

## Topic :- Equilibrium

- A solution of  $\text{FeCl}_3$  in water acts as acidic due to:  
a) Acidic impurities    b) Ionisation    c) Hydrolysis of  $\text{Fe}^{3+}$     d) Dissociation
- The concept that an acid is a proton donor and a base is a proton acceptor was introduced by:  
a) Arrhenius    b) Bronsted-Lowry    c) Lewis    d) Faraday
- Which is decreasing order of strength of bases?  
 $\bar{\text{O}}\text{H}, \bar{\text{N}}\text{H}_2, \text{HC} \equiv \text{C}^-$  and  $\text{CH}_3\text{CH}_2^-$   
a)  $\text{H}_3\text{CCH}_2^- > \text{NH}_2^- > \text{HC} \equiv \text{C}^- > \text{OH}^-$     b)  $\text{HC} \equiv \text{C}^- > \text{CH}_3\text{CH}_2^- > \text{NH}_2^- > \text{OH}^-$   
c)  $\text{OH}^- > \text{NH}_2^- > \text{CH} \equiv \text{C}^- > \text{H}_3\text{CCH}_2^-$     d)  $\text{NH}_2^- > \text{HC} \equiv \text{C}^- > \text{OH}^- > \text{H}_3\text{CCH}_2^-$
- The strength of an acid depends on its tendency to  
a) Accept protons    b) Donate protons    c) Accept electrons    d) Donate electrons
- The following reactions are known to occur in the body,  
 $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3 \rightleftharpoons \text{H}^+ + \text{HCO}_3^-$   
If  $\text{CO}_2$  escapes from the system, then:  
a) pH will decrease  
b) Hydrogen ion concentration will diminish  
c)  $\text{H}_2\text{CO}_3$  concentration will be unaltered  
d) The forward reaction will be promoted
- The common ion effect is shown by which of the following sets of solutions?  
a)  $\text{BaCl}_2 + \text{BaNO}_3$     b)  $\text{NaCl} + \text{HCl}$     c)  $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$     d) None of these
- In the reaction,  $\text{C}(s) + \text{CO}_2(g) \rightleftharpoons 2\text{CO}(g)$ , the equilibrium pressure is 12 atm. If 50% of  $\text{CO}_2$  reacts,  $K_p$  for the change is :  
a) 12 atm    b) 16 atm    c) 20 atm    d) 6 atm
- For a given solution  $\text{pH} = 6.9$  at  $60^\circ\text{C}$ , where  $K_w = 10^{-12}$ . The solution is:  
a) Acidic    b) Basic    c) Neutral    d) Unpredictable
- A quantity of  $\text{PCl}_5$  was heated in a 10 litre vessel at  $250^\circ\text{C}$  to show  $\text{PCl}_5(g) \rightleftharpoons \text{PCl}_3(g) + \text{Cl}_2(g)$ . At equilibrium the vessel contains 0.1 mole of  $\text{PCl}_5$ , 0.20 mole of  $\text{PCl}_3$  and 0.20 mole of  $\text{Cl}_2$ . The equilibrium constant of the reaction is :  
a) 0.02    b) 0.05    c) 0.04    d) 0.025
- One mole of ethyl alcohol was treated with one mole of acetic acid at  $25^\circ\text{C}$ .  $2/3$  of the acid changes into ester at equilibrium. The equilibrium constant for the reaction will be:  
a) 1    b) 2    c) 3    d) 4

11. 9.2 g of  $\text{N}_2\text{O}_4(\text{g})$  is taken in a closed 1 L vessel and heated till the following equilibrium is reached  
 $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$   
 At equilibrium, 50%  $\text{N}_2\text{O}_4(\text{g})$  is dissociated. What is the equilibrium constant (in  $\text{molL}^{-1}$ )?  
 (Molecular weight of  $\text{N}_2\text{O}_4 = 92$ )  
 a) 0.1                      b) 0.2                      c) 0.3                      d) 0.4
12. Assuming complete dissociation which of the following aqueous solutions will have the same pH value?  
 (i) 100 mL of 0.01 M HCl  
 (ii) 100 mL of 0.01 M  $\text{H}_2\text{SO}_4$   
 (iii) 50 mL of 0.01 M HCl  
 (iv) Mixture of 50 mL of 0.02 M  $\text{H}_2\text{SO}_4$  and 50 mL of 0.02 M NaOH  
 a) (i), (ii)                      b) (i), (iii)                      c) (ii), (iv)                      d) (i), (iv)
13. At 3000 K, the equilibrium pressure of  $\text{CO}_2$ ,  $\text{CO}$  and  $\text{O}_2$  are 0.6, 0.4 and 0.2 atm respectively.  $K_p$  for the reaction  $2\text{CO}_2 \rightleftharpoons 2\text{CO} + \text{O}_2$ , is  
 a) 0.089                      b) 0.098                      c) 0.189                      d) 0.198
14. The  $\text{p}K_a$  of weak acid  $\text{H}_A$  is 4.5. The pOH of an aqueous buffer solution of HA in which 50% of the acid is ionised:  
 a) 7.0                      b) 4.5                      c) 2.5                      d) 9.5
15. An amphoteric buffer solution in which conc. of  $\text{H}^+$  and HX is same. The value of  $K_a$  of HX is  $10^{-8}$ , then pH of buffer solution is  
 a) 3                      b) 8                      c) 10                      d) 14
16. In the reaction,  $3A + 2B \rightarrow 2C$ , the equilibrium constant  $K_c$  is given by  
 a)  $\frac{[3A] \times [2B]}{[C]}$                       b)  $\frac{[A]^3 \times [B]}{[C]}$                       c)  $\frac{[C]^2}{[A]^3 \times [B]^2}$                       d)  $\frac{[C]}{[3A][2B]}$
17. Which reaction is not affected by change in pressure?  
 a)  $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$                       b)  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$   
 c)  $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$                       d)  $2\text{C} + \text{O}_2 \rightleftharpoons 2\text{CO}$
18. Three reactions involving  $\text{H}_2\text{PO}_4^-$  are given below  
 (i)  $\text{H}_3\text{PO}_4 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{H}_2\text{PO}_4^-$   
 (ii)  $\text{H}_2\text{PO}_4^- + \text{H}_2\text{O} \rightarrow \text{HPO}_4^{2-} + \text{H}_3\text{O}^+$   
 (iii)  $\text{H}_2\text{PO}_4^- + \text{OH}^- \rightarrow \text{H}_3\text{PO}_4 + \text{O}^{2-}$   
 In which of the above does  $\text{H}_2\text{PO}_4^-$  act as an acid?  
 a) (ii) only                      b) (i) and (ii)                      c) (iii) only                      d) (i) only
19. pH for the solution of salt undergoing anionic hydrolysis (say  $\text{CH}_3\text{COONa}$ ) is given by:  
 a)  $\text{pH} = \frac{1}{2}[\text{p}K_w + \text{p}K_a + \log c]$   
 b)  $\text{pH} = \frac{1}{2}[\text{p}K_w + \text{p}K_a - \log c]$   
 c)  $\text{pH} = \frac{1}{2}[\text{p}K_w + \text{p}K_b - \log c]$

d) None of the above

20. For the reactions,  $A + B + Q \rightleftharpoons C + D$ , if the temperature is increased then concentration of the products will

a) Increase

b) Decrease

c) Remains the same

d) Become zero

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