

CHEMISTRY · JEE MAIN

Ionic Equilibrium

Chapter-wise previous year questions, with answer key

63

PYQS

2020–2025

PAPERS

5

TOPICS

pH and pKa

Solubility Product

Salt Hydrolysis

Acid-Base Concepts

Buffer Solutions

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Q1 JEE Main 2025 · 7 Apr · Shift 1

An aqueous solution of HCl with pH 1.0 is diluted by adding equal volume of water (ignoring dissociation of water). The pH of HCl solution would

(Given $\log 2 = 0.30$)

(A) increase to 1.3

(B) reduce to 0.5

(C) increase to 2

(D) remain same

[Step-by-step solution ► prepwiser.in/questions/_Tnz8deeEP](https://www.prepwiser.in/questions/_Tnz8deeEP)

Q2 JEE Main 2025 · 4 Apr · Shift 2

x mg of $\text{Mg}(\text{OH})_2$ (molar mass = 58) is required to be dissolved in 1.0 L of water to produce a pH of 10.0 at 298 K . The value of x is _____ mg. (Nearest integer)

(Given : $\text{Mg}(\text{OH})_2$ is assumed to dissociate completely in H_2O]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/CEJgjjQ6ak](https://www.prepwiser.in/questions/CEJgjjQ6ak)

Q3 JEE Main 2025 · 4 Apr · Shift 1

The pH of a 0.01 M weak acid HX ($K_a = 4 \times 10^{-10}$) is found to be 5 . Now the acid solution is diluted with excess of water so that the pH of the solution changes to 6 . The new concentration of the diluted weak acid is given as $x \times 10^{-4}$ M. The value of x is _____ (nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/2t6s_gRvt3](https://www.prepwiser.in/questions/2t6s_gRvt3)

Q4 JEE Main 2025 · 28 Jan · Shift 1

A weak acid HA has degree of dissociation x . Which option gives the correct expression of (pH - $\text{p}K_a$)?

(A) $\log \left(\frac{1-x}{x} \right)$

(B) 0

(C) $\log(1 + 2x)$

(D) $\log \left(\frac{x}{1-x} \right)$

[Step-by-step solution ► prepwiser.in/questions/VBxj86gK0t](https://www.prepwiser.in/questions/VBxj86gK0t)

Q5 JEE Main 2025 · 23 Jan · Shift 2

pH of water is 7 at 25°C . If water is heated to 80°C ., it's pH will :

(A) Decrease

(B) Remains the same

(C) Increase

(D) H^+ concentration increases, OH^- concentration decreases

[Step-by-step solution ► prepwiser.in/questions/6OdZ_mRmK-](https://www.prepwiser.in/questions/6OdZ_mRmK-)

Q6 JEE Main 2025 · 23 Jan · Shift 1

If 1 mM solution of ethylamine produces $\text{pH} = 9$, then the ionization constant (K_b) of ethylamine is 10^{-x} . The value of x is _____ (nearest integer).

[The degree of ionization of ethylamine can be neglected with respect to unity.]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/bN95BFxMYw](https://www.prepwiser.in/questions/bN95BFxMYw)

Q7 JEE Main 2023 · 15 Apr · Shift 1

Which of the following statement(s) is/are correct?

(A) The pH of 1×10^{-8} M HCl solution is 8 .

(B) The conjugate base of H_2PO_4^- is HPO_4^{2-} .

(C) K_w increases with increase in temperature.

(D) When a solution of a weak monoprotic acid is titrated against a strong base at half neutralisation point, $\text{pH} = \frac{1}{2}\text{pK}_a$

Choose the correct answer from the options given below:

(A) (A), (B), (C)

(B) (B), (C)

(C) (B), (C), (D)

(D) (A), (D)

[Step-by-step solution ► prepwiser.in/questions/9YuPLTpQQT](https://www.prepwiser.in/questions/9YuPLTpQQT)

Q8 JEE Main 2023 · 12 Apr · Shift 1

An analyst wants to convert 1 L HCl of pH = 1 to a solution of HCl of pH 2. The volume of water needed to do this dilution is _____ mL. (Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/-jBuPbCXyH](https://www.prepwiser.in/questions/-jBuPbCXyH)

