CHEMISTRY

BOOKS - NARENDRA AWASTHI

CHEMICAL EQUILIBRIUM

Exercise

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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2. The equilibrium constant K_c for the reaction $P_{4(g)} \Leftrightarrow 2P_{2(g)}$ is 1.4 at 400° C. Suppose that 3 moles of $P_{4(g)}$ and 2 moles of $P_{2(g)}$ are mixed in 2 litre container at 400° 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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3. 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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4. 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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5. Consider the reaction $2SO_{2(g)} + O_2(g) \leftrightarrow 2SO_{3(g)}$ for which $K_c = 278M^{-1}0.001$ mole of cash of the reagents $SO_{2(g)}$, $O_2(g)$ and $SO_3(g)$ are mixed in a 1.0l flask. Determine the reaction quotient of the system and the spontaneous 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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6. 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 in 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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7. For the reaction $A_{(g)} + 3B_{(g)} \Leftrightarrow 2C_{(g)}$ at $27^{\circ} C$.2 mole of A, 4 moles of B and 6 moles of C are present in 2 lit 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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8. 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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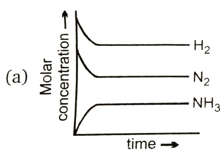
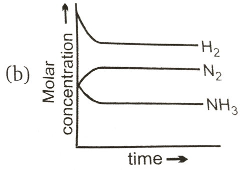
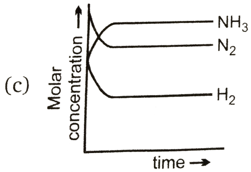
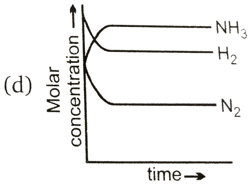
9. For the synthesis of ammonia by the reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ in the Haber's process ,the attainment of equilibrium is correctly predicated by the curve

A. 

B. 

C. 

D. 

Answer: a

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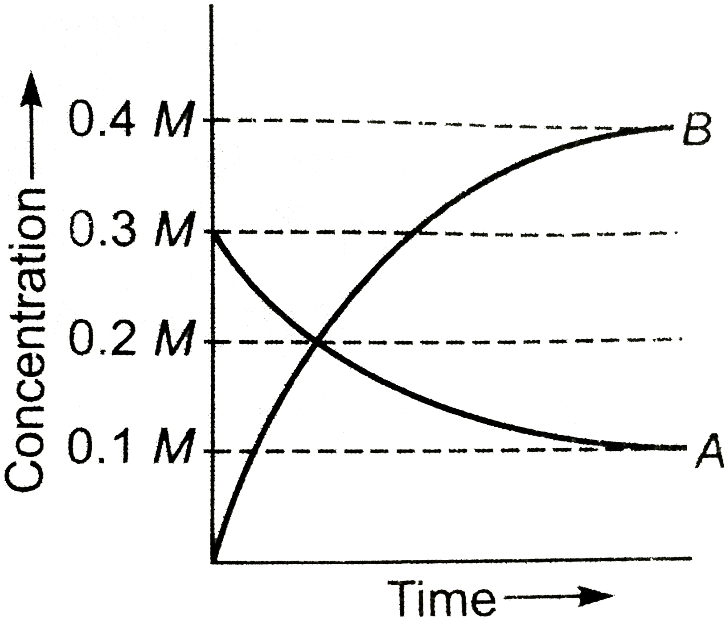
10. The figure shows the change in concentration of species A and B as a function of time.

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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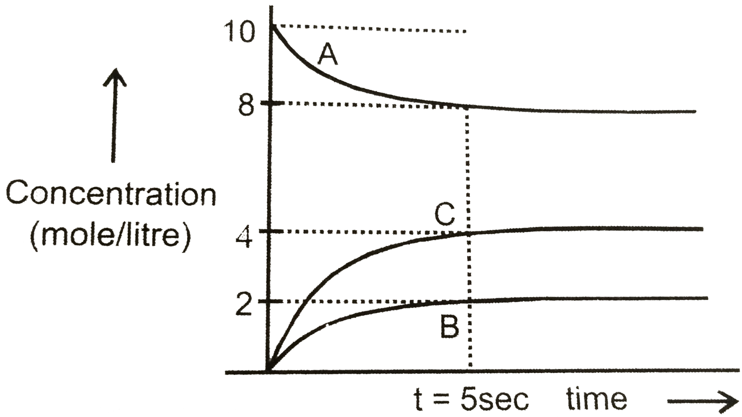
11. Attainment of the equilibrium $A(g) \Leftrightarrow 2C(g) + B(g)$gave the following graph . Find the correct option .(% dissociation=Fration dissoiated $\times$ 100)



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 % dissciation 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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12. 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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13. What is the unit of K_p for the reaction ?

$CS_2(g) + 4H_4(g) \Leftrightarrow CH_4(g) + 2H_2S(g)$

A. atm

B. atm^{-2}

C. atm^{2}

D. atm^{-1}

Answer: b

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14. 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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15. 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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16. 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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17. 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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18. 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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19. 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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20. 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 partial pressure is measured in atmosphers . 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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21. For the reaction $CO_{(g)} + Cl_{2(g)} \Leftrightarrow COCl_{2(g)}. The K_p / K_c$ is equal to

A. $\sqrt{RT}$

B. RT

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

D. 1.0

Answer: b

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22. Why the concentrations of pure liquids and pure solids are ignored from equilibrium constant expressions?

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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23. A catalyst

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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24. What is the effect of temperature on a system at equilibrium?

