M.

D. Concentration of C at equilibrium is 2 M.

Answer: A::C::D

View Text Solution

89. If $\frac{K_c}{K_p} - \log\frac{1}{RT} = 0$

then above is ture for the following equilibrium reaction :

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

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

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

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

Answer: A::B

View Text Solution

90. For a reversible reaction $\alpha A+\beta B \Leftrightarrow^{\cdot} cC+^{\cdot} dD$,the variation of K with temperature is given by $\log\frac{K_2}{K_1}=\frac{-\Delta H^{\circ}}{2.303R}\left[\frac{1}{T_2}-\frac{1}{T_1}\right]$ then,

A. $K_2 > K_1 \quad \text{if} \quad T_2 > T_1$ for an endothermic change

B. $K_2 < K_1 \quad \text{if} \quad T_2 > T_1$ for an endothermic change

C. $K_2 > K_1 \quad \text{if} \quad T_2 > T_1$ for an endothermic change

D. $K_2 < K_1 \quad \text{if} \quad T_2 > T_1$ for an endothermic change

Answer: A::D

View Text Solution

91. For the raction: $PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$ The forward reaction at constant temperature is favouraved by:

A. introduncing chlorine gas at constant volume

B. introducing an inert gas at constant pressure

C. increasing the volune of the conatainer

D. introducing PCI_5 at constant volume

Answer: B::C::D

View Text Solution

92. $2CaSO_4(s) \Leftrightarrow 2CaO(s) + 2SO_2(g) + O_2(g), \Delta H > 0$

Above equilibrium is established by taking some amount of $CaSO_4(s)$ in a closed container at 1600K. Then which of the following may be correct option?

A. Moles of CaSO(s) will increase with increase in temperature.

B. If the volume of the container is doubled at equilibrium then partical pressure of $SO_2(g)$ will change at new equilibrium

C. If the volume of the container is halved pressure of $O_2(g)$ at new equilibrium will remain same.

D. If two moles of the He gas is added at constant pressure then the moles of CaO(s) will increase.

Answer: A::C::D

View Text Solution

93. (P) $N_2(g) + O_2(g) \Leftrightarrow 2NO(g), \qquad K_1$

(Q) $\left(\frac{1}{2}\right)N_2(g) + \left(\frac{1}{2}\right)O_2(g) \Leftrightarrow NO(g), \qquad K_2$

(R)$2NO(g) \Leftrightarrow N_2(g) + O_2(g), \qquad K_3$

$(S)NO(g) \Leftrightarrow \left(\frac{1}{2}\right)N_2(g) + \left(\frac{1}{2}\right)O_2(g), \qquad K_4$

Correct relation between K_1, K_2, K_3 and $K_4 is/are$:

A. $K_1 K_3 = 1$

B. $\sqrt{K_1} \times K_4 = 1$

C. $\sqrt{K_3} \times K_2 = 1$

D. $K_1 \times K_2 \times K_3 = K_4$

Answer: A::B::C

View Text Solution

94. The equation $\alpha = \dfrac{D-d}{(n-1)d}$ is correctly matched for :

A. $A(g) \Leftrightarrow \frac{n}{2}B(g) + \frac{n}{3}C(g)$

B. $A(g) \Leftrightarrow \frac{2}{3}B(g) + \left(\frac{2n}{3}\right)C(g)$

C. $A(g) \Leftrightarrow \frac{n}{2}B(g) + \left(\frac{n}{4}\right)C(g)$

D. $A(g) \Leftrightarrow \frac{n}{2}B(g) + \left(\frac{n}{2}\right)C(g)$

Answer: B::D

View Text Solution

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

$NaNO_3(s) \Leftrightarrow NaNO_2(g) + \frac{1}{2}O(g)$:

A. addition of $NaNO_2$ favours reverse reaction

B. addition of $NaNO_3$ favours forward reaction

C. increasing temperature favours forward reaction

D. increasing pressure favours reverse reaction

Answer: C::D

View Text Solution

96. 1 mole each of $H_2(g)$ and $I_2(g)$ are introduced in a 1L evacuated vessel at 523 K and equilibrium $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is established. The concentration of HI(g) at equilibrium:

A. changes on changing pressure.

B. change on changing temperature.

C. is same even if only 2 mol of HI(g) were introduced in the vessel in the begining.

D. is same even when a platinum gauze is introduced to catalyse the reaction.

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

View Text Solution

97. The dissociation of phosgene, which occurs according to the reaction,

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

is an endothermic process. Which of the following will increase the degree of dissociation of $COCI_2$?

A. Adding CI_2 to the system

B. Adding helium to the system at constant pressure

C. Decresing the temperature of the system

D. Reducing the total pressure

Answer: B::D

View Text Solution

98. The equilibrium of which of the follwoing reactions will not be disturbed bt the addition of an inert gas at constant volume?

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

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

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

D. $C(g) + H_2O(g) \Leftrightarrow CO(g) + H_2(g)$

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

View Text Solution

99. An industrial fuel 'water gas', which consists of a mixture of H_2 and CO can be made by passing steam over red-hot carbon. The reaction is :

$C(s) + H_2O(g) \Leftrightarrow CO(g) + H_2(g), \Delta H = \ +131kJ$

The yield of CO and H_2 at a equilibrium would be shifted to the prodcuts side by :

A. raising the relative pressure of the steam

B. adddding hot carbon without increasing temperature

C. raising the temperature

D. reducing the volume of the system

Answer: A::C

View Text Solution

100. For the equilibrium,

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g), \Delta H = -198kJ$

the equilibrium concentration of SO_3 will be affected by

A. doubling the volume of the reaction vessel

B. increasing the temperature at constant volume

C. adding more oxygen to the reaction vessel

D. adding helium to the reaction vessel at constant volume.

Answer: A::B::C

View Text Solution

101. The dissociation of ammonium carbamate may be represents bt the equation,

$NH_4CO_2NH_2(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$

ΔH° for the forward reaction is negative, The equilibrium will shift from right to left if there is :

A. a decrease in pressure

B. an increase in temperatrure

C. an increase in the concentration of ammonia

D. an increase in the concentration of carbon dioxde

Answer: B::C::D

View Text Solution

102. For the reaction,

$A + B \Leftrightarrow 2C$

$K_C = 1$. If the initial concentration of A,B and C are 1m, 1m and 2m respectively then, at equilibrium.

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

B. $[A] = \frac{4}{3}M$

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

D. $[A] = \frac{1}{2}[C]$

Answer: A::B

View Text Solution

103. Choose incorrect option(s) for the given reaction:

A. $A(s) + B(g) \Leftrightarrow C(g)$: At equilibrium, if pressure is increased, no effect on equilibrium.

B. $X(g) \Leftrightarrow Y(g) + Z(g)$,If total pressure of the system is decreased at equilibrium,it will shift in forward direction.

C. $H_2O(g) + CO(g) \Leftrightarrow H_2(g) + CO(g)$,inert gas is added at constant volume at equilibrium,so total pressure will increase and no effect on equilibrium.

D. $H_2O(g) + CO(g) \Leftrightarrow H_2(g) + CO(g)$,inert gas is added at constant volume at equilibrium,so total pressure will increase and no effect on equilibrium.