Q9 JEE Main 2023 · 30 Jan · Shift 1

600 mL of 0.01 M HCl is mixed with 400 mL of 0.01 M H_2SO_4 . The pH of the mixture is _____ $\times 10^{-2}$. (Nearest integer)

[Given $\log 2 = 0.30$

$\log 3 = 0.48$

$\log 5 = 0.69$

$\log 7 = 0.84$

$\log 11 = 1.04]$

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/owwhGYffNm](https://www.prepwiser.in/questions/owwhGYffNm)

Q10 JEE Main 2023 · 29 Jan · Shift 1

Millimoles of calcium hydroxide required to produce 100 mL of the aqueous solution of pH 12 is $x \times 10^{-1}$. The value of x is _____ (Nearest integer).

Assume complete dissociation.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/6Zh6w3oB5_](https://www.prepwiser.in/questions/6Zh6w3oB5_)

Q11 JEE Main 2023 · 25 Jan · Shift 2

When the hydrogen ion concentration $[H^+]$ changes by a factor of 1000, the value of pH of the solution

- (A) decreases by 2 units (B) increases by 2 units
(C) decreases by 3 units (D) increases by 1000 units

Step-by-step solution ► [prepwisser.in/questions/PzlzCIYaCt](https://www.prepwisser.in/questions/PzlzCIYaCt)

Q12 JEE Main 2022 · 29 Jul · Shift 2

200mL of 0.01 M HCl is mixed with 400mL of 0.01 M H_2SO_4 . The pH of the mixture is _____.

Given: $\log 2 = 0.30$, $\log 3 = 0.48$, $\log 5 = 0.70$, $\log 7 = 0.84$, $\log 11 = 1.04$

- (A) 1.14 (B) 1.78
(C) 2.34 (D) 3.02

Step-by-step solution ► [prepwisser.in/questions/mq-JRtNPok](https://www.prepwisser.in/questions/mq-JRtNPok)

Q13 JEE Main 2022 · 28 Jul · Shift 1

K_a for butyric acid (C_3H_7COOH) is 2×10^{-5} . The pH of 0.2 M solution of butyric acid is _____ $\times 10^{-1}$.
(Nearest integer)

[Given $\log 2 = 0.30$]

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/rz-LYCJhXw](https://www.prepwisser.in/questions/rz-LYCJhXw)

Q14 JEE Main 2022 · 26 Jul · Shift 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.

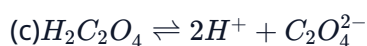
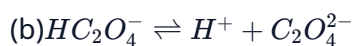
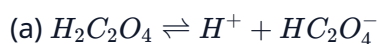
In the light of the above statements, choose the most appropriate answer from the options given below.

- (A) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(B) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
(C) A is true but R is false.
(D) A is false but R is true.

Step-by-step solution ► [prepwisser.in/questions/9kjp48VUZB](https://www.prepwisser.in/questions/9kjp48VUZB)

Q15 JEE Main 2022 · 25 Jul · Shift 2

K_{a_1} , K_{a_2} and K_{a_3} are the respective ionization constants for the following reactions (a), (b) and (c).



The relationship between K_{a_1} , K_{a_2} and K_{a_3} is given as :

(A) $K_{a_3} = K_{a_1} + K_{a_2}$

(B) $K_{a_3} = K_{a_1} - K_{a_2}$

(C) $K_{a_3} = K_{a_1} / K_{a_2}$

(D) $K_{a_3} = K_{a_1} \times K_{a_2}$

[Step-by-step solution ► prepwiser.in/questions/zxuKvmh5vv](https://www.prepwiser.in/questions/zxuKvmh5vv)

Q16 JEE Main 2022 · 27 Jun · Shift 2

pH value of 0.001 M NaOH solution is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/bdTCBoZ52R](https://www.prepwiser.in/questions/bdTCBoZ52R)

Q17 JEE Main 2020 · 5 Sep · Shift 1

A soft drink was bottled with a partial pressure of CO_2 of 3 bar over the liquid at room temperature. The partial pressure of CO_2 over the solution approaches a value of 30 bar when 44 g of CO_2 is dissolved in 1 kg of water at room temperature. The approximate pH of the soft drink is _____ $\times 10^{-1}$.

(First dissociation constant of

$H_2CO_3 = 4.0 \times 10^{-7}$; $\log 2 = 0.3$; density

of the soft drink = 1 g mL^{-1}).