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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25. The equilibrium constant for the reaction $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$ is 4×10^{-4} at 200K. In presence of a catalyste, equilibrium is attaincd ten times faster. Therefore, the equilibrium constant in the presence of the catalyst at 200K 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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26. 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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27. For the following three reactions a, b and c equilibrium constant are given

a) $CO_{(g)} + H_2O_{(g)} \leftrightarrow CO_{2(g)} + H_{2(g)}, K_1$

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

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

Which of the following relations is correct?

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

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

C. $K_3 = K_1K_2$

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

Answer: d

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28. 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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29. 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. 2×10^{-17}

B. 2.5×10^{33}

C. 5×10^{16}

D. none of these

Answer: d

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30. 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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31. 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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32. In the reaction $X_{(g)} + Y_{(g)} \Leftrightarrow 2Z_{(g)}$, 2 moles of X, I mole of Y and I mole of Z are placed in a 10 lit 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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33. An equilibrium mixture for the reaction, $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$ has 1 mole of H_2S, 0.2 mole of H_2 and 0.8 mole of S_2 in 2 L flask . The value of K_C in mol L^{-1} is

A. 0.0004

B. 0.008

C. 0.016

D. 0.160

Answer: c

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34. Given

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

for the following reaction at 900°C at eq.Calculate the equilibrium

constant (K_c).

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

A. 0.0120

B. 0.0980

C. 0.280

D. 0.120

Answer: c

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35. The equilibrium constant for the following reaction is 10.5 at 500 K .A

system 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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36. 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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37. 9.2 g of $N_2O_{4(g)}$ is taken in 1 lit vessel and heated . At equilibrium , 50 % is dissociated . Equilibrium constant (mol/lit) [MW = 92]

A. 0.1

B. 0.4

C. 0.2

D. 2

Answer: c

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

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

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

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

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

Answer: d

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39. 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 $SiCl_2.2H_2O(s)$?

A. 0.001torr0

B. 10^3 torr`

C. 0.76torr

D. $1.31 \rightarrow rr$

Answer: c

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40.

$CuSO_4.5H_2O_{(g)} \Leftrightarrow CuSO_4, 3H_2O_{(s)} + 2H_2O_{(g)}, K_p = 4 \times 10^{-4} atm^2$

. If the vapour pressure of wateris 38 torr then percentage of relative humidity is: (Assume all data at constant temperature)

A. 4

B. 10

C. 40

D. none of these

Answer: c

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

The equilibrium pressure at $25^\circ C$ is 0.660 atm . What is K_p for the reaction ?

A. 0.109

B. 0.218

C. 1.89

D. 2.18

Answer: a

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42. for the reaction $2A_{(g)} \Leftrightarrow B_{(g)} + 3C_{(g)}$, at a given temperature, K_c = 16. What must be the volume of the falsk, If a mixture of 2 mole cach A, B and C exist in equilibrium ?

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

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

C. 1

D. none of these

Answer: b

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

$CH_2OH_{(l)} + CH_3COOH_{(l)} \leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$

The ΔG° for the reaction at 298 K is:

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

B. 2

C. 3

D. 4

Answer: a

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44. $I_{2(aq)} + I^-_{(aq)} \Leftrightarrow I^-_{3(aq)}$. We started with I mole of I_2 and 0.5 mole of l^- in one litre flask. After equilibrium is reached, excess of $AgNO_2$ gave 0.25 mole of yellow precipitate. Equilibrium constant is

A. 1.33

B. 2.66

C. 2.0

D. 3.0

Answer: a

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

$H_2(g) + S(s) \Leftrightarrow H_2S(g), K_p = 7 \times 10^{-2}$

If 0.50 mole of hydrogen and 1.0 mole of sulphur are heated to $87^\circ C$ in 1.0 L vessel, what will be the partial pressure of H_2S at equilibrium?

A. $0.11M$

B. $0.022M$

C. $0.044M$

D. $0.08M$

Answer: a

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46. For the equilibrium $2SO_3(g) \leftrightarrow 2SO_2(g) + O_2(g)$ the partial pressure SO_3, SO_2 and O_2 gases , at 650 K are respectively 0.3 bar ,0.6 bar and 0.4 bar. IF the moles of both the oxides of sulphur are so adjusted as equal, what will be the partial pressure of O_2.

A. $0.4 atm$

B. $1.0 atm$

C. $0.8 atm$

D. $0.25 atm$

Answer: a

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47. Peqfor $NH_4COONH_{2(s)} \leftrightarrow 2NH_{3(g)} + CO_{2(g)}$ at certain temperature is 0.9 atm. Then, partial pressure of Ammonia at equilibrium (in atm)

A. 0.128

B. 0.426

C. 4.76×10^{-3}

D. none of these

Answer: c

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48. 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 casuse 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

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49. For the reaction $A + B \Leftrightarrow C + D$, the concentrations of A and B are equal . The equilibrium concentration of C is twice that of A . K_C of the reaction is

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

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

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

D. 4

Answer: d

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50. The equilibrium constant K_c for the $SO_{2(g)} + NO_{2(g)} \Leftrightarrow SO_{3(g)} + NO_{(g)}$ reaction is 16. if 1 mole of each of all the four gases is taken in ldm^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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51. Discuss the effect of temperature on the rate of a reaction.

A. always increases

B. always decreases

C. first increases and then decreases

D. may increase or decrease depending upon the nature of the reaction

Answer: a

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52. A: A catalyst increases the rate of a reaction.

R: In presence of a catalyst, the activation energy of the reaction increases.

