CHEMISTRY

FOR IIT JEE ASPIRANTS OF CLASS 11 FOR CHEMISTRY

CHEMICAL EQUILIBRIUM

Example -1

1. 8.5 grams of ammonia are dissolved to form 4L aqueous solution. Calculate the active mass.

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2. Number of molecules in V litre of a gas at NTP is

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3. The equilibrium constant for the reaction $2x + y \Leftrightarrow x_2y$ is $10L^2mol^{-2}$. The rate constant for the back ward reaction $2.8s^{-1}$. What is the rate constant of the forward reaction?

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4. For the cyclic trimerisation of acetylene to give one mole of benzene, $K_C = 4L^2mol^{-2}$. If the equilibrium concentration of benzene is 0.5 mol L^{-1}, calculate the equilibrium concentration of acetylene.

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5. K_p for the reaction, $NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$, at certain temperature is 4bar^2. Calculate the equilibrium perssure.

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6. PCl_5 was taken 2 atm in a closed vessel at 154^0C. Keeping the temperature constant, $PCl_5 \Leftrightarrow PCl_3 + Cl_2$ equilibrium is estabilished when 50% of PCl_5 decomposes. Calculate the K_p for the equilibrium.

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7. For the equilibrium

$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$, the partial pressure of SO_ySO_2 and O_2 gases at 650 K are respectively 0.2, 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.

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8. Calculate the ratio of pressure of CO_2 gas and CO gas at equilibrium in the reaction, $CO_2(g) + C(s) \Leftrightarrow 2CO(g)$, If K_p is 3 bar at 900K and initial pressure of CO_2 is 0.48 bar.

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9. At 500K, $K_P = 2.4 \times 10^{-2}$ atm for the reaction, $2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g)$. Calculate K_C at the same temperature.

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10. At 1065^0C, K_p= 0.118 atm for the reaction $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$ The enthalpy of the reaction is 177.3 kJ/mol. Calculate the given equilibrium constant at $1200^\circ C$ Given R=8.314 J

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11. Equilibrium constant, K_c the reaction $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$ is $2 \times 10^{-2} mol^{-2} lit^2$. What is the value of K_c for the reaction $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$?

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12. Equilibrium constant K_X, for the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$, is 49. What is the value of K_C for the reaction $\frac{1}{2}H_2(g) + \frac{1}{2}I_2(g) \Leftrightarrow HI(g)$ and $2HI(g) \Leftrightarrow H_2(g) + I_2(g)$?

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13. K_C values respectively for the reaction, $H_2SO_3 \Leftrightarrow H^+ + HSO_3^-$ and $HSO_3^- \Leftrightarrow H^+ + SO_3^{2-}$ are $2 \times 10^{-2} mo$. Calculate the K_C for the reaction $H_SSO_3 \Leftrightarrow 2H^+ + SO_3^{2-}$

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14. The equilibrium constant of the reaction, $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow 2SO_3(g)$ is $5 \times 10^{-2} atm.$ The equilibrium constant of the reaction,$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$

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15. If the equilibrium constant for the reaction, $H_2(g) + I_2 \Leftrightarrow 2HI(g)$ is K. What is the equilibrium constant of $HI(g) \Leftrightarrow \frac{1}{2}H_2(g) + \frac{1}{2}I_2(g)$?

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16. The K_c for the equilirbium $2CO_{2(g)} \Leftrightarrow 2CO_{(g)} + O_{2(g)}$ is 6.4×10^{-7} Predict whether reaction will take place to the left or to the right to reach equilibrium or remains or equilibrium

(a) $[CO_2] = 5.3 \times 10^{-2}, [CO] = 3.6 \times 10^{-4}, [O_2] = 2.4 \times 10^{-3}$

(b) $[CO_2] = 1.78 \times 10^{-1}, [CO] = 2.1 \times 10^{-2}, [O_2] = 5.7 \times 10^{-5}$

(c) $[CO_2] = 1.03 \times 10^{-1}, [CO] = 2.4 \times 10^{-2}, [O_2] = 1.18 \times 10^{-5}$

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17. The reaction was started with 0.1 M each of CO and H_2O at 800K. K_C for the reaction,

$CO(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g)$ at 800K, 4.24. What is the equilibrium concentration of CO_2 gas?

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18. The standard free energy of the reaction at 298K is -125.52 kJ/mole. Calculate the equilibrium constnat K_p.

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19. Vapour density of the equilibrium mixture of NO_2 and N_2O_4 is found to be 40 for the equilibrium

$N_2O_4 \Leftrightarrow 2NO_2$

Calculate

A. 0.1

B. 0.05

C. 0.2608

D. None of these

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20. PCl_5 is $10\,\%$ dissociated at $1atm$. What is $\%$ dissociation at 4 atm .

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

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

$X(s) \Leftrightarrow A(g) + 2B(g), K_{p_1} = 9 \times 10^{-3} atm^3$

$Y(s) \Leftrightarrow 2B(g) + C(g), K_{p_2} = 4.5 \times 10^{-3} atm^3$

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

A. 4.5 atm

B. 0.85 atm

C. 0.6 atm

D. 0.45 atm

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Evaluate Yourself -I

1. The active mass of 5.6 litres of O_2 at STP is

A. 5.6/22.4

B. 8/5.6

C. 32/5.6

D. 0.25/5.6

Answer: D

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2. A reaction $CaF_2 \Leftrightarrow Ca^{2+} + 2F^-$ is at equilibrium. If the concentration of Ca^{2+} is increased four times, what will be the change in F^- concentration as compared to the initial concentration of F^-?

A. One half of its initial value

B. Twice the initial value

C. 1/4th of its initial value

D. Thrice of its initial value

Answer: A

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3. For the reaction: $Cu(s) + 2Ag^+_{(aq)} \Leftrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$, the equilibrium constant is given by

A. $\frac{[Cu^{2+}][Ag]^{2+}}{[Cu][Ag^+]^2}$

B. $\frac{[Cu^{2+}][Ag]^2}{[Cu][Ag^+]^2}$

C. $\frac{[Cu^{2+}]}{[Ag^{+}]^2}$

D. $\frac{[Ag^{+}]^2}{[Cu^{2+}]}$

Answer: C

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

A. $\frac{k_1 a - k_2 b}{k_1 + k_2}$

B. $\frac{k_1 a - k_2 b}{k_1 - k_2}$

C. $\frac{k_1 a - k_2 b}{k_1 k_2}$

D. $\frac{k_1 a + k_2 b}{k_1 + k_2}$

Answer: A

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5. If the equilibrium constant for the reaction $2AB \Leftrightarrow A_2 + B_2$ is 36. What is the equilibrium constant for $AB \Leftrightarrow \frac{1}{2}A_2 + \frac{1}{2}B_2$

A. 49

B. 24

C. 6

D. 2

Answer: C

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6. The equilibrium constant of the reaction (K_c) when the reaction is conducted in a one litre vessel was found to be 2.5×10^{-3}. If the reaction is conducted at the same temperature in a 2 litre vessel then the value of K_c is

A. 6.25×100^{-4}

B. 1.25×10^{-3}

C. 2.5×10^{-3}

D. 5×10^{-3}

Answer: C

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7. According to law of mass action, for $CaCO_{3(s)} \Leftrightarrow CaO + CO_2)(R_r$=Rate of forward and R_b = Rate of backw

Which of the following is true at equilibrium?

A. $R_b = K_b[CaCO_3]^2$

B. $R_f = K_f[CaO_3]^2$

C. $R_f = K_b[CO_2]$

D. $\frac{R_f}{R_b} = [CO_2]^1$

Answer: C

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8. In which of the following reactions, the concentration of rectant is equal to concentration of product at equilibrium (K=equilibrium constant)

A. $A \Leftrightarrow B, K = 0.01$

B. $R \Leftrightarrow P, K = 1$

C. $X \Leftrightarrow Y, K = 10$

D. $L \Leftrightarrow J, K = 0.025$

Answer: C

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9. The following concentration were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium for the reaction $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

$[N_2] = 1.5 \times 10^{-2} M$

$[H_2] = 3.0 \times 10^{-2} M$

$[NH_3] = 1.2 \times 10^{-2} M$

Calculate equilibrium constant.

A. $8.83 \times 10^{-1} M$

B. $1.65 \times 10^{3} M$

C. $1.13 \times 10^{3} M$

D. $2.09 \times 10^{3} M$

Answer: B

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10. AB_2 dissociates as $AB_{2(g)} \Leftrightarrow AB_{(g)} + B_{(g)}$. Whwn the initial pressure of AB_2 is 600mm of Hg, the total equilibrium pressure is 800mm of Hg. Calculate K_p for the reaction, assuming that the volume of the system remains unchanged

A. 50

B. 100

C. 166.8

D. 400

Answer: A

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

A. 4

B. 20

C. 25

D. 15

Answer: A

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12. For the equilibrium $AB(g) \Leftrightarrow A(g) + B(g)$ at a given temperature, the pressure at which one-third of AB is dissociated is numerically equal to

A. 8 times K_p

B. 16 times K_p

C. 4 times K_p

D. 9 times K_p

Answer: A

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13. 2 mol of N_2 is mixed with 6 mol of H_2 in a closed vessel of one litre capacity. If $50\ \%\ N_2$ is converted into NH_3 at equilibrium, the value of K_c

for the reaction

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

A. $4/27$

B. $27/4$

C. $2/27$

D. 20

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Evaluate Yourself -II

1. For which of the reversible reaction $K_p = K_c$

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

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

C. $PCl_3(g) + Cl_2(g) \Leftrightarrow PCl_3(g)$

D. $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO(g)$

Answer: D

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2. For the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ at 741K, the value of equlibrium constant, K_c is 50. The value of K_p under the same conditions will be

A. 0.02

B. 0.2

C. 50

D. 50/RT

Answer: C

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3. For the reaction

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

K_p / K_c is equal to

A. 1/RT

B. RT

C. $\sqrt{R}T$

D. $(RT)^2$

Answer: A

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4. A reaction $S_8(g) \Leftrightarrow 4S_2(g)$ is carried out by taking 2 mol of $S_{g(g)}$ and 0.2 mol of $S_{2(g)}$ is a reaction vessel of 1 L and $K = 6.30 \times 10^{-6}$ then

(a) Reaction qutient is 8×10^{-4}

b) Reaction proceeds in backward direction

c) Reaction proceeds in forward direction

The correct options are

A. a,b

B. b,c

C. a,c

D. All

Answer: A

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5. At constant temperature, the equilibrium constant (K_p) for the decomposition reaction

$N_2O_4 \Leftrightarrow 2NO_2$

is expressed by $K_p = 4x^2p/(1-x^2)$, where p=pressure x= extent of decomposition. Which of the following statements is true?

A. K_p increases with increase of P

B. K_p increases with increase of x

C. K_p increases with decrease of x

D. K_p remains constant with change in P or x

Answer: A

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6. 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. $25X10^2$

B. 50

C. $4X10^{-4}$

D. 10

Answer: B

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Evaluate Yourself -III

1. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + heat$.What is the effect of the increase of temperature on the equilibrium of the reaction ?

A. Equilibrium is shifted to the right

B. Equilibrium is unaffected

C. Equilibrium is shifted to the left

D. Equilibrium is shifted first to right then to left

Answer: C

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2. Consider the reactions

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

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

The addition of an inert gas at constant volume

A. Will incease the dissociation of PCI_5 as well as N_2O_4

B. will reduce the dissociation of PCl_5 as well as N_2O_4

C. Will increase the dissociation of PCI_5 and step up the formation of N_2O_4

D. Will not distrub the equilibrium of the reactions

Answer: D

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3. For the following reaction, the value of K change with

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

A. Change in pressure at constant volume does not effect the equilibrium

B. Dn=0

C. The formation of NO is increased at higher temperature

D. The formation of NO is decreased at higher temperature

Answer: D

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4. The reaction

$3Fe(s) + 4H_2O \Leftrightarrow Fe_3O_4(s) + 4H_2(g)$ is reversible if it is carried out

A. Increasing the pressure

B. Passing more steam

C. Increasing the mass of iron

D. Decreasing the pressure

Answer: B

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5. For a reaction if $K_p > K_c$, the forward reaction is favoured by $(T > 15K)$

A. The backward reaction

B. No reaction

C. The forward reaction

D. Both forward and backward reaction equally

Answer: C

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6. For the reaction,

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

at a given temperature, the equilibrium amount of $CO_{2(g)}$ can be increased by:

A. I & IV

B. II, III & IV

C. I & II

D. I, II & III

Answer: C

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7. In the reaction, $2SO_2(s) + O_2(g) \Leftrightarrow 2SO_3(g) + Xcal$, most favourable conditions of temperature and pressure for greater yield of SO_3 are

A. Low temperature and low pressure

B. High temperature and low pressure

C. High temperature and high pressure

D. Low temperature and high pressure

Answer: D

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C.U.Q.

