CHEMISTRY

BOOKS - NARENDER AVASTHI CHEMISTRY (ENGLISH)

CHEMICAL EQUILIBRIUM

Level 1

1. A reversible reaction is one which

A. proceeds in one direction

B. proceeds in both directions

C. proceeds spontaneously

D. all the statements are wrong

Answer: b

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Level 2

1. The following equilibrium constants were determined at $1120K$:

$2CO(g) \Leftrightarrow C(s) + CO_2(g), , K_{p1} = 10^{-14} atm^{-1}$

$CO(g) + Cl_2(g) \Leftrightarrow COCl_2(g), , K_{p2} = 6 \times 10^{-3} atm^{-1}$

What is the equilibrium constant K_c for the foollowing reaction at $1120K$:

$C(s) + CO_2(g) + 2Cl_2(g) \Leftrightarrow 2COCl_2(g)$

A. $3.31 \times 10^{11} M^{-1}$

B. $5.5 \times 10^{10} M^{-1}$

C. $5.51 \times 10^{6} M^{-1}$

D. None of these

Answer: A

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Assertion Reason Type Question

1. Assertion (A): The endothermic reactions are favoured at lower temperature and the exothermic reactions are favoured at higher temperature.

Reason (R) : when a system in equilibrium is disturbed by changing the temperature, it will tend to adjust itself so as to overcome the effect of the change.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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2. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: The melting point of ice decreases with increase of pressure.

STATEMENT-2: Ice contracts on melting .

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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3. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: The equilibrium of $A(g) \Leftrightarrow B(g) + c(g)$ is not affected by changing the volume.

STATEMENT-2: K_c for the reaction does not depend on volume of the container.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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4. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1:For a chemical reaction at initial stage rate of forward reaction (r_f) is greater than rate of reversed reaction(r_b)

STATEMENT-2: When $r_f = r_b$,chemical reaction is at equilibrium.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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5. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: For the reaction $A(g) \Leftrightarrow B(g) + C(g)$, K_p=1atm. If we start with equal moles of all gases at 9 tm of initial pressure, then at equilibrium partial pressure of A increases.

STATEMENT-2: Reaction quotient $Q_p > K_p$ hence equilibrium shifts in backward direction.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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6. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1:The gas phase reaction $PCl_3(g) + Cl_2(g) \Leftrightarrow PCl_5(g)$ shifts to the right on increasing pressure.

STATEMENT-2: When pressure increase, equilibrium shifts towards more number of moles.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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7. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: For a reaction at equilibrium, the Gibb's free energy of reaction is minimum at constant temp. and pressure.

STATEMENT-2: The Gibb's free energy of both reactants and products increases and become equal at equilibrium.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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8. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: The physical equilibrium is not static but dynamic in nature.

STATEMENT-2: The physical equilibrium is a state in which two opposing process are proceeding at the same rate.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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9. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: Equilibrium constant for the reverse reaction is the inverse of the equilibrium constant for the reaction in the forward direction.

STATEMENT-2: Equilibrium constant depends upon the way in which the reaction is written.

A. (a) If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. (b) both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. (c) If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. (d) If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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10. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: If $Q_p < K_p$ reaction moves in direction of reactants.

STATEMENT-2: Reaction quotient is defined in the same way as equilibrium constant at any stage of the reaction.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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11. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

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, equilibrium concentration of all gases will be doubled.

STATEMENT-2: According to Le- Chatelier's principle, reaction shifts in a direction that tends to minimized the effect of the stess.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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12. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: The equilibrium constant of the exothermic reaction at high temperature decreases.

STATEMENT-2: Since ln $\frac{K_2}{K_1} = \frac{\Delta H^\circ}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$ and for exothermic reaction ,

$\Delta H^\circ =$ -ve and thereby, $\frac{K_2}{K_1} < 1$

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

13. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: For the reaction at certain temperature

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

there will be no effect by addition of inert gas at constant volume.

STATEMENT-2: Molar concentration of all gases remains constant.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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14. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: For the physical equilibrium $H_2O(s) \Leftrightarrow H_2O(l)$ on increasing temperature and increasing pressure more water will form.

STATMENT-2: Since forward reaction is endothermic in nature and voume of water is greater than that of the volume of ice.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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15. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2(Reason).

Examine the statements carefully and mark the correct answer according to the instruction given below:

STATEMENT-1: The catalyst does not alter the equilibrium constant.

STATEMENT-2: Because for the catalysed reaction and uncatalysed reaction ΔH reamains same and equilibrium constant depends of ΔH.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statement are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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Subjective Problems

1. 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.

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2. Calculate partial pressure of B at equilibrium in the following equilibrium

$A(s) \Leftrightarrow B(g) + 2C(g), \qquad K_P = 32atm^3.$

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3. In a gaseous reaction $A + 2B \Leftrightarrow 2C + D$ the initial concentration of B was 1.5 times that of A. At equilibrium the concentration of A and D were equal. Calculate the equilibrium constant K_C.

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4. For the reaction $A(g) \Leftrightarrow B(g), K_C = 10$

$B(g) \Leftrightarrow C(g), K_C = 2$

$C(g) \Leftrightarrow D(g), K_C = 0.01$

Calculate K_C for the reaction $D(g) \Leftrightarrow A(g)$.

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5. 5 litre vessel contains 2 moles of each of gases A and B at equilibrium. If 1 mole each of A and B are removed. Calculate K_C for the reaction $A(g) \Leftrightarrow B(g)$

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6. Calculate K_P for the reaction $A(g) \Leftrightarrow B(s) + 2C(g), K_C = 0.2$ at 305 K.

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7. A mixture of 3 moles of SO_2, 4 moles of NO_2, 1 mole of SO_3 and 4 moles of NO is placed in a 2.0L vessel. $SO_2(g) + NO_2(g) \Leftrightarrow SO_3(g) + NO(g)$.

At equilibrium, the vessel is found to contain 1 mole of SO_2. Calculate the value of K_C.

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8. The density of an equilibrium mixture of N_2O_4 and NO_2 at 1 atm and 373.5K is 2.0 g/L.

Calculate K_C for the reaction $N_2O_2(g) \Leftrightarrow 2NO_2(g)$

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9. If chemical equilibrium is attained at standard states then what is the value of ΔG°?

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10. Calculate the equilibrium concentration ratio of C to A if equimolar ratio of A and B were allowed to come to equilibrium at 300K.

$A(g) + B(g) \Leftrightarrow C(g) + D(g), \Delta G^{\circ} =$ -830 cal.

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11. A definite amount of solid NH_4HS is placed in a flask already containing ammonia gas at a certain temperature and 0.1 atm pressure. NH_4HS decompses to give NH_3 and H_2S and at equilibrium total pressure in flask is 1.1 atm. If the equilibrium constant K_P for the reaction

$NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ is represented as $z \times 10^{-1}$ then find the value of z.

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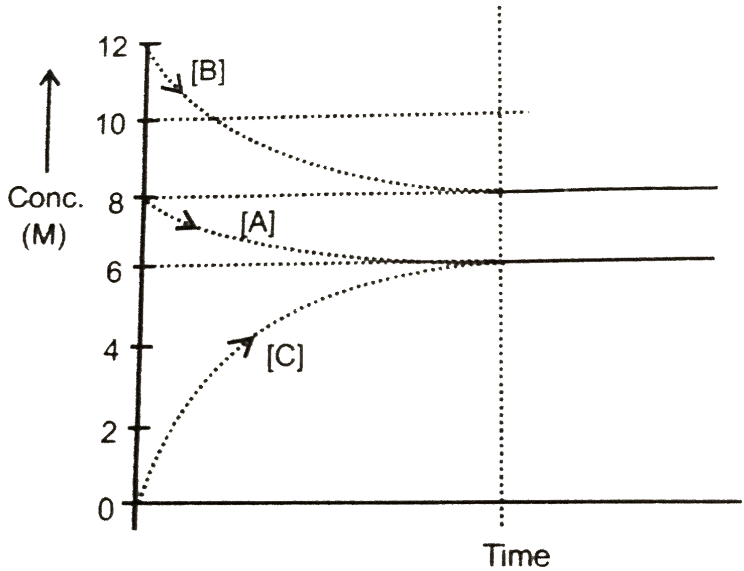
12. The gaseous reaction : $A(g) + nB(g) \Leftrightarrow mC(g)$ is represented by following curves

What is the value of n+m?



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Level 3

1. For a gaseous reaction

$aA(g) + bB(g) \Leftrightarrow cC(g) + dD(g)$

equilibrium constants K_c, K_p and K_x are

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, K_p = \frac{Pc^c . P_D^d}{P_A^a} / P_b^b$ and $Kx = \frac{x_C^c . x_D^d}{x_A^a . x_B^b}$

where $[A] \rightarrow$ molar concentration of $A, p_A \rightarrow$ partial pressure of A and P $\rightarrow$ total pressure, $x_A \rightarrow$ mole fraction of A

Select the write option

A. (a) $K_p = K_c(RT)^{\Delta ng}, K_x = K_p(RT)^{\Delta ng}$

B. (b) $K_c = K_c(RT)^{\Delta ng}, K_p = K_x P^{\Delta ng}$

C. (c) $K_c = K_x P^{\Delta ng}, K_p = K_x P^{\Delta ng}$

D. (d) $K_c = K_p(RT)^{-\Delta ng}, K_x = K_p(RT)^{\Delta ng}$

Answer: B

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One More Answer Is Are Correct

1. A catalyst :

A. increase the average kinetic energy of reactiong molecules

B. decreases the activation energy

C. can alters the reaction mechanism

D. Can change pre-exponential factor

Answer: B

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Match The Column

1. Column-I and Column-II contains fore enteries each. Entries of Column-I are to be matched with, some entries of Column-II One or more than one entries of Column-I may have the mathching with the same entries of

Column-II

Column-I	Column-II
(A) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$	(P) $K_p > K_c$ above room temperature
(B) $CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g)$	(Q) $K_p = K_c$ above room temperature
(C) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$	(R) $K_p < K_c$ above room temperature
(D) $HCl(g) \rightleftharpoons H^+(aq) + Cl^-(aq)$	(S) K_p and K_c not defined

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Others

1. The equilibrium constant K_c for the reaction

$P_4(g) \Leftrightarrow 2P_2(g)$

is 1.4 at $400^\circ C$. Suppose that 3 moles of $P_4(g)$ and 2 moles of $P_2(g)$are mixed in 2 litre container at$400^\circ C$. What is the value of reaction quotient(Q_c)?