A. increasing the actvation energy of a reaction

B. increasing the value of rataaaea constant $(K_f \text{ and } K_b)$

C. increasing the enthalpy change of the reaction

D. decreasing the enthalpy change of the reaction

Answer: b

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53. 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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54. The equilibrium constant for the reaction ,

$H_2(g) + CO_2(g) \Leftrightarrow H_2O(g) + CO(g)$ is 16 at $1000^\circ C$. If 1.0 mole of H_2

and 1.0 mole of CO_2 are placed in one litre flask , the final equilibrium concentration of CO at $1000^{\circ} C$ is

A. 0.533

B. 0.0534

C. 0.535

D. none of these

Answer: b

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55. A1 273 K and I atm, I Lof $N_2O_{4(g)}$ decomposes to $NO_{2(g)}$ as given, $N_2O_{4(g)} 2NO_{2(g)}$, At equilibrium . original volume is 25% lessthan the exisiting volume percentage decomposition of $N_2O_{4(g)}$ is thus,

A. 0.25

B. 0.33

C. 0.66

D. 0.5

Answer: b

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56. 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 I lit container already containing 3 moles of each of CO and H_2O to make 2M equilibrium concentration of CO ?

A. 15

B. 19

C. 5

D. 20

Answer: b

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57. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ for the reaction initially 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 partial pressure of NH_3 at equilibrium is

A. $4.5atm$

B. 3.0atm

C. 2.0atm`

D. $1.5atm$

Answer: b

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58. Ammonia under a pressure of 1.5 atm at 27°C is heated to 374°C in a closed vessel in the presence of a catalyst. Under the conditions, NH_3 is partially decomposed according to the equation. $2NH_3 \Leftrightarrow N_2 + 3H_2$ the vessel is such that the volume remains etfectively constant where as pressure increases to 50 atm. Calculate the percentage of NH_3 actually decomposed

A. 65%

B. 61.3%

C. 62.5%

D. 64%

Answer: b

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59. 0.1 mole of $N_2O_4(g)$ was sealed in a tube under one atmospheric conditions at $25^\circ C$ Calculate the number of moles of $NO_2(g)$ preesent , if the equilibrium $N_2O_4(g) \Leftrightarrow 2NO_2(g)(K_P = 0.14)$ is reached after some time :

A. 1.8×10^2

B. 2.8×10^2

C. 0.034

D. 2.8×10^{-2}

Answer: c

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

A. $0.52atm$

B. $0.21tm$

C. 0.41aatm

D. $0.82atm$

Answer: c

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61. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ for the reaction initially 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 partial 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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62. 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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63. At certain temperature compound $AB_2(g)$ dissociates accoring to the reacation

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

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. $p\frac{\alpha^3}{2}$

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

C. $P\frac{\alpha^3}{3}$

D. $\frac{P\alpha^2}{2}$

Answer: a

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64. At a given temperature, Ke is 4 for the reaction $H_{2(g)} + CO_{2(g)} \Leftrightarrow H_2O_{(g)} + CO_{(g)}$. Initially 0.6 moles each of H_2 and CO_2 are taken in 1lit flask. The equilibrium concentration of $H_2O_{(g)}$ is

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

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

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

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

Answer: a

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

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

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

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

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

Answer: c

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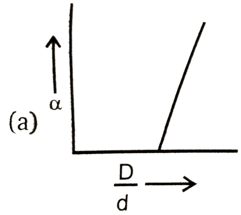
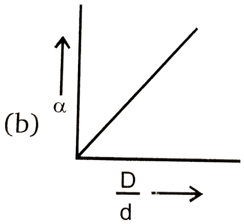
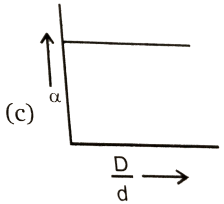
66. For the dissociation of PCI_5 into PCI_3 and Cl_2 in gaseous phase reaction, If "d' is the observed vapour density and 'D' theoretical vapour density with $'\alpha'$ as degree of dissociation. Variation of $\dfrac{D}{d}$ with $'\alpha'$ is given by which graph?

A. 

B. 

C. 

D. none of these

Answer: a

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67. 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. $3.11 g / litre$

B. $2.11 g / litre$

C. $4.5 g / litre$

D. none of these

Answer: a

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68. $COCl_2$ 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

Answer: c

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69. The degree of dissociation of I_2 molecule 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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70. 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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71. At $87^\circ C$, the following equilibrium is established

$H_2(g) + S(s) \Leftrightarrow H_2S(g), K_p = 7 \times 10^{-2}$

If 0.50 mole of hydrogen and 1.0 mole of sulphur are heated to $87^{\circ} C$ in 1.0 L vessel, what will be the partial pressure of H_2S at equilibrium?

A. 0.966 atm

B. 1.38 atm

C. 0.0327 atm

D. 1atm

Answer: a

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72. Pure PCl_5 is introduced into an evacuated chamber and to equilibrium at $247^{\circ} C$ and 2.0 atm .The equilibrium gases mixure 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. 0.625 atm

B. $4atm$

C. $1.6atm$

D. none of these

Answer: c

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73. For the reaction $SnO_{2(s)} + 2H_{2(g)} \Leftrightarrow 2H_2O_{(g)} + Sn_{(d)}$. Calculate K_p at 900K, where the equilibrium steam hydrogen mixture was 45% H_2 by volume.

A. 1.49

B. 1.22

C. 0.67

D. none of these

Answer: a

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74. For the reaction

$XCO_3 \Leftrightarrow XO(s) + CO_2(g), K_p = 1.642 atm \quad at 727^\circ C$ If 4 moles of XCo

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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75. $Fe_2O_3(s)$ 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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76. $AB_3(g)$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 (g)` is dissociated?