1. The following is a reversible reaction

A. $KClO_3$ heated in a sealed tube

B. Na_2CO_3 heated in a closed vessel

C. $CaCO_3$ heated in a closed vessel

D. CH_4 heated with excessofo, in a closed vessel

Answer: C

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2. The experimental curve obtained when the rate of a reaction is plotted against the concentration of the reactant, appeared parallel to the concentration axis after sometime in a reaction. This indicates that

A. the reaction is stopped

B. equilibrium is established

C. concentration of the reactant is negligible

D. the reaction is reomplex

Answer: A::B

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3. Which of the following is an irreversible reaction?

A. $PCl_5 \rightarrow PCl_3 + Cl_2$

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

C. $N_2 + 3H_{20 \rightarrow 2NH_3}$

D. $2KClO_3 \rightarrow 2KCl + 3O_2$

Answer: A::B::C::D

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4. Which of the following behaves as an irreversible reaction when conducted in a closed vessel

A. synthesis of ammonia

B. decomposition of PCI_5 solid

C. formation of SO_2 from $SO_2 \& O_2$

D. precipitation of Cl^- by $AgNO_3$

Answer: A::C::D

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5. An example of a reversible reaction is

A. $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(s)} + NaNO_{3(aq)}$

B. $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

C. $2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_2(g)$

D. $NH_4HS_{(s)} \rightarrow NH_3(g) + H_2S_{(g)}$

Answer: A::B::C::D

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6. Which of the following is a characteristic of a reversible reaction ?

A. Number of moles ofreactants and products are equal

B. It can be influenced by a catalyst

C. It can never proceed to completion

D. It can be attained in open vessel

Answer: C

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

A. Equal amounts of reactants and products are formed

B. Reactants are completely converted to products

C. The rate of forward reaction is equal to the rate of backward reaction

D. The concentration of the reactants and products is the same

Answer: B::C

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

A. Colour

B. Density

C. Pressure

D. All the above

Answer: B::D

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9. In line kilns, the following reaction,

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

proceeds to completion because of

A. High temperature

B. CaO is more stable than the $CaCO_3$

C. CaO is not dissociated

D. CO_2 escapes continuously

Answer: D

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10. Chemical equilibrium is a dynamic equilibrium because

A. The equilibrium attained quickly

B. The concentration of the reactants and products become same at equilibrium

C. The concentration of reactants and products are constant but different

D. Both forward and backward reactions occur at all time with the same speed

Answer: D

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11. Which of the following reagent(s) can show colour change when SO_2 gas is passed through it?

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

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

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

D. $\mathrm{C(graphite)} + CO_2(g) \Leftrightarrow 2CO(g)$

Answer: B::C::D

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12. A gas bulb is filled with NO_2 gas and immersed in an ice bath at $0^\circ C$, which becomes colourless after sometime. This colourless gas will be:

A. NO_2

B. N_2O

C. N_2O_4

D. N_2O_5

Answer: C

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13. Law of mass action cannot be applied to

A. Decomposition of gaseous HI

B. Decomposition of gaseous PCI_5

C. Transition of Rhombic Sulphur to Monoclicnic sulphur

D. Decomposition of Calcium Carbonate

Answer: A::B::C

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

A. Decreases

B. Increases

C. Remains constant

D. First decreases and increases

Answer: A::B::C::D

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

A. A and B

B. B and C

C. A and C

D. A,B,C

Answer: A::C

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16. For a reversible reaction, if the concentrations of the reactants are doubled, then the equilibrium constant value

A. Gets doubled

B. Gets halved

C. Remains the same

D. increases four times

Answer: A::C::D

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17. For reactions involving gaseous reactants and products the equilibrium constant K, is written in terms of

A. The pressure of the gases

B. The molar volumes of the gases

C. The partial pressures of the gases

D. The mole fraction of the gases

Answer: A::C

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

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

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

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

D. $\frac{n}{V}RT$

Answer: B::C

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19. The molar concentration of 64 g of SO_2 in a four litre flask would be

A. 2

B. 1

C. 5

D. 0.25

Answer: A::C::D

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20. The equilibrium constant of a reaction is 300, if the volume of the reaction flask is tripled, the equilibrium constant will be

A. Which has only numerical value and carries no units

B. With (or) without units depending upon the stoichiometric coefficients of the species involved in a chemical equation

C. Whose value always depends upon the units in which the concentrations of species involved in chemical reaction

D. Whose value change if the concentration of all the species involves in the chemical reaction are doubled

Answer: A::B::D

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21. With increase in temperature, the value of equilibrium constant

A. Increases

B. Decreases

C. May inerease or decrease

D. Remains constant

Answer: A::C::D

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22. If different quantities of ethyl alcohol and acetic acid are used in the reversible reaction

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

then the equilibrium constant at constant temperature will have the values

A. Same in all cases

B. Different in all cases

C. higher in cases when higher concentration of ethyl alcohol is used

D. Higher in cases when higher concentration of acetic acid is used

Answer: A::C::D

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23. The value of K_c for the reaction $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$ depends on

A. Temperature

B. Pressure

C. Collision

D. Concentration

Answer: A

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24. Which of the following is/are correct about chemical equilibrium?

A. There is not change in the concentrations of reactants and products with time

B. Equilibrium can be attained by starting with either reactants (or) products

C. Equilibrium is dynamic

D. Position of equilibrium cannot be disturbed by changing the concentrations of reactants (or) products

Answer: D

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25. When a catalyst is introduced into a reversible reaction

A. Increases rate of forward reaction only

B. Increases rate of backward reaction only

C. Equilibrium is not changed

D. Attains equilibrium quickly

Answer: D

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26. For a system in equilibrium, $\Delta G = 0$, under conditions of constant

A. Temperature and pressure

B. Temperature and volume

C. Energy and volume

D. Pressure and volume

Answer: A

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27. The unit of equilibrium constant (K_c) in general is

A. (mol/lit)

B. (lit/mol)

C. $(\mathrm{mol}/\mathrm{lit})^{\triangle n}$

D. $(\mathrm{lit}/\mathrm{mol})^{\triangle n}$

Answer: C

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28. According to van 't Hoff equation, K varies with temperature as:

A. $\log \frac{K_2}{K_1} = \frac{\triangle H}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

B. $\log \frac{K_1}{K_2} = +\frac{\triangle H}{2.303R}\left[\frac{1}{T_2} + \frac{1}{T}\right]$

C. $\log \frac{K_1}{K_2} = -\frac{\triangle H}{2.303R}\left[\frac{1}{T_2} + \frac{1}{T_2}\right]$

D. $\log \frac{K_2}{K_1} = +\frac{\triangle H}{2.303R}\left[\frac{1}{T_1} + \frac{1}{T_2}\right]$

Answer: A::C::D

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29. A vessel contains 1 mole of O_2 and 1 mole of He. The value of γ of the mixture is

A. K_1 for $N_2 + O_2 \Leftrightarrow 2NO$ in A and B are in the ratio 1:2

B. K_p for $N_2 + O_2 \Leftrightarrow$ in A and B are in the ratio 1:2

C. K_2 for $N_2 + O_2 \Leftrightarrow NO$ in A and B are equal

D. K_P for $N_2 + O_2 \Leftrightarrow = 2NO$ in A and B are in the ratio 2:1

Answer: A::B::C

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30. In the equilibrium, $AB(s) \rightarrow A(g) + B(g)$, if the equilibrium concentration of A is doubled, the equilibrium concentration of B would become

A. Reduced to half its initial value

B. Increases by two times

C. Remains unchanged

D. Increases by four times

Answer: A

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31. In which of the following equilibrium reactions, the equilibrium reactions, the equilibrium would shift to the right, if total pressure is increased

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

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

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

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

Answer: A

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32. The degree of dissociation of PCl_5

A. Increases with increasing pressure

B. Decreases with increasing pressure

C. No effect on change in pressure

D. Decreases with decreasing pressure

Answer: B

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33. The reaction in which an increase in pressure would favour the forward reaction is

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

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

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

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

Answer: B

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

A. Addition of $NaNO_2$ favours forward reaction

B. Addition of $NaNO_3$ favours forward reaction

C. Increasing of temperature favours forvard reaction

D. Both addition of $NaNO_3$ and increasing of

Answer: A::C::D

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35. For the reaction :

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

A. Temperature is increased

B. Temperature is decreased

C. Volume of vessel is increased

D. Amount of $CaCO_3$ is decreased

Answer: A::C::D

Watch Video Solution

36. Le-Chatelier principle is not applicable to

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

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

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

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

Answer: A::B::C::D

Watch Video Solution

37. $CH_3COCl + C_2H_5OH \xrightarrow{\text{Pyridine}} CH_3COOC_2H_5 + HCl$

The function pyridine in the above reaction is:

A. Increasing the temperature

B. Sudden cooling of the reaction mixture

C. Conducting the reaction in presence of a small quantity of NaOH

D. Taking excess of C_2H_5OH and CH_3COOC_2H

Answer: A::C::D

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38. In the equilibrium reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$, the sign of $\triangle H$ accompanying the reaction is

A. Positive

B. Negative

C. May be positive or negative

D. Cannot be predicted

Answer: A::B::C

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39. For which of the following equilibria does decrease in pressure not favour the forward reaction ?

A. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}, \triangle H = -Q_1$

B. $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)}, \triangle H = +Q_2$

C. $3O_{2(g)} \Leftrightarrow 2O_{3(g)}, \triangle H = +Q_3$

D. $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}, \triangle H = +Q_4$

Answer: C

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40. 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 which of the following facts:

A. The formation of more amount of SO_3

B. The formation of less amount of SO_3

C. No effect on the equilibrium concentration of SO_3

D. The system to move to a new equilibrium position which cannot be theoritcally predicted.

Answer: B::C::D

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41. Under what conditions of temperature and pressure the formation of atomic hydrogen from molecular hydrogen will be favoured most ?

A. High temperature and high pressure

B. Low temperature and low pressure

C. High temperature and low pressure

D. Low temperature and high pressure

Answer: B::C::D

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42. Changing the volume of the system does not after the number of moles in which of the following equilibrium.

A. $N_2 + O_2 \Leftrightarrow 2NO$

B. $PCl_5 \Leftrightarrow PCl_3 + Cl_2$

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

D. $SO_2Cl_2 \Leftrightarrow SO_2 + Cl_2$

Answer: A

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43. $H_4\underline{P_2}O_6 + H_2O \rightarrow H_3PO_3 + H_3PO_4$

A. H_3O^+

B. PO_4^{3-}

C. H_2O

D. H_3PO_4

Answer: A::C::D

Watch Video Solution

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

Reason: An increase in pressure favours the forward reaction.

A. $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

B. $2O_{3(g)} \Leftrightarrow 3O_{2(g)}$

C. $C_{\text{graphite}} \Leftrightarrow C_{\text{diamond}}$

D. $H_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow H_2O_{(g)}$

Answer: C

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45. The reaction $2SO_2 + O_2 \rightarrow 2SO_3 + heat$. The equilibrium reaction proceeds in forward direction by :

A. By adding more of C

B. By adding more of D

C. By raising the tempearture of the system

D. By lowering the temperature

Answer: A::C::D

Watch Video Solution

46. For conversion C (graphite) $\rightarrow C$ (diamond) the ΔS is

A. High temperature, low pressure

B. Low temperature, high pressure

C. High temperature, high pressure

D. Low temperature, low pressure

Watch Video Solution

47. The dissociation of $CaCO_3$ is suppressed at high pressure

A. The equilibrium shifts to the right

B. The equilibrium shifts to the left

C. The pressure of CO_2 increases

D. The position of equilibrium remains unchanged

Answer: A::C::D

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

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

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

A. Increasing temperature

B. Removing Cl_2

C. Increasing volume of vessel

D. Adding F_2

Answer: A::C::D

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

A. The acid dissociates further

B. The H^+ ion concentration increases

C. The acid dissociation is suppressed

D. The equilibrium is unaffected

Answer: C

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50. The catalyst and promoter respectively used in the Haber's process of industrial synthesis of ammonia are

A. Mv, V_2O_5

B. V_2O_5, Fe

C. Fe,Mo

D. Mo,Fe

Answer: C

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Exercise -I (C.W.)

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

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

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

C. $K_C = [O_2]^5$

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

Answer: B

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2. The equilibrium constant Kp for the reaction $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$ is

A. $K_P = \frac{P_{NH_3} \times P_{H_2S}}{P_{NH_4HS}}$

B. $K_P = \frac{P_{NH_4HS}}{P_{NH_3} \times P_{H_2S}}$

C. $K_P = P_{NH_4HS}$

D. $K_P = P_{NH_3} \times P_{H_2S}$

Answer: D

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3. In the process $N_2 + 3H \Leftrightarrow 2NH_3$, the initial concentration of Nitrogen and Hydrogen are one mole per litre and 3 moles per litre respectively. The equilibrium constant of the reaction is x. Then K_C for $2NH_3 \Leftrightarrow N_2 + 3H_2$ is

A. x

B. 2x

C. 1/x

D. 3x

Answer: C

Watch Video Solution

4. The equilibrium constant of a reaction at 298 K is 5×10^{-3} and at 1000 K is 2×10^{-5} What is the sign of $\triangle H$ for the reaction.