Answer: A::D

View Text Solution

104. The reaction for which $K_C < K_P$ at a given temperature (gt 50 k)is/are:

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

B. $CO_2(g) + C(s) \Leftrightarrow 2CO(g)$

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

D. $I_2(g) \Leftrightarrow 2I(g)$

Answer: A::B::D

View Text Solution

View Text Solution

105. Select correct statements:

A. Low pressure is favourable for evaporation of $H_2O(I)$.

B. The degree of dissociation of $CaCO_3(s)$ decreases with increase in pressure.

C. If the equilibrium constant of $A_2(g) + B_2(s)$ to 2AB(g) is 25, then equilibrium constant for $AB(g) \rightarrow \frac{1}{2}(g) + \frac{1}{2}B_2(g) is 0.2.$

D. If solid product is added to an equilibrium mixture,then equilibrium will be unaffected.

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

View Text Solution

106. Which among the following equilibrium, K_P does not depend upon the initial pressure of ractants?

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

B. $H_2(g) + CI_2(g) \Leftrightarrow 2HCI(g)$

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

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

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

View Text Solution

107. Which statement about the triple point of a substance is/are incorrect?

A. The triple point for a substance varies with pressure

B. The three phases (solid, liquid, gas) have same density

C. The three phases (solid, liquid,gas) are in equilibrium

D. The three phases(solid, liquid, gas) are indistinguishable in appearance.

Answer: A::B::D

View Text Solution

108. Which of the following is/are correct about chemical equilibrium?

A. Equilibrium conditions is most stable condition under given conditons

B. Equilibrium can be achieved from both reactants as well as prducts side

C. Catalyst does not affect the equilibrium constant and equilibrium compostion

D. For any given reaction equilibrium constant dopends on temperature only

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

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109. Select the correct statemens for following equilibrium:

A. On increasing pressure, melting point decreases while boiling point of CO_2 increases.

B. On increasing pressure, melting point decreases while boiling point increases for H_2O

C. On increasing pressure,sublimation temperature increases for both CO_2 and H_2O

D. On increasing pressure,sublimation temperature increases for CO_2 but decreases for H_2O.

Answer: A::B::C

View Text Solution

110. Two gases X and Y, one being the dimer of other are at equilibrium. Increase of volume at constant temperature or increase of temperature at constant pressure favours the formation of more Y. The reaction could not be represented by:

A. $2X \Leftrightarrow Y + Q$ calories

B. $2X \Leftrightarrow Y - Q$ calories

C. $2Y \Leftrightarrow X - Q$ calories

D. $2Y \Leftrightarrow X + Q$ calories

Answer: A::B::C

View Text Solution

111. For the equilibrium $N_2O_4(g) + heat \Leftrightarrow 2NO_2(g)$, which of the following will increase degree of dissociation (α) of $N_2O_4(g)$?

A. Increasing temperature at constant volume

B. Increasing volume at constant temperature

C. Introdcuing 'He' gas at constant pressure

D. Introducing $NO_2(g)$ at constant V and T.

Answer: A::B::C

View Text Solution

112. Which of the following statements is/are correct ?

A. Catalyst cannot change $\Delta_{rxn}G$

B. Catalyst cannot change equilibrium

C. Catalyst cannot change rate constant

D.

Answer: A::B::C

View Text Solution

113. A flask is initially filled with pure $N_2O_3(g)$ having pressure 2 bar and following equilibria are established.

$N_2O_3(g) \Leftrightarrow NO_2(g) + NO(g) \quad K_{P_1} = 2.5^-$

$2NO_2(g) \Leftrightarrow N_2O_4(g) \quad K_{P_2} = ?$

If at equilibrium partial pressure of NO(g) was found to be 1.5 bar,then:

A. Equilibrium parial pressure of $N_2O_3(g)$ is 0.5 bar.

B. Equilibrium partial pressure of $NO_2(g)$ is 0.83 bar.

C. Equilibrium parital pressure of N_2O_4 is 0.33 bar.

D. Value of K_{P_2} is 0.48 bar

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

View Text Solution

114. Solid ammonium carbamate it taken in an empty closed container and allowed to attain equilibrium as,

$NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g), K_P = 500$

choose the incorrect statements :

A. Equilibrium total pressure is 15 atm

B. On addition of more solid at equilibrium total pressure decreases at new equilibrium.

C. On increasing the volume of container, total pressure decreases at new equilibrium.

D. On increasing temperature,total pressure increases at new eqilibrium.

Answer: B::C

View Text Solution

115. Choose the correct options:

A. Favourable conditions for formation of graphite are high pressure and low temperature from equilibrium diamond $(d = 3.5g/ml) \Leftrightarrow$ graphite $(d = 2.3g/ml), \Delta = -1.9kJ/\text{mole}$

B. For reaction $N_2O_4(g) \Leftrightarrow 2NO, (g)$, degree of dissociation (α) is $\sqrt{\dfrac{K}{4P + K_P}}$ where P is equilibrium pressure.

C. For reaction $CI_2(g) + 3F_2(g) \Leftrightarrow 2CIF_3(g), \Delta H = -329kJ$,dissociation of $CIF_3(g)$ will be favoured by additon of inert gas at constant pressure.

D. Reaction stops at equilibrium (microscopically).

Answer: B::C

View Text Solution

116. In an empty cylinder piston arrangemnet, $NO_2(g)$ at2 atm and $N_2O_4(g)$at 4 atm is taken and the constant pressure of 6atm and temperature, $27^\circ C$, is maintained.

$N_2O_4(g) \Leftrightarrow 2NO_2(g), K_P = 20$ atm at 300K

Which of the following property(ies) of system will change correctly (as given) with time?

A. Density of sample will decrease.

B. Average molar mass of sample will increase.

C. The colour of solution becomes more and more deeper.

D. Reaction will not move in any direction.

Answer: A::C

View Text Solution

117. Following two equilibrium is simultaneously established in a container.

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

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

If some Ni(s) is introduced in the container forming $Ni(CO)_4(g)$ then at new equilibrium.

A. PCI_3 concentration will increase.

B. PCI_3 concentration will decrease.

C. `CI_2 concentration will remain same.

D. PCI_3 concentration will increase.

Answer: B

View Text Solution

118. The equilibrium between, gaseous isomers A,B and C can be represented as :

$$A(g) \rightleftharpoons B(g) \quad : \quad K_1 = ?$$

$$B(g) \rightleftharpoons C(g) \quad : \quad K_2 = 0.4$$

$$C(g) \rightleftharpoons A(g) \quad : \quad K_3 = 0.6$$

A. $[A] + [B] + [C] = 1$ M at any time of the reactions

B. concentration of C is 4.1 M at the attainment equilibrium in all the reactions

C. the value of K_1 is $\frac{1}{0.24}$.

D. isomer $[A]$ is least stable as per thermodynamics

Answer: A::C::D

View Text Solution

119. For the gas phase exothermic reaction.

$A_2 + B_2 \Leftrightarrow C_2,$

carried out in a closed vessel, the equilibrium moles of a_2 can be increased by:

A. increasing the temperature

B. decreasing the pressure

C. adding inert gas at constant pressure

D. removing some C_2

Answer: A::B::C

View Text Solution

120. Consider the equilibrium

$HgO(s) + 4I^-(aq) + H_2O(l) \Leftrightarrow HgI_4^{2-}(aq) + 2OH^-$

Which changes will decrease the equilibrium concentration of HgI_4^{2-}?

A. Addition of 0.1M (aq)

B. Addition of HgO(s)

C. Addition of $H_2O(l)$

D. Addition of KOH(aq)

Answer: C::D

View Text Solution

121. For a balanced reversible gaseous reaction :

$A(g) + B(g) \Leftrightarrow 3C(g) + 2D(g)$, which is non-spontaneous at low temperature? Identify the corrrect option(s).

[Assume ΔH° and ΔS° of reaction to be independent of temperature.]

A. It will be non-spontaneous even it higher temperatures.

B. If at equilibrium temperature increases,concentration of 'C' and 'D' will also increase at new equilibrium.

C. If volume of the container is suddenly increased at equilibrium without changing temperature,then concentration of 'C' and 'D' also increases at new equilibrium.