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

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

C. 1

D. none of these

Answer: b

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2. In a chemical reaction, equilibrium is said to have been established when the

A. opposing reacation ceases

B. concentrations of reactants and product are equal

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

D. reaction ceases to generate heat

Answer: bc

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3. The equilibrium constant for a reaction is K, and the reaction quotient is Q . For a particular reaction mixture , the ration $\frac{K}{Q}$ is 0.33. this means that:

A. the reaction mixture will equilirate to from more reactant species

B. the rection mixture will equilirate to from more product species

C. the equlibrium ratio of reactant to product concentration will be 3

D. the equilibrium ratio of reactant to product concentrations will be 0.33

Answer: b

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4. Consider the reaction $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$ for which $K_c = 278M^{-1}$.0.001 mole ofeach of the reagents $SO_2(g), O_2(g)$ and $SO_3(g)$ are mixed in a 1.0 L flask . Dterminr=e the reaction quotient of the system and the spontaneus direction of the system:

A. $Q_c = 1000$, the equilibrium shifts to the right

B. $Q_c = 1000$, the equilibrium shifts to the left

C. $Q_c = 0.001,$ the equilibrium shifts to the left

D. $Q_c = 0.001,$ theequilibrium shifts to the right

Answer: a

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5. In Q.No .5, if the mixture of gases was allowed to come to quilibrium .The volume of the reaction vessel was then rapidly increased by a factor of two .As a result of the change the reaction quotient (Q_c) would:

A. increase because of the pressure decrease

B. decrease because of the pressure decrease

C. remain the same because the equilibrium constant is indendent of volume

D. increase because the reaction is endothermioc

Answer: a

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6. For the reaction $A(g) + 3B(g) \Leftrightarrow 2C(g)$at $27^{\circ} C$, 2 moles of A, 4 moles of B and 6 moles of C are present in 2 litre vessel. If K_c for the reaction is 1.2, the reaction will proceed in :

A. Forward direction

B. backward direction

C. neither direction

D. none of these

Answer: a

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7. For a reversible gaseous reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ at equilibrium , if some moles of H_2 are replaced by same number of moles of T_2 (T is tritium , isotope of H and assume isotopes do not have different chemical properties) without affecting other parameters , then:

A. the sample of ammonia obtained after something will be radioactive .

B. moles of N_2 after the change will be different as compared to moles of $N)(2)$ present before the change

C. the volue of $K_p \text{or} K_c$ will change

D. the average molecular mass of new equilibrium will be same as that of old equilibrium

Answer: a

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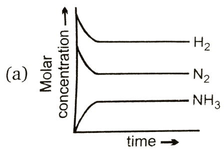
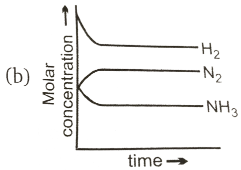
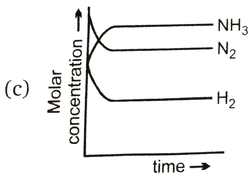
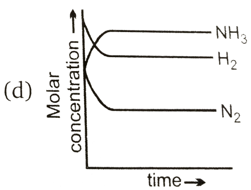
8. For the synthesis of ammonia by the reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ in the Haber's process ,the attainment of equilibrium is correctly predicated bt the curve

A. 

B. 

C. 

D. 

Answer: a

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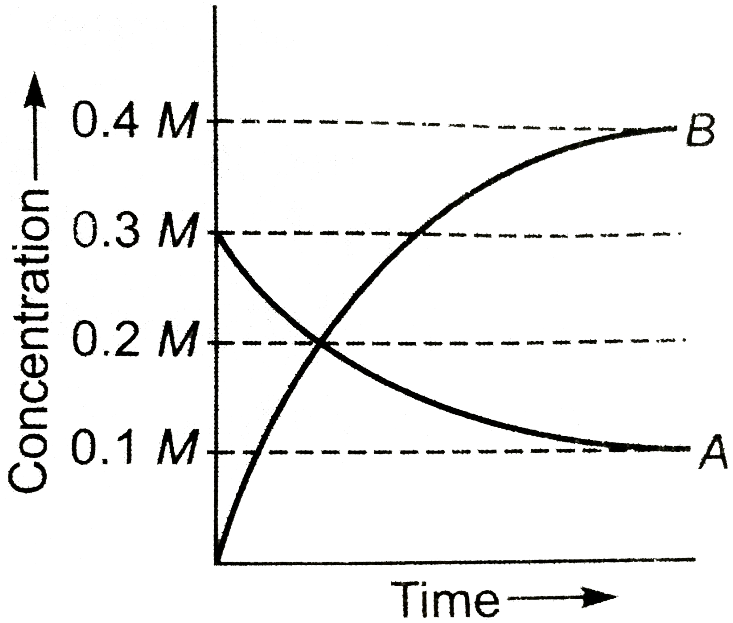
9. The figure shows the change in concentration of species A and B as a function of time.

The equilibrium constant K_c for the reaction $A(g) \Leftrightarrow 2B(g)$ is :



A. $K_c > 1$

B. $K < 1$

C. $K = 1$

D. data insufficient

Answer: a

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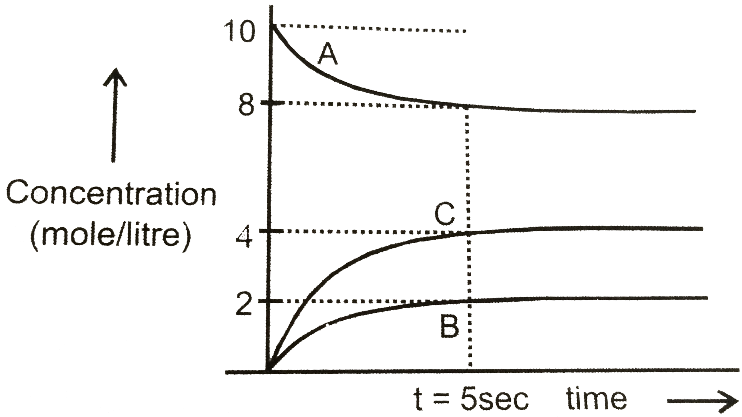
10. Attainment of the equilibrium $A(g) \Leftrightarrow 2C(g) + B(g)$gave the following graph . Find the correct option . ($\%\, dissociation = Fractiondissoiatedxx100$)



A. At t=5 sec equilibrium has been reached and $K_c = 40(mol/litre)^2$

B. At t=5 sec equilibrium has been reached and % disscíation of A is 20%

C. At t=5 sec equilibrum has been reached and % dissocition of A is 30%

D. none of these

Answer: b

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11. Using moler concentrations, what is the unit of K_c for the reaction ?

$CH_3OH(g) \Leftrightarrow CO(g) + 2H_2(g)$

A. M^{-2}

B. M^2

C. M^{-1}

D. M

Answer: b

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12. What is the unit of K_p for the reaction ?

$CS_2(g) + 4H_2(g) \Leftrightarrow CH_4(g) + 2H_2S(g)$

A. atm

B. atm^{-2}

C. atm^2

D. atm^{-1}

Answer: b

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13. What is the equilibrium expression for the reaction

$P_4(s) + 5O_2(g) \Leftrightarrow P_4O_{10}(s)$

A. $K_c = [O_2]^5$

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

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

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

Answer: d

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14. At $527^\circ C$, the reaction given below has $K_c = 4$

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

what is the 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. $\left(\frac{1}{4 \times 800R}\right)^2$

D. none of these

Answer: c

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15. The equilibrium constant for the reaction

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

at temperature T is 4×10^{-4}.

The value of K_c for the reaction

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

at the same temperature is

A. 4×10^{-4}

B. 50

C. 2.5×10^2

D. 0.02

Answer: b

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16. The equilibrium constant K_c for the following reaction at $842^\circ C$ is 7.90×10^{-3} .What is K_p at same temperature ?

$$\frac{1}{2}F_2(g) \Leftrightarrow F(g)$$

A. 8.64×10^{-5}

B. 8.26×10^{-4}

C. 7.90×10^{-2}

D. 7.56×10^{-2}

Answer: d

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17. The equilibrium constant K_p for the following rection at $191^\circ C$ is 1.24. what is K_c?

$$B(s) + \frac{3}{2}F_2(g) \Leftrightarrow BF_3(g)$$

A. 6.7

B. 0.61

C. 8.30

D. 7.6

Answer: d

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18. For the equilibrium $SO_2Cl_2(g) \Leftrightarrow SO_2(g) + Cl_2(g)$, what is the temperature at which $\frac{K_p(atm)}{K_c(M)} = 3$?

A. $0.027K$

B. $0.36K$

C. 36.54K

D. $273K$

Answer: c

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19. 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. $1.44 \times 10^{-5} / (0.082 \times 500)^{-2}$

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

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

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

Answer: d

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20. For the reaction $CO(g) + Cl_2(g) \Leftrightarrow COCl_2(g)$the value of $\left(\frac{K_c}{K_P}\right)$ is equal to :

A. $\sqrt{RT}$

B. RT

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

D. 1.0

Answer: b

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21. The concentration of a pure solid or liquid phase is not include in the expression of equilibrium constant because :

A. density of solid and liquid are independent of their quantities .

B. solids and liquids react slowly.

C. solids and liquids at equilibrium do not interact with gaseous phase.

D. the molecules of solids and liquids cannot migrate to the gaseous phose.

Answer: a

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22. A catalyst is a substance which

A. increase the equilibrium concentration of the product.

B. change the equilibrium constant of the reaction.

C. shortens the time to rach equilibrium.

D. supplies energy to the reaction.

Answer: c

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23. What will be the effect of the equilibrium constant on increasing temperature. If the reaction neither absorbs heat nor releases heat?

A. Equililbrium constant will remain constant.

B. Equilibrium constant will decrease .

C. Equilibrium constant will increase.

D. Can not be predicted.

Answer: a

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

A. 40×10^{-4}

B. 4×10^{-4}

C. 4×10^{-3}

D. difficult to compute without more data

Answer: a

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25. 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. concentration of H_2 and I_2

D. temperature

Answer: d

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26. Consider the reaction :-

$$2CO(g) + 2H_2O_{(g)} \Leftrightarrow 2CO_{2(g)} + 2H_{2(g)} \, eq. \, const = K_1$$

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

$$CH_{4(g)} + 2H_2O_{(g)} \Leftrightarrow CO_{2(g)} + 4H_{2(g)}, \, eq. \, const = K_3$$

Which of the following relation is correct ?

A. $K_3 = \frac{K_1}{K_2}$

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

C. $K_3 = K_1 K_2$

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

Answer: d

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27. For the reaction $2NO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow N_2O_5(g)$ if the equilibrium constant is K_p, then the equilibrium constant for the reaction

$2N_2O_5(g) \Leftrightarrow 4NO_2(g) + O_2(g)$would be :

A. K_P^2

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

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

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

Answer: c

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28. The equilibrium constant (K_c) for the reaction

$2HCl(g) \Leftrightarrow H_2(g) + Cl_2(g)$

is 4×10^{-34}at $25^{\circ} C$ .what is the equilibrium constant for the reaction ?