A. DH is +ve

B. DH is -ve

C. DH=0

D. DH is +ve

Answer: B

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5. $N_2 + 3H_2 \Leftrightarrow 2NH_3$ in this equilibrium system if the pressure is increased at $25^\circ C$ then the value of K will

A. Increases

B. Decreases

C. Remains the same

D. Depends on the nature of the reactants

Answer: C

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6. $A_{(s)} + B_{(g)} + \text{heat} \Leftrightarrow 2C_{(s)} + 2D_{(g)}$. At equilibrium the concentration of B is doubled. By what factor the concentration of D should change to retain the equilibrium

A. $\sqrt{2}$

B. 2

C. 3

D. $\sqrt{3}$

Answer: A

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7. For $A_{2(g)} + B_{2(g)} \underset{K_b=15}{\overset{K_f=5}{\Longleftrightarrow}} 2AB_{(g)}$, K_C for $2AB_{(g)} \Leftrightarrow A_{2(g)} + B_{2(g)}$, is

A. 3

B. 75

C. $\sqrt{3}$

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

Answer: A::B

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8. The equilibrium constant for a reaction

$A + 2B \Leftrightarrow 2C$ is 40. The equilibrium constant for reaction

$C \Leftrightarrow B + 1/2A$ is

A. $1/40$

B. $1/(40)^{1/2}$

C. $(1/40)^2$

D. 40

Answer: A::B

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9. The equilibrium constant for the reaction $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$ at 2000K is 4 * 10^-4 In presence of a catalyst the equilibrium is attained three times faster. The equilibrium constant in presence of the catalyst at 2000 K

A. $40 \cdot 10^{-4}$

B. $4 \cdot 10^{-4}$

C. $4 \cdot 10^{-3}$

D. $4 \cdot 10^{-8}$

Answer: B

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

A. Change to 1/4 K

B. Change to 1/2 K

C. Change to 2 K

D. Remain the same

Answer: D

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11. The unit for the equilibrium constant of the reaction

A. $[\text{mole/lit}]^{-}$

B. $[\text{mole/lit}]^{-2}$

C. Mole/lit

D. $[\text{mole/lit}]^{2}$

Answer: B

Watch Video Solution

12. For the equilibrium $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$ at 1000^0C the equilibrium constant is very low, then which of the following is correct at equilibrium ?

A. $[H_2]$ is very high but not $[N_2]$

B. $[H_2]$ is low

C. $[NH_3]$ is very low

D. $[N_2]$ is low

Answer: C

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13. In which of the following reactions, will the equilibrium mixture contain an appreciable concentration of both reactants and products.

A. $Cl_2(g) \Leftrightarrow 2Cl(g), K_c = 6.4 \times 10^{-39}$

B. $Cl_2(g) + 2NO(g) \Leftrightarrow 2NOCl(g) K_c = 3.7 \times 10^8$

C. $Cl_2(g) + 2NO_2(g) \Leftrightarrow 2NO_2Cl(g), K_C = 1.8$

D. $H_2(g) + S(s) \Leftrightarrow H_2S(g), K = 7.8 \times 10^5$

Answer: C

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14. The unit of equilibrium constant, K for the reaction, $A + B \rightarrow C$, would be

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

B. $[A] = [B] = [C] = [D] = 10.0M$

C. $[A][B] = 0.10[C][D]$

D. $[A][B] = 10.0[C][D]$

Answer: 3

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15. The equilibrium constant for the reversible reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ is K and for the reaction $\frac{1}{2}N_2 + \frac{3}{2}H_2 \Leftrightarrow NH_3$, the equilibrium constant is K', . K and K' will be related as

A. K

B. 2K

C. 1/K

D. K^2

Answer: A::B::C

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16. The active mass of 64g of HI In a 2Lit flask would be

A. 2

B. 1

C. 5

D. 0.25

Answer: A::B::C::D

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17. $AB_3(g)$ is dissociation as $AB_2(g) \Leftrightarrow AB_2(g) + \frac{1}{2}B_2(g)$,

When the initial pressure of AB_2 is 800 torr and

the total pressure developed at equilibrium is 900 torr.

What fraction of $AB_3(g)$ is dissociated ?

A. 0.1

B. 0.2

C. 0.25

D. 0.3

Answer: C

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18. In which one of the following gaseous equilibrium, K_p is less than K_c?

A. $N_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$

B. $2HI_{(g)} \Leftrightarrow H_{2(g)} + I_{2(g)}$

C. $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

D. $N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$

Answer: C

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19. In the reaction $H_{2(g)} + l_{2(g)} \Leftrightarrow 2HI_{(g)}$

A. $K_p = K_c$

B. $K_p \neq K_c$

C. $K_p > K_c$

D. $K_p < K_c$

Answer: A

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20. The equilibrium of the reaction $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$ will be shifted to the right when:

A. $K_p > 1$

B. $Q < K_p$

C. $Q = K_p$

D. $Q > K_p$

Answer: B

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21. Consider the following equilibrium $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$ in a closed container. At a fixed temperature, the volume of the reaction container is halved. For this change, which of the following statements holds true regarding the equilibrium constant (K) and degree of dissociation (a) ?

A. Neighter K_p nor a changes

B. Both K_p and a change

C. K_p changes, but a does not change

D. K_p does not change, but α changes

Answer: D

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22. One mole of A (g) is heated to 200° C in a one litre closed flask, till the following equilibrium is reached.

$A(g) \leftrightarrow B(g)$

The rate of forward reaction, at equilibrium, is 0.02 $molL^{-1}min^{-1}$. What is the rate (in $molL^{-1}min^{-1}$) of the backward reaction at equilibrium?

A. 0.2

B. 0.6

C. 0.8

D. 0.1

Answer: A::B::C

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23. Consider the following reaction equilibrium

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

Initially, 1 mole of N_2 and 3 moles of H_2 are taken in a 2 L flask. At equilibrium state if, the number of moles of N_2 is 0.6, what is the total number of moles of all gases present in the flask ?

A. 0.8

B. 1.6

C. 2.8

D. 3.2

Answer: D

Watch Video Solution

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

$The 3 equilibrium pressure at 25^(@)C is 0.660 atm. W\hat{i}s K_(p)`$ for the reaction ?

A. 0.5

B. 2

C. 1

D. 1.5

Answer: C

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25. One mole of A and 2 moles of B are allowed to react in a 0.5 lit flask. What is the value of K if at equilibirum, 0.4 moles of C is formed in the reaction $A + 2B \Leftrightarrow C + 2D$

A. $4/9$

B. $9/4$

C. $8/27$

D. $27/8$

Answer: C

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26. K_p/K_c for the reaction

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

A. RT

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

C. $\frac{1}{(RT)^3}$

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

Answer: A::B::C::D

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

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

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

then,

A. $K_1 = (1/K_2)^2$

B. $K_1 = K_2^2$

C. $K_1 = 1/K_2$

D. $K_1 = (K_2)^0$

Answer: A::B

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28. For the reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g)$, the degree of dissociation at equilibrium is 0.2 at 1 atm pressure. The equilibrium constant K_p will be

A. $1/2$

B. $1/4$

C. $1/6$

D. $1/8$

Answer: C

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29. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + heat$.What is the effect of the increase of temperature on the equilibrium of the reaction ?

A. Increase the rate of forward reaction

B. Increase the rate of backward reaction

C. Produces no change in the reaction

D. Results an increase in the volume

Answer: A

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30. Inert gas has been added to the following equilibrium system at constant volume

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

To which direction will the equilibrium shift?

A. Forward

B. Backward

C. No effect

D. Unpredictable

Answer: C

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31. For a hypothetical reaction of kind

$AB_2(g) + \frac{1}{2}B_2(g) \Leftrightarrow AB_3(g), \Delta H = -xkJ$

More AB_3 could be produceed at equilibrium by

A. Using a catalyst

B. Removing some of B_2

C. Increasing the temperature

D. Increasing the pressure

Answer: D

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32. The equilibrium concentration of C_2H_4 in the following gas phase reaction can be increased by

$C_2H_4(g) + H_2(g) \Leftrightarrow C_2H_6(g), \Delta H = -32.7kcal$

A. Removal of C_2H_6

B. Addition of H_2

C. Increase in temperature

D. Increase in pressure

Answer: C

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33. Assertion (A) : The value of K increases with increase in temperature in case of endothermic reaction

Reason (R) : The increase in temperature shifts the equilibrium in the backward direction in case of exothermic reaction.

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

B. $N_2 + O_2 \Leftrightarrow 2NO$

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

D. $PCl_5 \Leftrightarrow PCl_5 + Cl_2$

Answer: D

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34. H_2O_2 is obtained by which of the following

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 pressure on the system is increased

D. At low pressure, the nature of equilibrium changes to forward direction

Answer: A::B::C

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35. In the melting of ice, which one of the conditions will be more favourable?

A. High pressure and low temperature

B. High pressure and high temperature

C. Low pressure and low temperature

D. Low pressure and high temperature

Answer: A::B::C

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Exercise -I (H.W.)

1. Which one of the following has greater active mass

A. 200g of lime stone in 2L vessel

B. 90g of CS_2 liquid in 100ml vessel

C. 50g of N_2 gas in 0.5L vessel

D. 1mole of O_2 gas at STP

Answer: 3

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2. The following one is example to physical equilibrium

A. $\text{solid} \Leftrightarrow \text{liquid}$

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

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

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

Answer: A

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3. Law of mass action can not be applied to

A. $2HI \Leftrightarrow H_2 + I_2$

B. $PCl_5 \Leftrightarrow PCl_3 + Cl_2$

C. $\text{Water} \Leftrightarrow \text{Ice}$

D. $CaCO_3 \Leftrightarrow CaO + CO_2$

Answer: A::B::C

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4. In which of the following reaction is almost completed:-

A. $K_c = 1$

B. $K_c = 10^{10}$

C. $K_c = 10^{-10}$

D. $K_c = 10$

Answer: B::C

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5. Consider the equilibrium reactions,

$H_3PO_4 \overset{K_1}{\Longleftrightarrow} H^+ + H_2PO_4^-$

$H_3PO_4^- \overset{K_2}{\Longleftrightarrow} H^+ + HPO_4^{-2}$

$HPO_4^{-2} \overset{K_3}{\Longleftrightarrow} H^+ + PO_4^{-3}$

The equilibrium constant K for the following dissociation

$H_3PO_4 \Leftrightarrow 3H^+ + PO_4^-$ is

A. $K_1 = K_2 + K_3$

B. $\sqrt{K_1K_2K_3}$

C. $K_1xK_2xK_3$

D. $\frac{1}{K_1K_2K_3}$

Answer: C::D

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6. If K_1 and K_2 are the equilibrium constants of the equilibria (a) and (b) respectivel, what is the relationship between the two constants ?

(a) $SO_2 + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g), K_1$

(b) $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g), K_2$

A. $K_1 = K_2$

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

C. $K_2 = K_1^2$

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

Answer: D

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7. For an exothermic reaction, equilibrium constant at T_1 and T_2 are respectively K_1 and K_2 If $K_1 < K_2$ then : -

A. Increases with increase of temperature

B. Decreases with increase of temperature

C. Decreases with increase of temperature

D. Decreases with increase of pressure

Answer: B

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8. Ammonium chloride dissolves in water with absorption of heat. The solubility of ammonium chloride increases with ___in temperature.

A. The solubility of ammonium chloride decreases with increase in temperature

B. The solubility of ammoniurn chloride increases with increase in temperature

C. At higher temperature, ammonium chloride in solution exists as ammonia and hydrochloric acid

D. At lower temperature ammonium chloride in solution is present in the molecular form

Answer: B::C::D

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9. Equilibrium constants (K) for the reaction $2NO(g) + Cl_2(g) \Leftrightarrow 2NOCl(g)$ is correctly given by the expression

A. $K = \dfrac{[2NOCl]}{[2NO][Cl_2]}$

B. $K = \dfrac{[2NOCl]^2}{[NO^2][Cl_2]}$

C. $K = \dfrac{(NOCl]^2}{[NO_2]^2[Cl_2]}$

D. $K = \dfrac{[NOCl]^2}{[NO]^2[Cl_2]}$

Answer: D

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

A. 1

B. 0.3

C. 2.25

D. $4/9$

Answer: C

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11. K_c for $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ is 0.00466 at $298K$. If a $1-L$ container initially contained 0.8 mol of N_2O_4, what would be the concentrations of N_2O_4 and NO_2 at equilibrium? Also calculate the equilibrium concentration of N_2O_4 and NO_2 if the volume is halved at the same temperature.

A. $9atm^{-1}$

B. 9 atm

C. $4.5atm^2$

D. 10 atm

Answer: B

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12. For the reaction, $2NO_2(g) \rightarrow 2NO(g) + O_2(g), K_c = 1.8 \times 10^{-6} \text{at} 185^\circ C$, the value of K_c for the reaction $NO(g) + \frac{1}{2}O_2(g) \rightarrow NO_2(g)$ is

A. $2 < 1 < 4 < 3$

B. $3 < 4 < 2 < 1$

C. $1 < 3 < 4 < 2$

D. $4 < 3 < 1 < 2$

Answer: A::B::C::D

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13. The equilibrium constant K of a reversible reaction is 10. The rate constant for the reverse reaction is 2.8. What is the rate constant for the forward reaction

A. 0.28

B. 28

C. 0.028

D. 280

Answer: B::C

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

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

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

A.

