PHYSICAL / INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 15

Total Marks : 45

Max. Time : 54 min.

Topic : Ionic Equilibrium

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9, 9]
Subjective Questions ('–1' negative marking) Q.4 to Q.12	(4 marks, 5 min.)	[36, 45]

1. **(a)** $[Cl^-]$ in a mixture of 200mL of 0.01 M HCl and 100 ml of 0.01 M $BaCl_2$ is :
(A) 0.01 M (B) 0.0133 M (C) 0.03 M (D) 0.02 M

(b) Which has maximum pH ?
(A) 0.01 M H_2SO_4 (B) 0.01 M HCl (C) 0.01 M $Ca(OH)_2$ (D) 0.01 M NaOH

2. **(a)** 10^{-2} mole of NaOH was added to 10 litre of water. The pH will change by
(A) 4 (B) 3 (C) 11 (D) 7

(b) 100 mL of 1 M HCl is mixed with 50 mL of 2 M HCl. Hence, $[H_3O^+]$ is :
(A) 1.00 M (B) 1.50 M (C) 1.33 M (D) 3.00 M

3. Blue litmus turns red in the following muxture of acid and base :
(A) 100 mL of 1×10^{-2} M H_2SO_4 + 100 mL of 1×10^{-2} M $Ca(OH)_2$
(B) 100 mL of 1×10^{-2} M HCl + 100 mL of 1×10^{-2} M $Ba(OH)_2$
(C) 100 mL of 1×10^{-2} M H_2SO_4 + 10 mL of 1×10^{-2} M NaOH
(D) 100 mL of 1×10^{-2} M HCl + 100 mL of 1×10^{-2} M NaOH

4. Calculate pH of
(a) 10^{-2} N H_2SO_4 (b) 10^{-2} M H_2SO_4 (c) 10^{-2} N $Ca(OH)_2$ (d) 10^{-2} M $Ca(OH)_2$

5. (a) pH of a solution is 10 in NaOH solution. What is concentration of NaOH ?
(b) What is molar concentration of $Ca(OH)_2$ if its solution has pH of 12 ?

6. How many moles of calcium hydroxide must be dissolved to produce 250 ml of an aqueous solution of pH 10.48. Assume complete dissociation. [log 3 = 0.48].

7. **(a)** Calculate the pH of solution obtained by mixing 100 ml of 0.01 M HCl & 100 ml of 0.02 M H_2SO_4 . [log 2 = 0.3]

(b) What will be the pH of a solution obtained by mixing 800 ml of 0.05 N NaOH and 200 ml of 0.1 N HCl, assuming complete ionization of the acid and the base.

8. What is normality of the resulting solution (acidic/basic/neutral) when following solution are mixed?
(i) 0.1 M H_2SO_4 , (ii) 0.1 M HCl,
(iii) 0.1 M $Ca(OH)_2$ (iv) 0.1 M NaOH
(a) i and ii, in 1 : 1 volume (b) i and ii in 1 : 2 volume
(c) i and iv in 1 : 2 volume (d) i and iii in 1 : 1 volume
(e) ii and iii in 1 : 1 volume (f) ii and iii in 2 :1 volume
(g) ii and iv in 1 : 2 volume

9. The dissociation constants of HCOOH & CH_3COOH are 2×10^{-4} & 1.6×10^{-5} respectively . Calculate the relative strengths of the acids.

10. Calculate the dissociation constant (K_a) of monobasic acid which is 3% dissociated in N/20 solution at 20ºC.

11. **(a)** Calculate the pH of a decinormal solution of acetic acid which is 1.2% ionized. Also find its K_a.

(b) The pH of 0.05 M aqueous solution of diethyl amine is 12 . Calculate its K_b ?

12. Calculate (a) K_a for a monobasic acid whose 0.10 M solution has pH of 4.50.
(b) K_b for a monoacidic base whose 0.10 M solution has a pH of 10.50.

Answer Key

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1. **(a)** (B) **(b)** (C) **2.** **(a)** (A) **(b)** (C) **3.** (C)

4. (a) 2 (b) 1.7 (c) 12 (d) 12.3 **5.** (a) $[OH^-] = [NaOH] = 10^{-4}$; (b) $[OH^-] = 5 \times 10^{-3}$ M

6. 3.75×10^{-5} moles **7.** **(a)** 1.6. **(b)** 1.7.

8. (a) 0.15 N acidic, (b) 0.133 N acidic, (c) neutral, (d) neutral, (e) 0.05 N basic, (f) neutral, (g) 0.05 N basic

9. 12.5. **10.** 4.5×10^{-5} **11.** **(a)** pH = 2.92, $K_a = 1.44 \times 10^{-5}$ **(b)** 2.5×10^{-3}

12. (a) $K_a = 10^{-8}$ (b) $K_b = 10^{-6}$

Hints & Solutions

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2. **(a)** Initially pH = 7

finally $[NaOH] = 10^{-3}$ so pOH = 3

pH = 11

so $\Delta(pH) = 4$

6. pH + pOH = 14

pOH = 14 –10.48 = 3.52

$[OH^-] = 3 \times 10^{-4}$ mol/litre

NO. of OH^- moles in 250 ml = $\frac{3 \times 10^{-4}}{4} = 7.5 \times 10^{-5}$

No. of moles of $Ca(OH)_2$ dissolved = $\frac{1}{2} \times 7.5 \times 10^{-5} = 3.75 \times 10^{-5}$