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/eh8jLoN1iU](https://www.prepwiser.in/questions/eh8jLoN1iU)

Q18 JEE Main 2020 · 8 Jan · Shift 2

For the following Assertion and Reason, the correct option is :

Assertion : The pH of water increases with increase in temperature.

Reason : The dissociation of water into H^+ and OH^- is an exothermic reaction.

(A) Both assertion and reason are false.

(B) Both assertion and reason are true, but the reason is not the correct explanation for the assertion.

(C) Both assertion and reason are true, and the reason is the correct explanation for the assertion.

(D) Assertion is not true, but reason is true.

[Step-by-step solution ► prepwiser.in/questions/fWmgrc6VHd](https://www.prepwiser.in/questions/fWmgrc6VHd)

Q19 JEE Main 2020 · 7 Jan · Shift 1

Two solutions, A and B, each of 100L was made by dissolving 4g of NaOH and 9.8 g of H_2SO_4 in water, respectively. The pH of the resultant solution obtained from mixing 40L of solution A and 10L of solution B is :

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/V5yCNBdt2k](https://www.prepwisser.in/questions/V5yCNBdt2k)

Solubility Product · 23 PYQs

Q20 JEE Main 2025 · 2 Apr · Shift 1

If equal volumes of AB_2 and XY (both are salts) aqueous solutions are mixed, which of the following combination will give a precipitate of AY_2 at 300 K ? (Given K_{sp} (at 300 K) for $\text{AY}_2 = 5.2 \times 10^{-7}$)

(A) $2.0 \times 10^{-4} \text{MAB}_2, 0.8 \times 10^{-3} \text{MXY}$

(B) $2.0 \times 10^{-2} \text{MAB}_2, 2.0 \times 10^{-2} \text{MXY}$

(C) $1.5 \times 10^{-4} \text{MAB}_2, 1.5 \times 10^{-3} \text{MXY}$

(D) $3.6 \times 10^{-3} \text{MAB}_2, 5.0 \times 10^{-4} \text{MXY}$

[Step-by-step solution ► prepwisser.in/questions/XPq-okZJne](https://www.prepwisser.in/questions/XPq-okZJne)

Q21 JEE Main 2025 · 28 Jan · Shift 2

Arrange the following in increasing order of solubility product :

$\text{Ca(OH)}_2, \text{AgBr}, \text{PbS}, \text{HgS}$

(A) $\text{PbS} < \text{HgS} < \text{Ca(OH)}_2 < \text{AgBr}$

(B) $\text{HgS} < \text{AgBr} < \text{PbS} < \text{Ca(OH)}_2$

(C) $\text{HgS} < \text{PbS} < \text{AgBr} < \text{Ca(OH)}_2$

(D) $\text{Ca(OH)}_2 < \text{AgBr} < \text{HgS} < \text{PbS}$

[Step-by-step solution ► prepwisser.in/questions/gcSC_V0R0m](https://www.prepwisser.in/questions/gcSC_V0R0m)

Q22 JEE Main 2025 · 24 Jan · Shift 1

K_{sp} for Cr(OH)_3 is 1.6×10^{-30} . What is the molar solubility of this salt in water?

(A) $\sqrt[5]{1.8 \times 10^{-30}}$

(B) $\frac{1.8 \times 10^{-30}}{27}$

(C) $\sqrt[4]{\frac{1.6 \times 10^{-30}}{27}}$

(D) $\sqrt[2]{1.6 \times 10^{-30}}$

[Step-by-step solution ► prepwisser.in/questions/bAQWGmiCyZ](https://www.prepwisser.in/questions/bAQWGmiCyZ)

Q23 JEE Main 2025 · 23 Jan · Shift 1

Which of the following happens when NH_4OH is added gradually to the solution containing 1 M A^{2+} and 1MB^{3+} ions?

Given : $K_{\text{sp}} [\text{A}(\text{OH})_2] = 9 \times 10^{-10}$ and $K_{\text{sp}} [\text{B}(\text{OH})_3] = 27 \times 10^{-18}$ at 298 K .