$\frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \Leftrightarrow HCl(g)$

A. (a) 2×10^{-17}

B. (b) 2.5×10^{33}

C. (c) 5×10^{6}

D. (d) none of these

Answer: d

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29. At a certain temperature , the following reactions have the equilibrium constants as shown below:

$S(s) + O_2(g) \Leftrightarrow SO_2(g), K_c = 5 \times 10^{52}$

$2S(s) + 3O_2(g) \Leftrightarrow 2SO_3(g), K_c = 10^{29}$

what is the equilibrium constant $K_c$for the reaction at tahea same temperature?

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

A. 2.5×10^{76}

B. 4×10^{23}

C. 4×10^{-77}

D. none of these

Answer: c

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30. Given

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

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

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

The equilibrium constant for

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

will be

A. $K_1K_2K_3$

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

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

D. $\frac{K_1K_3^2}{K_3}$

Answer: d

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31. In the reaction $X(g) + Y(g) \Leftrightarrow 2Z(g)$, 2 mole of X,1 mole of Y and 1 mole of Z are placed in a 10 litre vessel and allowed to reach equilibrium .If final concentration of Z is 0.2 M , then $K_c$for the given reaction is :

A. 1.60

B. $\frac{80}{3}$

C. $\frac{16}{3}$

D. none of these

Answer: c

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

A. 0.0004

B. 0.008

C. 0.016

D. 0.160

Answer: c

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33. Given

$[CS_2] = 0.120M, [H_2] = 0.10, [H_2S] = 0.20 \text{ and } [CH_4] = 8.40 \times 10^{-5}M$

for the following reaction at 900°C at eq.

Calculate the equilibrium constant (K_c).

$CS_2(g) + 4H_2(g) \leftrightarrow CH_4(g) + 2H_2S(g)$

A. (a) 0.0120

B. (b) 0.0980

C. (c) 0.280

D. (d) 0.120

Answer: c

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34. The equilibrium constant for the following reaction is 10.5 at 500 K .A syatem at equilibrium has $[CO] = 0.250M$ and $[H_2] = 0.120M$ what is the $[CH_3OH]$?

$CO(g) + 2H_2(g) \Leftrightarrow CH_3OH(g)$

A. 0.0378

B. 0.435

C. 0.546

D. 0.0499

Answer: a

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35. When sulphur (in the form of S_8 is heated at temperature T, at equilibrium , the pressure of S_8 falls by 30% from $1.0 atm$, because $S_8(g)$ in partially converted into $S_2(g)$.

Find the value of K_P for this reaction.

A. 2.96

B. 6.14

C. 204.8

D. none of these

Answer: a

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36. 9.2 grams of $N_2O_{4(g)}$ is taken in a closed one litre vessel and heated till the following equilibrium is reached $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$. At equilibrium, $50\% N_2O_{4(g)}$ is dissociated. What is the equilibrium constant (in mol $litre^{-1}$) (Molecular weight of $N_2O_4 = 92$) ?

A. 0.1

B. 0.4

C. 0.2

D. 2

Answer: c

Watch Video Solution

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

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

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

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

D. $27/16 mol^2 litre^{-2}$

Answer: d

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38. In the presence of excess of anhydrous (in torr) of water taken up is governed by $K_p = 10^{12} atm^{-4}$ for the following reaction at $273K$

$SrCl_2.2H_2O(s) + 4H_2O(g) \Leftrightarrow SrCl_2.6H_2O(s)$

What is equilibrium vapour pressure (in torr) of water in a closedvessel that contains $SrCl_2.2H_2O(s)$?

A. 0.001torr`

B. 10^3 torr`

C. 0.76torr

D. 1.31torr`

Answer: c

Watch Video Solution

39.

$CuSO_4.5H_2O(s) \Leftrightarrow CuSO_4.\,3H_2O(s) + 2H_2O(g), K_p = 4 \times 10^{-4} atm^2$

If the vapour pressure of water is 38 toor then percentage of relatative humidity is :(Assume all data at constant temperture)

A. 4

B. 10

C. 40

D. none of these

Answer: c

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

$The equilibrium pressure at 25$ degree Celsius ` is 0.660 atm . What is Kp for the reaction ?

A. 0.109

B. 0.218

C. 1.89

D. 2.18

Answer: a

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41. For the reaction $2A(g) \Leftrightarrow B(g) + 3C(g)$, at a given temperature , $K_c = 16$. What must be the volume of the flask , if a mixture of 2 mole rach of A,B and C exist in equilibrium ?

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

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

C. 1

D. none of these

Answer: b

Watch Video Solution

42. One mole of pure ethyl alcohol was treated with one mole of pure acetic acid at $25^{\circ}C$ One -third of the acid changes into ester at equilibrium . The equilibrium constant for the reaction will be:

A. (a) $\frac{1}{4}$

B. (b) 2

C. (c) 3

D. (d) 4

Answer: a

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43. $I_2 + I^{\ominus} \Leftrightarrow I_3^{\ominus}$

This reaction is set-up in aqueous medium. We start with 1 mol of I_2 and

0.5 mol of $I^{\ominus}$ in $1L$ flask. After equilibrium reached, excess of $AgNO_3$ gave 0.25 mol of yellow precipitate. Equilibrium constant is

A. 1.33

B. 2.66

C. 2.0

D. 3.0

Answer: a

Watch Video Solution

44. At $87^{\circ}C$, the following equilibrium is established.

$H_2(g) + S(s) \Leftrightarrow H_2S(g), K_c = 0.08$

If 0.3 mole hydrogen and 2 mole sulphur are heated to $87^{\circ}C$ in a $2L$ vessel, what will be concentration of H_2S at equilibrium ?

A. $0.011M$

B. $0.022M$

C. $0.044M$

D. $0.08M$

Answer: a

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45. In the equilibrium $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$, the partial pressure of SO_2, O_2 and SO_3 are 0.662,0.10 and 0.331 atm respectively . What should be the partial pressure of Oxygen so that the equilibrium concentrations of SO_3 are equal ?

A. (a) $0.4atm$

B. (b) $1.0atm$

C. (c) $0.8atm$

D. (d) $0.25atm$

Answer: a

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46. When heated , ammonium carbamate decomate decompoes as follows :

$NH_4COOH_2(s) gives 2NH_3(g) + CO_2(g)$

At a certain temperature , the equilibrium pressure of the system is $0.318 atm. Kp$ for the reaction is:

A. 0.128

B. 0.426

C. 4.76×10^{-3}

D. none of these

Answer: c

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

A. Two times original value

B. One half of its original value

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

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

Answer: d

Watch Video Solution

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

A. (a) $\frac{4}{9}$

B. (b) $\frac{9}{4}$

C. (c) $\frac{1}{9}$

D. (d) 4

Answer: d

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49. The equilibrium $K_c$for the reaction $SO_2(g)NO_2(g) \Leftrightarrow SO_3(g) + NO(g) is 16$ 1 mole of rach of all the four gases is taken in $1dm^3$ vessel , the equilibrium concentration of NO would be:

A. $0.4M$

B. $0.6M$

C. $1.4M$

D. $1.6M$

Answer: d

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50. On increasing the temperature , the rate of a reaction:

A. (a) always increases

B. (b) always decreases

C. (c) first increases and then decreases

D. (d) may increase or decrease depending

upon the nature of the reaction

Answer: a

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51. A catalyst increases the rate of a reaction by:

A. (a) increasing the activation energy of a reaction

B. (b) decreasing the activation energy

C. (c) increasing the enthalpy change of the reaction

D. (d) decreasing the enthalpy change of the reaction

Answer: b

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52. At a certain temperature , only 50% HI is dissociated at equilibrium in the following reaction:

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

the equilibrium constant for this reaction is:

A. 0.25

B. 1.0

C. 3.0

D. 0.5

Answer: a

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53. The equilibrium constant K_p for the reaction

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

is 4.0 at $1660^\circ C$ Initially 0.80 mole H_2 and 0.80 mole CO_2 are injected into a 5.0 litre flask. What is the equilibrium concentration of $CO_2(g)$?

A. 0.533

B. 0.0534

C. 0.535

D. none of these

Answer: b

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54. At 273 K and 1atm , 10 litre of N_2O_4 decompose to NO_4 decompoes to NO_2 according to equation

$N_2O_4(g) \Leftrightarrow 2NO_\circ(G)$

What is degree of dissociation (α) when the original volume is 25% less then that os existing volume?

A. 0.25

B. 0.33

C. 0.66

D. 0.5

Answer: b

Watch Video Solution

55. The equilibrium constant for the reaction $CO(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g) is 5$ how many moles of CO_2 must be added to 1 litre container alrady containing 3 moles each of CO and H_2O to make 2 M equilibrium conentration of CO?

A. 15

B. 19

C. 5

D. 20

Answer: b

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56. A nitrogen-hydrogen mixture initially in the moler ratio of $1:3$ reached equilibrium to from ammonia when 25% of the N_2 and N_2 had reacterd .If the pressure of the system was 21 atm , the partial pressure of ammonia at the equilibrium was :

A. $4.5atm$

B. 3.0atm

C. 2.0atm`

D. $1.5atm$

Answer: b

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57. NH_3 is heated at 15 atm, 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. (a) 65%

B. (b) 61.3%

C. (c) 62.5%

D. (d) 64%

Answer: b

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58. 0.1 mole of $N_2O_4(g)$ was sealed in a tude under one atmospheric conditions at $25^\circ C$ Calculate the number of moles of $NO_2(g)$ present , if the equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)(K_P = 0.14)$ is reached after some time :

A. 1.8×10^2

B. 2.8×10^2

C. 0.036

D. 2.8×10^{-2}

Answer: c

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59. 5 moles of $SO_2$and 5 moles of O_2 are allowed to react .At equilibrium , it was foumnd that 60% of SO_2 is used up .If the pressure of the equilibrium mixture is one aatmosphere, the parital pressure of O_2 is :

A. $0.52atm$

B. $0.21atm$

C. $0.41atm$

D. $0.82atm$

Answer: c

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

For the reaction intially the mole ratio was $1:3$ of $N_2:H_2$.At equilibrium 50% of each has reacted .If the equilibrium pressure is P, the parial pressure of NH_3 at equilibrium is :

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

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

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

D. $\frac{p}{8}$

Answer: a

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61. 2.0 mole ofPCl_5 were nttoducedd in a vessel of 5.0 L capacity of a particular temperature At equilibrium, PCl_5 was found to be 35 % dissociated into PCl_3 and Cl_2 the value of K_c for the reaction

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

A. 1.89

B. 0.377

C. 1.33

D. 13.3

Answer: d

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62. At certain temperature compound $AB_2(g)$ dissociates according to the reaction