D. If inert gas is added at constant volume at same temperature, the total pressure will increase.

Answer: B::D

View Text Solution

122. For a gaseous reaction : $A(g) \rightarrow 3B(g) + C(g), \Delta H$ is positive and the reaction attains equilibrium at 1 bar total pressure and 400 K. Identify the incorrect statement(s) regarding the above reaction:

A. On increase of temperature,equilibrium will be shifted in forward direction.

B. When inert gas is introduced into a rigid container containing above equilibria equilibrium shifts towards left.

C. $\Delta^{\circ}_{400} = 0$,for the above reaction.

D. If volume of vessel containing the above equilibria is increased without change in temperature then partial pressure kof B decreases as compared to original equilibrium partial pressure of B.

Answer: B::C

View Text Solution

123. If more than one phase is present in the reversible reaction then it is said to be heterogenous system.

Example: $CaO(s) + CO_2(g)$ Expression of equilibrium constant for the above reaction can be taken as :

$$K = \frac{[CaO(s)][CO_2(g)]}{[CaO(s)]}." ".....(i)$$

Now concentration of $CaO(s) = [CaO(s)]$

$$= \frac{\text{moles of CaO}}{\text{volume of CaO}}$$

as density of $CaO\left[\rho_{CaO(s)}\right]$ and molar mass of $CaO\left[M_{CaO(s)}\right]$ are a fixed quantity therefore concentration of pure solid and liquid term is uncharge with respect to time. Hence, equilibrium constant for the equation (i) can be written as :

$$K_C = [CO_2(g))]$$

$$K_P = P_{CO_2}$$

As K_p and K_c is not containing solid terms therefore, addition or removel of pure solid and pure liquid has no effect on the equilibrium process.

K_p for the reaction $NH_4I(s) \Leftrightarrow NH_3(g) + HI(g)$is $1/4 at 300 K$.If above equilibrium is established by taking 4 moles of $NH_4I(s)$ in 100 litre contanier, then moles of $NH_4I(s)$ left in the container at equilibrium is $\left[\text{Taken R=1/12Lt.atm mol}^{-1}K^{-1}\right]$.

A. 1

B. 2

C. 3

D. 4

Answer: B

View Text Solution

124. If more than one phase is present in the reversible reaction then it is said to be heterogenous system.

Example: $CaO(s) + CO_2(g)$ Expression of equilibrium constant for the above reaction can be taken as :

$K = \frac{[CaO(s)][CO_2(g)]}{[CaO(s)]}$." ".....(i)

Now concentration of $CaO(s) = [CaO(s)]$

$= \frac{\text{moles of CaO}}{\text{volume of CaO}}$

as density of $CaO\left[\rho_{CaO(s)}\right]$ and molar mass of $CaO\left[M_{CaO(s)}\right]$are a fixed quantity therefore concentration of pure solid and liquid term is uncharge with respect to time. Hence, equilibrium constant for the equation (i) can be written as :

$K_C = [CO_2(g))]$

$K_P = P_{CO_2}$

As K_p and K_c is not containing solid terms therefore, addition or removel of pure solid and pure liquid has no effect on the equilibrium process.

$200 gof CaCO_3(g)$ taken in 4Ltr container at a certain temperature. K_c for the dissociation of $CaCO_3$ at this temperature is found to be $1/4$ mole Ltr^{-1}then the concentration of CaO in mole/litre is :

[Given :$\rho_{CaO} = 1.12 gcm^{-3}$] $[Ca = 40, O = 16]$

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

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

C. 0.02

D. 20

Answer: C

View Text Solution

125. If more than one phase is present in the reversible reaction then it is said to be heterogenous system.

Example: $CaO(s) + CO_2(g)$ Expression of equilibrium constant for the above reaction can be taken as :

$$K = \frac{[CaO(s)][CO_2(g)]}{[CaO(s)]}." ".....(i)$$

Now concentration of $CaO(s) = [CaO(s)]$

$$= \frac{\text{moles of CaO}}{\text{volume of CaO}}$$

as density of $CaO\left[\rho_{CaO(s)}\right]$ and molar mass of $CaO\left[M_{CaO(s)}\right]$are a fixed quantity therefore concentration of pure solid and liquid term is uncharge with respect to time. Hence, equilibrium constant for the equation (i) can be written as :

$$K_C = [CO_2(g))]$$

$$K_P = P_{CO_2}$$

As K_p and K_c is not containing solid terms therefore, addition or removel of pure solid and pure liquid has no effect on the equilibrium process.

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

At equilibrium in the above case, 'a' moles of $CaCO_3$, 'b' moles of CaO and 'c' moles of CO_2 are found then identify the wrong statement:

A. a' will decrease with the additon of inert gas at constant pressure.

B. a' will remain constant with the increase in volume.

C. If volume of the vessel is halved then 'a' increases.

D. ['b' decreases with the increase in pressure.

Answer: B

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126. According to Le Chateier principle, when an equilibrium is subjected to any external change, the equilibrium/reaction shifts to comensate the effect of the change. This principle helps in shifting the reaction towards appropriate diections so as to increase % yield of any reaction.

Which of the following changes cannot cause an increase in extent of dissociation of CH_3COOH in its aqueous solution as per the reaction?

$CH_3COOH(aq) + H_2O(l) \Leftrightarrow CH_3COO^-(aq) + H^+(aq)$

A. Addition of water into the solution

B. Addition of NaOH into the solution

C. Addition of HCl into the solution

D. Remove of CH_3COO^- from solution.

Answer: C

View Text Solution

127. According to Le Chateier principle, when an equilibrium is subjected to any external change, the equilibrium/reaction shifts to comensate the effect of the change. This principle helps in shifting the reaction towards appropriate diections so as to increase % yield of any reaction.

Which of the following changes cannot cause an incresase in extent of dissociation of CH_3COOH in its aqueous solution as per the reaction?

A,B,C and D are in equilibrium in a 2 litre container at 400 K and their moles are respectively 4,5,8 and 6. If the reaction involved is $3A(g) + 2B(g) \Leftrightarrow C(g) + 5D(g)$ then calculate equilibrium concentration of C when volume is increased to 10 litre.

A. 4M

B. 0.8M

C. 5M

D. none of these

Answer: D

View Text Solution

128. According to Le Chateier principle, when an equilibrium is subjected to any external change, the equilibrium/reaction shifts to comensate the effect of the change. This principle helps in shifting the reaction towards appropriate diections so as to increase % yield of any reaction.

Which of the following changes cannot cause an incresase in extent of dissociation of CH_3COOH in its aqueous solution as per the reaction?

If is given that conversion of graphite to diamond in an endothermic reaction and the conversion $C_{\text{graphite}} \Leftrightarrow C_{\text{diamond}}$ attains equilibria at 1.5×10^9 Pa at 300K then comment at what pressure equilibria can be attained at 500 K?

A. $P > 1.5 \times 10^9 Pa$

B. $P < 1.5 \times 10^9 Pa$

C. $P = 1.5 \times 10^9 Pa$

D. At ant pressure

Answer: D

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129. A reversible reaction achieves equilibrium when the rates of forward and backward reactions equal. At equilibrium, the ratio of product of molar concentrations of prodcuts and the prodcut of molar concentration of reactants each raised to the powers equal to their stoichiometric coefficients, becomes constant. In case of gaseous reactios, the partial pressure of gases may be used in place of their molar concentrations.

If 1 mole of $PCI_5(g)$ and 1 mole of $CI_2(g)$ is taken in a 10L vessel, then the equilibrium concentration of $PCI_3(g)$ will be :

$$PCI_3(g) + CI_2(g) \Leftrightarrow PCI_5(g), \qquad K_c = \frac{20}{3} M^{-1}$$

A. 0.05

B. 0.04

C. 0.06

D. 0.025

Answer: A

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130. A reversible reaction achieves equilibrium when the rates of forward and backward reactions equal. At equilibrium, the ratio of product of molar concentrations of prodcuts and the prodcut of molar concentration of reactants each raised to the powers equal to their stoichiometric coefficients, becomes constant. In case of gaseous reactios, the partial pressure of gases may be used in place of their molar concentrations.