- (A) $\text{A}(\text{OH})_2$ will precipitate before $\text{B}(\text{OH})_3$
- (B) $\text{A}(\text{OH})_2$ and $\text{B}(\text{OH})_3$ will precipitate together
- (C) Both $\text{A}(\text{OH})_2$ and $\text{B}(\text{OH})_3$ do not show precipitation with NH_4OH
- (D) $\text{B}(\text{OH})_3$ will precipitate before $\text{A}(\text{OH})_2$

[Step-by-step solution ► prepwisser.in/questions/Punezw9J5r](https://www.prepwisser.in/questions/Punezw9J5r)

Q24 JEE Main 2024 · 9 Apr · Shift 2

For a sparingly soluble salt AB_2 , the equilibrium concentrations of A^{2+} ions and B^- ions are $1.2 \times 10^{-4}\text{M}$ and $0.24 \times 10^{-3}\text{M}$, respectively. The solubility product of AB_2 is :

- (A) 0.069×10^{-12}
- (B) 0.276×10^{-12}
- (C) 6.91×10^{-12}
- (D) 27.65×10^{-12}

[Step-by-step solution ► prepwisser.in/questions/PgMmtknnpn](https://www.prepwisser.in/questions/PgMmtknnpn)

Q25 JEE Main 2024 · 1 Feb · Shift 2

Solubility of calcium phosphate (molecular mass, M) in water is W_g per 100mL at 25°C . Its solubility product at 25°C will be approximately.

- (A) $10^7 \left(\frac{W}{M}\right)^3$
- (B) $10^3 \left(\frac{W}{M}\right)^5$
- (C) $10^7 \left(\frac{W}{M}\right)^5$
- (D) $10^5 \left(\frac{W}{M}\right)^5$

[Step-by-step solution ► prepwisser.in/questions/Pw90raxqPH](https://www.prepwisser.in/questions/Pw90raxqPH)

Q26 JEE Main 2024 · 30 Jan · Shift 1

The pH at which



begins to precipitate from a solution containing 0.10MMg^{2+} ions is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/VHW_jwo41s](https://www.prepwisser.in/questions/VHW_jwo41s)

Q27 JEE Main 2023 · 13 Apr · Shift 1

25.0mL of $0.050\text{M Ba}(\text{NO}_3)_2$ is mixed with 25.0mL of 0.020M NaF . K_{sp} of BaF_2 is 0.5×10^{-6} at 298K . The ratio of $[\text{Ba}^{2+}] [\text{F}^-]^2$ and K_{sp} is _____.

(Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/z35_u8uxNj](https://www.prepwisser.in/questions/z35_u8uxNj)

Q28 JEE Main 2023 · 11 Apr · Shift 1

25mL of silver nitrate solution (1M) is added dropwise to 25mL of potassium iodide (1.05M) solution. The ion(s) present in very small quantity in the solution is/are :

- (A) I^- only (B) K^+ only
(C) Ag^+ and I^- both (D) NO_3^- only

Step-by-step solution ► [prepwiser.in/questions/1RhOCjczl5](https://www.prepwiser.in/questions/1RhOCjczl5)

Q29 JEE Main 2023 · 8 Apr · Shift 2

The solubility product of $BaSO_4$ is 1×10^{-10} at 298K. The solubility of $BaSO_4$ in $0.1MK_2SO_4(aq)$ solution is _____ $\times 10^{-9}gL^{-1}$ (nearest integer).

Given: Molar mass of $BaSO_4$ is $233gmol^{-1}$

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/TEGIAACRJX](https://www.prepwiser.in/questions/TEGIAACRJX)

Q30 JEE Main 2023 · 1 Feb · Shift 2

$1 \times 10^{-5}M AgNO_3$ is added to 1L of saturated solution of $AgBr$. The conductivity of this solution at 298K is _____ $\times 10^{-8}Sm^{-1}$.

