| Date Planned : __ / __ / __ | Daily Tutorial Sheet-1 | Expected Duration : 90 Min |
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| Actual Date of Attempt : __ / __ / __ | JEE Main (Archive) | Exact Duration :_________ |

**1.** For the reaction, $H_2(g)+I_2(g) \rightleftharpoons 2HI(g)$ the equilibrium constant $K_p$ changes with: **(1981)**

**(A)** total pressure **(B)** catalyst

**(C)** the amount of $H_2$ and $I_2$ present **(D)** temperature

**2.** Pure ammonia is placed in a vessel at a temperature where its dissociation constant $(\alpha)$ is appreciable. At equilibrium, $N_2+3H_2 \rightleftharpoons 2NH_3$ **(1984)**

**(A)** $K_p$ does not change significantly with pressure

**(B)** $\alpha$ does not change with pressure

**(C)** concentration of $NH_3$ does not change with pressure

**(D)** concentration of hydrogen is less than that of nitrogen

**3.** One mole of $N_2$ and 3 moles of $PCl_5$ are placed in a 100L vessel heated to $227°C$. The equilibrium pressure is 2.05 atm. Assuming ideal behaviour, calculate the degree of dissociation for $PCl_5$ and Kp for the reaction. $PCl_5(g) \rightleftharpoons PCl_3(g)+Cl_2(g)$ **(1984)**

**4.** An example of a reversible reaction is: **(1985)**

**(A)** $Pb(NO_3)_2(aq)+2NaI(aq) \rightarrow PbI_2(s)+2NaNO_3(aq)$

**(B)** $AgNO_3(aq)+HCl(aq) \rightarrow AgCl(s)+HNO_3(aq)$

**(C)** $2Na(s)+2H_2O(\ell) \rightarrow 2NaOH(aq)+H_2(g)$

**(D)** $KNO_3(aq)+NaCl(aq) \rightarrow KCl(aq)+NaNO_3(aq)$

**5.** The equilibrium $SO_2Cl_2(g) \rightleftharpoons SO_2(g)+Cl_2(g)$ is attained at $25°C$ in a closed container and an inert gas, helium is introduced. Which of the following statements are correct? **(1989)**

**(A)** concentration of $SO_2, Cl_2$ and $SO_2Cl_2$ change

**(B)** More chlorine is formed

**(C)** concentration of $SO_2$ is reduced

**(D)** None of the above

**6.** One mole of $N_2O_4(g)$ at 300 K is kept in a closed container under one atmosphere. It is heated to 600K when 20% by mass of $N_2O_4(g)$ decomposes to $NO_2(g)$. The resultant pressure is: **(1996)**

**(A)** 1.2 atm **(B)** 2.4 atm **(C)** 2.0 atm **(D)** 1.0 atm

**7.** For the reaction, $CO(g)+H_2O(g) \rightleftharpoons CO_2(g)+H_2(g)$, at a given temperature, the equilibrium amount of $CO_2(g)$ can be increased by: **(1998)**

**(A)** adding a suitable catalyst **(B)** adding an inert gas

**(C)** decreasing the volume of the container **(D)** increasing the amount of CO(g)

**8.** For the chemical reaction, $3X(g) + Y(g) \rightleftharpoons X_3Y(g)$

The amount of $X_3Y$ at equilibrium is affected by **(1999)**

**(A)** temperature and pressure **(B)** temperature only

**(C)** pressure only **(D)** temperature, pressure and catalyst

**9.** When two reactants, A and B are mixed to give products, C and D, the reaction quotient, (Q) at the initial stages of the reaction: **(2000)**

**(A)** is zero **(B)** decreases with time

**(C)** is independent of time **(D)** increases with time

**10.** In which of the following reactions, an increase in the volume of the container will favour the formation of products ? **(2008)**

**(A)** $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$

**(B)** $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

**(C)** $4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(\ell)$

**(D)** $3O_2(g) \rightleftharpoons 2O_3(g)$

**11.** For the reaction, $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$ if $K_p = K_C(RT)^x$ where, the symbol have usual meaning, then the value of x is (assuming ideality) **(2014)**

**(A)** $-1$ **(B)** $-\frac{1}{2}$ **(C)** $\frac{1}{2}$ **(D)** 1

**12.** The standard Gibbs energy change at 300K for the reaction, $2A \rightleftharpoons B + C$ is 2494. 2J. At a given time, the composition of the reaction mixture is $[A] = \frac{1}{2}, [B] = 21$ and $[C] = \frac{1}{2}$. The reaction proceeds in the $(R = 8.314 JK/mol, e = 2.718)$ **(2015)**

**(A)** forward direction because $Q > K_C$

**(B)** reverse direction because $Q > K_C$

**(C)** forward direction because $Q < K_C$

**(D)** reverse direction because $Q < K_C$

**13.** The equilibrium constant at 298 K for a reaction $A + B \rightleftharpoons C + D$ is 100. If the initial concentration of all the four species were 1M each, then equilibrium concentration of D (in $mol L^{-1}$) will be: **(2016)**

**(A)** 0.818 **(B)** 1.818

**(C)** 1.182 **(D)** 0.182

**14.** At 320 K, a gas $A_2$ is 20% dissociated to A(g). The standard free energy change at 320 K and 1 atm in $J mol^{-1}$; is approximately : $(R = 8.314 JK^{-1} mol^{-1};\ \ln 2 = 0.693;\ \ln 3 = 1.098)$ **(2018)**