A. 10%

B. 20%

C. 25%

D. 30%

Answer: c

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77. 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. 0.01

B. 0.02

C. 0.04

D. none of these

Answer: b

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78. pure nitrosyl chloride (NOCl) gas was heated to $240^\circ C$ in a 1.0L 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. $1.02atm$

B. 16.875×10^{-3}atm

C. 16×10^{-2}atm

D. none of these

Answer: b

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79. 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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80. At $200^{\circ} CPCl_5$ dissociates as follow , $PCl_{s(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$. It was found that the equilibrium vapour. are 62 times as heavy as hydrogen. The degree of dissociation of PCl_5 at 200° C is nearly.

A. 10%

B. 42%

C. 50%

D. $68\ \%$

Answer: d

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

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

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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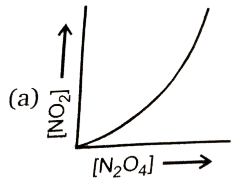
82. Consider the following equilibrium

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

Then the select the correct graph , which shows the variation in concentratins of N_2O_4 Against concentrations of NO `:

A.



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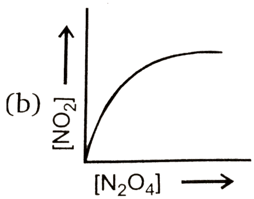

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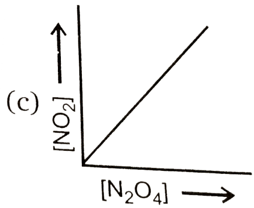
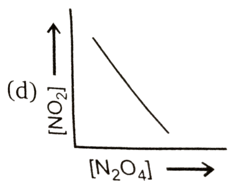


D.



Answer: b

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83. 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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84. Calculate the equilibrium constant (K_c) for the reaction given below , if at equilibrium maxture 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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85. 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 dissocition of A(g) and X(g) be same then the toal pressure at equilibrium

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

A. $3 : 1$

B. $36:1$

C. $1:1$

D. $0.5:1$

Answer: b

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86. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$. If some HCl gas is passed into the reaction mixture at the equilibrium of this R reaction,

A. more $NH_3$is produced

B. Less $NH_3(g)$ is produced

C. No affect on the equilibrium

D. K_p of the reaction is decreased

Answer: b

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87. 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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88. For the reaction

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

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

A. volume is increased

B. volume is decreased

C. argon gas is added at constant volume

D. NH_3 Is removed

Answer: a

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89. 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 equilbrium is re-establised.

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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90. Some inert gas is added at constant volume to the following reaction at equilibrium. $NH_4H_{5(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$ predict the effect of adding the inert gas.

A. The equilibrium shifts in the forward dircetion

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

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

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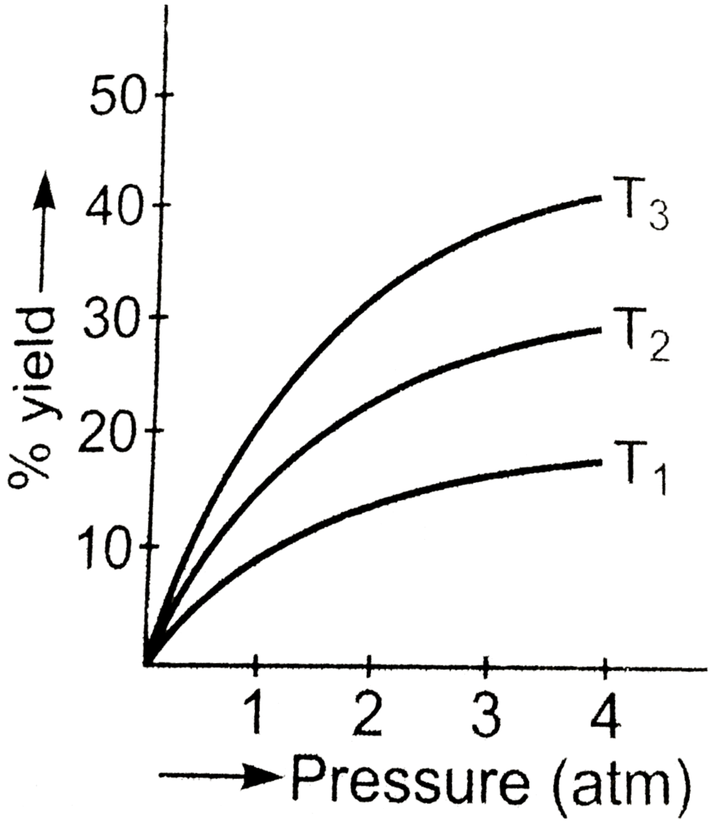
92. The prepation of $SO_3(g)$ by reaction $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$ is an exothermic reaction .If the preparation follows the following temperature -pressure relationship for % yield , then for temperatures

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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93. In a vessel containing N_2, H_2 and NH_3 at equilibrium , some helium gas is introduced do that total pressure increase while temperature and volume ramain 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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94. 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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95. Consider the following reactions .In which case the formation of product is favoured by decreasing 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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96. 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. A)$1, 2$

B. B) 2 only

C. C)1,2,3

D. D) 3,4

Answer: d

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97. For which of the following reactions 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)hArr2O_(3)(g),DeltaH^(@)=285KJ`

Answer: b

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98. For which of the following reactions 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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99. Which of the following reactions will get affected by increasing the pressure? Also mention whether chasnge will cause the reaction to go into forward or backward direction.

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

(ii) $CH_4(g) + 2S_2(g) \Leftrightarrow CS_2(g) + 2H_2S(g)$

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

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

A. $2, 3$

B. 1,4

C. 2,4

D. 2,3,4

Answer: a

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100. 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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101. Consider the following reaction and determine which of the 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. adding a catalyst

D. none of above is correct

Answer: d

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102. 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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103. 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 an increases in the total pressure caused by a decreases in volume have on the equlibrium?