	$[H_2][M]$	$[I_2][M]$	$[HI][M]$
1	0.200	0.200	0.0200

B.

	$[H_2][M]$	$[I_2][M]$	$[HI][M]$
2	0.00427	0.00427	0.0315

C.

	$[H_2][M]$	$[I_2][M]$	$[HI][M]$
3	0.315	0.0315	0.00850

D.

	$[H_2][M]$	$[I_2][M]$	$[HI][M]$
4	0.00478	0.00478	0.0352

Answer: B

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15. 4.5 moles each of hydrogen and iodine heated in a sealed 10 litrevesel. At equilibrium, 3 moles of HI was foun. The equilibrium constant for $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is

A. 1

B. 10

C. 5

D. 0.33

Answer: A

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16. 1 mole of $A_{(g)}$ is heated to $200^{\circ}C$ in a one litre closed flask, till the following equilibrium is reached. $A_{(g)} \Leftrightarrow B_g)$. The rate of forward reaction at equilibrium is 0.02 mol $\text{lit}^{-1}\text{min}^{-1}$. What is the rate $\left(\text{mol. Lit}^{-1}\ \ \text{min}^{-1}\right)$ of the backward reaction at equilibrium?

A. 0.04

B. 0.01

C. 0.02

D. 1

Answer: A::B::C

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17. The equilibrium constant for the reaction is $H_2O_{(l)} + CO_{(g)} \Leftrightarrow H_{2(g)} + CO_{2(g)}$ is 64. If the rate constant for the forward reaction is 160, the rate constant for the backward reaction is

A. 0.4

B. 2.5

C. 6.2

D. 10.24×10^3

Answer: B::C

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18. At equilibrium, the concentrations of $N_2 = 3.0 \times 10^{-3} M, O_2 = 4.2 \times 10^{-3} M,$ and $NO = 2.8 \times 10^{-3} M$ in a sealed vessel at $800 K$. What will be K_c for the reaction

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

A. 0.622

B. 6.22

C. 1.244

D. 2.488

Answer: A::B::C

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19. The equilibrium constant for the reaction, $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$ is 64 at a certain temperature. The equilibrium concentrations of H_2 and HI are $2mol/L$ and $16mol/L$ respectively. What is the equilibrium concentration (in mol/L) of I_2 ?

A. 16

B. 4

C. 8

D. 2

Answer: B::C::D

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20. If K_1 and K_2 are respective equilibrium constants for two reactions :

$XeF_6(g) + H_2O \Leftrightarrow XeOF_4(g) + 2HF_g$

$XeO_4(g) + XeF_6(g) \Leftrightarrow XeOF_4(g) + XeO_3F_2(g)$

Then equilibrium constant for the reaction

$XeO_4(g) + 2HF(g) \Leftrightarrow XeO_3F_2(g) + H_2O(g)$ will be

A. $K_1 . K_2$

B. K_2 / K_1

C. $K_1 / (K_2)^2$

D. K_1 / K_2

Answer: A::B::D

Watch Video Solution

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

A. 0.15 mole

B. 0.06 mole

C. 0.03 mole

D. 0.2 mole

Answer: B

Watch Video Solution

22. If the equilibrium constant for the reaction $2AB \Leftrightarrow A_2 + B_2$ is 49, what is the value of equilibrium constant for

$AB \Leftrightarrow \frac{1}{2}A_2 + \frac{1}{2}B_2$

A. 49

B. 4

C. 7

D. 0.02

Answer: C

Watch Video Solution

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

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

$2S(s) + 3O_2(g) \Leftrightarrow 2SO_3(g), K_c = 5 \times 10^{29}$

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. 2×10^{7}

Answer: A::B::C

Watch Video Solution

24. The equilibrium constant of a reaction is 300, if the volume of the reaction flask is tripled, the equilibrium constant will be

A. 100

B. 300

C. 250

D. 150

Answer: A::B::C::D

Watch Video Solution

25. When 1 mole of $H_{2(g)}$ is heated with one mole of $I_{2(g)}$, it was found that 1.48 moles of $HI_{(g)}$ is formed at equilibrium. Its K_c is

A. 16

B. 32

C. 8

D. 24

Answer: B

Watch Video Solution

26. The K_p of the reaction is $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$. If the total pressure at equilibrium is 30 atm.

A. $15atm^2$

B. $225atm^2$

C. $30atm^2$

D. 15 atm

Answer: B

Watch Video Solution

27. The equilibrium constant K_p for the reaction $2SO_2 + O_2 \Leftrightarrow 2SO_3$ is 2.5 atm^{-1}. What would be the partial pressure of O_2 at equilibrium. If the equilibrium pressures of SO_2 and SO_3 are equal

A. 304 mm

B. 30.4 mm

C. 0.04 mm

D. 760 mm

Answer: A::B

Watch Video Solution

28. HI was heated in a sealed tube at $400^\circ C$ till the equilibrium was reached. HI was found to be $22\,\%$ decomposed. The equilibrium constant for dissociation is

A. 0.282

B. 0.0796

C. 0.0199

D. 1.99

Answer: C

Watch Video Solution

29. A reaction, $A(g) + 2B(g) \Leftrightarrow 2C(g) + D(g)$ was studied using an initial concentraction of B which was 1.5 times that of A. But the equilibrium concentrations of A and B were found to be equal. The vlue of K_p for the equilibrium is

A. 4

B. 8

C. 6

D. 2

Answer: A

Watch Video Solution

30. 1 mol of H_2, 2 mol of I_2 and 3 mol of HI were taken in a $1-L$ flask. If the value of K_c for the equation $H_2(g)+I_2(g) \Leftrightarrow 2HI(g)$ is 50 at $440^\circ C$, what will be the concentration of each specie at equilibrium?

A. 0.3

B. 1.3

C. 4.4

D. 2.7

Answer: C

Watch Video Solution

31. NO_2 is involved in the information of smog and acid rain.a reaction that is improtant in the formation of NO_2 is $O_3(g) + NO(g) \Leftrightarrow O_2(g) + NO_2(g), K_c = 6 \times 10^{34}$, if the air over KOTA contained $1 \times 10^{-6} MO_3, 1 \times 10^{-5} MNO, 2.5 \times 10^{-4} MNO_2$ and $8.2 \times 10^{-3} MO_2$, what can we conclude ?

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

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

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

D. There will be a tendency to form more NO and O_2.

Answer: B

Watch Video Solution

32. If $mol \cdot L^{-1}$ and 'atm' be the units of concentration and pressure respectively, then what will be the value of K_p / K_c for the reaction,

`N_2O_4(g)

A. 1,2

B. 3,2

C. 2,3

D. All

Answer: D

Watch Video Solution

33. For the reaction $A + B \Leftrightarrow 3.C$ at $25^{\circ}C$, a $3L$ vessel contains 1, 2, and 4 moles of A, B and C respectively. Predict the direction of reaction if:

a. K_c for the reaction is 10.

b. K_c for the reaction is 15.

c. K_c for the reaction is 10.66

A. Backward

B. Forward

C. Equilibrium

D. Any direction

Answer: A::C

Watch Video Solution

34. One mole of SO_3 was placed in a litre reaction vessel at a certain temperature. The following equilibrium was established $2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g)$ At equilibrium 0.6 moles of SO_2 were formed. The equilibrium constant of the reaction will be

A. 0.36

B. 0.45

C. 0.54

D. 0.675

Answer: D

Watch Video Solution

35. 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. 0.2

C. 0.4

D. 2

Answer: B

Watch Video Solution

36. An equilibrium mixture for the reaction

$2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$

had 1 mole of H_2S, 0.2 mole of H_2 and 0.8 mole of S_2 in a 2 litre flask. The value of K_c in mol L^{-1} is

A. 0.004

B. 0.08

C. 0.016

D. 0.16

Answer: B::C

Watch Video Solution

37. When CO_2 dissolves in water, the following equilibrium is established.

$CO_2 + 2H_2O \Leftrightarrow H_3O^+ + HCO_3^-$

for which the equilibrium constant is 3.8×10^{-6} and pH 6.0. What would be the ratio of concentration of bicarbonate ion to carbon dioxide *i. e.* $\left[HCO_3^-\right] / [CO_2]$

A. $3x10^{-1}$

B. $3.8x10^{-13}$

C. 13.4

D. 6

Answer: A

Watch Video Solution

38. At $27^{\circ}C$ and 1 atmosphere pressure N_2O_4 is 20% dissociated into NO_2 find K_P

A. 0.2

B. 0.166

C. 0.15

D. 0.1

Answer: B

Watch Video Solution

39. 28g of N_2 and 6g of H_2 were mixed. At equilibrium 17g of NH_3 was formed. The weight of N_2 and H_2 at equilibrium are respectively

A. 11 g & zero

B. 19 & 3g

C. 14g & 3g

D. 11g & 3g

Answer: A::B::C::D

Watch Video Solution

40. Find the value of K_p for the reaction : $2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$, if the partial pressures of SO_2, O_2, and SO_3 are 0.559 atm, 0.101 atm and 0.331 atm respectively. What will be the partial pressure of O_2 gas if at equilibrium, equal amounts (in moles) of SO_2 and SO_3 are observed?

A. 0.5 atm

B. 0.3 atm

C. 0.2 atm

D. 0.1 atm

Answer: C

Watch Video Solution

41. The value of $\Delta G^{\ominus}$ for the phosphorylation of glycose in glycolysis is $13.8 kJ mol^{-1}$. Find the value of K_c at $298 K$

A. 5.8×10^{-5}

B. 5.8×10^{5}

C. 3.8×10^{3}

D. 3.8×10^{-3}

Answer: D

Watch Video Solution

42. The value of (K_p/K_c) for the reversible reaction $SO_{2(g)} + 1/2O_{2(g)} \Leftrightarrow SO_{3(g)}$ at constant temperature T is

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

B. RT

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

D. 1/RT

Answer: A::B::C

Watch Video Solution

43. For the equilibrium

$2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g)$

the value of the equilibrium constant, K_c is 3.75×10^{-6} at $1069K$. Calcualate the K_p for the reaction at this temperature?

A. 0.066

B. 3.33

C. 0.33

D. 0.033

Answer: A::C::D

Watch Video Solution

44. At $27^\circ C$, K_p value for the reversible reaction $PCl_5(g) \leftrightarrow PCl_3(g) + Cl_2(g)$ is 0.65, calculate K_c.

A. 1

B. 0.65

C. 0.2

D. 0.026

Answer: A::C::D

Watch Video Solution

45. The reaction,

$C_6H_5ONa + CO_2 + H_2O \rightarrow C_6H_5OH + NaHCO_3$

suggests that :

A. Exposing the system to light

B. Adding an alkali

C. Adding an acid

D. Adding C_2H_5Br

Answer: C

Watch Video Solution

46. In which reaction will an increase in the volume of the container favor the formation of products?

A. Increases

B. Decreases

C. Remains same

D. Data insufficient

Answer: A

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47. The dissociation of $CaCO_3$ is suppressed at high pressure

A. Adding of more $CaCO_3$

B. Removal of some Cao

C. Increasing the pressure

D. Decreasing the pressure by removing some CO_2 from the equilibrium mixture

Answer: B::D

Watch Video Solution

48. At constant pressure, the addition of argon to $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

A. Reduces the formation of ammonia from nitrogen and hydrogen

B. Increases the formation of ammonia from nitrogen and hydrogen

C. Does not effect the equilibrium of the reaction in which ammonia is formed from nitrogen and dasan

D. Reuces the dissociation of ammonia

Answer: A

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

A. $2NF_3(g) \rightarrow N_2(g) + 3F_2(g) - 54.40$ k.cals

B. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + 22.08\,\text{k.cals}$

C. $Cl_2(g) + 2O_2(g) \rightarrow 2ClO_2(g) - 49.4\,\text{k.cals}$

D. $2Cl_2O_7(g) \rightarrow 2Cl_2(g) + 7O_2(g) - 126.8\,\text{k.cals}$

Answer: C

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50. The reaction

$1/2H2(g) + AgCl(s) \rightarrow H^{\oplus}(aq) + Cl^{c-}(aq) + Ag(s)$ occurs in the galvanic cell.

A. Decreases as the amount of $AgCl_{(s)}$ decreases

B. Decreases as the amount of $AgCl_{(s)}$ increases

C. Increases as the amount of $AgCl_{(s)}$ decreases

D. Increases as the amount of $AgCl_{(s)}$ increases

Answer: B::C

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51. When PCl_5 is heated

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Exercise -II (C.W.)

1. Active mass of 56g of N_2 contained in 2 ltr. flask is

A. 16 Mole. lit^{-1}

B. 32 Mole. lit^{-1}

C. 1.00 Mole. lit^{-1}

D. 0.1 Mole. lit^{-1}

Answer: C

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2. $\alpha - \text{sulphur} \Leftrightarrow \beta -$ sulphur is an example to

A. Physical equilibrium

B. chemical equilibrium

C. Irreversible reaction

D. Both physical and chemical equilibrium

Answer: A

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3. Law of mass action is applicable to

A. Homogeneous chemical equilibria only

B. Heterogeneous chemical equilibria only

C. Physical equilibria

D. Both homogeneous and heterogeneous chemical equilibrium

Answer: D

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4. In which of the following case does the reaction go farthest to completion?