[Given : $K_{SP}(AgBr) = 4.9 \times 10^{-13}$ at 298K

$$\begin{aligned}\lambda_{Ag^+}^0 &= 6 \times 10^{-3}Sm^2mol^{-1} \\ \lambda_{Br^-}^0 &= 8 \times 10^{-3}Sm^2mol^{-1} \\ \lambda_{NO_3^-}^0 &= 7 \times 10^{-3}Sm^2mol^{-1}\end{aligned}$$

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/NkZYtqeNS4](https://www.prepwiser.in/questions/NkZYtqeNS4)

Q31 JEE Main 2022 · 29 Jul · Shift 1

If the solubility product of PbS is 8×10^{-28} , then the solubility of PbS in pure water at 298 K is $x \times 10^{-16}mol L^{-1}$. The value of x is _____. (Nearest Integer)

[Given : $\sqrt{2} = 1.41$]

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/wVdYfOWWht](https://www.prepwiser.in/questions/wVdYfOWWht)

Q32 JEE Main 2022 · 27 Jul · Shift 1

At 310K, the solubility of CaF_2 in water is $2.34 \times 10^{-3}g/100mL$. The solubility product of CaF_2 is _____ $\times 10^{-8}(mol/L)^3$. (Give molar mass : $CaF_2 = 78gmol^{-1}$)

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/XbZqOiCJR9](https://www.prepwiser.in/questions/XbZqOiCJR9)

Q33 JEE Main 2022 · 29 Jun · Shift 1

The solubility of AgCl will be maximum in which of the following?

- (A) 0.01 M KCl
- (B) 0.01 M HCl
- (C) 0.01 M AgNO₃
- (D) Deionised water

[Step-by-step solution ► prepwiser.in/questions/VgPEkzNPuX](https://www.prepwiser.in/questions/VgPEkzNPuX)

Q34 JEE Main 2021 · 20 Jul · Shift 2

A solution is 0.1 M in Cl⁻ and 0.001 M in CrO₄²⁻. Solid AgNO₃ is gradually added to it. Assuming that the addition does not change in volume and $K_{sp}(\text{AgCl}) = 1.7 \times 10^{-10} \text{ M}^2$ and $K_{sp}(\text{Ag}_2\text{CrO}_4) = 1.9 \times 10^{-12} \text{ M}^3$.

Select correct statement from the following :

- (A) AgCl precipitates first because its K_{sp} is high.
- (B) Ag₂CrO₄ precipitates first as its K_{sp} is low.
- (C) Ag₂CrO₄ precipitates first because the amount of Ag⁺ needed is low.
- (D) AgCl will precipitate first as the amount of Ag⁺ needed to precipitate is low.

[Step-by-step solution ► prepwiser.in/questions/8X75BRX8eM](https://www.prepwiser.in/questions/8X75BRX8eM)

Q35 JEE Main 2021 · 18 Mar · Shift 1

Given below are two statements : One is labelled as Assertion A and the other labelled as reason R

Assertion A : During the boiling of water having temporary hardness, Mg(HCO₃)₂ is converted to MgCO₃.

Reason R : The solubility product of Mg(OH)₂ is greater than that of MgCO₃.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (A) Both A and R are true but R is not the correct explanation of A
- (B) A is true but R is false
- (C) Both A and R are true and R is the correct explanation of A
- (D) A is false but R is true

[Step-by-step solution ► prepwiser.in/questions/TAA3O-mRBV](https://www.prepwiser.in/questions/TAA3O-mRBV)

Q36 JEE Main 2021 · 16 Mar · Shift 1

Two salts A₂X and MX have the same value of solubility product of 4.0×10^{-12} . The ratio of their molar solubilities i.e. $\frac{S(A_2X)}{S(MX)} = \underline{\hspace{2cm}}$. (Round off to the Nearest Integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/uhxHLT-fQ7](https://www.prepwiser.in/questions/uhxHLT-fQ7)

Q37 JEE Main 2021 · 25 Feb · Shift 2

The solubility of Ca(OH)_2 in water is :

[Given : The solubility product of Ca(OH)_2 in water = 5.5×10^{-6}]

(A) 1.11×10^{-6}

(B) 1.11×10^{-2}

(C) 1.77×10^{-6}

(D) 1.77×10^{-2}

[Step-by-step solution ► prepwisar.in/questions/_8WUirIe67](https://www.prepwisar.in/questions/_8WUirIe67)

Q38 JEE Main 2021 · 24 Feb · Shift 2

The solubility product of PbI_2 is 8.0×10^{-9} . The solubility of lead iodide in 0.1 molar solution of lead nitrate is $x \times 10^{-6}$ mol/L. The value of x is _____. (Rounded off to the nearest integer) [Given $\sqrt{2} = 1.41$]

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/VLtjpJT_0M](https://www.prepwisar.in/questions/VLtjpJT_0M)

Q39 JEE Main 2020 · 6 Sep · Shift 2

If the solubility product of AB_2 is $3.20 \times 10^{-11} \text{ M}^3$, then the solubility of AB_2 in pure water is ____ $\times 10^{-4} \text{ mol L}^{-1}$.