The equilibrium partial pressure of $N_2O_4(g)$ and $NO_2(g)$ are 4 and 2 atmm, respectively. Now, at constant temperature the pressure of system is increased to 60 atm. The new equilibrium partial pressure of N_2O_4(g) becomes.

A. 40atm

B. 46.6atm

C. 20atm

D. 33.4atm

Answer: B

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131. 4.4 grams of CO_2 are introduced into a 0.82 L flask containing excess solid carbon at $627^\circ C$, so that the equilibrium:

The density of equilibrium gaseous mixture corresponds to an average molecular weight of 36.

$K_p = \frac{P_{CO}^2}{P_{CO_2}}$ and $K_C \frac{[CO]^2}{[CO_2]}$

$[R = 0.082\text{Lt-atm/mol-K}, C = 12, 0 = 16]$

Total number of moles of equilibrium gaseous mixture is :

A. $\frac{1}{30}$

B. $\frac{2}{15}$

C. $\frac{1}{15}$

D. $\frac{1}{10}$

Answer: D

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132. 4.4 grams of CO_2 are introduced into a 0.82 L flask containing excess solid carbon at $627^\circ C$, so that the equilibrium:

The density of equilibrium gaseous mixture corresponds to an average molecular weight of 36.

$K_p = \frac{P_{CO}^2}{P_{CO_2}}$ and $K_C \frac{[CO]^2}{[CO_2]}$

$[R = 0.082\text{Lt-atm/mol-K}, C = 12, 0 = 16]$

K_p of the reaction $C(s) + CO_2(g) \Leftrightarrow 2CO(g)$ is :

A. 6atm

B. 12atm

C. 24atm

D. 15atm

Answer: A

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The density of equilibrium gaseous mixture corresponds to an average molecular weight of 36.

$$K_p = \frac{P_{CO}^2}{P_{CO_2}} \text{ and } K_C \frac{[CO]^2}{[CO_2]}$$

$[R = 0.082\text{Lt-atm/mol-K}, C = 12, 0 = 16]$

If in the problem,where actually 1.2g of solid carbon is present initially, how many total moles of CO_2 would have to be inroduced initiallly so that at equilibrium only a trace of carbon remained?

A. 0.25

B. 0.7

C. 0.6

D. 0.4

Answer: B

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134. Le Chatelier's Principle

If a system at equilibrium is subjected to a change of any one of the factors such as concentration, pressure or temperature, the system adjusts itself in such a way as to nullify the effect of that change.

Change of pressure : If a system consists of gases, then the concentration of all the components can be alterd by changing the pressure. To increase the pressure on the system,the volume has to be decreased proportionally. The total number of mols per unit volume will now be more and the equilibrium will shift in the direction in which there is a decrease in number of moles i,e. towards the direction in which there can be decrease in pressure.

Effect of pressure on melting point : There are two types of solids:

(a) Solids whose volume decreases on melting e.g., ice,diamond carborundum magnesium nitride and quratz.

Solids (higher volume) $\Leftrightarrow$ Liquid (lower volume) The process of melting is facilitated at high pressure, thus, melting point is lowerd.

(b) Solids whose volume increase on melting e.g.,Fe,Cu,Ag,Au,etc.

Solid (lower volume) $\Leftrightarrow$ Liquid (higher volume) In this case the process of melting become difficult at high pressure, thus melting point becomes high.

(c) Solubility of substances : When solid substances are dissolved in water, either heat is evolved (exothermic) or heat is absorbed (endothermic).

$KCI + aq \Leftrightarrow KCI(aq) - heat$

In such cases, solubility increase with increase in temperature. Consider the case of KOH, when this is dissolved,heat is evolved.

$KOH + aq \Leftrightarrow KOH(aq) + heat$

In such cases, solubility decrease with increase in temperature.

(d) Solubility of gases in liquids : When a gas dissolves in liquid,there is decrease in volume. Thus increase of pressure will favour the dissolution of gas in liquid.

A gas 'X' when dissolved in water,heat is evolved. Then solubility of 'X' will increase:

A. low pressure high temperature

B. low pressure,low temperature

C. high pressure,high temperature

D. high pressure,low temperature

Answer: B

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In such cases, solubility decrease with increase in temperature.

(d) Solubility of gases in liquids : When a gas dissolves in liquid,there is decrease in volume. Thus increase of pressure will favour the dissolution of gas in liquid.

Au(g) $\Leftrightarrow$ Au(l)

Above equilibrium is favoured at :

A. high pressure,low temperature

B. high pressure, high temperature

C. low pressure,high temperature

D. low pressure, low temperature

Answer: C

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Change of pressure : If a system consists of gases, then the concentration of all the components can be alterd by changing the pressure. To increase the pressure on the system,the volume has to be decreased proportionally. The total number of mols per unit volume will now be more and the equilibrium will shift in the direction in which there is a decrease in number of moles i,e. towards the direction in which there can be decrease in pressure.

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$$KCI + aq \Leftrightarrow KCI(aq) - heat$$

In such cases, solubility increase with increase in temperature. Consider the case of KOH, when this is dissolved,heat is evolved.

$$KOH + aq \Leftrightarrow KOH(aq) + heat$$

In such cases, solubility decrease with increase in temperature.

(d) Solubility of gases in liquids : When a gas dissolves in liquid,there is decrease in volume. Thus increase of pressure will favour the dissolution of gas in liquid.

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

If pressure is increased by reducing the volume of the container then:

A. total pressure at equilibrium will change

B. concentration of all the component at equilibrium will change .

C. oncentration of all the component at equilibrium will remain change.

D. equilibrium will shift in the forward direction.

Answer: A::B

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137. Equilibrium constants are given (in atm) for the following reactions at $0^\circ C$:

$SrCl_2.\ 6H_2O(s) \Leftrightarrow SrCl_2.\ 2H_2O(s) + 4H_2O(g) K_p = 5 \times 10^{-12}$

$Na_2HPO_4.\ 7H_2O(s) + 5H_2O(g) K_p = 2.43 \times 10^{-13}$

$Na_2SO_4.\ 10H_2O(s) \Leftrightarrow Na_2SO_4(s) + 10H_2O(g) K_p = 1.024 \times 10^{-27}$

The vapour pressure of water at $0^\circ C$ is 4.56 torr.

Which is the most effective drying agent at $0^\circ C$?

A. $SrCl_2.\ 2H_2O$

B. $Na_H PO_4.\ 7H_2O$

C. Na_2SO_4

D. All equally

Answer: A

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$Na_2SO_4 . 10H_2O(s) \Leftrightarrow Na_2SO_4(s) + 10H_2O(g) K_p = 1.024 \times 10^{-27}$

The vapour pressure of water at $0^{\circ}C$ is 4.56 torr.

At what relative humidity will $Na_2SO_4 . 10H_2O$ be efflorescent when exposed to air at $0^{\circ}C$?

A. above 33.33%

B. below 33.33%

C. above 66.66%

D. below 66.66%

Answer: B

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$SrCl_2.\,6H_2O(s) \Leftrightarrow SrCl_2.\,2H_2O(s) + 4H_2O(g) K_p = 5 \times 10^{-12}$

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$Na_2SO_4.\,10H_2O(s) \Leftrightarrow Na_2SO_4(s) + 10H_2O(g) K_p = 1.024 \times 10^{-27}$

The vapour pressure of water at $0^{\circ}C$ is 4.56 torr.