**(A)** 4763 **(B)** 2068

**(C)** 1844 **(D)** 4281

**15.** Consider the following reversible chemical reactions : **(2019)**

$A_2(g) + B_2(g) \xrightleftharpoons{K_1} 2AB(g)$ ........(1)

$6AB(g) \xrightleftharpoons{K_2} 3A_2(g) + 3B_2(g)$ ........ (2)

The relation between $K_1$ and $K_2$ is :

**(A)** $K_2 = K_1^{3-}$ **(B)** $K_1K_2 = \frac{1}{3}$ **(C)** $K_1K_2 = 3$ **(D)** $K_2 = K_1^3$

**16.** 5.1 g $NH_4SH$ is introduced in 3.0 L evacuated flask at 327°C, 30% of the solid $NH_4SH$ decomposed to $NH_3$ and $H_2S$ as gases. The $K_p$ of the reaction at 327°C is : **(2019)**

($R = 0.082$ L atm $mol^{-1} K^{-1}$, Molar mass of $S = 32\,g\ mol^{-1}$, molar mass of $N = 14\,g\ mol^{-1}$)

**(A)** $0.242\,atm^2$ **(B)** $4.9 \times 10^{-3} atm^2$ **(C)** $0.242 \times 10^{-4} atm^2$ **(D)** $1 \times 10^{-4} atm^2$

**17.** Considerthe reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ **(2019)**

The equilibrium constant of the above reaction is $K_p$. If pure ammonia is left to dissociated, the partial pressure of ammonia at equilibrium is given by : (Assume that $P_{NH_3} << P_{total}$ at equilibrium)

**(A)** $\frac{3^{3/2}K_p^{1/2}P^2}{16}$ **(B)** $\frac{3^{3/2}K_p^{1/2}P^2}{4}$ **(C)** $\frac{K_p^{1/2}P^2}{16}$ **(D)** $\frac{K_p^{1/2}P^2}{4}$

**18.** Two solids dissociates as follows **(2019)**

$A(s) \rightleftharpoons B(g) + C(g);\ K_{p_1} = x\,atm^2$

$D(s) \rightleftharpoons C(g) + E(g);\ K_{p_2} = y\,atm^2$

The total pressure when both the solids dissociate simultaneously is :

**(A)** $2(\sqrt{x+y})$ atm **(B)** $(x + y)$ atm **(C)** $\sqrt{x+y}$ atm **(D)** $x^2 + y^2$

**19.** In a chemical reaction, $A + 2B \xrightleftharpoons{K} 2C + D$, the initial concentration of B was 1.5 times of the concentration of A, but the equilibrium concentrations of A and B were found to be equal. The equilibrium constant(K) for the aforesaid chemical reaction is : **(2019)**

**(A)** 1 **(B)** 16 **(C)** $\frac{1}{4}$ **(D)** 4

**20.** The values of $K_p / K_c$ for the following reactions at 300K are, respectively : **(2019)**

(At 300K, $RT = 24.62\,dm^2$ atm $mol^{-1}$)

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

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

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

**(A)** 1, $4.1 \times 10^{-2} dm^{-3} atm^{-1}$ mol, 606 $dm^6 atm^2 mol^{-2}$

**(B)** 1, 24.62 dm atm $mol^{-1}$, 606.0 $dm^6 atm^2 mol^{-2}$

**(C)** 24.62 $dm^3$ atm $mol^{-1}$, 606.0 $dm^6 atm^2 mol^{-2}$

**(D)** 1.24.62 $dm^3$ atm $mol^{-1}$, $1.65 \times 10^{-3} dm^{-6} atm^{-2} mol^2$

**21.** In which one of the following equilibria, $K_P \neq K_C$ ? **(2019)**

**(A)** $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$ **(B)** $2C(s) + O_2(g) \rightleftharpoons 2CO(g)$

**(C)** $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ **(D)** $NO_2(g) + SO_2(g) \rightleftharpoons NO(g) + SO_3(g)$

**22.** For the reaction,

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ ,

$\Delta H = -57.2 kJ\,mol^{-1}$ and $K_c = 1.7 \times 10^{16}$ .

Which of the following statement is INCORRECT? **(2019)**

**(A)** The equilibrium constant decreases as the temperature increases

**(B)** The addition of inert gas at constant volume will not affect the equilibrium constant

**(C)** The equilibrium constant is large suggestive of reaction going to completion and so no catalyst is required.

**(D)** The equilibrium will shift in forward direction as the pressure increases.

**23.** For the following reactions, equilibrium constants are given

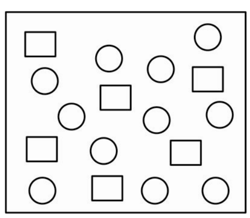
$S(s) + O_2(g) \rightleftharpoons SO_2(g)$; $K_1 = 10^{52}$

$2S(g) + 3O_2(g) \rightleftharpoons 2SO_3(g)$; $K_2 = 10^{129}$

The equilibrium constant for the reaction, $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is : **(2019)**

**(A)** $10^{77}$ **(B)** $10^{154}$ **(C)** $10^{25}$ **(D)** $10^{181}$

**24.** In the figure shown below reactant A (represented by square) is in equilibrium with product B (represented by circle). The equilibrium constant is : **(2020)**



**(A)** 2 **(B)** 4 **(C)** 8 **(D)** 1