JEE MAIN : CHAPTER WISE TEST PAPER-7

SUBJECT :- CHEMISTRY

CLASS :- 11th

CHAPTER :- IONIC EQUILIBRIUM

DATE...

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SECTION...#:..

(SECTION-A)

1. Calculate the pH of a solution containing 0.2 M HCO_3^- and 0.1 M CO_3^{2-}

[$K_1(H_2CO_3) = 4 \times 10^{-7}$; $K_2(HCO_3^-) = 4 \times 10^{-11}$]

(A) 10.4   (B) 10.1   (C) 6.1   (D) 10.7

2. The dissociation constant of a monobasic acid which is 3.5% dissociated in $\frac{N}{20}$ solution at 20ºC is –

(A) 3.5×10^{-2} (B) 5×10^{-3}

(C) 6.125×10^{-5} (D) 6.75×10^{-2}

3. Calculate $[OH^-]$ in 0.20 M solution of NH_3 if K_b for NH_3 is 1.8×10^{-5}.

(A) 4.24×10^{-7}M   (B) 4.24×10^{-5}M

(C) 4.24×10^{-3}M   (D) 4.24×10^{-2}M

4. A certain weak acid has $K_a = 1.0 \times 10^{-4}$. Calculate the equilibrium constant for its reaction with a strong base -

(A) 10^9 (B) 10^{10} (C) 10^{11} (D) 10^{12}

5. Calculate pH of 0.002 N NH_4OH having 2% dissociation-

(A) 7.6   (B) 8.6

(C) 9.6   (D) 10.6

6. Calculate the pH of solution having H^+ ion concentration of 5×10^{-4} mole/litre –

(A) 3.3   (B) 2.26

(C) 1.26   (D) 0.26

7. The dissociation constant of weak acid HA is 4.9×10^{-8}. After making the necessary approximations. Calculate pH in 0.1 M acid –

(A) 1.155   (B) 2.155

(C) 3.155   (D) 4.155

8. Saccharin ($K_a = 2 \times 10^{-12}$) is a weak acid respectively by formula HSaC. A 4×10^{-4} mole amount of Saccharin is dissolved in 200cc water of pH 3. Assuming no change in volume. Calculate the concentration of Sac. ions in the resulting solution at equilibrium -

(A) 2×10^{-12} M   (B) 3×10^{-12} M

(C) 4×10^{-12} M   (D) 5×10^{-12} M

9. Which of the following has pH is equal to near about one -

(A) 100 ml $\frac{M}{10}$ HCl + 100ml $\frac{M}{10}$ NaOH

(B) 55ml $\frac{M}{10}$ HCl + 100ml $\frac{M}{10}$ NaOH

(C) 10ml $\frac{M}{10}$ HCl + 90ml $\frac{M}{10}$ NaOH

(D) 75ml $\frac{M}{5}$ HCl + 25ml $\frac{M}{5}$ NaOH

10. Calculate K for the $A^- + H_3O^+ \rightleftharpoons HA + H_2O$ if K_a value for the acid HA is 1.0×10^{-6}.

(A) 1.0×10^6 (B) 2.0×10^6

(C) 3.0×10^6 (D) 5.0×10^6

11. 20 ml of 0.2 M NaOH is added to 50 ml, of 0.2 M CH_3COOH to give 70ml, of the solution. What is the pH of the solution ? The ionization constant of acetic acid is 2×10^{-5} –

(A) 4.522   (B) 5.568

(C) 6.522   (D) 7.568

12. How many mole of NH_4Cl must be added to one litre of 1.0 M NH_4OH to have a buffer of pH = 9. $K_{NH4OH} = 1.8 \times 10^{-5}$?