At what relative humidities will Na_2SO_4 be deliquescent (i.e. absorb moisture) when exposed to the air at $0^{\circ}C$?

A. above 33.33%

B. below 33.33%

C. above 66.66%

D. below 66.66%

Answer: A

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140. In a 7.0 L evacuated chamber, 0.50 mole H_2 and 0.50 mole I_2 react at 427° C. According to reaction

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

At the given temperature, $K_c = 49$ for the reaction. What is the value of K_p?

A. 7

B. 49

C. 24.35

D. None of these

Answer: B

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141. In a 7.0 L evacuated chamber, 0.50 mole H_2 and 0.50 mole I_2 react at 427° C. According to reaction

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

At the given temperature, $K_c = 49$ for the reaction. What is the total pressure (atm) in the chamber?

A. 83.14

B. 831.4

C. 8.21

D. None of these

Answer: C

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142. In a 7.0 L evacuated chamber, 0.50 mole H_2 and 0.50 mole I_2 react at 427° C. According to reaction

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

At the given temperature, $K_c = 49$ for the reaction. How many moles of the iodine remain unreached at equilibrium?

A. 0.388

B. 0.112

C. 0.25

D. 0.125

Answer: B

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143. In a 7.0 L evacuated chamber, 0.50 mole H_2 and 0.50 mole I_2 react at 427° C. According to reaction

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

At the given temperature, $K_c = 49$ for the reaction. What is the partial pressure (atm) of HI in the equilibrium mixture?

A. 6.371

B. 12.77

C. 40.768

D. 646.58

Answer: A

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144. Mass action ratio or reaction quotient Q for a reaction can be calculated using the law of mass actionl,

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

$$Q = \frac{[C][D]}{[A][B]}$$

The value of Q decides whether the reaction is at equilibrium or not.

At equilibrium, Q=K

For non-equilibrium process $Q \neq K$

When $Q > K$, reaction will be favoured in backward direction and when $Q < K$, it will be favoured in forward direction. For the reaction : $2A + B \Leftrightarrow 3C$ at 298 K, $K_c = 49$ A 3 L vessel contains 2, 1 and 3 moles of A, B and C respectively. The reaction at the same temperature :

A. must proceed in forward direction.

B. must proceed in back direction

C. must be predicted

D. cannot be predicted

Answer: A

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145. Mass action ratio or reaction quotient Q for a reaction can be calculated using the law of mass actionl,

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

$$Q = \frac{[C][D]}{[A][B]}$$

The value of Q decides whether the reaction is at equilibrium or not.

At equilibrium, Q=K

For non-equilibrium process $Q \neq K$

When $Q > K$, reaction will be favoured in backward direction and when $Q < K$, it will be favoured in forward direction. In a reaction mixture containing H_2, N_2 and NH_3 at partial pressure of 2 atm, 1 atm and 3 atm respectively, the value of K_p at 725 K is $4.28 \times 10^{-5}\ \text{atm}^{-2}$. In which direction the net reaction will go ?

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

A. Forward

B. Backward

C. No net reaction

D. Direction cannot be predicated

Answer: B

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146. Mass action ratio or reaction quotient Q for a reaction can be calculated using the law of mass actionl,

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

$Q = \frac{[C][D]}{[A][B]}$

The value of Q decides whether the reaction is at equilibrium or not.

At equilibrium, Q=K

For non-equilibrium process $Q \neq K$

When $Q > K$, reaction will be favoured in backward direction and when $Q < K$, it will be favoured in forward direction.

In the following reaction :

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

The equilibrium is not attained. The rate of forward reaction is greater than that of backward reaction. Thus, which of the following is the correct relation between K_p and Q_p?

A. $K_p = Q_p$

B. $Q_p < K_p$

C. $Q_p < K_p$

D. $K_p = Q_p = 1$

Answer: C

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147. If we know the equilibrium constant for a particular reaction, we can calculate the concentration in the equilibrium mixture from the initial concentrations. Generally only the initial concentration of reactions are given. In a study of equilibrium

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

1 mole of H_2 and 3 mol of I_2 gave rise at equilibrium to x mol of HI, Further addition of 2 mol of H_2 gave an additional x mol of HI. What is x ?

A. 0.5

B. 1

C. 1.5

D. None of these

Answer: C

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148. If we know the equilibrium constant for a particular reaction, we can calculate the concentration in the equilibrium mixture from the initial concentrations. Generally only the initial concentration of reactions are given. In above problem, what is K_p of the reaction?

A. 1

B. 2

C. 4

D. None of these

Answer: C

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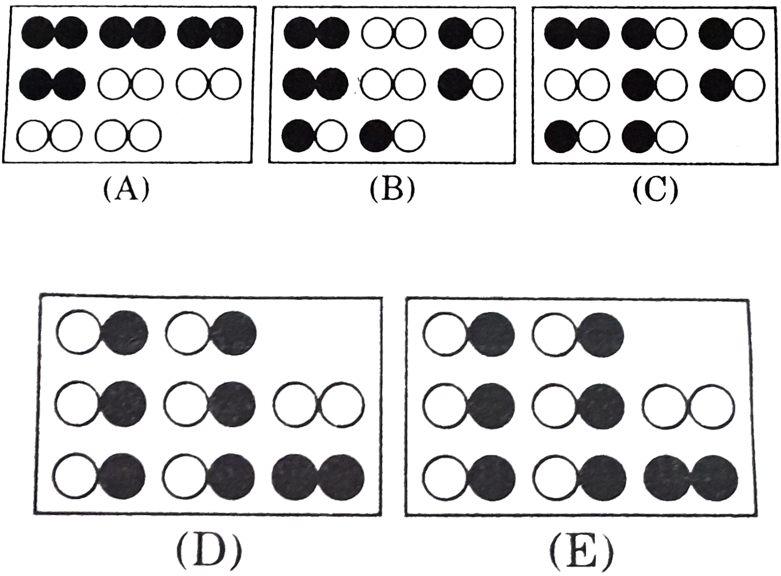
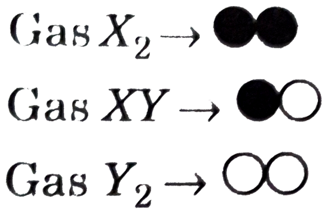
149. The shown snapshots represents five molecular level scenes of a gaseous mixture as it reaches equilibrium over a time in a vessel of volume 1 litre.





Reaction : $X_2(g) + Y_2(g) \rightleftharpoons 2XY(g)$

Reaction : $X_2(g) + Y_2(g) \Leftrightarrow 2XY(g)$

If each particle represents 0.2 moles then what will be the value of reaction quotient (Q) for scene B?

A. 0.36

B. 0.18

C. 4

D. 5

Answer: C

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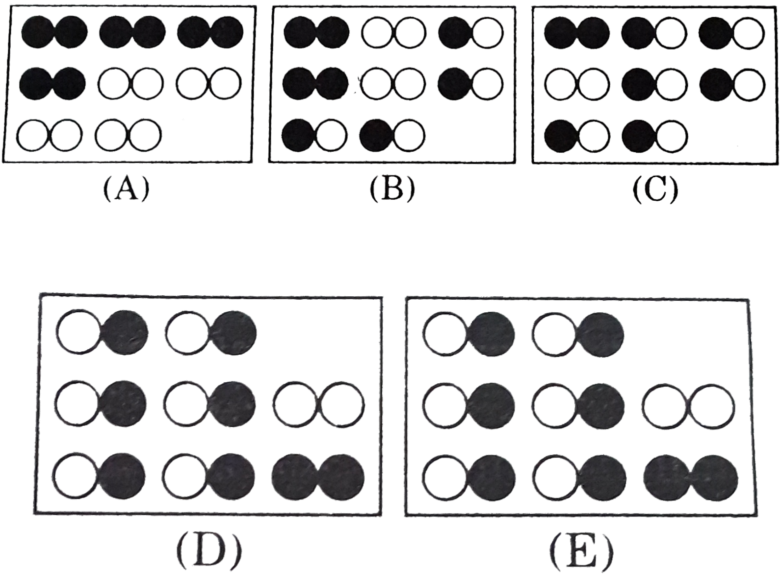
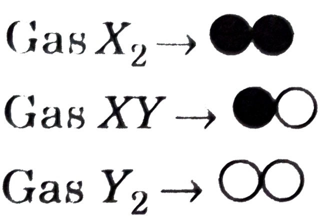
150. The shown snapshots represents five molecular level scenes of a gaseous mixture as it reaches equilibrium over a time in a vessel of volume 1 litre.

