1. A student needs to prepare a buffer solution of propanoic acid and its sodium salt with pH 4. The

ratio of $\dfrac{[CH_3CH_2COO^-]}{[CH_3CH_2COOH]}$ required to make buffer is ....

Given: $K_a(CH_3CH_2COOH) = 1.3 \times 10^{-5}$

(1) 0.03   (2) 0.13   (3) 0.23   (4) 0.33

[JEE Main, June 2022]

2. Given below are two statements: one is labelled as Assertion A and the other is labelled as

Reason R.

Assertion (A):   Phenolphthalein is a pH dependent indicator, remains colourless in acidic

solution and gives pink colour in basic medium

Reason (R):   Phenolphthalein is a weak acid. It doesn't dissociate in basic medium.

In the light of the above statements, choose the most appropriate answer

from the options given below:

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and Rare true but R is NOT the correct I explanation of A.

(3) A is true but R is false

(4) A is false but R is true   **[JEE Main, July 2022]**

3. The Plot of pH-metric titration of weak base NH_4OH vs strong acid HCl looks like:
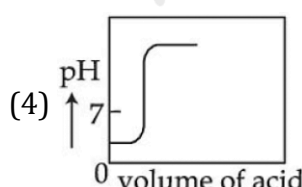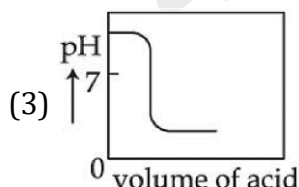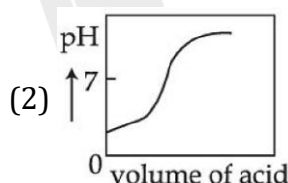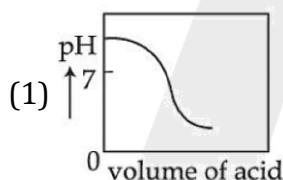
[JEE Main, July 2022]

4. What is the molar solubility of $Al(OH)_3$ in 0.2 M NaOH solution? Given that, solubility product of

$Al(OH)_3 = 2.4 \times 10^{-24}$:   **[Jee Main, April 2019]**

(1) 12×10^{-23} (2) 3×10^{-22}

(3) 12×10^{-21} (4) 3×10^{-19}

5. For the following Assertion and Reason, the correct option is

Assertion (A) : When Cu (II) and sulphide ions are mixed, they react together extremely quickly to give a solid.

Reason (R) : The equilibrium constant of $Cu^{2+}(aq) + S^{2-}(aq) \longrightarrow CuS(s)$ is high because the solubility product is low.

(1) (A) is false and (R) is true.

(2) Both (A) and (R) are true but (R) is not explanation for (A).

(3) Both (A) and (R) are false.

(4) Both (A) and (R) are true and (R) is the explanation for (A)   **[Jee Main, 2020]**

6. A solution is 0.1 M in Cl^- and 0.001 M in CrO_4^{2-}. Solid $AgNO_3$ is gradually added to it Assuming that the addition does not change in volume and $K_{sp}(AgCl) = 1.7 \times 10^{-10}$ M^2 and $K_{sp}(Ag_2CrO_4) = 1.9 \times 10^{-12}$ M^3.

Select correct statement from the following :   **[JEE Main, July 2021]**

(1) AgCl precipitates first because its K_{sp} is high.

(2) Ag_2CrO_4 precipitates first as its K_{sp} is low.

(3) Ag_2CrO_4 precipitates first because the amount of Ag^+ needed is low.

(4) AgCl will precipitate first as the amount of Ag^+ needed to precipitate is low.

7. The strength of an aqueous NaOH solution is most accurately determined by titrating:

(Note : consider that an appropriate indicator is used)

(1) Aq. NaOH in a pipette and aqueous oxalic acid in a burette

(2) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask

(3) Aq. NaOH in a burette and concentrated H_2SO_4 in a conical flask

(4) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask   **[Jee Main, 2020]**

8. Assuming that $Ba(OH)_2$ is completely ionised in aqueous solution under the given conditions the concentration of H_3O^+ ions in 0.005 M aqueous solution of $Ba(OH)_2$ at 298 K is ____ $\times 10^{-12}$ mol L^{-1}. (Nearest integer)   **[JEE Main, July 2021]**

9. 0.01 moles of a weak acid $HA(K_a = 2.0 \times 10^{-6})$ is dissolved in 1.0 L of 0.1 M HCl solution. The degree of dissociation of HA is _____ $\times 10^{-5}$. (Round off to the Nearest Integer). [Neglect volume change on adding HA. Assume degree of dissociation <<1]

[JEE Main, March 2021]

10. 3 g of acetic acid is added to 250 mL of 0.1 M HCl and the solution made up to 500 mL. To 20 mL of this solution $\frac{1}{2}$ mL of 5 M NaOH is added. The pH of the solution is _____.

[Given: pK_a of acetic acid = 4.75, molar mass of acetic acid = 60 g/mol, log3 = 0.4771]

Neglect any changes in volume. **[Jee Main, 2020]**

11. 0.4g mixture of NaOH, Na_2CO_3 and some inert impurities was first titrated with $\frac{N}{10}$ HCl using phenolphthalein as an indicator, 17.5 mL of HCl was required at the end point. After this methyl orange was added and titrated. 1.5 mL of same HCl was required for the next end point. The weight percentage of Na_2CO_3 in the mixture is ……….. (Rounded-off to the nearest integer)

[JEE Main, Feb 2021]

12. Two salts A_2X and MX have the same value of solubility product of 4.0×10^{-12}. The ratio of their molar solubilities i.e. $\frac{S(A_2X)}{S(MX)} = $ _____. (Round off to the Nearest Integer).

[JEE Main, March 2021]

ANSWERS KEY

1.	(2)	2.	(3)	3.	(1)	4.	(2)	5.	(2)	6.	(4)
7.	(4)	8.	(1)	9.	(2)	10.	(5.23)	11.	(4)	12.	(50)