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

With degree of dissociation α Which is small compared with unity, the expression of K_p in terms of α and initial pressure P is :

A. (a) $\frac{P\alpha^3}{2}$

B. (b) $\frac{P\alpha^2}{3}$

C. (c) $\frac{P\alpha^3}{3}$

D. (d) $\frac{P\alpha^2}{2}$

Answer: a

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63. For the reaction

$H_2(g) + CO_2(g) \Leftrightarrow CO(g) + H_2O(g),$ if the initial concentration of

$[H_2] = [CO_2]$and x moles /litres of hydrogen is consumed at equilibrium , the correct expression of K_p is :

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

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

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

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

Answer: a

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64. If D_T and D_o are the theoretical and observed vapour densities at a definite temperature and α be the degree of dissociation of a substance ,then ,α in the terms of D_o, D_T and n (number of moles of products formed from 1 mole reactant) is calculated by the formula :

A. (a) $\alpha = \frac{D_o - D_T}{(1-n)D_T}$

B. (b) $\alpha = \frac{D_T - D_o}{(n-1)D_T}$

C. (c) $\alpha = \dfrac{D_T - D_o}{(n-1)D_o}$

D. (d) $\alpha = \dfrac{D - D_T}{(n-1)D_T}$

Answer: c

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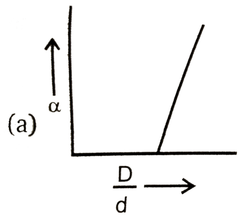
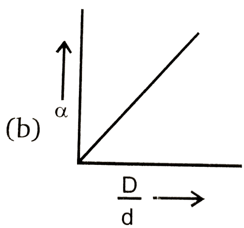
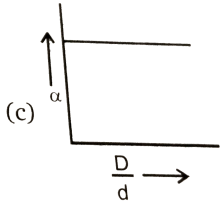
65. For the dissociation of PCl_5 into PCl_3 and Cl_2 in gaseous phase reaction , if d is the observed vapour density and D the theoretical vapour density with $'\alpha'$ as degree of dissociation ,variaton of D/d with $'\alpha'$ is given by ?

A. (a)



B. (b)





C. (c)

D. (d) none of these

Answer: a

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66. At $27^{\circ} C$ and 1 atm pressure ,N_2O_4 is 20% dissociation into $NO_{\circ}$ .What is the density of equilibrium mixture of N_2O_4 and NO_2 at $27^{\circ} C$ and 1 atm?

A. (a) $3.11 g / litre$

B. (b) $2.11 g / litre$

C. (c) $4.5 g / litre$

D. (d) none of these

Answer: a

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67. $COCl_2$ gas dissociates according to the equation, $COCl_2 \Leftrightarrow CO(g) + Cl_2(g)$. When heated to 700 K the density of the gas mixture at 1.16 atm and at equilibrium is $1.16 g / litre$ The degree of dissociation of $COCl_2$ at 700K is :

(a)0.28

(b)0.50

(c)0.72

(d)0.42

A. 0.28

B. 0.50

C. 0.72

D. 0.42

Answer: c

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68. The degree of dissociation of I_2 "mole"cule at $1000^\circ C$ and under $1.0 atm$ is 40% by volume. If the dissociation is reduced to 20% at the same temperature, the total equilibrium pressure on the gas will be:

A. $1.57 atm$

B. $2.57 atm$

C. $3.57 atm$

D. $4.57 atm$

Answer: d

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69. Determinre the value of equilibrium constant (K_C) for the reaction

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

if 10 moles of A_2 ,15 moles ofB_2 and 5 moles of AB are placed in a 2 litre vessel and allowed to come to equilibrium . The final concentration of AB is 7.5 M:

A. 4.5

B. 1.5

C. 0.6

D. none of these

Answer: a

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70. At $87^\circ C$, the following equilibrium is established

$H_2(g) + S(s) \Leftrightarrow H_2(g), K_p = 7 \times 10^{-2}$

If 0.50 mole of hydrogen and 1.0 mole of sulphur are heated to $87^\circ C$ in $1L$ vessel. What is the partial pressure of $H_2S(g)$ at equilibrium?

A. 0.966 atm

B. 1.38n atm

C. 0.0327 atm

D. 1atm

Answer: a

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71. Pure PCl_5 is introduced into an evacuated chamber and to equilibrium at $247^\circ C$ and 2.0 atm .The equilibrium gases mixture contains 40% chlorine by volume .

Calculate K_p at $247^\circ C$ for the reaction

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

A. (a) 0.625 atm

B. (b) $4atm$

C. (c) $1.6atm$

D. (d) none of these

Answer: c

Watch Video Solution

72. For the reaction

$XCO_3 \Leftrightarrow XO(s) + CO_2(g), Kp = 1.64atm$at $727\hat{}(@)C \quad . If 4mo \leq sof X$

was put into a 50 litre container and heated to $727^\circ C$

What mole percent of the XCO_3 remains unreacted at equilibrium ?

A. 20

B. 25

C. 50

D. none of these

Answer: d

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73. $Fe_2O_3(s)$ may be converted to Fe by the reaction

$Fe_2O_3(s) + 3H_2(g) \Leftrightarrow 2Fe(s) + 3H_2O(g)$ for which $K_c = 8$at temp . $720^\circ c.$

What percentage of the H_2 ramains unreacted after the reaction hascome to equilibrium ?

A. 22%

B. 34%

C. 66%

D. 78%

Answer: b

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74. $AB_3(g)$is dissociates as $AB_3(g) \Leftrightarrow AB_2(g) + \frac{1}{2}B_2(g)$

When the initial pressure of AB_3 is800 torr and the pressure developed at equilibrium is 900 torr , what fraction of $AB_3(g)$ is dissociated?

A. $10\ \%$

B. $20\ \%$

C. $25\ \%$

D. $30\ \%$

Answer: c

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75. At 1000 K , a sample of pure NO_2 gases decomposes as :

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

The equilibrium constant K_P is 156.25 atm .Analysis showns that the partial pressure of O_2 is 0.25 atm at equilibrium .The parital pressure o f NO_2 at equilibrium is :

A. 0.03

B. 0.02

C. 0.025

D. 0.04

Answer: b

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76. pure nitrosyl chloride (NOCl) gas was heated to $240^{\circ}C$ in a 1.0 L container. At equilibrium the total pressure was 1.0 atm and the NOCl pressure was 0.64 atm . What would be the value of K_P ?

A. $1.02 atm$

B. 16.875×10^{-3}atm

C. 16×10^{-2}atm

D. none of these

Answer: b

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77. At a certain temperature the equilibrium constant K_c is 0.25 for the reaction

$A_2(g) + B_2(g) \Leftrightarrow C_2(g) + D_2(g)$

If we take 1 mole of each of the four gases in a 10 litre container ,what would be equilibrium concentration of A_2 (g)?

A. 0.331 M

B. 0.033M

C. 0.133M

D. $1.33M$

Answer: c

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78. At $200^{\circ} CPCl_5$ dissociates as follows :

$PCl_5(g0 \Leftrightarrow PCl_3(g) + Cl_2(g)$

It was found that the equilibrium vapours are 62 times as heavy as hydreogen .The degree of dissociation of PCl_5 at $200^{\circ} C$ is nearly :

A. $10\ \%$

B. $42\ \%$

C. $50\ \%$

D. $68\ \%$

Answer: d

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79. For the dissociation reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g)$, the degree of dissociation (α)interms of K_p and total equilibrium pressure P is:

A. $\alpha = \sqrt{\dfrac{4P + K_p}{K_P}}$

B. $\alpha = \sqrt{\frac{K_P}{4P + K_p}}$

C. $\alpha = \sqrt{\frac{K_P}{4P}}$

D. none of these

Answer: b

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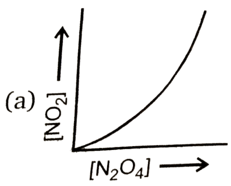
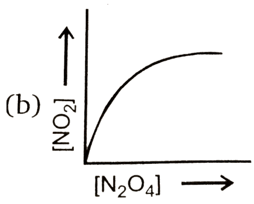
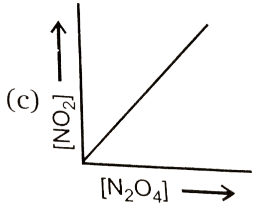
80. Consider the following equilibrium

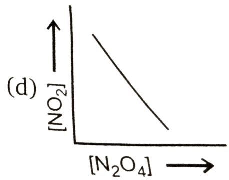
$N_2O_4(g) \Leftrightarrow 2NO_2(g)$

Then the select the correct graph , which shows the variation in concentrations of N_2O_4 against concentrations of NO_2:

A. 

B. 

C. 

D. 

Answer: b

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81. The vapour pressure of mercury is 0.002 mm Hg at $27^{\circ}C$ .K_c for the process $Hg(l) \Leftrightarrow Hg(g)$is :

A. 0.002

B. 8.12×10^{-5}

C. 6.48×10^{-5}

D. 1.068×10^{-7}

Answer: d

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82. Calculate the equilibrium constant (K_c) for the reaction given below , if at equilibrium, mixture contains 5.0 mole of A_2,3 mole of B_2 and 2 mole of AB_2 at 8.21 atm and 300K

$$A_2(g) + 2B_2(g) \Leftrightarrow 2AB_2(g) + Heat$$

A. 1.333

B. 2.66

C. 20

D. none of these

Answer: b

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83. For the reaction (1)and(2)

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

$X(g) \Leftrightarrow 2Y(g)$

Given , $K_{p1} : K_{p2} = 9 : 1$

If the degree of dissociation of A(g) and X(g) be same then the total pressure at equilibrium

(1) and (2) are in the ratio:

A. (a) $3 : 1$

B. (b) $36 : 1$

C. (c) $1 : 1$

D. (d) $0.5 : 1$

Answer: b

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84. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$. Some inert gas at constant pressure is added to the system. Predict the following facts:

A. (a) more $NH_3$is produced

B. (b) Less NH_3 is produced

C. (c) No affect on the equilibrium

D. (d) K_p of the reaction is decreased

Answer: b

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85. In which of the following equilibrium ,change in 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. $SO_2Cl_2(g) \Leftrightarrow SO_2 \Leftrightarrow SO_2(g) + Cl_2(g)$

Answer: a

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86. For the reaction

$N_2(G) + 3H_2(g) \Leftrightarrow 2NH_3(g), \Delta = -93.6KJmol^{-1}$

The number of moles of H_2 at equilibrium will increase If :

A. (a) volume is increased

B. (b) volume is decreased

C. (c) argon gas is added at constant volume

D. (d) NH_3 Is removed

Answer: a

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87. The volume of the reaction vessel containing an equilibrium mixture is increased in the following reaction

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

When equilibrium is re-established :

A. The amount of $Cl_2(g)$ remains unchanged

B. the amount of $Cl_2(g)$ increases

C. The amount of$SO_\circ Cl_2(g)$decreases

D. The amount of $SO_\circ(g)$ decrsases

Answer: b

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88. Some inert gas is added at constant volume to the following reaction at equilibrium

$NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ predict the effect of adding the inert gas:

A. The equilibrium shifts in the forward direction

B. The equilibrium shifts in the backward direction

C. The equilibrium remins unaffected

D. The value of K_p is increased

Answer: c

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89. Consider thr reaction where $K_p = 0.497$at 500K

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

If the htree gasses are mixed in a right container so that the partial pressure of each gas in initially 1 atm ,then which is correct observation ?