[Assuming that neither kind of ion reacts with water]

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/adp2vmzCF-](https://www.prepwisar.in/questions/adp2vmzCF-)

Q40 JEE Main 2020 · 2 Sep · Shift 1

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 $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightleftharpoons \text{CuS}(\text{s})$ is high because the solubility product is low.

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

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

(C) Both (A) and (R) are true and (R) is the explanation for (A).

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

[Step-by-step solution ► prepwisar.in/questions/EsqNSUZInz](https://www.prepwisar.in/questions/EsqNSUZInz)

Q41 JEE Main 2020 · 9 Jan · Shift 2

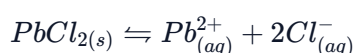
The solubility product of $\text{Cr}(\text{OH})_3$ at 298 K is 6.0×10^{-31} . The concentration of hydroxide ions in a saturated solution of $\text{Cr}(\text{OH})_3$ will be :

- (A) $(2.22 \times 10^{-31})^{1/4}$
- (B) $(4.86 \times 10^{-29})^{1/4}$
- (C) $(18 \times 10^{-31})^{1/4}$
- (D) $(18 \times 10^{-31})^{1/2}$

[Step-by-step solution ► prepwiser.in/questions/SRU5Gca_2F](https://www.prepwiser.in/questions/SRU5Gca_2F)

Q42 JEE Main 2020 · 9 Jan · Shift 1

The K_{sp} for the following dissociation is 1.6×10^{-5}



Which of the following choices is correct for a mixture of 300 mL 0.134 M $\text{Pb}(\text{NO}_3)_2$ and 100 mL 0.4 M NaCl ?

- (A) $Q > K_{\text{sp}}$
- (B) Not enough data provided
- (C) $Q < K_{\text{sp}}$
- (D) $Q = K_{\text{sp}}$

[Step-by-step solution ► prepwiser.in/questions/8xjz3VkcN5](https://www.prepwiser.in/questions/8xjz3VkcN5)

Salt Hydrolysis · 4 PYQs

Q43 JEE Main 2024 · 1 Feb · Shift 1

K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5} . The pH of ammonium acetate solution will be _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/7FhlOwlLR](https://www.prepwiser.in/questions/7FhlOwlLR)

Q44 JEE Main 2024 · 27 Jan · Shift 1

Given below are two statements :

Statement (I) : Aqueous solution of ammonium carbonate is basic.

Statement (II) : Acidic/basic nature of salt solution of a salt of weak acid and weak base depends on K_a and K_b value of acid and the base forming it.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (A) Both Statement I and Statement II are correct
- (B) Statement I is correct but Statement II is incorrect
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is incorrect but Statement II is correct

[Step-by-step solution ► prepwiser.in/questions/yYan1gBIZi](https://www.prepwiser.in/questions/yYan1gBIZi)

Q45 JEE Main 2021 · 26 Feb · Shift 2

The pH of ammonium phosphate solution, if pK_a of phosphoric acid and pK_b of ammonium hydroxide are 5.23 and 4.75 respectively, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/pDZqjPWc9-](https://www.prepwisar.in/questions/pDZqjPWc9-)

Q46 JEE Main 2020 · 6 Sep · Shift 1

Arrange the following solutions in the decreasing order of pOH :

- (A) 0.01 M HCl
- (B) 0.01 M NaOH
- (C) 0.01 M CH_3COONa
- (D) 0.01 M NaCl

(A) (B) > (C) > (D) > (A)

(B) (A) > (D) > (C) > (B)

(C) (A) > (C) > (D) > (B)

(D) (B) > (D) > (C) > (A)

[Step-by-step solution ► prepwisar.in/questions/hzvL8aa-YH](https://www.prepwisar.in/questions/hzvL8aa-YH)