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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104. The concentration of $2NO_2(g) \Leftrightarrow N_2O_4(g)$ is an exothermic equilibrioum . 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?

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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105. For a physical equilibrium, H_2 O (Ice) $\Leftrightarrow$ H_2 O (Water) which of the following is the true statement:

A. The pressure changes do not affect the equilibrium

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

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

D. The pressure changes may increase may increase or decrease the degree of advancement of the process

Answer: b

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106. Assertion: A pressure cooker reduces cooking time

Reason: The boiling point of water inside the cooker is increased

A. the higher pressure inside the cooker crushes the food material

B. cooking involes chemical change helped by a rise I teperature

C. heat is more evenly dissributed in the cooking space

D. boiling point of water involed in cooking is increased

Answer: d

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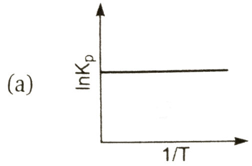
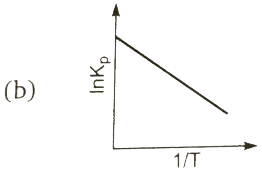
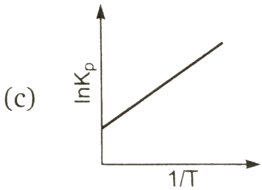
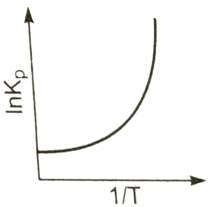
107. In exothermic reaction

A. 

B. 

C. 

D. 

Answer: c

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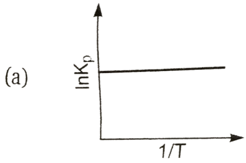
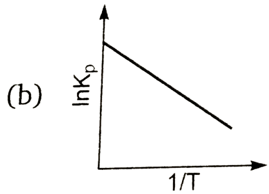
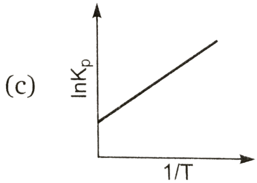
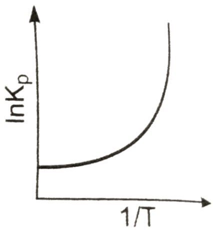
108. In which of the following plots, an endothermic reaction if correctly represented?

A. 

B. 

C. 

D. 

Answer: b

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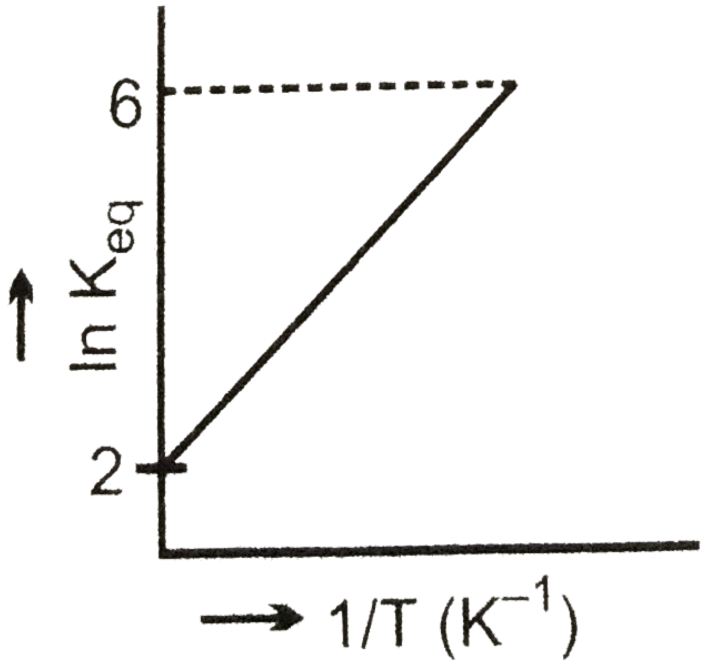
109. A schematic plot of ln K_{eq} versus inverse of temperature for a reaction is shown below



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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110. The correct realtionship 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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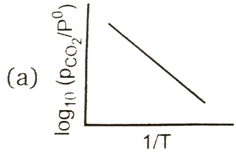
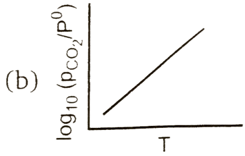
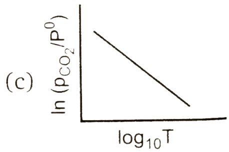
111. For the chemical equilibrium,

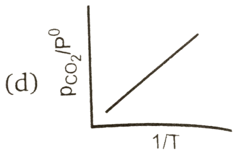
$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$

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

A. 

B. 

C. 

D. 

Answer: a

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112. 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

Watch Video Solution

113. Van'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 realation:

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.

D.

Answer: b

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114. For a reaction, the value of K_p increases with increase in temperature . The Delta H for the reaction would be

A. positive

B. negative

C. zero

D. cannot be prediacted

Answer: A

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115. The most stable oxides of nitrogen will be :

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

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

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

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

Answer: A

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

$CH_2OH_{(l)} + CH_3COOH_{(l)} \leftrightarrow CH_3COOC_2H_{5(l)} + H_2O_{(l)}$

The ΔG° for the reaction at 298 K is:

A. 3435 J

B. 4 J

C. -3435 J

D. zero

Answer: C

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117. What must be true of value of ΔG° for a reaction if

$K = 1$

A. $-RT$

B. -1

C. 0

D. $+RT$

Answer: C

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118. A plot of Gibbs energy of a reaction mixture against the extent of the reaction is :

A. minimum at eqilibrium

B. zero at equilibrium

C. miximum at equilibrium

D. None of these

Answer: A

Watch Video Solution

119. For the reaction at 300 K $A_{(g)} \leftrightarrow V_{(g)} + S_{(g)}$. $\Delta_t H^\circ = -30\text{KJ/mol}\,\Delta_t S^\circ = -0.1 K.J.K^{-1}.\text{mole}^{-1}$ What Is the value of equilibrium constant ?