A. More PCl_5 will be produced

B. More PCl_3 will be produced

C. Equilibrium will be eatablished when 50% reaction is complete

D. none of these

Answer: a

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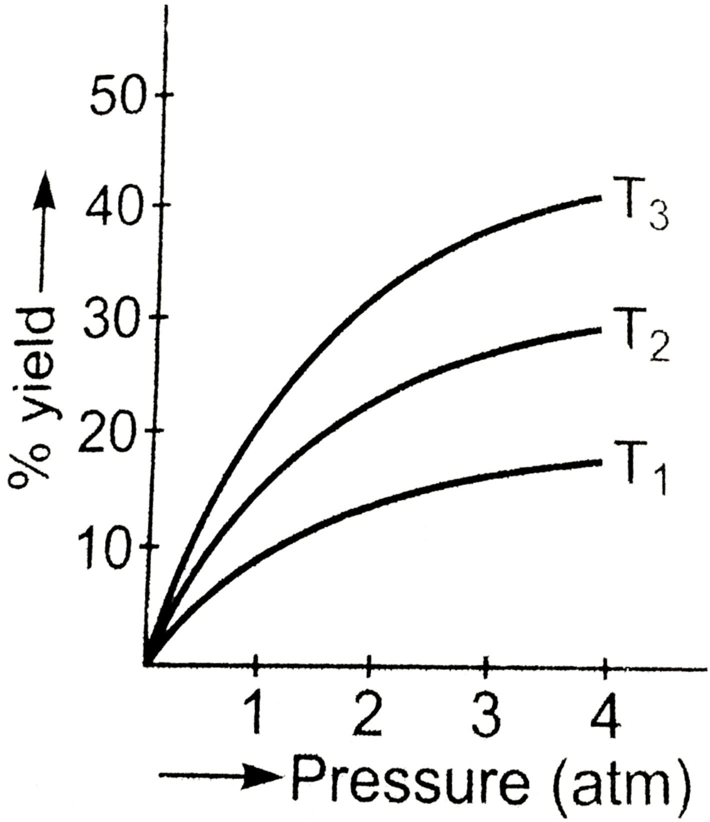
90. The prepation of $SO_3(g)$ by reaction $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$ is an exothermic reaction .If the preparation follows the following temperature -pressure relationship for % yield , then for temperatures

T_1, T_2 and T_3 the correct option is:



A. $T_3 > T_2 > T_1$

B. $T_1 > T_2 > T_3$

C. $T_1 = T_2 = T_3$

D. Nothing could be predicated about temperature though given information

Answer: b

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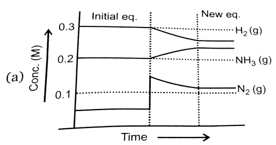
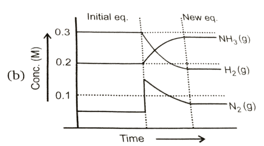
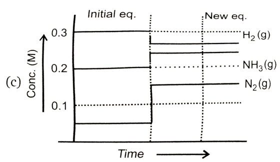
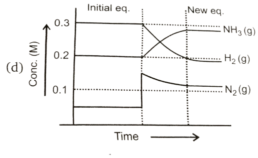
91. An equilibrium mixture at 700 K of 0.05M $N_2(g)$ and $0.2 M NH_3(g)$ is present in a container .Now if this equilibrium is disturbed by adding $N_{\circ}$ (g) so that its concentration becomes 0.15M just after addition then which of the following graph represents the above situation more appropriately:

A. 

B. 

C. 



D.

Answer: a

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92. In a vessel containing N_2, H_2 and NH_3 at equilibrium , some helium gas is introduced so that total pressure increase while temperature and volume remain constant .According to Le Chatelier's principle , the dissociation of NH_3:

A. Increases

B. decreases

C. remains unltered

D. changes unpredictably

Answer: c

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93. Le - Chatelier principle is not applicable to :

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

B. $Fe(s) + S(s) \Leftrightarrow FeS(s)$

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

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

Answer: b

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94. Consider the following reactions .In which case the formation of product is favoured by decreasein pressure?

(1)$CO_2(g) + C(s) \Leftrightarrow 2CO(g), \Delta H^\circ = +172.5Kj$

(2)$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) \Leftrightarrow 2NH_3(g), \Delta H^\circ = -91.8KJ$

(3) $N_2(g) + O_2(g) \Leftrightarrow 2NO(g), \Delta H^\circ = 181KJ$

(4) $2H_2O(g) \Leftrightarrow 2H_2(g) + O_2(g), \Delta H^\circ = 484.6KJ$

A. 2, 3

B. 3, 4

C. 2, 4

D. 1, 4

Answer: d

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95. In which of the following reactions, the formation of product is favoured by decrease in temperature ?

(1)$N_2(g) + O_2(g) \Leftrightarrow 2NO(g), \Delta H^\circ = 181$

(2)$2CO_2(g) \Leftrightarrow 2CO(g) + O_2(g), \Delta H^\circ = 566$

(3)$H_2(g) + I_2 \Leftrightarrow 2HI(g), \Delta H^\circ = -9.4$

(4)$H_2(g) + F_2(g) \Leftrightarrow 2HF(g), \Delta H^\circ = -541$

A. 1, 2

B. 2 only

C. 1,2,3

D. 3,4

Answer: d

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96. For which of the following reaction is product formation favoured by low pressure and high temperature?

A. $H_2(g) + I_2(g) \Leftrightarrow 2HI(g), \Delta H^\circ = -9.4KJ$

B. $CO_2(g) + C(s) \Leftrightarrow 2CO(g), \Delta H^\circ = 172.5KJ$

C. $CO(g) + 2H_2(g) \Leftrightarrow CH_3OH, \Delta H^\circ = -21.7KJ$

D. $3O_2(g) \Leftrightarrow 2O_3(g), \Delta H^\circ = 285KJ$

Answer: b

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97. For which of the following reaction is product formation favoured by low pressure and high temperature?

A. $CO_2(g) + C(s) \Leftrightarrow 2CO(g), \Delta H^\circ = 172KJ$

B. $CO(g) + 2H_2(g) \Leftrightarrow CH_3OH, \Delta H^\circ = -21.7KJ$

C. $2O_3(g) \Leftrightarrow 3O_2(g), \Delta H^\circ = -285KJ$

D. $H_2(g) + F_2(g) \Leftrightarrow 2HF(g), \Delta H^\circ = -541Kj$

Answer: c

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98. Consider the following reaction at equilibrium and determine which of the indicated changes will cause the reaction to proceed to right.

(1) $CO(g) + 3H_2(g) \Leftrightarrow CH_4(g) + H_2O(g)(add \quad CH_4)$

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

(3) $H_2(g) + F_2(g) \Leftrightarrow 2HF(g)(addF_2)$

(4) $BaO(s) + SO_3(g) \Leftrightarrow BASO_4(s)(addBaO)$

A. $2, 3$

B. 1,4

C. 2,4

D. 2,3,4

Answer: a

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99. If the pressure in a reaction vessel for the following reaction is increased by decreasing the volume ,what will happen to the concentrations of CO and CO_2?

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

A. both the [CO] and $[CO_2]$ will decrease

B. neither the [Co] nor the $[CO_2]$ will change

C. the [CO] will decrease and the $[CO_2]$ will increase

D. both the [CO] and $[CO_2]$ will increase

Answer: d

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100. Cosider the following reaction and determine which o fthe conditions will shift the equilibrium postion to the right ?

$4NH_3(g) + 5O_2(g) \Leftrightarrow 4NO(g) + 6H_2O(g) + heat$

A. Increasing the temperature

B. increasing the pressure

C. assigning a catalyst

D. none of above is correct

Answer: d

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101. The conversion of ozone into oxygen is exothermic under what conditions is ozone is most stable?

$2O_3(g) \Leftrightarrow 3O_2(g)$

A. At low pressure and low temperature

B. At high pressure and high temperature

C. At high pressure and low temperature

D. At low pressure and high temperature

Answer: b

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102. A System at equilibrium is described by the equation of fixed temperature T.

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

What effect will be the effect on equilibrium, if total pressure is reducing volume?

A. Concentration of $SO_2Cl_2(g)$ increases

B. Concentrations of $SO_2(g)$ increases

C. Concentration of $Cl_2(g)$ increases

D. Concentration of all gases increaseses

Answer: d

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103. The reaction $2NO_2(g) \Leftrightarrow N_2O_4(g)$ is an exothermic equilibrium . This means that:

A. equilibration of this gas mixture will be slower at high temperature

B. A mole of N_2O_4will occupy twice the volume of a mole of NO_2 at the same temperature.

C. the equilibrium will move to the right if an equilibrium maxture is cooled

D. the postion of equilibrium will move to the left with increasing gas pressure

Answer: c

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104. Densities of diamond and graphite are $3.5g/mL$ and $2.3g/mL$

$\Delta_r H = -1.9kJ/mol$

Favourable conditions for formation of diamond are:

A. (a) high pressure and low temperature

B. (b) low pressure and high temperature

C. (c) high pressure and high temperature

D. (d) low pressure and low temperature

Answer: d

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105. For an equilibrium $H_2O(s) \Leftrightarrow H_2O(l)$, which of the following statements is ture ?

A. The pressure changes do not affect the equilibrium

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

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

D. Less of ice melts if the pressure on the system is increased.

Answer: b

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106. A pressure cooker reduces cooking time because

A. (a) the higher pressure inside the cooker crushes the food material

B. (b) cooking involves chemical change helped by a rise in temperature

C. (c) heat is more evenly distributed in the cooking space

D. (d) boiling point of water involed in cooking is increased

Answer: d

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107. The vapour pressure of a liquid in a closed container depends upon (1) temperature of liquid (2) quantity of liquid (3) surface area of the liquid

A. 1 only

B. 2 only

C. 1 and 3 only

D. 1,2,and3

Answer: a

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108. The pressure on a sample of water at its triple point is reduced while the temperature is held constant .Which phases changes are favoured?