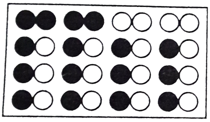


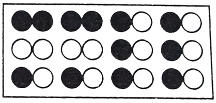


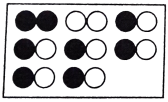
Reaction : $X_2(g) + Y_2(g) \rightleftharpoons 2XY(g)$

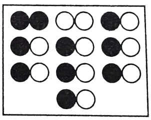
Reaction : $X_2(g) + Y_2(g) \Leftrightarrow 2XY(g)$ In snapshot 'A-E' if each particle represents 0.1 mole then on introducing another 0.4 mole each of X_2

and Y_2 in scene A, the equilibrium stage can be represents by which of the picture?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: A

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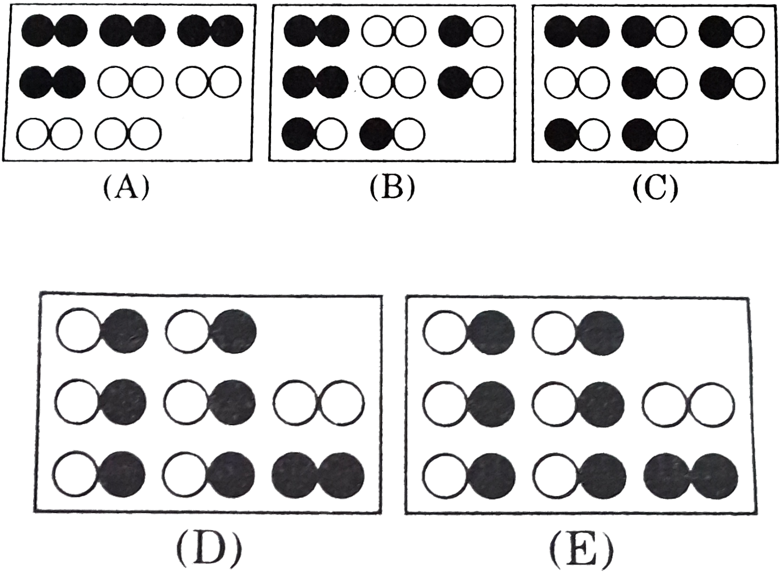
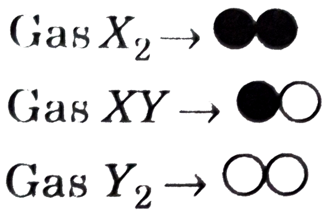
151. The shown snapshots represents five molecular level scenes of a gaseous mixture as it reaches equilibrium over a time in a vessel of volume 1 litre.





Reaction : $X_2(g) + Y_2(g) \rightleftharpoons 2XY(g)$

Reaction : $X_2(g) + Y_2(g) \Leftrightarrow 2XY(g)$ Which part of the 'film strip' represents the equilibrium irrespective of the value of each particle in terms of moles?

A. A

B. B

C. C

D. None of these

Answer: C

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152. 10 moles of pure PCl_5 gas is put into a closed container of volume 'V' and temerature 'T' and allowed to reach equilibrium, at an equilibrium pressure 20 atm. The pure PCl_5 is found to be 50% dissociated at equilibrium.

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ K_p for the above the reaction is :

A. $\frac{20}{3}$

B. 100

C. $\frac{10}{3}$

D. $\frac{20}{3}$

Answer: A

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153. 10 moles of pure PCl_5 gas is put into a closed container of volume 'V' and temerature 'T' and allowed to reach equilibrium, at an equilibrium pressure 20 atm. The pure PCl_5 is found to be $50\,\%$ dissociated at equilibrium.

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ The partial pressure of PCl_5, if equilibrium is established at new equlibrium pressure 35 atm by changing volume is :

A. 10 atm

B. 15 atm

C. 18 atm

D. 12 atm

Answer: B

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154. 10 moles of pure PCl_5 gas is put into a closed container of volume 'V' and temerature 'T' and allowed to reach equilibrium, at an equilibrium pressure 20 atm. The pure PCl_5 is found to be $50\,\%$ dissociated at equilibrium.

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ If 20 moles of $PCl_5(g)$ is added to original equilibrium mixture keeping total pressure constant to 20 atm at same tempereture 'T', then ratio of new equilibriujm volume to the initial volume V will be :

A. 1.5

B. 2.0

C. 1.8

D. 3.0

Answer: D

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155. Consider folllowing reaction at 300 K :

$N_2O_5(g) \Leftrightarrow N_2O_5(g) + O_2(g)\ K_c = 5$

$N_2O_5(g) \Leftrightarrow N_2O(g) + O_2(g)$ If 4 moles N_2O_5 is kept in 1 L, Container to attain equilibrium and at equilibrium 5 moles of O_2 are produced, then at equilibrium 5 moles of O_2 are produced, then at equilibrium moles of N_2O_3 will be :

A. 1

B. 3

C. 2

D. 4

Answer: A

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156. Consider folllowing reaction at 300 K :

$N_2O_5(g) \Leftrightarrow N_2O_5(g) + O_2(g)\ K_c = 5$

$N_2O_5(g) \Leftrightarrow N_2O(g) + O_2(g)$. For second reaction, if energy of activation of forward and backward reaction are respectively 85 and $42 KJ / \text{mole}$, then at 400K, K_c for the second reaction is :

A. 10

B. < 10

C. > 10

D. can be greater or less than 10

Answer: C

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157. According to Le Chatelier's principle, on applying any external force to desturb equilibrium, the reaction moves in that direction in which effect of exteranal force is minimised as far as possible. A container whose volume is V contains an equilibrium mixture that contains 2 moles each of PCl_5, PCl_3 and Cl_2n (all gases). The pressure is 3atm and temperature is T. A certain amount of $Cl_2(g)$ is now introduced keeping the pressure and temperature constant untill the equilbrium volume changes to 2 V.

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$. The moles Cl_2 that was added is :

A. 2

B. $\frac{10}{7}$

C. $\frac{8}{3}$

D. $\frac{20}{3}$

Answer: D

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158. According to Le Chatelier's principle, on applying any external force to desturb equilibrium, the reaction moves in that direction in which effect of exteranal force is minimised as far as possible. A container whose volume is V contains an equilibrium mixture that contains 2 moles each of PCl_5, PCl_3 and Cl_2n (all gases). The pressure is 3atm and temperature is T. A certain amount of $Cl_2(g)$ is now introduced keeping the pressure and temperature constant untill the equilbrium volume changes to 2 V.

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$. The equilibrium constant K of the reaction :

A. 1

B. 2

C. 3

D. 4

Answer: A

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159. The state of equilibrium is in a dynamic balance between forward and backward reaction. This balance can be disturbed by changing concentration, temperature or pressure. If done so a cartain net change occurs in the system. The direction of change can be predicted with the help of Le Chatelier principle. It states that when a system in equilibrium is disturbed by a change in concentration of temperature, a 'net' change occurs in it in a direction that tends to decrease the disturbing factor. For the equilibrium,

$$\underset{(\text{yellow})}{Fe^{3+}(aq)} + SCN^-(aq) \Leftrightarrow \underset{(\text{deep red})}{\left[Fe(SCN)^{2+}\right](aq)}$$

Select the correct option.

