

Time : 1 Hour 15 Minute

STD 11 Science Chemistry
Chapter Based Test

Total Marks : 40

SECTION A

* Choose The Right Answer From The Given Options.[1 Marks Each] [6]

- Which of the following is not a buffer solution?
(A) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$ (B) $\text{H}_3\text{BO}_3 + \text{Na}_3\text{BO}_3$
(C) $\text{HClO}_4 + \text{NaClO}_4$ (D) $\text{NH}_4\text{OH} + (\text{NH}_4)_2\text{SO}_4$
- One litre of a buffer solution containing 0.01M NH_4Cl and 0.1M NH_4OH having pK_b of 5 has pH of:
(A) 9 (B) 10 (C) 6 (D) 7
- The equilibrium constant of a reaction at 298K and 1000K is 5×10^{-3} and 2×10^{-3} respectively. The ΔH for the reaction is:
(A) Positive. (B) Negative.
(C) Either positive or negative. (D) Zero.
- If little heat is added to $\text{ice} \rightleftharpoons \text{liquid}$, equilibrium in a sealed container, then:
(A) Pressure will rise. (B) Temperature will rise.
(C) Temperature will fall. (D) No change in pressure and temperature.
- Which of the following factors will favour the reverse reaction in a chemical equilibrium?
(A) Increase in concentration of one of the reactants.
(B) Increase in concentration of one of the products.
(C) Removal of one of the products regularly.
(D) None of these.
- Addition of water to this solution will not change $[\text{H}_3\text{O}^+]$.
(A) Chemical pH indicator. (B) Acid/ base buffer.
(C) Anhydrous solution. (D) Hypotonic solution.

* Answer The Following Questions In One Sentence.[1 Marks Each] [5]

- What is K_c for the following equilibrium when the equilibrium concentration of each substance is:
 $[\text{SO}_2] = 0.60\text{M}$, $[\text{O}_2] = 0.82\text{M}$ and $[\text{SO}_3] = 1.90\text{M}$?
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$
- Predict which of the following reaction will have appreciable concentration of reactants and products:
 $\text{Cl}_2(\text{g}) \rightleftharpoons 2\text{Cl}(\text{g}) K_c = 5 \times 10^{-39}$

9. Predict if the solutions of the following salts are neutral, acidic or basic:
 NH_4NO_3
10. Describe the effect of:
 removal of CH_3OH
 on the equilibrium of the reaction:
 $2\text{H}_2(\text{g}) + \text{CO}(\text{g}) \rightleftharpoons \text{CH}_3\text{OH}(\text{g})$
11. Which of the following is weakest acid?
 $\text{HClO}_4, \text{HClO}_3, \text{HCl}_2, \text{HClO}$

SECTION B

* **Given Section consists of questions of 2 marks each.** [6]

1. Conjugate acid of a weak base is always stronger. What will be the decreasing order of basic strength of the following conjugate bases?
 $\text{OH}^-, \text{RO}^-, \text{CH}_3\text{COO}^-, \text{Cl}^-$
2. i. Write the conjugate acid for NH_2^- and NH_3 .
 ii. What is the relationship between pK_a and pK_b values?
3. K_b for NH_4OH is 1.8×10^{-5} and for CH_3NH_2 is 4.4×10^{-4} Which of them is strongest base and why?

SECTION C

* **Given Section consists of questions of 3 marks each.** [9]

1. If 0.561g of KOH is dissolved in water to give 200mL of solution at 298K. Calculate the concentrations of potassium, hydrogen and hydroxyl ions. What is its pH?
2. A sample of HI(g) is placed in flask at a pressure of 0.2 atm. At equilibrium the partial pressure of HI(g) is 0.04 atm.
 What is K_p for the given equilibrium?
 $2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$
3. Which of the following reactions involve homogeneous equilibrium and which involve heterogeneous equilibrium?
- $\text{Ag}_2\text{O}(\text{s}) + 2\text{HNO}_3(\text{aq}) \rightleftharpoons 2\text{AgNO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 - $\text{C}(\text{s}) + \text{CO}_2(\text{g}) \rightleftharpoons 2\text{CO}(\text{g})$
 - $\text{CH}_3\text{COOC}_2\text{H}_5(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{CH}_3\text{COOH}(\text{aq}) + \text{C}_2\text{H}_5\text{OH}(\text{aq})$
 - $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$

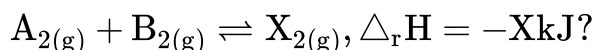
SECTION D

* **Case study based questions** [4]

1. Read the passage given below and answer the following questions from (i) to (iii).
 Le Chatelier's principle is also known as the equilibrium law, used to predict the effect of change on a system at chemical equilibrium. This principle states that equilibrium adjusts the forward and backward reactions in such a way as to accept the change affecting the equilibrium condition. When factor-like concentration, pressure,

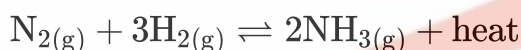
temperature, inert gas that affect equilibrium are changed, the equilibrium will shift in that direction where the effects caused by these changes are nullified. This principle is also used to manipulate reversible reactions in order to obtain suitable outcomes.

- i. Which one of the following conditions will favour the maximum formation of the product in the reaction?



- Low temperature and high pressure.
- Low temperature and low pressure.
- High temperature and high pressure.
- High temperature and low pressure.

- ii. For the reversible reaction,



The equilibrium shifts in forwarding direction

- By increasing the concentration of $NH_3(g)$
- By decreasing the pressure.
- By decreasing the concentrations of $N_2(g)$ and $H_2(g)$
- By increasing pressure and decreasing temperature.

- iii. In which one of the following equilibria will the point of equilibrium shift to left when the pressure of the system is increased?

- $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$
- $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$
- $C_{(s)} + O_{2(g)} \rightleftharpoons CO_{2g}$
- $2H_{2(g)} + O_{2(g)} \rightleftharpoons 2H_2O_{(g)}$

SECTION E

* Given Section consists of questions of 5 marks each.

[10]

1. At 1127K and 1 atm pressure, a gaseous mixture of CO and CO_2 in equilibrium with solid carbon has 90.55% CO by mass



Calculate K_c for this reaction at the above temperature.

2. The ionization constant of HF, HCOOH and HCN at 298K are 6.8×10^{-4} , 1.8×10^{-4} and 4.8×10^{-9} respectively. Calculate the ionization constants of the corresponding conjugate base.

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