A. $K = 10^4$

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

C. K=10

D. K=1

Answer: A

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5. Consider the following gaseous equilibria with equilibrium constant $K_1 \text{and} K_2$ respectively.

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

The equilibrium constant are related as :

A. 0.9

B. $400/9$

C. $9/400$

D. $1/9$

Answer: A

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6. The equilibrium constants for the following reactions

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

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

respectively.

The equilibrium constant (K) for the reaction

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

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

B. $K_1^2 - K_2^2$

C. $K_1 \times K_2^2$

D. $K_1^2 - K_2$

Answer: C

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7. For the equilibrium, $PCl_5 \Leftrightarrow PCl_3 + Cl_2, K_c = \alpha^2/(1-\alpha)V$, temperature remaining constant

A. K_c will increase with increase in volume

B. K_c will increase with decrease in volume

C. K_c will not change with the change in volume

D. K_c may increase or decrease with the change in volume depending upon its numerical value

Answer: C

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8. Solubility of a substance which dissolves with a decrease in volume and absorption of heat will be favoured by

A. High P and high T

B. Low P and low T

C. High P and low T

D. Low P and high T

Answer: A

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9. The equilibrium constant for the reaction $NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ is correctly given by

A. $\frac{[NH_3][H_2S]}{[NH_4HS]}$

B. $\frac{[NH_4HS]}{[NH_3][H_2S]}$

C. $[NH_3][H_2S]$

D. $\frac{[NH_3] + [H_2S]}{NH_4HS}$

Answer: C

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

$N_2O_4 \Leftrightarrow 2NO_2$ is

A. $1X10^{-2}$

B. $2X10^{-3}$

C. $1X10^{-5}$

D. $2X10^{-5}$

Answer: C

Watch Video Solution

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

A. 0.5

B. 3

C. 4

D. 3.2

Answer: B::C

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12. In which of the following reactions, the concentration of product is higher than the concentration of reactant at equilibrium? (K = equilibrium constant)

A. $A \Leftrightarrow B, K = 0.001$

B. $M \Leftrightarrow N, K = 10$

C. $X \Leftrightarrow Y, K = 0.005$

D. $R \Leftrightarrow P, K = 0.01$

Answer: A::B::C::D

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13. Equilibrium constant for an equilibrium reaction is 100. Its forward reaction rate constant $K_f = 10^5$. Its backward reaction rate constant K_b is

A. 10^2

B. 10

C. 10^{-3}

D. 10^3

Answer: B::C::D

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14. In the reaction

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$, the equilibrium concentrations of PCl_5 and PCl_3 are 0.4 and 0.2 mole / litre respectively. If the value of K_c is 0.5 , what is the concentration of Cl_2 in moles / litre ?

A. 0.5

B. 0.1

C. 1.5

D. 0.75

Answer: B::C

Watch Video Solution

15. For the reaction, $A(g) + 2B(g) \Leftrightarrow 2C(g)$ one mole of A and 1.5 mol of B are taken in a 2.0 L vessel. At equilibrium, the concentration of C was found to be 0.35 M. The equilibrium constant (K_c) of the reaction would be

A. 4

B. 0.5

C. 2

D. 0.25

Answer: D

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

A. Rate of forward reaction is equal to rate of backward reaction at equilibrium.

B. After reaching the chemical equilibrium, the concentrations of reactants and prouducts remain unchanged with time.

C. For $A(g) \Leftrightarrow B(g), K_c$ is 10^{-2}. If this reaction is carried out in the presence of catalyst, the value of K_C decreases

D. After reaching the equilibrium, both forward and backward reactions continue to take place

Answer: C

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17. Equilibrium constant for the reaction $H_2O_{(g)} + CO_{(g)} \Leftrightarrow H_{2(g)} + CO_{2(g)}$ is 81. If the rate constant of the forward reaction is 162 lit $mol^{-1}, \sec^{-1}$, what is the velocity constnat $\left(\text{in lit}.mo \leq {}^{-1}\sec^{-1}\right)$ for the backward reaction?

A. 131

B. 2

C. 261

D. 243

Answer: B

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18. PCl_3, PCl_3 and Cl_2 are at eqilibrium at 500 K and above have concentration 1.59 M for $PCl_3, 1.59M$ for Cl_2 and 1.41 M for PCl_5. Calculate K_c for the reaction :

$PCl_5 \Leftrightarrow PCl_3 + Cl_2$

A. 1.79

B. 17.9

C. 3.58

D. 0.895

Answer: A

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19. $A + B \rightarrow C + D$

Initially moles of A and B are equal. At equilibrium, moles of C are three times of A. The equilibrium constant of the reaction will be

A. $P_A < P_B \& P_D < P_C$

B. $P_C = 2P_D \& P_A = 3P_B/4$

C. $P_A = P_C \& P_B = P_D$

D. $P_A > P_D \& P_A > P_C$

Answer: C

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20. The K_c for the reaction $A + B \Leftrightarrow C$ is 4 and K. for $2A + D \Leftrightarrow C$ 6. The value of K_c for $C + D \Leftrightarrow 2B$ is

A. 0.67

B. 0.375

C. 2.7

D. 1.5

Answer: A::B::C

Watch Video Solution

21. 1.50 moles each of hydrogen and iodine is p[laced in a sealed 10 litre container maintained at 717 K. At equilibrium 1.25 moles each of

hydrogen and iodine were left behind. The equilibrium constant K_c for the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g) at 717$ K is

A. 12.2

B. 1.67

C. 731

D. 13.4

Answer: D

Watch Video Solution

22. At a given temperature the equilibrium constant for the reaction $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ is 2.4×10^{-3}. At the same temperature the equilibrium constant for the reaction $PCl_3(g) + Cl_2(g) \Leftrightarrow PCl_5(g)$

A. $2.4x10^{-3}$

B. -2.4×10^{-3}

C. 4.2×10^{2}

D. 4.8×10^{-2}

Answer: C

Watch Video Solution

23. In alkaline solution, the following equilibria exist

a. $S^{2-} + S \rightarrow S_2^{2-}$ equilibrium constant K_1

b. $S_2^{2-} + S \rightarrow S_3^{2-}$ equilibrium constant K_2

K_1 and K_2 have values 12 and 11, respectively.

$S_3^{2-} \rightarrow S^{2-} + 2S$. What is equilibrium constant for the reaction

A. 23

B. 132

C. 1/132

D. $1/32$

Answer: A::B::C

Watch Video Solution

24. The equilibrium constant (K_p) for the reaction, $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$ is 16. If the volume of the container is reduced to half of its original volume, the value of K_p for the reaction at the same temperature will be:

A. 32

B. 64

C. 16

D. 4

Answer: C

Watch Video Solution

25. The rate constant of the reaction $A \rightarrow 2B$ is 1.0×10^{-3} mol lit^{-1} min^{-1}, if the initial concentration of A is 1.0 mole lit^{-1} . What would be the concentration of B after 100 minutes.

A. 0.9

B. 0.81

C. 81

D. 8.1

Answer: C

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26. For a reaction at equilibrium which of the following is correct ?

A. log K=log a+log b+log c

B. K=a+b+c

C. $\frac{1}{K} = \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$

D. $K = \frac{1}{a} \times \frac{1}{b} \times \frac{1}{c}$

Answer: A

Watch Video Solution

27. The equilibrium constant, K_p for the reaction

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

is $44.0atm^{-1}\text{at}1000K$. What would be the partial pressure of O_2 if at equilibrium the amound of SO_2 and SO_3 is the same?

A. 0.2 atm

B. 0.3 atm

C. 0.4 atm

D. 0.1 atm

Answer: A::B::C

Watch Video Solution

28. In the dissociation of PCl_5 as

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

If the degree of dissociation is α at equilibrium pressure P, then the equilibrium constant for the reaction is

A. 0.25

B. 0.3

C. 0.5

D. 1

Answer: C

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29. In an equilibrium $A + B \Leftrightarrow C + D$, A and B are mixed in vessel at temperature T. The initial concentration of A was twice the initial concentration of B. After the equilibrium has reaches, concentration of C was thrice the equilibrium concentration of B. Calculate K_c.

A. 4.5

B. 9

C. 1.8

D. 0.9

Answer: C

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30. At 550 K, the Kc for the following reaction is $10^4 mol^{-1}L$. $X(g) + Y(g) \rightarrow Z(g)$ At equilibrium, it was observed that $[X] = \frac{1}{2}[Y] = \frac{1}{2}[Z]$. What is the value of $[Z]\left(\text{in } mol^{-1}L\right)$ at equilibrium ?

A. 2×10^{-4}

B. 10^{-4}

C. 2×10^4

D. 10^4

Answer: A::B::C

Watch Video Solution

31. The equilibrium constant for the given reaction is 100.

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

What is the equilibrium constant for the reaction ?

$NO_2(g) \Leftrightarrow 1/2N_2(g) + O_2(g)$

A. 10

B. 1

C. 0.1

D. 0.01

Answer: A::B::C

Watch Video Solution

32. For the reaction, $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$-

A. 72

B. 12×10^{-2}

C. 3

D. 27

Answer: B

Watch Video Solution

33. The value of K_c for the reaction $2A \Leftrightarrow B + C$ is 2.0×10^{-3}. At a given time, the composition of reaction mixture is $[A] = [B] = [C] = 3 \times 10^{-4} M$. In which direction the reaction will proceed?

A. Forward

B. Backward

C. At equilibrium

D. Forward or Backward

Answer: B

Watch Video Solution

34. In a 500mL falsk, the degree of dissociation of PCI_5 at equilibrium is $40\,\%$ and the initial amount is 5 moles. The value of equilibrium constant in mol L^{-1} for the decomposition of PCI_5 is

A. 2.33

B. 2.66

C. 5.32

D. 4.66

Answer: B

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35. One mole of H_2 and 2 moles of I_2 are taken initially in a two litre vessel. The number of moles of H_2 at equilibrium is 0.2. Then the number of moles of I_2 and HI at equilibrium is

A. 3.2 M

B. 4M

C. 1.6M

D. 1M

Answer: C

Watch Video Solution

36. In a 500 ml capacity vessel CO and Cl_2 are mixed to form $COCl_2$. At equilibrium, it contains 0.2 moles of $COCl_2$ and 0.1 mole of each of CO and Cl_2. The equilibrium constant K_c for the reaction $CO + Cl_2 \Leftrightarrow COCl_2$ is

A. 20

B. 15

C. 10

D. 5

Answer: C

Watch Video Solution

37. The following concentrations were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium at $500K$. $[N_2] = 1.5 \times 10^{-2}M$, $[H_2] = 3.0 \times 10^{-2}M$, and $[NH_3] = 1.2 \times 10^{-2}M$. Calculate the equilibrium constant.

A. 3.55×10^2

B. 1.06×10^{-3}

C. 2.12×10^{-3}

D. 2.12×10^3

Answer: A::B::C

Watch Video Solution

38. In the dissociation of HI, 20% of HI is dissociated at equilibrium. Calculate K_p for

$HI(g) \Leftrightarrow 1/2H_2(g) + 1/2I_2(g)$

A. 1.25

B. 0.125

C. 12.5

D. 0.0125

Answer: B

Watch Video Solution

39. If $340g$ of a mixture of N_2 and H_2 in the correct ratio gas a $20\,\%$ yield of NH_3. The mass produced would be:

A. 16g

B. 17g

C. 20g

D. 68g

Answer: B::C::D

Watch Video Solution

40. At $600^\circ C$, K_P for the following reaction is 1 atm.

$X(g) \rightarrow Y(g) + Z(g)$

At equilibrium, 50% of X (g) is dissociated. The total pressure of the equilibrium system is p atm. What is the partial pressure (in atm) of at equilibrium ?

A. 1

B. 4

C. 2

D. 0.5

Answer: A

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41. Hydrolysis of sucrose gives

$\text{Sucrose} + H_2O \Leftrightarrow \text{Glucose} + \text{Fructose}$

Equilibrium constant K_c for the reaction is 2×10^{13} at $300K$. Calculate $\Delta G^{\ominus}$ at $300K$.

A. 7.64×10^4 J Mole^{-1}

B. 7.64×10^{-4} J Mole^{-1}

C. -7.64×10^{-4} J Mole^{-1}

D. -7.64×10^4 J Mole^{-1}

Answer: D

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42. For the process

$NH_3(g) + HCI(g) \rightarrow NH_4CI(s)$

A. $K_p = K_c$

B. $K_p = K_c x(RT)$

C. $K_p = K_c x(RT)^{-2}$

D. $K_p = K_c x(RT)^{-1}$

Answer: A::B::C

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43. For the reversible reaction, $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ At $500^\circ C$, the value of Kp is 1.44×10^{-5} when partial pressure is measured in

atmosphere. The corresponding value of Kc with concentration in mol/L 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: B::C::D

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44. For reaction,

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

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

A. 0.0006

B. 0.57

C. 0.61

D. 0.83

Answer: A::B::C

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45. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + heat$.What is the effect of the increase of temperature on the equilibrium of the reaction ?