(A) 2.7   (B) 3.6   (C) 4.56   (D) 1.8

13. The pH of a 0.01M solution of a monobasic acid is four. Which one of the following statement about the acid is incorrect –

(A) When a little NaOH is added, it will form a buffer solution

(B) It is a weak acid

(C) It's sodium salt will be acidic

(D) It's sodium salt will be basic

14. A salt $M_2 X_3$ dissolves in water such that its solubility is x g. mole/litre. Its K_{SP} is –

(A) x^5 (B) $6x^2$

(C) $108 x^5$ (D) $6x^5$

15. The solubility of AgCl in water, in 0.02 M $CaCl_2$, in 0.01M NaCl and in 0.05 M $AgNO_3$ are S0, S_1, S_2, S_3 respectively. Which of the following relationships between these quantities is correct –

(A) $S_0 > S_1 > S_2 > S_3$ (B) $S_0 > S_2 > S_1 > S_3$

(C) $S_0 > S_1 = S_2 > S_3$ (D) $S_0 > S_2 > S_3 > S_1$

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16. Solubility product of AgCl is 2.8×10^{-10} at 25ºC. Calculate solubility of the salt in 0.1 M $AgNO_3$ solution –
(A) 2.8×10^{-9} mole/litre
(B) 2.8×10^{-10} mole/litre
(C) 3.2×10^{-9} mole/litre
(D) 3.2×10^{-12} mole/litre

17. K_a for cyanoacetic acid is 4×10^{-3}. What is the value of degree of hydrolysis of 0.4 M sodium cyano acetate solution ?
(A) 4.5×10^{-6} (B) 5.5×10^{-6}
(C) 2.5×10^{-6} (D) 3.5×10^{-6}

18. Calculate the pH of aqueous solution of 1.0 M $HCOONH_4$ assuming complete dissociation (pK_a of HCOOH = 3.8 and pK_b of NH_3= 4.8) –
(A) 3.5 (B) 4.5 (C) 5.5 (D) 6.5

19. What amount of sodium propanoate should be added to one litre of an aqueous solution containing 0.02 mole of propanoic acid (K_a = 1.0×10^{-5} at 25ºC) to obtain a buffer solution of pH 6 –
(A) 0.5M (B) 0.2M (C) 0.3M (D) 0.8M

20. What will be the pH of the solution, if 0.01 mole of HCl is dissolved in a buffer solution containing 0.03 mole of propanoic acid $\left(K_a = 1.0 \times 10^{-5}\right)$ and 0.02 moles of salt ,at $25°C$ -
(A) 3.699 (B) 4.699 (C) 5.11 (D) 6.11

(SECTION-B)

21. 224 ml of CO_2(g) at 1 atm & 273 K was passed in 1 L of NaOH solution of unknown molarity. Resulting solution when titrated with 1 M HCl required 30 ml for phenolphthalein end point. Find the molarity of original NaOH solution.
[Write your answer multiplying by 100]

22. How many millimoles of $MgCl_2$ should be added to just precipitate $Mg(OH)_2$ in 500 ml buffer solution containing 0.1 M NH_4OH & 0.1 M $(NH_4)_2SO_4$?
{Given : K_b (NH_4OH) = 10^{-5} ; K_{sp} [$Mg(OH)_2$] = 10^{-11}}

23. How many **millimoles** of NH_3 must be added to one litre of 0.004 M-Ag^+ solution to just prevent the precipitation of AgCl, when [Cl^-] reaches 0.001 M?
[Given : K_{sp} of AgCl = 1.0×10^{-10} and $K_{instability}$ of $Ag(NH_3)_2^+$ = 1.0×10^{-8}]

24. Calculate the molarity of HOCl(aq) solution, $K_{a, HOCl}$ = 2×10^{-6} that can be added in a 0.1 M aqueous solution of CH_3COOH without changing degree of dissociation of CH_3COOH.

Given : $K_{a, \, CH_3COOH} = 10^{-5}$
Multiply actual answer with 10 and report your answer to nearest integer.

25. Determine degree of dissociation (%) of 0.05 M NH_3 at 25ºC in a solution of pH = 11.

26. The pH of a 0.05 M solution of H_2SO_4 in water is nearly –

27. A certain buffer solution contains equal concentration of X^- and HX. K_b for X^- is 10^{-10}. Calculate pH of buffer–

28. Calculate pH of a solution of given mixture (0.1 mole CH_3COOH + 0.2mole CH_3COONa) in

29. What volume of 0.1 M HCOONa solution should be added to 50ml of 0.05 M formic acid to produce a buffer solution of pH = 4.0, pK_a of formic acid = 3.7

30. $M(OH)_x$ has K_{SP} = 4×10^{-12} and its solubility in water is 10^{-4}. Calculate the value of x.