JEE MAIN : CHAPTER WISE TEST PAPER-6

SUBJECT :- CHEMISTRY **DATE.....**
CLASS :- 11th **NAME.....**
CHAPTER :- CHEMICAL EQUILIBRIUM **SECTION.....**

(SECTION-A)

1. Chemical equilibrium is dynamic in nature because –
(A) The equilibrium in maintained quickly
(B) Conc. of reactants and products become same at equilibrium
(C) Conc. of reactants and products are constant but different
(D) Both forward and backward reactions occur at all times with same speed

2. The equilibrium constant for the reaction $Zn(s)+CO_2(g) \rightleftharpoons ZnO(s) + CO(g)$ is

(A) $\frac{P\infty}{P\infty_2}$ (B) $\frac{[ZnO]}{[Zn]}$

(C) $\frac{P_{ZnO}\ P_{CO}}{P_{Zn}\ P_{CO_2}}$ (D) $\frac{P_{Zn}\ P_{CO_2}}{P_{ZnO}\ P_{CO_2}}$

3. The unit of equilibrium constant for the reaction $H_2 + I_2 \rightleftharpoons 2HI$ is –
(A) $Mole^{-1}$ litre (B) Mole–2 litre
(C) Mole litre (D) None

4. For the dissociation of $MgCO_3$ as $MgCO_3(s) \rightleftharpoons MgO(s) + CO_2(g)$ identify the **correct** option regarding extent of dissociation of $MgCO_3$
(A) As temperature is increased, extent of dissociation decreases.
(B) Extent of dissociation at equilibrium will increase if equilibrium is attained at the same temperature in a container of lesser volume.
(C) Extent of dissociation of $MgCO_3$ will increase if taken in a larger container.
(D) Extent of dissociation will remain unchanged on changing volume of the container.

5. Which of the following factor will not increase the solubility of $NH_3(g)$ in H_2O?
$NH_3(g) + H_2O(aq) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$
(A) Increase in pressure
(B) Addition of water
(C) Addition of NaOH
(D) Decrease in temperature

6. For the reaction : $A(s) \rightleftharpoons B(g) + C(g)$ .What will be the value of natural logarithm of ratio of total pressure at 400K to that at 300K $\left[= \ln \frac{P_{400}}{P_{300}}\right]$ if ΔH = 16.628 kJ. (**Given :** R = 8.314J/K-mole)
(A) 5/3 (B) 5/6 (C) 3/5 (D) 6/5

7. On increasing the temperature, the equilibrium constant of an endothermic reaction increases. It is due to
(A) greater increase in the activation energy of forward reaction in comparision to that of backward reaction.
(B) Greater decrease in the activation energy of forward reaction in comparision to that of backward reaction.
(C) Greater increase in rate constant of forward reaction in comparision to that of backward reaction.
(D) Increase in rate constant of forward reaction but decrease in rate constant of backward reaction.

8. For which of the following reaction $K_P = K_C$.
(A) $4Fe(s) + 3O_2(g) \rightleftharpoons 2Fe_2O_3(g)$
(B) $P_4(s) + 5O_2(g) \rightleftharpoons P_4O_{10}(s)$
(C) $CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(l)$
(D) $3Fe(s) + 4H_2O(g) \rightleftharpoons Fe_3O_4(s) + 4H_2(g)$

9. For the following Equilibria :

$H_2O(l) \rightleftharpoons H_2O(g)$ $\quad K_P = P_{H_2O}$

where $P_{H_2O} \longrightarrow$ Vapour pressure of $H_2O(g)$

By which of the following ways P_{H_2O} can be changed
(A) By adding more $H_2O(l)$
(B) By adding more $H_2O(g)$
(C) By changing temperature
(D) All of the above

10. Which of the following statements is correct regarding dissociation of gaseous PCl_5 as :

$$PCl_{5(g)} \rightarrow PCl_{3(g)} + Cl_{2(g)}$$

(A) Increase in pressure at constant temperature increases equilibrium constant.
(B) Increase in pressure at constant temperature decreases concentration of PCl_5.
(C) Increase in volume at constant temperature increases degree of dissociation of PCl_5.
(D) Increase in temperature decreases degree of dissociation.

11. At a equilibrium pressure of 3.3 atm N_2O_4 undergoes 10% decomposition to NO_2. At same temperature what will be equilibrium pressure required for 20% dissociation.
(A) 3.3 atm (B) 6.6 atm
(C) 4 atm (D) 0.8 atm

12. For the reaction $H_2O_{(l)} \rightleftharpoons H_2O_{(g)}$, which of the following options is incorrect regarding possible value of vapour pressure at given temperature.
(A) 1 atm at 373 K (B) 0.8 atm at 400 K
(C) 1 bar at 372.6 K (D) $\frac{1}{2}$ atm at 353 K

13. For the reaction :
$A(g) + 2B(g) \rightleftharpoons 4C(g)$; ΔH = –ve.
The favourable condition for the greater yield of C(g) is
(A) Increase in pressure of system.
(B) Increase in temperature
(C) Addition of inert gas at constant volume
(D) Addition of inert gas at constant pressure

14. Ammonia at a pressure of 10 atm and CO_2 at a pressure of 20 atm are introduced into an evacuated chamber. If K_P for the reaction $NH_2COONH_4(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$ is 2020 atm^3, the total pressure after a long time is
(A) less than 30 atm (B) more than 30 atm
(C) equal to 30 atm (D) can't be predicted

15. Which of the following change at equilibrium will shift reaction in backward direction :
$Fe^{3+}(aq) + SCN^-(aq) \rightleftharpoons Fe(SCN)^{2+}(aq)$
(A) Addition of water
(B) Addition of KOH(aq) [$Fe(OH)_3$ is insoluble in water]
(C) Addition of $NaNO_3(s)$
(D) (A) and (B) both

16. Which one of the following statements is **incorrect** about chemical equilibrium-
(A) Chemical equilibrium can be attained, whether we start with reactants or products.
(B) Chemical equilibrium is dynamic in nature.
(C) Chemical equilibrium $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ is attained when $CaCO_3(s)$ is heated in an open vessel.
(D) At equilibrium concentration of each of the reactants and products become constant.