A. Equilibrium shifts towards left

B. Equilibrium shifts towards right

C. Concentration of H_2 increases

D. The equilibrium is not affected

Answer: B

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

A. Decreases in temperature

B. Increase in pressure

C. Decrease in pressure suddenly which results in decrease of solubility of CO_3, gas in water

D. None of the above

Answer: A::C

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47. $5.1g$ of solid NH_4HS is introduced in a 16.4 lit. vessel & heated upto $500K$ K_B for equilibrium $NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$ is 0.16 .

The maximum pressure developed in the vessel will be :

A. Adding some more NH_4HS

B. Adding some more NH_3

C. Removing some NH_3 from the reaction mixture

D. Adding some more H_2S

Answer: C

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48. Assertion: To a system at equilibrium addition of inert gas at constant pressure and temperature drive the reaction to the side where larger number of active species is present.

Reason: Addition of inert gas at constant temperature and pressure increases the equilibrium volume.

A. Reduces the dissociation of PCl_5

B. Increase the dissociation of PCI_5

C. Does not affect the degree of dissociation of PCl_5

D. Steps up the formation of PCl_5

Answer: B

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49. In a reaction $A_2(g) + 4B_2(g) \Leftrightarrow 2AB_4(g), \Delta H < 0$. The formation of AB_4 is not favoured by

A. Low temperature and high pressure

B. High temperature and low pressure

C. Low pressure and low temperature

D. High temperature and high pressure

Answer: A

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50. CO_3^{2-} and $S_2O_3^{2-}$ can be distinguished by:

A. Amount of $AgCl(s)$ increases

B. System cannot achieve equilibrium

C. Concentration of $\left[Ag(S_2O_3)_2\right]^{3-}(aq)$ decreases

D. Concentration of $Cl^-(aq)$ increases

Answer: D

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51. Two samples of HCl having 1M and 0.25 M are mixed. Find the volumes of these samples respectively taken in order to prepare 0.75 M HCl solution.

A. More than 5 lit vessel

B. More in 10 lit vessel

C. Equal in both vessels

D. Cannot be said

Answer: C

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Exercise -II (H.W.)

1. v36.3

A. $1/2$

B. 2

C. 1

D. $1/4$

Answer: B

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2. 2mole of PCl_5 were heated in a closed vessel of $2litre$ capacity. At equilibrium $40\,\%$ of PCl_5 dissociated into PCl_3 and Cl_2. The value of the equilibrium constant is:

A. 0.25 lit/mole

B. 1.31 lit/mole

C. 0.76 lit/mole

D. 2.6 lit/mole

Answer: C

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3. How much PCl_5 must be added to a one little vessel at $250^\circ C$ in order to obtain a concentration of 0.1 mole of Cl_2 at equilibrium. K_c for $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ is 0.0414

A. 3.415 mole

B. 34.15 mole

C. 0.03415 mole

D. 0.3415 mole

Answer: D

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

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

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

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

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

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

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

Answer: A

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

A. 0.11

B. 0.17

C. 0.18

D. 0.3

Answer: A

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6. A mixture of SO_3, SO_2 and O_2 gases is maintained in a $10L$ flask at a temperature at which the equilibrium constant for the reaction is 100:

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

a. If the number of moles of SO_2 and SO_3 in the flask are equal. How many moles of O_2 are present?

b. If the number of moles of SO_3 in flask is twice the number of moles of SO_2, how many moles of oxygen are present?

A. 0.1 and 0.4

B. 0.5 and 0.7

C. 0.8 and 0.4

D. 0.1 and 4

Answer: A

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

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

A. Greater than 0.95%

B. Greater than 0.29%

C. Greater than 0.71%

D. Greater than 0.05%

Answer: A

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8. For the reaction, $AB(g) \Leftrightarrow A(g) + B(g)$, AB is $33\,\%$ dissociated at a total pressure of 'p' Therefore, 'p' is related to K_p by one of the following options

A. $P = K_p$

B. $P = 3K_p$

C. $P = 4K_p$

D. $P = 8K_p$

Answer: D

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9. When $20g$ of $CaCO_3$ were put into $10litre$ flask and heated to $800^\circ C$, $35\,\%$ of $CaCO_3$ remained unreacted at equilibrium. K_p for decomposition of $CaCO_3$ is :

A. 25g, 14g, 1/22.4 mol/lit

B. 1,1 1/89.6 mol/lit

C. 25, 14, 1/89.6 mol/lit

D. 1, 1, 1

Answer: B

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10. For the reaction

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

The degree of dissociation (α) of $HI(g)$ is related to equilibrium constant K_p by the expression

a. $\frac{1+2\sqrt{K_p}}{2}$, b. $\sqrt{\frac{1+2K_p}{2}}$

c. $\sqrt{\frac{2K_p}{1+2K_p}}$, d. $\frac{2\sqrt{K_p}}{1+2\sqrt{K_p}}$

A. $\left(1+2\frac{\sqrt{K_p}}{2\sqrt{K_p}}\right.$

B. $\sqrt{\left(1+2\frac{K_0}{2}\right)}$

C. $\sqrt{\frac{2K_p}{1+2K_p}}$

D. $\frac{2\sqrt{K_p}}{1+2\sqrt{K_p}}$

Answer: D

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11. For the reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g)$ the degree of dissociation at equilibrium is 0.2 at 1 atmospheric pressure. The equilibrium constant K_p will be

A. 50

B. 100

C. 166.8

D. 600

Answer: B

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12. For the reaction $N_2O_4 \Leftrightarrow 2NO_{2(g)}$, the degree of dissociation of N_2O_4 is 0.2 at 1 atm. Then the K_p of $2NO_2 \Leftrightarrow N_2O_4$ is

A. 0.53

B. 1.06

C. 0.265

D. 2

Answer: A

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13. 3.00 mol of PCl_5 kept in 1 L closed reaction vessel was allowed to attain equilibrium at 380K. Calculate the composition of the mixture at equilibrium. $K_c = 1.80$.

A. $[PCl_5] = 1.41M, [PCl_3] = [Cl_2] = 2.59M$

B. $[PCl_5] = 1.41M, [PCl_3] = [Cl_2] = 1.5M$

C. $[PCl_5] = 1.41M, [PCl_3] = [Cl_2] = 5.59M$

D. $[PCl_5] = 1.41M, [PCl_3] = [Cl_2] = 9.59M$

Answer: B::C

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14. Gram (+) and Gram (-) forms of bacteria are differentible through staining with

A. 44g

B. 20.33g

C. 22g

D. 58.66g

Answer: D

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15. The dissociation equilibrium of a gas AB, can be represented as The degree of dissociation is x and is small compared to 1. The expression

relating the degree of dissociation (x) with equilibrium constant $K_{„}$ and total pressure p is

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

B. K_P / P

C. $2K_p / P$

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

Answer: D

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

$Fe(OH)_3(s) \Leftrightarrow Fe^{3+}(aq.) + 3OH^-(aq.)$

is decreased by $1/4$ times, then the equilibrium concentration of Fe^{3+} will increase by

A. 4 times

B. 8 times

C. 16 times

D. 64 times

Answer: D

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17. When a mixture of 10 moles of SO_2 and 15 moles of O_2 was passed over catalyst, 8 moles of SO_3 was formed. How many moles of SO_2 and O_2 did not enter into combination?

A. 375

B. 187

C. 360

D. 150

Answer: D

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18. The concentration of reactants is increased by x, then equilibrium constant K becomes

A. K

B. 2xK

C. $\frac{K}{2x}$

D. uncertain

Answer: A

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19. The active mass of water at 4^0C is

A. 5.55

B. 55.5

C. 0.55

D. Data in sufficient

Answer: B

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20. 1 mol of N_2 and 4 mol of H_2 are allowed to react in a vessel and after reaction, H_2O is added. Aqueous solution required 1 mol of HCI for neutralization. Mol fraction of H_2 in the mixture after reaction is :

A. 8

B. 12

C. 16

D. 20

Answer: C

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21. At a certain temperature and a total pressure of $10^5 Pa$, iodine vapour contains $40\ \%$ by volume of Iatoms, Calculate K_p for the equilibrium.

$I_{2(g)} \Leftrightarrow 2I_{(g)}$

A. 0.67

B. 1.5

C. 2.67×10^4

D. 9.0×10^4

Answer: C

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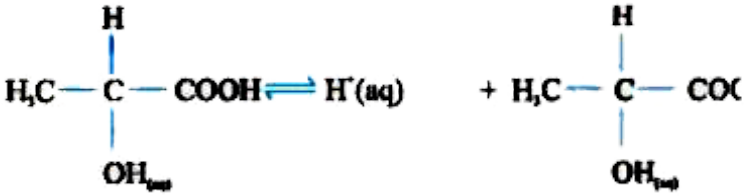
22. The degree of ionization of 0.10 M lactic acid is 4.0%



The value of K_C

A. 1.66×10^{-5}

B. 1.66×10^{-4}

C. 1.66×10^{-3}

D. 1.66×10^{-2}

Answer: B

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23. The reaction of dimerisation of NO_2 in N_2O_4 is $2NO_2 \Leftrightarrow N_2O_4$. The reaction is carried out by taking 1 mole each of NO_2 and N_2O_4 in a closed vessel of 1 litre at $400K$. The equilibrium pressure was found to be $77atm$.

The ratio of partial pressures of NO_2 and N_2O_4 at equilibrium is:

A. 0.16 bar

B. 0.32 bar

C. 0.48 bar

D. 0.64 bar

Answer: D

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

A. 1.8 atm

B. 3 atm

C. 0.3 atm

D. 0.18 atm

Answer: A

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

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

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

C. $3.3 \times 10^{-3} \ \text{mol L}^{-1}$

D. $3.3 \times 10^{3} \ \text{mol L}^{-1}$

Answer: C

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26. In the dissociation of PCl_5 as

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

If the degree of dissociation is α at equilibrium pressure P, then the equilibrium constant for the reaction is

A. $K_p = \frac{\alpha^2}{1 + \alpha^2 P}$

B. $K_P = \frac{\alpha^2 P^2}{1 + \alpha^2}$

C. $K_p = \frac{p^2}{1 - \alpha^2}$

D. $K_p = \frac{\alpha^2 P}{1 - \alpha^2}$

Answer: D

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27. $Ag^+ + NH_3 < \Rightarrow [Ag(NH_3)]^+, k_1 = 6.8 \times 10^{-5}$

$[Ag(NH_3)]^+ + NH_3 < \Rightarrow \left[Ag(NH_3)_2\right]^+,$

$k_2 = 1.6 \times 10^{-3}$

The formation constant of $\left[Ag(NH_3)_2\right]^+$ is :

A. 10^{-6}

B. 2×10^{-2}

C. 2×10^{-8}

D. 2×10^4

Answer: A::B::C

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28. The most stable oxides of nitrogen will be :

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

B. $2N_2O_5(g) \Leftrightarrow 2N_2(g) + 5O_2(g), K = 1.2 \times 10^{24} \text{ mol}^5 L^{-5}$

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

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

Answer: A

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29. In the reaction

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$, the equilibrium concentrations of PCl_5

and PCl_3 are 0.4 and 0.2 mole / litre respectively. If the value of K_c is 0.5 , what is the concentration of Cl_2 in moles / litre ?

A. 1

B. 2

C. 3

D. 4

Answer: B

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30. The equilibrium constant for the given reaction:

$SO_{3(g)} \Leftrightarrow SO_{2(g)} + 1/2O_{2(g)}, \left(K_c = 4.9 \times 10^{-2}\right)$

The value of K_c for the reaction:

$2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$, will be :

A. 9.8×10^{-2}

B. 4.9×10^{-2}

C. 416

D. 2.40×10^{-3}

Answer: A::B::C::D

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31. K_c for $3/2H_2 + 1/2N_2 \Leftrightarrow NH_3$ are 0.0266 and $0.0129 atm^{-1}$, respectively, at $350^\circ C$ and $400^\circ C$. Calculate the heat of formation of NH_3.

A. 12.140 k.cal

B. 1.214 k.cal

C. $-12.140k.\ cal$

D. $-1.214K.\ cal$

Answer: C

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32. For the following reactions (1), (2) and (3) equilibrium constants are given

$(1) CO_2(g) + H_2O(g) \Leftrightarrow CO_2(g) + H_2(g), K_1$

$(2) CH_4(g) + H_2O(g) \Leftrightarrow CO(g) + 3H_2(g), K_2$

$(3) CH_4(g) + 2H_2O(g) \Leftrightarrow CO_2(g) + 4H_2(g), K_3$

Which of the following relation is correct ?