(1) melting of ice

(2)sublimation of ice

(3) vaporization of liquid water

A. 1 only

B. 3 only

C. 2 only

D. 2 and 3

Answer: d

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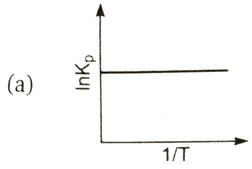
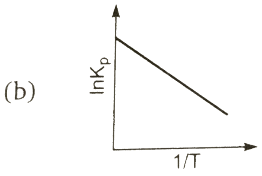
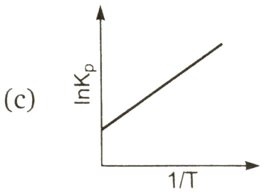
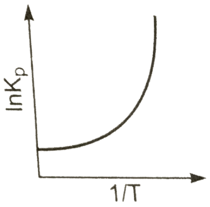
109. An exothermic reaction is represented by the graph :

A. 

B. 

C. 

D. 

Answer: c

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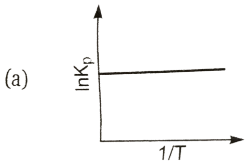
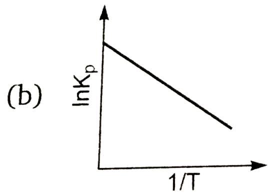
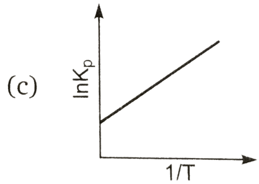
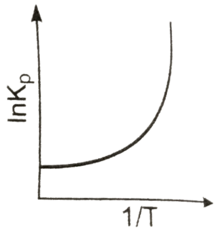
110. An endothermic reaction is represented by the graph :

A. 

B. 

C. 

D. 

Answer: b

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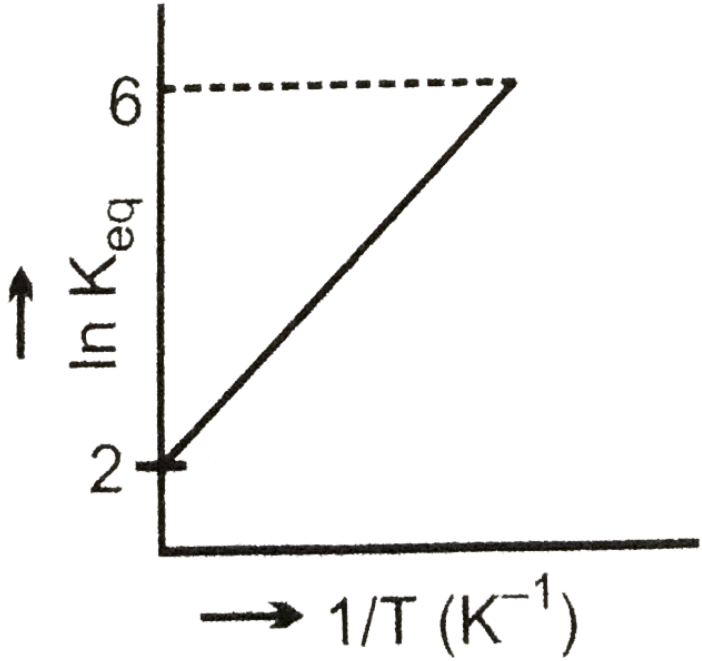
111. A schematic plot of ln K_{eq} versus inverse o ftemperature for a reaction is shown below



the reaction must be:

A. Exothermic

B. Endothermic

C. One with negligible enthalpy change

D. Highly spontaneous at ordinary temperature

Answer: a

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112. The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_c is:

A. $\Delta G^\circ = RTInK$

B. $\Delta G^\circ = -RTInK$

C. $\Delta G = RTInK$

D. $\Delta G = -RTInK$

Answer: b

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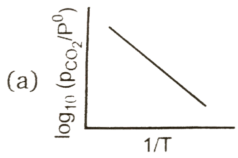
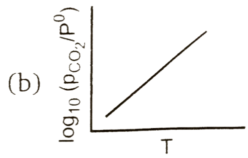
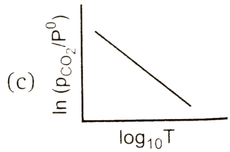
113. For the chemical equilibrium,

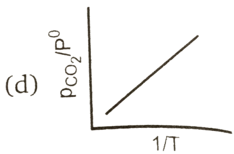
$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$

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

A. 

B. 

C. 

D. 

Answer: a

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114. $K_p$has the value of $10^{-6} atm^3$ and $10^{-4} atm^3$ at 298 K and 323 K respectiely for the reaction

$CuSO_4.3H_2O(s) \Leftrightarrow CuSO_4(s) + 3H_2O(g)$

$\Delta_r H^\circ$ for the reaction is :

A. $7.7KJ/mol$

B. $-147.41KJ/mol$

C. $147.41KJ/mol$

D. none of these

Answer: c

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115. Vant's Hoff's equation shows the effect of temperature on equilibrium constants K_c and K_p .The K_P varies with tempertaure according to the relation:

A. $\log \frac{K_{p2}}{K_{p1}} = \frac{\Delta H^\circ}{2.303R}\left(\frac{T_1 - T_2}{T_1 T_2}\right)$

B. $\log \frac{K_{p2}}{K_{p1}} = \frac{\Delta H^\circ}{2.303R}\left(\frac{T_2 - T_1}{T_1 T_2}\right)$

C. $\log \frac{K_{p2}}{K_{p1}} = \frac{\Delta E^\circ}{2.303R}\left(\frac{T_2 - T_1}{T_1 T_2}\right)$

D. None of these

Answer: b

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116. For a reaction, the value of K_p increases with increase n temperature.

The ΔH for the reaction would be :

A. positive

B. negative

C. zero

D. cannot be predicted

Answer: A

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117. The most stable oxides of nitrogen will be :

A. (a) $2NO_2(g) \Leftrightarrow N_2(g) + 2O_2(g), , K = 6.7 \times 10^{16} molL^{-1}$

B. (b) $2N_2O_5(g) \Leftrightarrow 2N_2(g) + 50_2(g), , K = 1.2 \times 10^{-24} mol^5 L^{-5}$

C. (c) $2NO(g) \Leftrightarrow N_2(g) + O_2(g), , K = 2.2 \times 10^{30}$

D. (d) $2N_2O(g) \Leftrightarrow 2N_2(g) + O_2(g), , K = 3.5 \times 10^{33}, molL^{-1}$

Answer: A

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118. When 1 mole of pure ethyl alcohol (C_2H_5OH) is mixed with 1 mole of acetic acid at $25^\circ C.$ the equilibrium mixture contains $2/3$ mole each of ester and water

$C_2h_5OH(l) + CH_3COOH(l) \Leftrightarrow CH_3COOC_2H_5(l) + H_2O(l)$

The ΔG° for the reaction at $298K$ is :

A. 3435 J

B. 4 J

C. -3435 J

D. zero

Answer: C

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119. The value of ΔG° for a reaction in aqueous phase having $K_c = 1$, would be :

A. $-RT$

B. -1

C. 0

D. $+RT$

Answer: C

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120. A plot of Gibbs energy of a reaction mixture against the exent of the reaftion is :

A. minimum at eqilibrium

B. zero at equilibrium

C. miximum at equilibrium

D. None of these

Answer: A

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121. For the reaction at $300K$

$A(g) \Leftrightarrow V(g) + S(g)$

$\Delta_r H^\circ = -30kJ/mol, \Delta_r S^\circ = -0.1kJK^{-1}.mol^{-1}$

What is the value of equilibrium constant ?

A. 0

B. 1

C. 10

D. None of these

Answer: B

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122. Solid $Ca(HCO_3)_2$ decomposes as

$Ca(HCO_3)_2(s) \Leftrightarrow CaCO_3(s) + CO_2(g) + H_2O(g)$

If the total pressure is 0.2 bat at $420K$, what is the standard free energy change for the given reaction $(\Delta_r G^\circ)$?

A. $840kJ/mol$

B. $3.86kJ/mol$

C. $6.98kJ/mol$

D. $16.083kJ/mol$

Answer: D

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123. The standard free energy change of a reaction is $\Delta G^{\circ} = -115kJ/mol^{-1}$ at $298K$. Calculate the value of $\log_{10} K_p$ $(R = 8.314JK^{-1}mol^{-1})$

A. 20.16

B. 2.303

C. 2.016

D. 13.83

Answer: A

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124. One mole of N_2 (g) is mixed with 2 moles of $H_2(g)$ in a 4 litre vessel If $50\ \%$ of N_2(g) is converted to NH_3(g) by the following reaction :

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

What will the value of K_c for the following equilibrium ?

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

A. 256

B. 16

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

D. None of these

Answer: C

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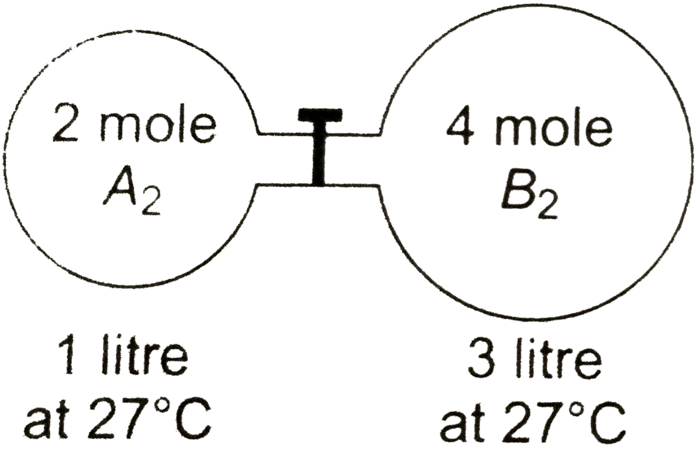

125.

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 concentrartion of AB when equilibrium is established ?

A. 1.33 M

B. 2.66 M

C. 0.66 M

D. 0.33 M

Answer: C

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126. Assume that the decomposition of HNO_3 can be repersented by the following equation

$4HNO_3(g) \Leftrightarrow 4NO_2(g) + 2H_2O(g) + O_2(g)$ and the reaction approaches wquilibrium at $400K$ temperature and 30 atm pressure. At equilibrium partial pressure of HNO_3 is 2 atm

Calculate K_c in $(mol/L - K)$ at $400K$

$(Use: R = 0.08 atm - L/mol - K)$

A. 4

B. 8

C. 16

D. 32

Answer: D

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127. For the equilibrium:

$LiCl.3NH_{3(s)} \Leftrightarrow LiCl.NH_{3(s)} + 2NH_3, K_p = 9atm^2$

at $40^\circ C$. A $5 litre$ vessel contains 0.1 mole of $LiCl.NH_3$. How many mole of NH_3 should be added to the flask at this temperture to derive the backward reaction for completion?