17. Initially for the equilibrium,

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

2 moles of A_2 was taken in a 2 litre vessel and 2 mole of B_2 was taken in a 3 litre vessel. Both vessel were then connected. At equilibrium, concentration of AB(g) is 0.7 M. Equilibrium concentrated of A_2 and B_2 gases would be
(A) 0.07 M, 0.07 M (B) 0.05 M, 0.05 M
(C) 0.08 M , 0.08 M (D) 0.06 M, 0.06 M

18. For the reaction in equilibrium
$2NOBr(g) \rightleftharpoons 2NO(g) + Br_2(g)$
if $p_{Br_2} = P/9$ at equilibrium and P is the total pressure. The ratio K_P/P is equal to-
(A) $\frac{1}{9}$ (B) $\frac{1}{81}$ (C) $\frac{1}{27}$ (D) $\frac{1}{25}$

19. Consider the following equilibrium
$H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$ $K_1 = 2$
$FeO(s) + CO(g) \rightleftharpoons Fe(s) + CO_2(g)$ $K_2 = 4$
Then K for reaction.
$Fe(s) + H_2O(g) \rightleftharpoons FeO(s) + H_2(g)$
(A) 2 (B) 1 (C) $\frac{1}{2}$ (D) $\sqrt{2}$

20. For the reaction at equilibrium :

$$A(g) + 2B(g) \rightleftharpoons C(g)$$

Equilibrium constants as function of temperature are
K at 300°C 4×10^{-4}
K at 450°C 4.5×10^{-5}
K at 600°C 6×10^{-7}
Then
(A) Reaction is exothermic.
(B) On adding D(g) at constant volume reaction will move towards right. [D(g) is non reactive gas]
(C) Yield of reaction will increase on increasing temperature.
(D) Both (A) and (C)

(SECTION-B)

21. Consider the following equilibrium at 300 K.
$A(g) + 3B(g) + 4C(g) \rightleftharpoons 2D(g) + 3E(g)$
The equilibrium was established in a closed rigid container of volume 10 *l* when A, B and C were taken in a molar ratio of 1 : 3 : 4. If % by volume of product gases is 20% total 100 moles are taken and if value of equilibrium constant K_C is given by $a \times 10^5$ then calculate **a**.

22. For the reaction,
$A(g) + 2B(g) \rightleftharpoons C(g) + D(g) \quad K_C = 10^{12}$
If initial moles of A, B, C and D are 0.5, 1, 0.5 and 3.5 moles respectively in one litre vessel. If equilibrium concentration of B is **($y \times 10^{-4}$ M)** then find **y**.

23. Consider the following equilibria at 300K.
$2A(g) + H_2O(g) \rightleftharpoons C(g) + 3D(g) \quad K_P = 3 \times 10^{22}$ atm
The equilibrium was attained in a container by taking A, C and D at partial pressures of 2 atm each along with large amount of liquid water. If vapour pressure of water at 300 K is 38 mm of Hg then calculate partial pressure of A when equilibrium gets established.
[Express your answer in terms of 10^{-10} atm.]

24. For the reaction : $A(g) \rightleftharpoons 2B(g)$, the equilibrium partial pressures of gases A and B is 4 bar and 2 bar, respectively. If the equilibrium mixture is slowly & isothermally compressed to 12 bar, maintaining equilibrium, then the new equilibrium pressure (in bar) of B(g) becomes
(**Take :** $\sqrt{184} = 13.5$)

25. 4.6 gm of liquid ethanol (C_2H_5OH) is taken in 12 litre container and at 27°C, 40% of ethanol is vaporised till equilibrium. Now if volume of container is halved and system is allowed to attain equilibrium then find pressure developed (**in atm**). [**Assume** volume of liquid ethanol is neligible]
[**Given :** R = 0.08 atm lit / mole-K]
[Give your answer after multiplication by 100]

26. Consider the following reaction at certain temperature:
$$H_2(g) + Cl_2(g) \rightleftharpoons 2HCl(g)$$
The mixing of 1 mol of H_2 with 4 moles of Cl_2 form x moles of HCl at equilibrium. If we add 5 moles of H_2 at equilibrium then another 2x moles of HCl are produced. Then find K_{eq} for above reaction.

27. For a reaction whose standard enthalpy change is – 2.070 Kcal/mol at 300 K. At what temperature (in K) the equilibrium constant will become double of the value at 300 K.
[Take : log2 = 0.3, R = 2 Cal mol^{-1} K^{-1}, ln 10 = 2.3]

28. An equimolar mixture of PCl_3 and Cl_2 is taken. Calculate the equilibrium pressure , if 75% of PCl_3 is converted into PCl_5?
$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g) \quad K_p = 5$ atm

29. The pressure over pure solid A is 60 mm of Hg at a certain temperature T and the pressure over pure solid D is 80 mm of Hg at same temperature T. if A and D dissociate as
$A(s) \rightleftharpoons B(g) + C(g)$ and
$D(s) \rightleftharpoons B(g) + E(g)$
then the total pressure over a mixture of excess of A(s) and D(s) at same temperature will be

30. K_P for the reaction $H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(l)$ is 8.0 $bar^{-3/2}$ at T Kelvin temperature. If vapour pressure of H_2O is 2.0 bar at same temperature then K_P° for the reaction $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is