A. Addition of $H_2C_2O_4$ which forms $\left[Fe(C_2O_4)_3\right]^{3-}$ deepens red colour.

B. Addtion of H_2O has no effect on the colour.

C. Addition of SCN^- intensifies red colour.

D. Addition of Hg^{2+} which forms $\left[Hg(SCN)_4\right]^{2-}$ deepens red colour.

Answer: C

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160. The state of equilibrium is in a dynamic balance between forward and backward reaction. This balance can be disturbed by changing concentration, temperature or pressure. If done so a cartain net change occurs in the system. The direction of change can be predicted with the help of Le Chatelier principle. It states that when a system in equilibrium is disturbed by a change in concentration of temperature, a 'net' change occurs in it in a direction that tends to decrease the disturbing factor. Consider the following exothermic heterogenous equilibrium,

$M_2O(s) + 2HNO_3(aq) \Leftrightarrow 2MNO_3(aq) + H_2O(l)$ with $K_C = 3$ at 300K. Select the incorrect option.

A. Addition of $H_2O(l)$ to above equilibrium has no effect on equilibrium composition ($\%$) of HNO_3 and MNO_3.

B. On dilution, concentration of both HNO_3 and MNO_3 decreases.

C. At 310 K, $K_C < 3$.

D. K_C is dependent on equilibrium concentration of HNO_3.

Answer: D

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161. $2Cl(s) + O_2(g) \Leftrightarrow 2CO(g) \quad \Delta H < 0$. What is the equilibrium expression for the reaction represented by the equation above?

A. $K = \frac{2[CO]}{2[C] + [O_3]}$

B. $K = \frac{2[CO]}{[O_2]}$

C. $K = \frac{[CO]^2}{[C]^2 + [O_2]}$

D. $K = \frac{[CO]^2}{[O_2]}$

Answer: D

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162. $2Cl(s) + O_2(g) \Leftrightarrow 2CO(g) \quad \Delta H < 0$. If the reaction is at equilibrium with excess $C(s)$ remaining, what change will increase the quantity of $CO(g)$ for the reaction at equilibrium ?

(P) Adding C(s)

(Q) Increasing the temperature

(R) Increasing the pressure.

A. P only

B. R only

C. P,Q and R

D. None of these

Answer: D

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163. $H_2(g) + I_2(g) \Rightarrow 2HI(g) \quad (\Delta H = +51.8KH = KJ]$ Which would increase the equlibrium quantity of HI(g)? Assume the system has reached equilibrium with all three components present.

(P) Increasing pressure

(Q) Increasing temperature

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: B

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164. $H_2(g) + I_2(g) \Rightarrow 2HI(g) \quad (\Delta H = +51.8KH = KJ]$ What is the equilibrium constant expression for this system?

A. $K = \frac{[HI]^2}{[H_2][I_2]}$

B. $K = \frac{[H_2][I_2]}{[HI]^2}$

C. $K = \frac{2[HI]}{[H_2][I_2]}$

D. $K = \frac{[HI]^2}{[H_2]}$

Answer: D

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165. $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$ $K_p = 80.0$ at 250° C. What is K_p for this reaction?

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

A. 0.0125

B. 0.112

C. 8.94

D. 40.0

Answer: B

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166. $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$ $K_p = 80.0$ at 250° C. What is the expression for K_p at 250° C for this reaction?

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

A. $K_c = \dfrac{K_p}{(RT^2)}$

B. $K_c = \dfrac{K_p}{(RT)}$

C. $K_c = K_p(RT)^2$

D. $K_c = K_p(RT)$

Answer: A

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167. $2NO(g) + O_2(g) \Leftrightarrow 2NO_2(g)$ Which would increase the partial pressure of $NO_3(g)$ at equlibrium?

A. Decreasing the volume of the system

B. Adding a mole gas to increase the pressure of the system

C. Removing some NO(g) from the system

D. Adding an appropriate catalyst

Answer: A

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168. $2NO(g) + O_2(g) \Leftrightarrow 2NO_2(g)$ At a certain temperature the equilibrium concentration for this system are :

[NO]=0.25M, $[O_2]$=0.24M,$[NO_2]$=0.18M.

What is the value of K_c at this temperature?

A. 0.063

B. 0.50

C. 1.4

D. 2.0

Answer: B

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169.

	Column-I		Column-II
(a)	$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ ($t = 300°$ C)	(p)	$\Delta n_g > 0$
(b)	$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ ($t = 50°$ C)	(q)	$K_P < K_C$
(c)	$C(s) + H_2O(g) \rightleftharpoons CO(g) + H_2(g)$	(r)	K_P not defined
(d)	$CH_3COOH(l) + C_2H_5OH(l) \rightleftharpoons CH_3COOC_2H_5(l) + H_2O(l)$	(s)	$P_{intial} > P_{eq}$

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Column-I (Assume only reactant were present initially)		Column-II	
(a)	For the equilibrium, $NH_4I(s) \rightleftharpoons NH_3(g) + HI(g)$, if pressure is increased at equilibrium.	(p)	Forward shift
(b)	For the equilibrium, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ volume is increased at equilibrium.	(q)	No change
(c)	For the equilibrium, $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$ inert gas is added at constant pressure at equilibrium.	(r)	Backward shift
(d)	For the equilibrium, $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ then Cl_2 is removed at equilibrium.	(s)	Final pressure is more than initial pressure

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Column-I		Column-II (At equilibrium)	
(a)	$N_2O_4(g) \rightleftharpoons 2NO_2(g)$ On increasing volume at constant temperature	(p)	Density of gaseous mixture remain constant

171.

(b)	$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ On addition of inert gas He at constant P and T	(q)	Density of gaseous mixture decreases
(c)	$2NO(g) + Br_2(g) \rightleftharpoons 2NOBr(g)$ On decreasing pressure at constant temperature	(r)	Average molar mass of gaseous mixture increases
(d)	$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ On increasing temperature at constant volume	(s)	Total number of moles of gases increases
		(t)	Value of equilibrium constant increases

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172. Match the column for the following reaction started with

$NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$

At equilibrium , partial pressure of NH_3 and CO_2 are P_{NH_3} and P_{CO_2}

respectively then :

Column-I		Column-II	
(a)	Partial pressure of $NH_2COONH_4(s)$	(p)	$p^2_{NH_3} \times p_{CO_2}$
(b)	K_p	(q)	$p_{NH_3} + p_{CO_2}$
(c)	Total pressure at equilibrium	(r)	$(p^2_{NH_3} \times p_{CO_2}) \times (RT)^{-3}$
(d)	K_C	(s)	Zero
		(t)	$\frac{3}{2} P_{NH_3}$

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173.

Column-I		Column-II	
(a)	$2HI(g) \rightleftharpoons H_2(g) + I_2(g)$	(p)	$K_p = P_{eq} \times \alpha^2 / (1-\alpha^2)$
(b)	$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$	(q)	$K_p = 4P_{eq} \times \alpha^2/(1-\alpha^2)$
(c)	$N_2O_4 \rightleftharpoons 2NO_2$	(r)	$\alpha = 2\sqrt{K_p} / (2\sqrt{K_p} + 1)$
(d)	$2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$	(s)	$M_{eq} = M_0$ [M_0 : Initial molecular weight]
		(t)	$M_{eq} < M_0$ [M : Avg mol. wt. of Eq^m. mixture]

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	Column-I		Column-II
(a)	$H_2O(l) \rightleftharpoons H_2O(g)$ Addition of $H_2O(l)$ at equilibrium	(p)	Favours forward reaction
(b)	$I_3^-(aq) \rightleftharpoons I_2(aq) + I^-(aq)$ Addition of $H_2O(l)$ at equilibrium	(q)	Does not shift equilibrium state
(c)	$2AB(g) \rightleftharpoons A_2(g) + B_2(g)$ On increasing the volume at equilibrium	(r)	Concentration of product decrease

174.