A. 0.2

B. 0.59

C. 0.69

D. 0.79

Answer: D

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128. Solid Ammonium carbamate dissociates as:

$NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$.

In a closed vessel, solid ammonium carbamate is in equilibrium with its dissociation products. At equilibrium, ammonia is added such that the partial pressure of NH_3 at new equilibrium now equals the original total pressure. Calculate the ratio of total pressure at new equilibrium to that of original total pressure.

A. 4

B. 9

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

D. $\frac{2}{9}$

Answer: C

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129. For the reaction $C_2H_6(g) \Leftrightarrow C_2H_4(g) + H_2(g)$

K_p is 5×10^{-2} atm. Calculate the mole per cent of $C_2H_6(g)$ at equilibruium if pure C_2H_6 at 1 atm is passed over a suitable catalyt at $900K$:

A. 20

B. 33.33

C. 66.66

D. None of these

Answer: C

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130. $2NOBr(g) \Leftrightarrow 2NO(g) + Br2(g)$. If nitrosyl bromide (NOBr) 40% dissociated at certain temp. and a total pressure of 0.30 atm K_p for the reaction $2NO(g) + Br_2(g) \Leftrightarrow 2NOBr(g)$ is

A. 45

B. 25

C. 0.022

D. 0.25

Answer: A

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131. Consider the pertial decomposition of A as

$2A(g) \Leftrightarrow 2B(g) + C(g)$ At equilibrium 700mL gaseous mixture contains 100mL of gas C at 10 atm and $300K$ what is the value of K_p for the reaction ?

A. $\frac{40}{7}$

B. $\frac{1}{28}$

C. $\frac{10}{28}$

D. $\frac{28}{10}$

Answer: C

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132. At a certain temperature and 2 atm pressure equilibrium constant (K_p) is 25 for the reaction

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

Initially if we take 2 moles of each of the four gases and 2 moles of inert gas, what would be the equilibrium partial pressure of NO_2?

A. (a) 1.33 atm

B. (b) 0.1665 atm

C. (c) 0.133 atm

D. (d) None of these

Answer: C

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133. 0.020 g of selenium bapour at equilibrium occupying a volume of 2.463 mL at 1 atm and $27^\circ C$. The selenium is in a state of equilibrium according to reaction

$3Se_2(g) \Leftrightarrow Se_6(g)$

What is the degreeo f association of selenium ?

(At.mass of se $= 79$)

A. 0.205

B. 0.315

C. 0.14

D. None of these

Answer: B

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134. Determine the degree of association (polymerization) for the reaction in aqueous solution, if observed (mean) molar mass of HCHO and $C_6H_{12}O_6$ is 150 :

$6HCHO \Leftrightarrow C_6H_{12}O_6$

A. (a) 0.50

B. (b) 0.833

C. (c) 0.90

D. (d) 0.96

Answer: D

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135. A reaction system in equilibrium according to reaction $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$ in one litre vessel at a given temperature was found to be 0.12 mole each of SO_2 and SO_3 and 5 mole of O_2 In another vessel of one litre contains 32 g of SO_2 at the same temperature. What mass of O_2 must be added to this vessel in order that at equilibrium $20\,\%$ of SO_2 is oxidized to SO_3?

A. 0.4125g

B. 11.6 g

C. 1.6 g

D. None of these

Answer: B

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136. The equilibrium constant K_p for the following reaction is 4.5

$N_2O_4(g) \Leftrightarrow 2NO_2(g)$ What would be the average molar mass $(\text{in} g/mol)$ of an equilibrium mixture of N_2O_4 and NO_2 formed by the dissociation of pure N_2O_4 at a total pressure of 2 atm ?

A. 69

B. 57.5

C. 80.5

D. 85.5

Answer: B

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137. A flask containing 0.5 atm pressure of $A_2(g,)$some solid AB added into flask which undergoes dissociation according to $2AB(s) \Leftrightarrow A_2(g) + B_2(g), K_p = 0.06 atm^2$

The total pressure (in atm) at equilibrium is :

A. 0.70

B. 0.6

C. 0.10

D. None of these

Answer: A

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138. A vessel of 250 litre was filled with 0.01 mole of Sb_2S_3 and 0.01 mole of H_2 to attain the equilibrium at $440^\circ C$ as

$Sb_2S_3(s)3H_2(g) \Leftrightarrow 2Sb(s) + 3H_2S(g)$ After equilibrium, the H_2S formed was analysed by dissolved it in water and treating with execess of

Pb^{2+} to give 1.19 g of PbS as precipitate. What is the value of K_c at $440^{\circ} C$?

A. 1

B. 2

C. 4

D. 8

Answer: A

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139. 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. 4×10^{-4}

B. 2×10^{-4}

C. 10^{-4}

D. 8×10^{-4}

Answer: A

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140. The equilibrium constant for the following reaction in aqueous solution is 0.90.

$H_3BO_3 + \text{glycerin} \Leftrightarrow (H_3BO_3 - \text{glycerin})$

How many mole of glycerin should be added per litre of $0.10 M H_3BO_3$ so that 80% of the H_3BO_3 is converted to the boric-acid glycerin complex ?

A. 4.44

B. 4.52

C. 3.6

D. 0.08

Answer: B

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141. Rate of diffucion of ozonized oxygen is $0.4\sqrt{5}$ times that of pure oxygen what is the per cent degreeof association of oxygen assuming pure O_2 in the sample initially ?

A. 20

B. 40

C. 60

D. `None of these

Answer: C

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142. One mole of SO_3 was placed in a two litre vessel at a certain temperature. The following equilibrium was established in the vessel

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

The equilibrium mixture reacts with 0.2 mole $KMnO_4$ in acidic medium. Hence, K_c is :

A. 0.50

B. 0.25

C. 0.125

D. None of these

Answer: C

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143. At $800^\circ C$, the following equilibrium is established as

$F_2(g) \Leftrightarrow 2F(g)$

The cojmpositionof equilibrium may be determinded by measuring the rate of effusion of theh kmixture through a pin hole. It is found that at $800^\circ C$ and 1 atm mixture effuses 1.6 times as fast as SO_2 effuse under the similar conditions. (At. mass of F =19) what is the value of K_p (in atm) ?

A. 0.315

B. 0.685

C. 0.46

D. 1.49

Answer: D

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144. The equilibrium constant for the ionization of RNH_2 (g) in water as

$RNH_2(g) + H_2O(l) \Leftrightarrow RNH_3^+(aq) + OH^-(aq)$

is $8 \times 10^{-6} at 25^\circ C$. find the pH of a solution at equilibrium when pressure of RNH_2(g) is 0.5 bar :

A. ≈ 12.3

B. ≈ 11.3

C. ≈ 11.45

D. None

Answer: B

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145. Calculate $\Delta_r G$ for the reaction at $27^\circ C$

$H_2(g) + 2Ag^+(aq) \Leftrightarrow 2Ag(s) + 2H^+(aq)$

Given : $P_{H2} = 0.5$ bar, $[Ag^+] = 10^{-5}M$,

$[H^+] = 10^{-3}M$, $\Delta_r G^\circ [Ag^+(aq)] = 77.1kJ/mol$

A. $-154.2kJ/mol$

B. $-178.9kJ/mol$

C. $-129.5kJ/mol$

D. None of these

Answer: C

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146. When N_2O_5 is heated at certain temperature, it dissociates as $N_2O_5(g) \Leftrightarrow N_2O_3(g) + O_2(g), K_c = 2.5$ At the same time N_2O_3 also decomposes as :

$N_2O_3(g) \Leftrightarrow N_2O(g) + O_2(g)$. "If initially" 4.0 moles of N_2O_5 "are taken in" 1.0 litre flask and alowed to dissociate. Concentration of O_2 at equilibrium is 2.5 M. "Equilibrium concentratio of " N_2O_5 is :

A. (a) 1.0 M

B. (b) 1.5M

C. (c) $2.166M$

D. (d) 1.846 M

Answer: D

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147. 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. (a) 4.5atm

B. (b) 0.45 atm

C. (c) 0.6 atm

D. (d) None of these

Answer: B

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148. For a gaseous reaction

$aA(g) + bB(g) \Leftrightarrow cC(g) + dD(g)$

equilibrium constants K_c, K_p and K_x are represented by the following reation

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, K_p = \frac{Pc^c.\,P_D^d}{P_A^a} \text{ and } Kx = \frac{x_C^c.\,x_D^d}{x_A^a.\,x_B^b}$$

where $[A]$ represents molar concentrationof A, p_A represents partial pressure of A and P represents total pressure, x_A represents mole fraction of A

For the reaction $SO_2Cl_2(g) \Leftrightarrow SO_2(g) + Cl_2(g), K_p > K_x$ is obtained at :

A. 0.5 atm

B. 0.8 atm

C. 1 atm

D. 2atm

Answer: D

Watch Video Solution

149. For a gaseous reaction

$aA(g) + bB(g) \Leftrightarrow cC(g) + dD(g)$

equilibrium constants K_c, K_p and K_x are represented by the following reation

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, K_p = \frac{Pc^c.\ P_D^d}{P_A^a} \text{ and } Kx = \frac{x_C^c.\ x_D^d}{x_A^a.\ x_B^b}$$

where $[A]$ represents molar concentrationof A, p_A represents partial pressure of A and P represents total pressure, x_A represents mole fraction of For the following equilibrium relation betwen K_c and K_c (in terms of mole fraction) is

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

A. $K_c = K_x(RT)^{-1}$

B. $K_c = K_x(RT)$

C. $K_c = K_x\left(\frac{RT}{P}\right)$

D. $K_c = K_x\left(\frac{P}{RT}\right)$

Answer: C

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150. Variation of equilibrium constan K with temperature is given by van't Hoff equation

$$InK = \frac{\Delta_r S^\circ}{R} - \frac{\Delta_r H^\circ}{RT}$$

for this equation, $(\Delta_r H^\circ)$ can be evaluated if equilibrium constants K_1 and K_2 at two temperature T_1 and T_2 are known.

$$\log\left(\frac{K_2}{K_1}\right) = \frac{\Delta_r H^\circ}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

For an isomerization $X(g) \Leftrightarrow Y(g)$ the temperature dependency of equilibrium constant is given by :

$$\ln K = 2 - \frac{1000}{T}$$

The value of $\Delta_r S^\circ$ at $300K$ is :

A. 2 R

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

C. 1000 R

D. None of these

Answer: A

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151. Variation of equilibrium constan K with temperature is given by van't Hoff equation

$$InK = \frac{\Delta_r S^\circ}{R} - \frac{\Delta_r H^\circ}{RT}$$

for this equation, $(\Delta_r H^\circ)$ can be evaluated if equilibrium constans K_1 and K_2 at two temperature T_1 and T_2 are known.

$$\log\left(\frac{K_2}{K_1}\right) = \frac{\Delta_r H^\circ}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Select the correct statement :

A. Value of K_{eq} always increases with increasing temperature

B. For expthermic reaction of value of K_{eq} increases with decreasing in temperature

C. For endothermic reaction value of K_{eq} increases with decreasihng in temperature

D. For exothermic reactionslope is $(\log KVs.1/T)$ negative

Answer: B

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152. Variation of equilibrium constan K with temperature is given by van't Hoff equation

$$InK = \frac{\Delta_r S^\circ}{R} - \frac{\Delta_r H^\circ}{RT}$$

for this equation, $(\Delta_r H^\circ)$ can be evaluated if equilibrium constans K_1 and K_2 at two temperature T_1 and T_2 are known.

$$\log\left(\frac{K_2}{K_1}\right) = \frac{\Delta_r H^\circ}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Variation of $\log_{10}$ K with $\frac{1}{T}$ is shown by the following graph in which straight line is at 45° hence ΔH° is :

A. $-4.606 kJ/mol$

B. $-19.147 kJ/mol$

C. $-8.314 kJ/mol$

D. $-10 kJ/mol$

Answer: B

Watch Video Solution

153. Variation of equilibrium constan K with temperature is given by van't Hoff equation

$$InK = \frac{\Delta_r S^\circ}{R} - \frac{\Delta_r H^\circ}{RT}$$

for this equation, $(\Delta_r H^\circ)$ can be evaluated if equilibrium constants K_1 and K_2 at two temperature T_1 and T_2 are known.