A. $K_2K_3 = K_1$

B. $K_3 = K_1K_2$

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

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

Answer: B

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33. For the reaction $2NO_2(g) \Leftrightarrow 2NO(g) + O_2(g)$

$K_c = 1.8 \times 10^{-6}$ at $184^\circ C$, $R = 0.00831 kJ/$ (mol.K) when K_p and K_c are compared at $184^\circ C$, it is found

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

B. $K_p = K_c$

C. K_p is less than K_c

D. k_p is greater than K_c

Answer: D

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34. The vapour pressure of water at 25°C is 0.0313 atm. Calculate the values of K_p and Kc at 25°C for the equilibrium $H_2O(1) \Leftrightarrow H_2O(g)$.

A. 1.28×10^{-3} and 0.03 13 atm respectively

B. 0.0313 and 1.28×10^{-3} atm respectively

C. 1.28×10^{-3} and 1.28×10^{-3} atm respectively

D. 0.0313 and 0.0313 atm respectively

Answer: B

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35. One dm^3 of hydrogen is present in a flask at a pressure of 10^{-12} bar of Hg and at $0^\circ C$. Calculate the number of oxygen molecules in the flask.

A. 230 KJ/mole

B. 460 KJ/mole

C. 23 KJ/mole

D. 200 KJ/mole

Answer: A

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36. For the reaction at $25^{\circ}C$,

$C_2H_4(g) + H_2(g) \Leftrightarrow C_2H_6(g), K_p = 308.08$

What is ΔG° for this reaction in $kJ \times mol^{-1}$?

A. $11.19 \ \text{kj mol}^{-1}$

B. $22.40 \ \text{kj mol}^{-1}$

C. $33.57 \ \text{kj mol}^{-1}$

D. $27.98 \ \text{kj mol}^{-1}$

Answer: B

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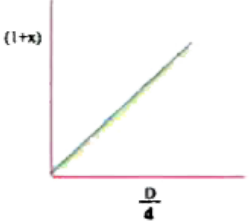
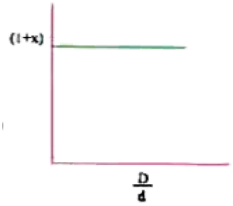
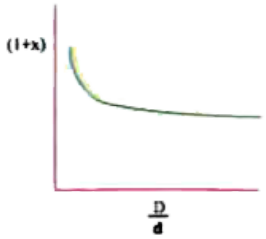
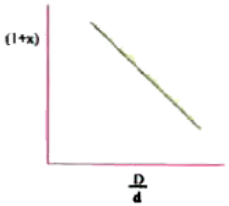
37. In the dissociation of N_2O_4 into NO_2, $(1 + \alpha)$ values with the vapour densities ratio $\left(\frac{D}{d}\right)$ is given by: [α degree of dissociation, D-vapour density before dissociation, d-vapour density after dissociation]

A. 

B. 

C. 

D. 

Answer: A

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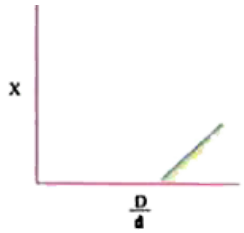
38. The degree of dissociation of PCl_5 will be more at ..... pressure.

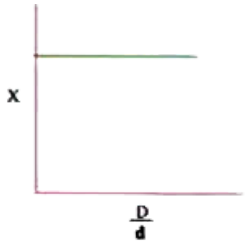
A.

B.



C.

D.



Answer: B

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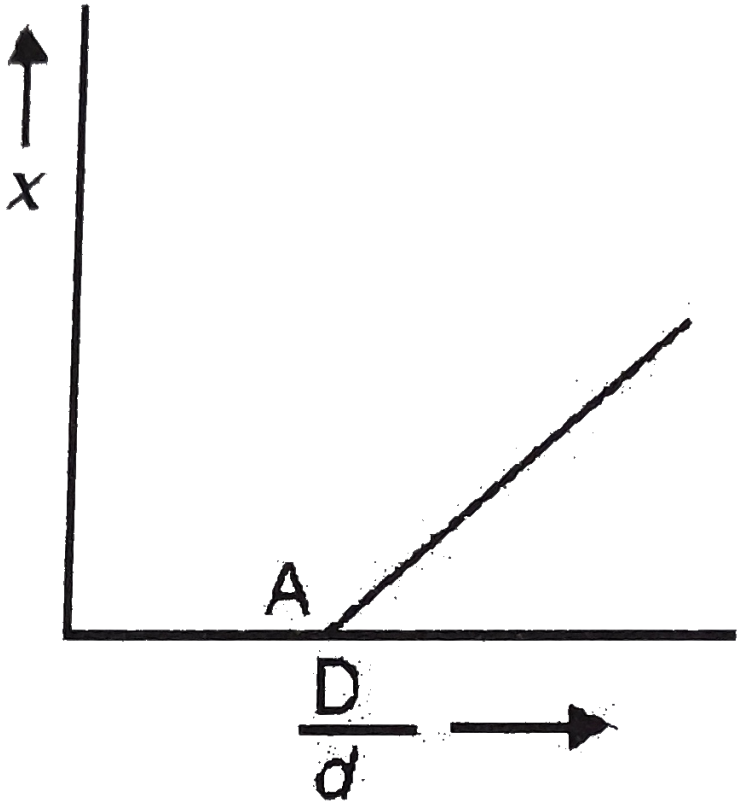
39. Before equilibrium is set-up for the chemical reaction, $N_2O_4 \Leftrightarrow 2NO_2$, vapour density of the gaseous mixture was measured. If D is the theoretical value of vapour density, variation of x with D/d is by the graph.



A. 0

B. 0.5

C. 1

D. 1.5

Answer: C

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

A. 7.5×10^{-5}

B. 2.50×10^{-5}

C. 2.5×10^{-4}

D. 1.72×10^{-4}

Answer: D

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41. N_2O_4 is dissociated to $33\,\%$ and $50\,\%$ at total pressure P_1 and $P_2 atm$ respectively. The ratio of P_1 / P_2 is:

A. $P_1 : P_2 = 7 : 4$

B. $P_1 : P_2 = 7 : 2$

C. $P_1 : P_2 = 4 : 7$

D. $P_1 : P_2 = 3 : 4$

Answer: C

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42. The following equilibrium constants are given :

$N_2 + 3H_3 \Leftrightarrow 2NH_3, K_1$

$N_2 + O_2 \Leftrightarrow 2NO, K_2$

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

The equilibrium constant for the oxidation of NH_3 by oxygen to give NO is :

A. $\frac{K_2K_3^2}{K_1}$

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

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

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

Answer: D

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43. For the reaction, $PCl_3(g) + Cl_2(g) \Leftrightarrow PCl_5(g)$ at $27^\circ C$, K_p is $0.41\ \text{atm}^{-1}$. Then K_c is :

A. $6Lmol^{-1}$

B. $60Lmol^{-1}$

C. $10.08Lmol^{-1}$

D. $1.008 \times 10^2 Lmol^{-1}$

Answer: C

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44. The equilibrium constant K_{p_1} and K_{p_2} for the reactions $X \Leftrightarrow 2Y$ and $Z \Leftrightarrow P + Q$, respectively are in the ratio of $1:9$. If the degree of dissociation of X and Z be equal, then the ratio of total pressure at these equilibrium is:

A. $1:36$

B. $1:1$

C. $1:3$

D. $1:9$

Answer: A

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45. 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. 80

Answer: C

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

A. -1

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

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

D. 1

Answer: B

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47. For the reaction,

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

the reaction connecting the degree of dissociation (α) of $N_2O_4(g)$ with eqilibrium constant K_p is

where P_τ is the total equilibrium pressure.

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

B. $\alpha = \frac{K_p}{4 + k_P}$

C. $\alpha = \frac{K_p/P}{(4 + K_p/P)^{1/2}}$

D. $\alpha = \frac{K_P}{(4 + K_P)^{\frac{1}{2}}}$

Answer: C

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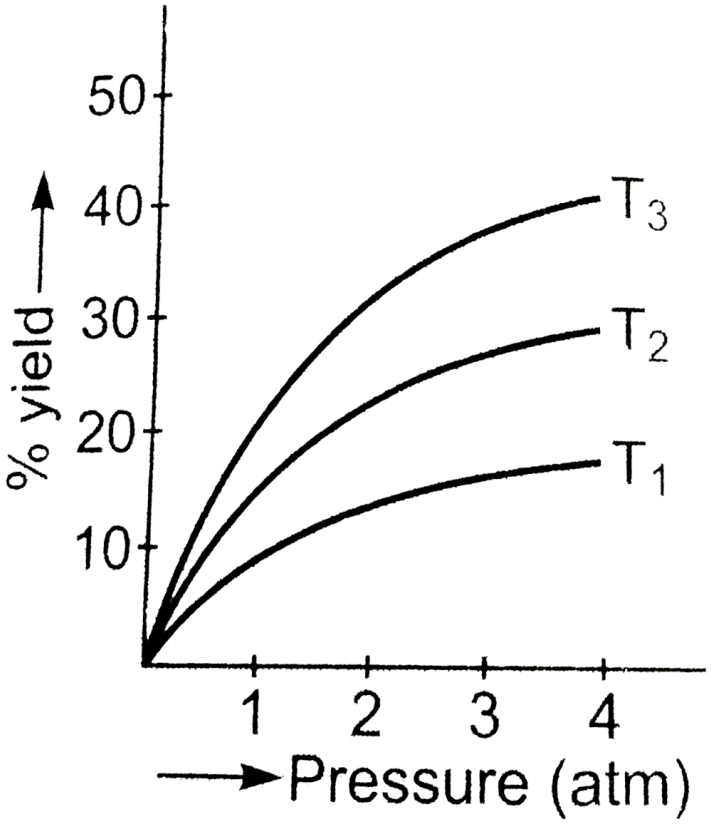
48. The prepation of $SO_3(g)$ by reaction $SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g)$ is an exothermic reaction .If the preparation follows the following temperature -pressure relationship for % yield , then for temperatures

T_1, T_2 and T_3 the correct option is:



A. $T_3 > T_2 > T_1$ `

B. T_(1)

C. $T_1 = T_2 = T_3$

D. Nothing could be predicted about temperature through given information

Answer: A::B::C::D

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49. For a reaction at equilibrium $PCl_{5(g)} \Leftrightarrow pcL_{3(G)} + Cl_{2(g)}$, the degree of dissociation of PCl_5 at 2 atm is 0.02. Then the degree of dissociation at 4 atm is

A. 1.41×10^{-1}

B. 2×10^{-2}

C. 1.41×10^{-4}

D. 2×10^{-4}

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Exercise -3

1. The following equilibrium constants are given :

$N_2 + 3H_3 \Leftrightarrow 2NH_3, K_1$

$N_2 + O_2 \Leftrightarrow 2NO, K_2$

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

The equilibrium constant for the oxidation of NH_3 by oxygen to give NO is :

A. K_1K_2 / K_3

B. $K_2K_3^3 / K_1$

C. $K_2K_3^2 / K_1$

D. $K_2^2K_3 / K_1$

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2. On doubling P and V at constant temperature, the equilibrium constant will

A. Remain constan

B. Become double

C. Become one- fourth

D. None of these

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3. At temperature T, a compound $AB_2(g)$ dissociation according to the reaction, $2AB_2(g) \Leftrightarrow 2AB(g) + B_2(g)$ with degree of dissociation, α, which is small compared to unity . Deduce the expression for α in terms of the equilibrium constant K_p and the total pressure P.

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

B. K_P / P

C. $2K_P / P$

D. $(2K_P / P)^{1/3}$

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4. In which of the following reactions, the concentration of product is higher than the concentration of reactant at equilibrium? (K = equilibrium constant)

A. $A \Leftrightarrow B, K = 0.001$

B. $M \Leftrightarrow N, K = 10$

C. $X \Leftrightarrow Y, K = 0.005$

D. $R \Leftrightarrow P, K = 0.01$

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

$Fe(OH)_3(s) \Leftrightarrow Fe^{3+}(aq.) + 3OH^-(aq.)$

is decreased by $1/4$ times, then the equilibrium concentration of Fe^{3+} will increase by

A. 64 times

B. 4 times

C. 8 times

D. 16 times

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6. At equilibrium of the reaction

$2X(g) + Y(g) \Leftrightarrow X_2Y(g)$

the number of moles of X_2Y at equilibrium is affected by the

A. Temperature and pressure

B. temperature only

C. pressure only

D. Temperature, pressure and catalyst used

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

A. 3×10^4

B. 3×10^5

C. 3×10^{-5}

D. 3×10^{-4}

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8. K_p and K_p^* are the equilibrium constants of the two reactions, given below

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

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

Therefore, K_p and K_p^* are related by

A. $K_p = K_p^{'2}$

B. `K_(p)= sqrtK_(p)^(')

C. $K_p = 2K_p'$

D. $K_p = K_p'$

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9. 3.1 mol Fe^{3+} and 3.2 mol SCN^{Θ} present in 1 L solution. At equilibrium 3 mol $FeSCN^{2+}$ are formed The equilibrium constant K_c for the reaction $Fe^{3+} + SCN^{\Theta} \Leftrightarrow FeSCN^{2+}$ will

A. 6.66×10^{-3}

B. 0.3

C. 3.3

D. 150

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10. In which of the following equilibrium K_c and K_p are not equal?