(d)	$A_2(g) \rightleftharpoons 2A(g)$ Addition of catalyst at equilibrium	(s)	Concentration of product remain constant
		(t)	Concentration of reactant decrease

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Column-I		Column-II	
(a)	$K_P < K_C$	(p)	$N_2 + 3H_2 \rightleftharpoons 2NH_3$
(b)	Introduction of inert gas at constant pressure will decrease the concentration of reactants	(q)	$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(c)	K_P^o is dimensionless	(r)	$2NO_2(g) \rightleftharpoons N_2O_4(g)$
(d)	Temperature increase will shift the reaction on product side	(s)	$NH_3(g) + HI(g) \rightleftharpoons NH_4I(s)$

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Column-I (Reactions)		Column-II (Favourable Conditions)	
(a)	Oxidation of nitrogen $N_2(g) + O_2(g) + 180.5\ kJ \rightleftharpoons 2NO(g)$	(p)	Addition of inert gas at constant pressure
(b)	Dissociation of $N_2O_4(g)$ $N_2O_4(g) + 57.2\ kJ \rightleftharpoons 2NO_2(g)$	(q)	Decrease in pressure
(c)	Oxidation of $NH_3(g)$ $4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(g) + 905.6\ kJ$	(r)	Decrease in temperature
(d)	Formation of $NO_2(g)$ $NO(g) + O_3(g) \rightleftharpoons NO_2(g) + O_2(g) + 200\ kJ$	(s)	Increase in temperature

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177.

	Column-I (Reactions)		Column-II (If α is negligible w.r.t. 1, $V = 1$ litre)
(a)	$2X(g) \rightleftharpoons Y(g) + Z(g)$	(p)	$\alpha = 2 \times \sqrt{K_c}$
(b)	$X(g) \rightleftharpoons Y(g) + Z(g)$	(q)	$\alpha = 3 \times \sqrt{K_c}$
(c)	$3X(g) \rightleftharpoons Y(g) + Z(g)$	(r)	$\alpha = (2K_c)^{1/3}$
(d)	$2X(g) \rightleftharpoons Y(g) + 2Z(g)$	(s)	$\alpha = \sqrt{K_c}$

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178. Density of equilibrium mixture of N_2O_4 and NO_2 at $1atm$ and $384K$ is $1.84gdm^{-3}$. Calculate the equilibrium constant of the reaction.

$N_2O_4 \Leftrightarrow 2NO_2$

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179. For reaction

$XeF_6 + H_2O \Leftrightarrow XeOF_4 + 2HF, K_1 = 4$

$XeO_4 + XeF_6 \Leftrightarrow XeOF_4 + XeO_3F_2, K_2 = 100$

Find equilibrium constant of $\frac{1}{2}XeO_4 + HF \Leftrightarrow \frac{1}{2}XeO_3F_2 + \frac{1}{2}H_2O$

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180. For the reversible reaction $A(g) + B(s) \Leftrightarrow 2C(g), \frac{K_p}{K_c} = (RT)^x$.

Hence x is :

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181. In the following reaction :

$3A(g) + B(g) \Leftrightarrow 2C(g) + D(g)$ initial mol of B is double of A.At equilibium mol of A and C are equal . Hence % dissociation of B is :

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182. 138 gm N_2O_4 is introduced into 8.21 litre container at 300 K. Temperature is increased to 600 K where it dissociates into NO_2.If equilibrium partial pressure of N_2O_4 and NO_2 are equal than K_p (in atm) for $N_2O_4(g) \Leftrightarrow 2NO_2$ at 600 K.

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183. CH_3OH, methanol can be prepared from CO and H_2.

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

The value of K_p at 500 K is 6.23×10^{-3}

When total pressure (in atm) at equilibrium is required to convert 25% of CO to CH_3OH at 500 K if CO and H_2 comes from

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

Given your answer excluding decimal places.

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184. In a vessel, two equilibrium are simultaneously established at the same temperature as follows

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), K_{P_1}$

$N_2(g) + 2H_2(g) \Leftrightarrow N_2H_4(g), K_{P_2}$

Initially , vessel contains N_2 and H_2 in molar ratio 9:13. The equilibrium pressure is $7P_0$ in which pressure due to NH_3 is P_0 and due to H_2 to $2P_0$

Find the value of $\dfrac{K_{P_2}}{K_{P_1}}$

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185. For the reaction $3A(g) + B(g) \Leftrightarrow 2C(g)$ at a given temperature, K_c=9.0 what must be the volume (in L) of the flask , if a mixture of 2.0 mol each of A,B and C exist in equilibrium ?

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186. Starting with pure 'A' molar mass becomes half of its initial value at equilibrium as shown by a reaction $A(g) \Leftrightarrow nB(g)$.if A is 50% dissociated at equilibrium, find value of n.

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187. 2 mol of C(g) and 4 mole of D(g) are taken in a closed rigid container of 1 litre volume and allowed to attain equilibrium as :

$A(g) + 2B(g) \Leftrightarrow C(g) + D(g), K_C = 10^{-8}$

Calculate the equilibrium concentration of C(g).(If your answer in scientific notation is $x \times 10^{-y}$ then fill y).

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188. $A(g) \Leftrightarrow B(g) + C(g), K_C = 10^{-8}$

$C(g) \Leftrightarrow D(g), K_C = 10^{-5}$

1 mole of A(g) is taken in a closed container of volume 1 litre at

temperature T. If concentration of D at equilibrium is 10^{-x}, then , calculate value of x.

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189. 2 mole of X and 1 mole of Y are allowed to react in a 2 litre container.when equilibrium is reached, the following reaction occurs

$2X(g) + Y(g) \Leftrightarrow Z(g)$ at 300 K.

If the moles of Z at equilibrium is 0.5 then what is equilibrium constant K_C?

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190. For the reaction : $A(g) \Leftrightarrow 2B(g), K_p = 4.0$ bar. The equilibrium pressure pf A(g) is 1.0 bar. Now the equilibrium mixture is compressed reversibly and isothermally such that the final total pressure of system becomes 8 bar. The partial pressure of A(g) (in bar)at this new equilibrium is :

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191. Pure gas'A' was taken in a closed container at an initial pressure of 5 atm. The pressure in the container changed due to reactions.

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

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

If the total pressure due to mixture of gas A,B,C and D was found to be 10 atm, in which pressure due to C was 3 atm. Find K_p for first equilibria.

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192. If CI_2 HCI and O_2 are mixed in such a manner that the partial pressure of each is 2 atm and the mixture (V.P.=0.5 atm). What would be the approximate partial pressure of CI_2 when equilibrium is attained at temperature (T)? If your answer in scientific notation is $\times x10^{-y}$,write the value of y.

[Given:$2H_2O(g) + 2CI_2(g) \Leftrightarrow 4HCI(g) + O_2(g), K_p = 12 \times 10^8$ atm)

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193. $2A(S) \Leftrightarrow B(g) + 2C(g) + 3D(g)$

Total pressure developed in closed conatainer by decomposition of A at equilibrium is 12 atm at $727^\circ C$. Calculate ΔG° (in cal)of the reaction at $727^\circ C$.

(R=2cal/mol-K,In2=0.7,In3=1.1)

[Fill your answer as $\frac{|\Delta G^\circ|}{100}$].

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