$\log\left(\frac{K_2}{K_1}\right) = \frac{\Delta_r H^\circ}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$ The equilibrium constant Kp for the following reaction is 1 at $27^\circ C$ and 4 at $47^\circ C$.

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

For the reaction calculate enthalpy change for the

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

$(Given: R = 2cal/mol - K)$

A. $-13.31Kcal/mol$

B. $13.31Kcal/mol$

C. $-19.2Kcal/mol$

D. $-55.63Kcal/mol$

Answer: A

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154. N_2O_3 is an unstable oxide of nitrogen and it decomposes into NO (g) and $NO_2(g)$where $NO_2(g)$ is further dimerise dimerise into N_2O_4 as

$N_2O_3(g) \Leftrightarrow NO_2(g) + NO(g) \quad , K_{p_1=2.5}$ bar

$2NO_2(g) \Leftrightarrow N_2O_4(g) \quad : K_{P2}$

A flask is initially filled with pure $N_2O_3(g)$ having pressure 2 bar and equilibria was established.

At equilibrium partial pressure of NO (g) was found to be 1.5 ber.

The equilibrium partiaal pressure of $N_2O_3(g)$ is :

A. 0.5bar

B. 1.0 bar

C. 1.5 bar

D. 0.1 bar

Answer: A

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155. N_2O_3 is an unstable oxide of nitrogen and it decomposes into NO (g) and $NO_2(g)$where $NO_2(g)$ is further dimerise dimerise into N_2O_4 as

$N_2O_3(g) \Leftrightarrow NO_2(g) + NO(g) \quad , K_{p_1=2.5}$ bar

$2NO_2(g) \Leftrightarrow N_2O_4(g) \quad : K_{P2}$

A flask is initially filled with pure $N_2O_3(g)$ having pressure 2 bar and equilibria was established.

At equilibrium partial pressure of NO (g) was found to be 1.5 ber.

The equilibrium partial presure of $NO_2(g)$ is:

A. 0.066bar

B. 0.133 bar

C. 0.423 bar

D. 0.83 bar

Answer: D

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156. N_2O_3 is an unstable oxide of nitrogen and it decomposes into NO (g) and $NO_2(g)$where $NO_2(g)$ is further dimerise dimerise into N_2O_4 as

$N_2O_3(g) \Leftrightarrow NO_2(g) + NO(g) \quad , K_{p_1=2.5}$ bar

$2NO_2(g) \Leftrightarrow N_2O_4(g) \quad : K_{P2}$

A flask is initially filled with pure $N_2O_3(g)$ having pressure 2 bar and equilibria was established.

At equilibrium partial pressure of NO (g) was found to be 1.5 ber.

The value of K_{P2} is

A. 0.16bar^{-1}

B. 0.32bar^{-1}

C. 0.48bar^{-1}

D. 0.64bar^{-1}

Answer: C

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157. A gas $X(g)$ is when dissolved in water heat is evolved. Then solubility of X' will increase :

A. high temperature, low pressure

B. low temperature, high pressure

C. high temperature, high pressure

D. low temperature, high pressure

Answer: B

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158. $Fe(l) \Leftrightarrow Fe(s)$

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: A

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159. For the reaction

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

If pressure id increased by reducing the volume of the container then :

A. total pressure at equilibrium will remain same

B. concentration of all the component at equilibrium will change

C. concentration of all the component at equilibrium will ramin same

D. equilibrium will shift in the beckward direction

Answer: B

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160. Which of the following is correct about the chemical equilibrium ?

A. $(\Delta G)_{T,p} = 0$

B. Equilibrium constant is independent of initial concentration of reactants

C. Catalyst has no effect on equilibrium state

D. Reaction stops at equilibrium

Answer: A,B,C

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161. For the reaction

$AB_2(g) \Leftrightarrow AB(g) + B(g)$

If $\propto$ is negligiable w.r.t 1 then degree of dissociaation ($\propto$) of AB_2 is proportional to :

A. $\dfrac{1}{P}$

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

C. $\frac{1}{\sqrt{P}}$

D. $\sqrt{V}$

Answer: C,D

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162. Consider the reaction given below. In which cases will the reaction proceed toward right by increasing the pressure ?

A. $4HCl(g) + O_2(g) \rightarrow 2Cl_2(g) + 2H_2O(g)$

B. $Cl_2(g) + H_2O(g) \rightarrow 2HCl(g) + \frac{1}{2}O_2(g)$

C. $CO_2(g) + 4H_2(g) \rightarrow CH_4(g) + 2H_2O(g)$

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

Answer: A,C

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163. Ammonia is a weak base that reacts with water according to the equation

$NH_3(aq) + H_2O(l) \Leftrightarrow NH_4^+(aq) + OH^-(aq)$

Select the correct option (s) that can increase the moles of ammonium ion in water:

A. Addition of HCl

B. Addition of NaOH

C. Additon of NH_4Cl

D. Addition of H_2O

Answer: D

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164. Consider the reaction $2CO(g) + O_2(g) \Leftrightarrow 2CO_2(g) + Heat$

Under what conditions shift is undeterminable ?

A. Addition of O_2 and decrease in volume

B. Addition of CO and removal of CO_2 at constant volume

C. Increase in temperature and decrease in volume

D. Addition of CO and increase in temperature at constant volume

Answer: C,D

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165. What will be the effect of addition of catalyst at constant temperature ?

A. The equilibrium constant will remain constant

B. ΔH of the reaction will remain constant

C. K_f and K_b wil increase upto same extent

D. equilibrium composition will change

Answer: A,B,C

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166. For the reaction $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g),$ the forward reaction at constant temperature favorrd by :

A. introducing an inert gas at constant volume

B. introducing chlorine gas at constant volume

C. introducing an inert gas at constant pressure

D. increasing the volume of the container

Answer: C,D

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167. For the reaction : $ClF_2(g) + 3F_2(g) \Leftrightarrow 2ClF_3(g), \Delta H = -329kJ,$ dissociation of $ClF_3(g)$ will be favourate by :

A. increasing the temperature

B. increasing the volume of the container

C. adding of F_2 gas

D. adding of inert gas at constant pressure

Answer: A,B,D

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168. Increase in the presssure for the following equilibrium results in the :

$H_2O(l) \Leftrightarrow H_2O(g)$

Equilibrium will shift left

A. formation of more H_2O (l)

B. formation of more $H_2O(g)$

C. increase in b.p of $H_2O(l)$

D. decrease in b.p. of $H_2O(l)$

Answer: A,C

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169. Heating a II group metal carbonate leads to decomposition as :

$BaCO_3(s) \Leftrightarrow BaO(s) + CO_2(g)$

Equilibrium will shift left

A. by addition of BaO (s)

B. by addition of $CO_2(g)$

C. by decreasing the temperature

D. by decreasing the volume of the vessel

Answer: B,C,D

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170. $N_2(g)$ and $H_2(g)$ are allowed to react in a closed vessel at given temp. and pressure for the formation of $NH_3(g)$, $[N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) + 22.4kcal]$ If He (g) is added at equilibrium at constant pressure than which is/are correct ?

A. Concentration of $N_2(g)$, $H_2(g)$ and $NH_3(g)$ decrease.

B. Moles of $NH_3(g)$ decreases.

C. The extent of cooling depends on amount of he (g) added.

D. Concentration of N_2 and H_2 increases and concentration of NH_3 decreases.

Answer: D

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171. Match the following columns

Column-I	Column-II
(A) $3O_2(g) \rightleftharpoons 2O_3(g)$	(P) no unit
(B) $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$	(Q) $atm^{-1/2}$
(C) $2HF(g) \rightleftharpoons H_2(g) + F_2(g)$	(R) atm^{-1}
(D) $CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$	(S) atm^{-2}

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172. Match the following columns

Column-I (Reaction)	Column-II (If α is negligiable w.r.t. 1)
(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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173. Match the following columns

Column-I	Column-II
(A) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g); \Delta H = -ve$	(P) K increases with increase in temperature
(B) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g); \Delta H = +ve$	(Q) K decreases with increase in temperature
(C) $A(g) + B(g) \rightleftharpoons 2C(g) + D(g); \Delta H = +ve$	(R) Pressure has no effect
(D) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g); \Delta H = +ve$	(S) Moles of product increase due to addition of inert gas at constant pressure

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174. Match the following columns

Column-I	Column-II
(A) $\frac{K_{10+T°C}}{K_{T°C}} = 2$	(P) Endothermic
(B) $\frac{K_{10+T°C}}{K_{T°C}} = \frac{1}{2}$	(Q) Not affected by pressure
(C) $A(g) + B(g) \rightleftharpoons C(g)$	(R) Exothermic
(D) $X(s) + Y(g) \rightleftharpoons Z(g)$	(S) Affected by volume

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175. Match the following

Column-I	Column-II
(A) Pressure increased in $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$	(P) Equilibrium shifted in forward direction
(B) Pressure increased in $CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$	(Q) Equilibrium shifted in backward direction
(C) Temp. increased and pressure increased $3O_2(g) \rightleftharpoons 2O_3(g)$; $\Delta H = 285$ kJ	(R) Equilibrium remains unaffected
(D) Pressure decreased and moles of N_2 increased $N_2(g) + 2O_2(g) \rightleftharpoons 2NO_2(g)$; $\Delta H = 66.4$ kJ	(S) Theoretically we cannot predict

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