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

B. $2SO_2(g) + NO_2(g) \Leftrightarrow SO_3(g) + NO(g)$

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

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

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

A. 0.088

B. 0.533

C. 0.133

D. 0.177

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12. For the reaction, $AB(g) \Leftrightarrow A(g) + B(g), AB$ is $33\,\%$ dissociated at a total pressure of 'p' Therefore, 'p' is related to K_p by one of the following options

A. $P = K_p$

B. $P = 3K_p$

C. $P = 4K_p$

D. $P = 8K_p$

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13. In which of the following equilibrium K_c and K_p are not equal?

A. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

B. $2C_{(s)} + O_2(g) \Leftrightarrow 2CO_{2(g)}$

C. $2NO_{(g)} \Leftrightarrow N_{2(g)} + O_{2(g)}$

D. $SO_{2(g)} + NO_{2(g)} \Leftrightarrow N_{2(g)} + O_{2((g))}$

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14. The reaction,

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

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

A. $\left[(0.75)^3(0.25)\right] \div \left[(0.50)^2(0.25)\right]$

B. $\left[(0.75)^3(0.25)\right] \div \left[(0.75)^2(0.25)\right]$

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

D. $\left[(0.75)^3(0.25)\right] \div \left[(1.00)^2(1.00)\right]$

Answer: B::C::D

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15. The value of ΔH for the reaction $X_2(g) + 4Y_29g) \Leftrightarrow 2XY_4(g)$ is less than zero. Formation of $XY_4(g)$ will be favoured at :

A. High temperature and low pressure

B. High pressure and low temperature

C. High temperature and high pressure

D. Low pressure and low temperature

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

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

What is K for the reaction

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

A. $[1/K_1K_2]^{1/2}$

B. $1/(K_1K_2)$

C. $1/(2K_1K_2)$

D. $1/(4K_1K_2)$

Watch Video Solution

17. The value of ΔH for the reaction $X_2(g) + 4Y_29g) \Leftrightarrow 2XY_4(g)$ is less than zero. Formation of $XY_4(g)$ will be favoured at :

A. High temperature and low pressure

B. High temperature and high pressure

C. low pressure and low temperature

D. high temperature and low pressure

Watch Video Solution

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

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

What is K for the reaction

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

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

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

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

D. $\left[\frac{1}{K_1 K_2}\right]^{1/2}$

Watch Video Solution

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

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

A. 1.8×10^{-3}

B. 3.6×10^{-3}

C. 6.0×10^{-2}

D. 1.3×10^{-5}

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

At equilibrium, the concentrtation

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

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

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

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

A. 2

B. 1.9

C. 0.62

D. 4.5

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21. For a given exothermic reaction , K_p and k'_p are the equilibrium constants at temperatures T_1 and T_2 respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2 , it is readily observed that

A. $K_p = \frac{1}{K'_P}$

B. $K_p > K'_p$

C. $K_p < K'_p$

D. $K_p = K'_p$

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22. For the reversible reaction

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

The equilibrium shifts in forward direction

A. by increasing pressure and decreasing temperature

B. by increasing the concentration of $NH_3(g)$

C. by decreasing pressure

D. by decreasing the concentration $N_2(g)$ and $H_2(g)$

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23. If the equilibrium constant for

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

A. K

B. K^2

C. $K^{1/2}$

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

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

A. mostly products

B. similar amounts of reactants and product

C. all reactants

D. mostly reactants

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Exercise -IV

1. We know that the relationship between K_c and K_p is

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

What would be the value of Δ^{ng} for the reaction

$NH_4CI_{(s)} \Leftrightarrow NH_3(g) + HCI(g)$

A. 1

B. 0.5

C. 1.5

D. 2

Answer: D

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2. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$, the standard free energy is $\Delta G^{\Theta} > 0$. the equilibrium constant (k) would be.

A. K=0

B. $K > 1$

C. K=1

D. $K < 1$

Answer: D

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3. Which of the following is not a general characteristic of equilibrium involving physical processes ?

A. Equilibrium is possible only in a closed system at a given temperature.

B. All measurable properties of the system remain constant.

C. All the physical processes stop at equilibrium.

D. The opposing processes occur at the same rate and there is dynamic but stable condition.

Answer: C

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4. PCI_5, PCI_3 and CI_2 are in equilibrium at 500 K in a closed container and their concentration are $0.8 > 10^{-3}\ \text{mol}L^{-1}$ and $1.2 \times 10^{-3}\text{mol}L^{-1}$ and $1.2 \times 10^{-3}\text{mol}L^{-1}$ respectively. The value of K_c for the reaction $PCI_5(g) \Leftrightarrow PCI_3(g) + CI_2(g)$ will be

A. $1.8 \times 10^3\ \text{mol L}^{-1}$

B.

C.

D.

Answer: B

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5. Which of the following statements is incorrect

A. In equilibrium mixture office and water kept in perfectly insulated flask mass ofice and water does not change with time.

B. The intensity of red colour increases when oxalic acid is added to a solution containing iron (III) nitrate and potassium thiocyanate.

C. On addition of catalyst the equilibrium constant value is not affected.

D. Equilibrium constant for a reaction with negative $\triangle H$ value decreases as the temperature increases.

Answer: B

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6. When hydrochloric aicd is addded to cobalt and nitrate solution at room temperautre, the following reaction takes place and the reaction mixture becomes blue. On cooling the mixture it becomes pink. On the basis of this information mark the corect ansewer.

$\underset{\text{pink}}{\left[Co(H_2O)_6\right]^{3+}}(aq) + 4CI^- \Leftrightarrow$

$\underset{\text{blue}}{CoCI_4{}^{2-}}(aq) + 6H_2O(l)$

A. $\triangle H > 0$ for the reaction

B. $\triangle H < 0$ for the reaction

C. $\triangle H = 0$ for the reaction

D. The sign of $\triangle H$ cannot be predicted on the basis of this information.

Answer: A

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7. Which of the following options will be correct for the stage of half competiton of the reaction $A \to B$?

A. $\triangle H^\circ = 0$

B. $\triangle H^\circ > 0$

C. $\triangle H^{\circ} < 0$

D. $\triangle H^{\circ} = -RT \ln K$

Answer: A

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8. What will be the correct order of vapour pressure of water, acetone and ether at $30.^{\circ} C$. Given that among these compounds, water has maximum boiling point and ether has minimum boiling point ?

A. $\text{Water} < \text{ether} < \text{aceton}$

B. $\text{Water} < \text{acetone} < \text{ether}$

C. $\text{Ether} < \text{acetone} < \text{water}$

D. $\text{Acetone} < \text{ether} < \text{water}$

Answer: B

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9. At 500 K, equlibrium constant, K_c for the following reaction is 5.

$1/2H_2(g) + 1/2(g) \Leftrightarrow HI(g)$

What would be the equilibrium constant K_c for the reaction $2hi(g) \Leftrightarrow H_2(g) + l_2(g)$

A. 0.04

B. 0.4

C. 25

D. 2.5

Answer: A

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10. On increasing the pressure, in which dirction will the gas phase reaction proceed to re-establish equilibrium, is predicated by applying the Le Chatelier's principle. Consider the reaction.

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

Which of the following is correct, if the total pressure at which the equlibrium is established, is increased without changing the temperature ?

A. K will remain same

B. K will decrease

C. K will increase

D. K will increase initially and decrease when pressure is very high

Answer: A

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11. In which of the following reactions, the equilibrium reamins unaffected on addition of small amount of argon at constant volume?

A. $H_{2(g)} + I_2(g) \Leftrightarrow 2HI(g)$

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

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

D. The equilibrium will remain unaffected in all the three cases

Answer: D

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12. For the reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g)$, the value of K is 50 at 400 K and 1700 at 500 K. Which of the following options is correct?

A. The reaction is endothermic

B. The react is exothermic

C. If $NO_2(g)$ and $N_2O_4(g)$ are mixed at 400 K at partial pressures 20 bar and 2 bar respectively, more $N_2O_4(g)$ will be formed

D. The entropy of the system increases ans (a,c,d)

Answer: A::C::D

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13. The value of K_c for the reaction $2HI(g) \Leftrightarrow H_2 + I_2(g)$ is 1×10^{-4}.

At a given time, t he composition of reaction mixture is

$[HI] = 2 \times 10^{-5} mol, [H_2] = 1 \times 10^{-5}$ mol and $[l_2] = 1 \times 10^{-5}$ mol

In which direction will the reaction proceed ?

A. forward

B. backward

C. equilibrium

D. none

Answer: B

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14. For a reaction,

$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

$\Delta_f H^\circ(CaO) = -631.1 \text{ kJ mol}^{-1}$

$\Delta_f H^\circ(CO_2) = -393.5\ \text{kJ mol}^{-1}$ and

$\Delta_f H^\circ(CaCO_3) = -1206.9\ \text{kJ mol}^{-1}$

Which of the following is a correct statement?

A. Increase

B. decreases

C. no effect

D. both a & b

Answer: A

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

A. increased mass of BaO_2

B. increased mass of BaO

C. increased temperature of equilibrium

D. increased mass of BaO_2

Answer: C

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

where K_c is the equilibrium constant.

A. $Q > K_c$

B. $Q = 0$

C. $Q = K_c$

D. $Q < K_c$

Answer: A

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17. Equilibrium constants K_1 and K_2 for the following equilibria

$NO(g) + 1/2O_2(g) \overset{K_1}{\Longleftrightarrow} NO_2(g)$ and 2NO_(2)(g) overset(K_(2)) (hArr)2NO(g)+O_(2)(g)`

are related as

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

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

C. $K_2 = K_1^2$

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

Answer: A

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18. For the reaction

$CH_4(g) + 2O_2(g) \Leftrightarrow CO_2(g) + 2H_2O(I)$

$\Delta_r H = -170.8 kJ mol^{-1}$

Which of the following statements is not true ?

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

B. The reaction is exothermic

C. At equilibrium the concentration of $CO_2(g)$ and $H_2O(l)$ are not equall.

D. The equilibrium constant for the reaction is given by, $K_p = \frac{|CO_2|}{[CH_4][O_2]}$

Answer: D

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19. The following equilibria are given by :

$N_2 + 3H_2 \Leftrightarrow 2NH_3, K_1$

$N_2 + O_2 \Leftrightarrow 2NO, K_2$

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

The equilibrium constant of the reaction $2NH_3 + \frac{5}{2}O_2 \Leftrightarrow 2NO + 3H_2O$ in terms of K_1, K_2 and K_3 is

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

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

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

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

Answer: D

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20. The dissociation equilibrium of a gas AB, can be represented as The degree of dissociation is x and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium constant K„ and total pressure p is

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

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

C. (K_P / P)

D. $(2K_P / P)$

Answer: A

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

$Fe(OH)_3(s) \Leftrightarrow Fe^{3+}(aq.) + 3OH^-(aq.)$

is decreased by $1/4$ times, then the equilibrium concentration of Fe^{3+} will increase by

A. 16 times

B. 64 times

C. 4 times

D. 8 times

Answer: B

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22. the value of equilibrium constant for the reaction

$HI(g) \Leftrightarrow 1/2H_2(g) + 1/2I_2(g)$ is 8.0

The equilibrium constant for the reaction

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

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

B. 16

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

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

Answer: A

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

A. 3.0×10^{5}

B. 3.0×10^{-5}

C. 3.0×10^{-4}

D. 3.0×10^{4}

Answer: D

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

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

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

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

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

Answer: D

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25. The reaction,

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

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

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

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

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

D. $\left[(0.75)^3(0.25)\right] \div \left[(0.75)^2(0.25)\right]$

Answer: B

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

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

What is K for the reaction

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

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

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

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

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

Answer: D

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

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

A. $1.8x10^{-3}$

B. 3.6×10^{-3}

C. 6.0×10^{-2}

D. 1.3×10^{-5}

Answer: C

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

At equilibrium, the concentrtation

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

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

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

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

A. 2

B. 1.9

C. 0.62

D. 4.5

Answer: C

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29. For the reversible reaction, $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) +$ heat. The equilibrium shifts in forward direction

(1) (1) By increasing the concentration of $NH_3(g)$

(2) By decreasing the pressure

(3) By decreasing concentration of $N_2(g)$ and $H_2(g)$

(4) By increasing the pressure and decreasing temperature

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30. For a given exothermic reaction , K_p and k'_p are the equilibrium constants at temperatures T_1 and T_2 respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2 , it is readily observed that

A. $K_p > K_P$

B. $K_p < K_p$

C. $Kp = K'_p$

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

Answer: A

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

A. $\triangle G^0 = -2.30 \ \mathrm{RT} \log \mathrm{K}$

B. $\triangle G^0 = 2.30 \ \mathrm{RT} \log \mathrm{K}$

C. $\triangle G = -2.30 \ \mathrm{RT} \log \mathrm{K}$

D. $\triangle G = 2.30 \ \mathrm{RT} \log \mathrm{K}$

Answer: A

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

A. mostly products

B. similar amounts of reactants and product

C. all reactants

D. mostly reactants

Answer: A

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33. If the equilibrium constant for

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

A. K

B. K^2

C. $K^{1/2}$

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

Answer: C

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