A. 0

B. 1

C. 10

D. None of these

Answer: B

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120. 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 bar 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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121. The standard free energy change of a reaction is $\Delta G^{\circ} = -115 kJ / mol^{-1}$ at $298K$. Calculate the value of $\log_{10} K_p$ $(R = 8.314 JK^{-1} mol^{-1})$

A. 20.16

B. 2.303

C. 2.016

D. 13.83

Answer: A

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122. The following equilibrium constants were determined at 1120k :

$2CO_{(g)} \Leftrightarrow C_{(s)} + CO_{2(g)}, Kp_I = 10^{-14} atm^{-1}, CO_{(g)0+Cl_{2(g)} \Leftrightarrow COCl_{2(g)}},$

What is the equilibrium constant Kc for the following reaction at 1120K:

$C_{(s)} + CO_{2(g)} + 2Cl_{2(g)} \Leftrightarrow 2CO_2Cl_{(g)}$

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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123. 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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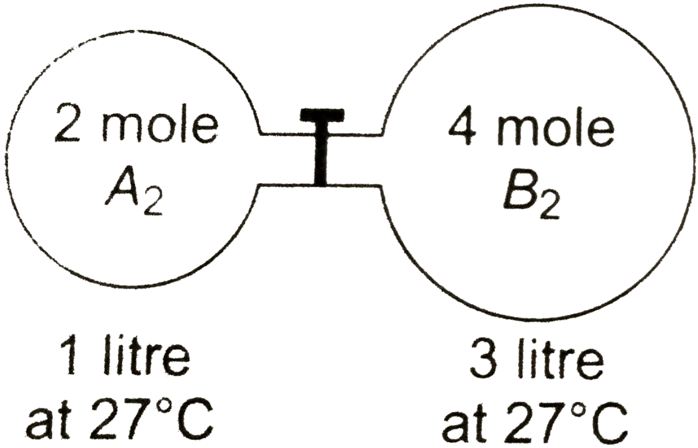

124.

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

Watch Video Solution

125. Assume that the decomposition of HNO_3 can be represented by the following equation

$4HNO_{3(g)} \Leftrightarrow 4NO_{2(g)} + 2H_2O_{(g)} + O_{2(g)}$ and the reaction approaches equilibrium at 400K temperature and the copper turnning 0 atm pressure. At cquilibrium partial pressure of HNO_3 is 2 atm. Calculate Kc in $(\text{mole}/L)^3$ at 400 K.

A. 4

B. 8

C. 16

D. 32

Answer: D

Watch Video Solution

126. For the cqiuilibrium LiCI $3NH_{3(s)}$ LiCI $NH_{3(s)} + 2NH_{3(g)}$, Kp = 9 atm^2at37°C. A 5 lires vesel contains 0. 1 mole of LiCI NH_3. How many moles of NH_3 should be added to the llask at this temperature to derive the backward reaction for completion ?

A. 0.2

B. 0.59

C. 0.69

D. 0.79

Answer: D

Watch Video Solution

127. Solid Ammonium carbamate dissociates as:

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

In a closed vessel, solid ammonium carbonate 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. Also find the partial pressure of ammonia gas added.

A. 4

B. 9

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

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

Answer: C

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128. 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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129. $2NOBr(g) \Leftrightarrow 2NO(g) + Br2(g)$. 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. 0.025

Answer: A

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130. Consider the partial decomposition of A as $2A_{(g)} \Leftrightarrow 2B_{(g)} + C_{(g)}$

At equilibrium 700 m/ gaseous mixture contains 100 ml of gas C at 10 atm and 300K. What is the value of Kp 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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131. 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 pparital pressure of NO_2?

A. 1.33 atm

B. 0.1665 atm

C. 0.133 atm

D. None of these

Answer: C

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132. 0.020 g of selenium vapour 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 degree of 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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133. Determine the degree of association (polymerisation) for the reaction in aqueous solution . 6 HCHO $\Leftrightarrow C_6H_{12}O_6$. If observed molar mass of HCHO and $C_6H_{12}O_6$ is 150 :

A. 0.50

B. 0.833

C. 0.90

D. 0.96

Answer: D

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134. 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 vessell 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. 0.4125

B. 11.6 g

C. 1.6 g

D. None of these

Answer: B

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135. The equilibrium constant Kp for the reaction $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ is 4.5. What would be the average molar naSs (in g/mol) of an eyuilibriunm mixture of N_2O_4 and NO_2 formed by the dissociation of pure V_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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136. A flask containing 0.5 atm pressure of $A_2(g,)$some solid AB added into flask which undergoes dissociation according to $2AB(s) \Leftrightarrow A_2(g) + B_2(g), K_p = 0.06atm^2$

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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137. 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

$Sb_2S_3(s)3H_2(g) \Leftrightarrow 2Sb(s) + 3H_2D(g)$ After equilibrium, the H_2S formed was analysed was analysed by dissloved it in water and treating with execedd of Pb^{20+} 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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138. 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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139. 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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140. Rate of diffusion of ozonised oxygen is $0.4\sqrt{5}$ times that of pure oxygen. What is the percent degree of 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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141. One lit of SO_3 was placed in a two litre vessels of a certain temperature. The following equilibrium was established in the vessel $2SO_{3(g)} \Leftrightarrow 2SO_{2(g)} + O_{2(g)}$ the equilibrium mixture reacted with 0.2

mole KMnO, in acidic medium. Kc value is $1.25x10^{-x}$ then the value of x is:

A. 0.50

B. 0.25

C. 0.125

D. None of these

Answer: C

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142. 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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143. The equilibrium constant for the ionisation of $RNH_{2(g)}$ in water as

$RNH_{2(g)} + H_2O_{(l)} \Leftrightarrow \mathrm{RNH}_{3(aq)}^{+} + OH_{(aq)}^{-}$ is 8×10^{-6} at 25° 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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144. The molecularity of a complex reaction given below is :

$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

A. 1.0 M

B. 1.5M

C. $2.166M$

D. 1.846 M

Answer: D

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145. 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. 4.5atm

B. 0.45 atm

C. 0.6 atm

D. None of these

Answer: B

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146. 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

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, K_p = \frac{Pc^c . P_D^d}{P_A^a}$ 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

On the basis of above work-up select the write option

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

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

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

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

Answer:

Watch Video Solution

147. 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:

Watch Video Solution

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 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:

Watch Video Solution

149. 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.

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

For an isomerization $X(g) \Leftrightarrow Y(g)$ the temperature dependency of equilibrium cohnstant 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:

Watch Video Solution

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

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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:

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151. 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:

Watch Video Solution

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

A. 6.6 bar

B. 3.3bar

C. 4.23 bar

D. 8.3 bar

Answer:

Watch Video Solution

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

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 bar.

The value of K_{P2} is

A. 0.16bar^{-1}

B. 0.32bar^{-1}

C. 0.48bar^{-1}

D. 0.64bar^{-1}

Answer:

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154. 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 so as to minimise the effect of that change.

Effect of change in concentration on equilibrium:

As we add or remove reactant (or product) the ratio of equilibrium concentratio become 'Q' (reaction quotient) and depending upon.

$Q < K$: equilibrium will shift ihn forward direction

$Q > K$ equilibrium will shift in backward direction

Effect of change in pressure :

If a system in equilibrium consists of gases, then the concentrations of all the components can be altered by changing the pressure. When the pressure on the system is increased, then equilibrium will shift in the direction in which there is decrease in number of moles i.e., towards the direction in which there is decrease in volume.

Effect of change in pressure on melting point : There are two rypes of solids :

Solids whose volume decreases on melting, e.g., ice, diamond, carborundum, magnesium nitride and quartz.

Solid (higher volume) $\Leftrightarrow$ Liquid (higher volume)

The process of melting is facillitated at high pressure, thus melting point is lowered.

Solid 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 melring becomes difficult at high pressure, thuse melting point becomes high.

Solubility of substances : When solid substance are dissolved in water, either heat is evolved.

for endothermic solubility process solubility increase with increase in temperature. For exothemic solubility decrease with increase in temperature.

Solubility of gases in liquids : when a gas dissolves in liquid, there is decreases in voolume. Thus increase of pressure will faavour the dissolution of gas in liquid.

Effect of temperature : For endotherimic reacrtion as temperature increases reaction shift in backward direction

A'X'(g) solute 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, low pressure

Answer:

Watch Video Solution

155. 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 so as to minimise the effect of that change.

Effect of change in concentration on equilibrium:

As we add or remove reactant (or product) the ratio of equilibrium concentratio become 'Q' (reaction quotient) and depending upon.

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Solubility of gases in liquids : when a gas dissolves in liquid, there is decreases in voolume. Thus increase of pressure will faavour the dissolution of gas in liquid.

Effect of temperature : For endotherimic reacrtion as temperature increases reaction shift in backward direction

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

Above equilibrium is favaured at :

A. high pressure, low temperature

B. high pressure, high temperature

C. low pressure, high temperature

D. low pressure, low temperature

Answer:

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156. What is the effect of pressure on gaseous chemical equilibrium?

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:

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157. 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:

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158. 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:

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159. For the reaction $AB_{2(g)} \Leftrightarrow AB_{(g)} + B_{(g)}$ if α is negligiable w.rt 1 then degree of dissociation (α) of AB_2 is proportional to

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

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

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

D. $\sqrt{V}$

Answer:

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160. 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:

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161. 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:

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162. 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:

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163. 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:

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164. For the reaction $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$ the forward reaction at constant temperature is favoured 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:

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165. Exothermic formation represented by equation $Cl_{2(g)} + 3F_{2(g)} \Leftrightarrow 2ClF_3(g)$. Δ H = - 339 KJ . Which of the following will increase the quantity of CIF_3 in equilibrium mixture ?

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:

Watch Video Solution

166. For the following equilibrium, $H_2O(l) \Leftrightarrow H_2O(g)$ the increase in the pressure causes

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:

Watch Video Solution

167. Heating a II group metal cabonate leads to decomposition on

$\mathrm{BaCO}_{3(s)} \Leftrightarrow BaO_{(s)} + CO_{2(g)}$, 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:

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168. $N_2(g)$ 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:

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169. Column-I and Column-II contains four 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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170. 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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171. 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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172. 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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173. Match the following columns

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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174. 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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175. (A) : The melting point of ice decreases with increase of pressure.

(R) : 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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176. 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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177. If the rate for the chemical reaction is expresssed at Rate =K[A][B]" then

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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178. For the reaction $A(g) \rightarrow B(g) + C(g)$, write the intergrated rate equation in terms of total pressure 'P' and the partial pressures $P_A P_B P_C$.

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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179. Under certain conditions, the equilibrium constant for the decomposition of $PCl_5(g)$ into $PCl_3(g)$ and $Cl_2(g)$ is $0.0211 \mathrm{mol} L^{-1}$. What are the equilibrium concentrations of PCl_5, $PCl_3 d$ and Cl_2 if the initial concentration of PCl_5 was $1.00 M$?

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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180. 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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181. 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 pysical 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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182. 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. 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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183. 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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184. 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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185. 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 In $\frac{K_2}{K_1} = \frac{\Delta H^\circ}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$ and for exothermic reaction ,

ΔH° = -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

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186. 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 certainn 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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187. 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 $H_2O \Leftrightarrow H_2O(l)$ 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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188. 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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189. 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. If $K_P = y^2$ then what is 'y" ?

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

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

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191. 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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192. 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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193. 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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194. Calculate K_P for the reaction $A(g) \Leftrightarrow B(s) + 2C(g), K_C = 0.2$ at 305 K.

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195. 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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196. 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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197. In aa chemical reaction equilibrium is established when :

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198. 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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199. 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

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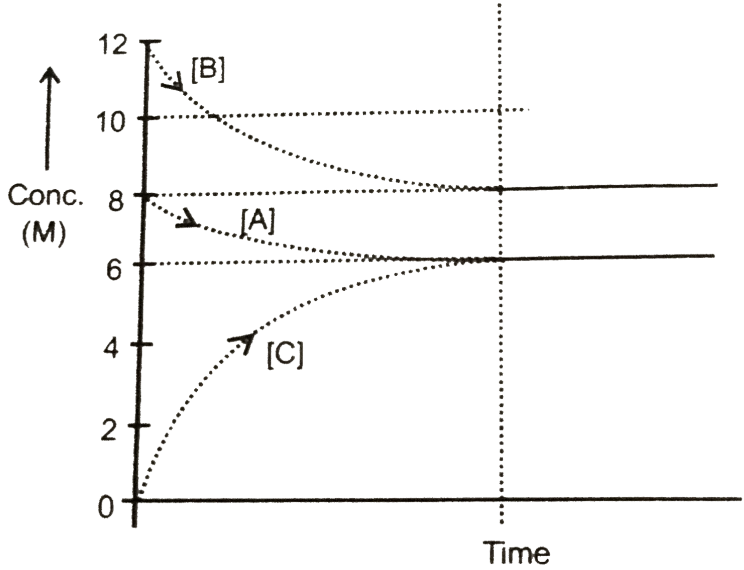
200. The gaseous reaction : $A(g) + nB(g) \Leftrightarrow mC(g)$ is represented by following curves



What is the value of n+m?

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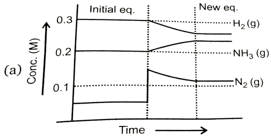
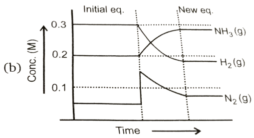
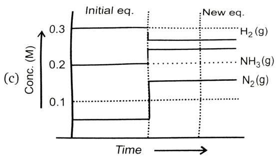
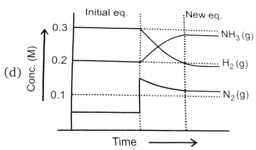
Level 1 Q 93 To Q 122

1. 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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Level 2

1. 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, $\left[Ag^{+}\right] = 10^{-5}M$,

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

A. $-154.2kJ/mol$

B. $-178.9kJ/mol$

C. $-129.5kJ/mol$

D. None of these

Answer: C

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Others

1. 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. $-4.606kJ/mol$

B. $-19.147kJ/mol$

C. $-8.314kJ/mol$

D. $-10kJ/mol$

Answer:

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

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

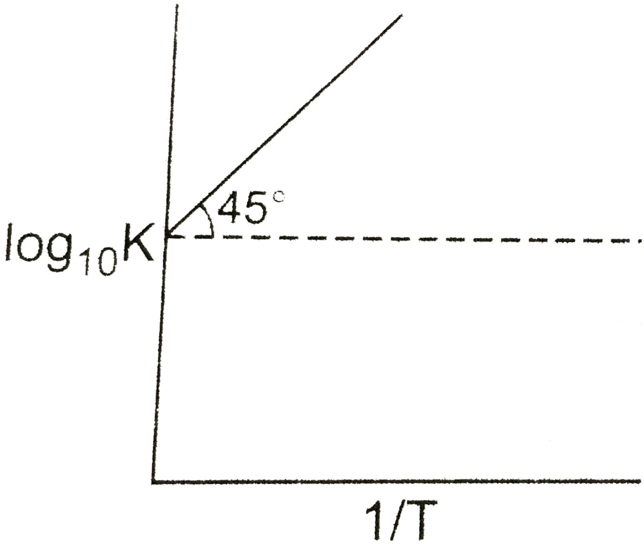
for this equation, $(\Delta_r H^\circ)$ can be evaluated if equilibrium constans K_1 and K_2 at two temperature T_1 and T_2 are known.

$$\log\left(\frac{K_2}{K_1}\right) = \frac{\Delta_r H^\circ}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right] The equilibrium cons \tan t$$K_(p)

f or $the follow \in g reaction is$ 1at27^(@)C and 4at47^(@)C.

A(g)hArrB(g)+C(g)F or $the reaction calc\underline{a}te enthalpy chan \geq f$ or the

B(g)+C(g)hArrA(g)(Given : R=2cal//mol-K)`



A. $-13.31 Kcal / mol$

B. $13.31 Kcal / mol$

C. $-19.2 Kcal / mol$

D. $-55.63 Kcal / mol$

Answer:

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