Acid-Base Concepts · 6 PYQs

Q47 JEE Main 2025 · 3 Apr · Shift 2

10 mL of 2 M NaOH solution is added to 20 mL of 1 M HCl solution kept in a beaker. Now, 10 mL of this mixture is poured into a volumetric flask of 100 mL containing 2 moles of HCl and made the volume upto the mark with distilled water. The solution in this flask is :

(A) 0.2 M NaCl solution

(B) 20 M HCl solution

(C) Neutral solution

(D) 10 M HCl solution

[Step-by-step solution ► prepwisar.in/questions/YtW7v-z2u3](https://www.prepwisar.in/questions/YtW7v-z2u3)

Q48 JEE Main 2023 · 31 Jan · Shift 2

The incorrect statement for the use of indicators in acid-base titration is :

(A) Phenolphthalein is a suitable indicator for a weak acid vs strong base titration.

(B) Methyl orange may be used for a weak acid vs weak base titration.

(C) Methyl orange is a suitable indicator for a strong acid vs weak base titration.

(D) Phenolphthalein may be used for a strong acid vs strong base titration.

[Step-by-step solution ► prepwisar.in/questions/vrh8BKwod0](https://www.prepwisar.in/questions/vrh8BKwod0)

Q49 JEE Main 2022 · 29 Jul · Shift 2

A compound 'X' is a weak acid and it exhibits colour change at pH close to the equivalence point during neutralization of NaOH with CH_3COOH . Compound 'X' exists in ionized form in basic medium. The compound 'X' is

(A) methyl orange

(B) methyl red

(C) phenolphthalein

(D) erichrome Black T

[Step-by-step solution ► prepwisar.in/questions/9X2jdXxf17](https://www.prepwisar.in/questions/9X2jdXxf17)

Q50 JEE Main 2022 · 25 Jun · Shift 2

Given below are two statements one is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : The amphoteric nature of water is explained by using Lewis acid/base concept.
Reason R : Water acts as an acid with NH_3 and as a base with H_2S .

In the light of the above statements choose the correct answer from the options given below :

- (A) Both A and R are true and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false but R is true.

[Step-by-step solution ► prepwisser.in/questions/cD33SO3rF8](https://www.prepwisser.in/questions/cD33SO3rF8)

Q51 JEE Main 2020 · 2 Sep · Shift 1

While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required?

- (A) Pipette and distilled water
- (B) Clamp and phenolphthalein
- (C) Burette and porcelain tile
- (D) Bunsen burner and measuring cylinder

[Step-by-step solution ► prepwisser.in/questions/fyKpYDIJkG](https://www.prepwisser.in/questions/fyKpYDIJkG)

Q52 JEE Main 2020 · 8 Jan · Shift 1

The strength of an aqueous NaOH solution is most accurately determined by titrating :
(Note : consider that an appropriate indicator is used)

- (A) Aq. NaOH in a pipette and aqueous oxalic acid in a burette
- (B) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask
- (C) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask
- (D) Aq. NaOH in a burette and concentrated H_2SO_4 in a conical flask

[Step-by-step solution ► prepwisser.in/questions/tDT_0v9q49](https://www.prepwisser.in/questions/tDT_0v9q49)

Buffer Solutions · 11 PYQs

Q53 JEE Main 2025 · 7 Apr · Shift 2

One litre buffer solution was prepared by adding 0.10 mol each of NH_3 and NH_4Cl in deionised water.
The change in pH on addition of 0.05 mol of HCl to the above solution is _____ $\times 10^{-2}$.
(Nearest integer)

Given : pK_b of $\text{NH}_3 = 4.745$ and $\log_{10} 3 = 0.477$

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Jr8bzytwaf](https://www.prepwisser.in/questions/Jr8bzytwaf)

Q54 JEE Main 2024 · 8 Apr · Shift 2

Given below are two statements :

Statement (I) : A Buffer solution is the mixture of a salt and an acid or a base mixed in any particular quantities

Statement (II) : Blood is naturally occurring buffer solution whose pH is maintained by $\text{H}_2\text{CO}_3/\text{HCO}_3^-$ concentrations.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Both Statement I and Statement II are false
- (B) Both Statement I and Statement II are true
- (C) Statement I is false but Statement II is true
- (D) Statement I is true but Statement II is false

[Step-by-step solution ► prepwiser.in/questions/BxyIc20kIa](https://www.prepwiser.in/questions/BxyIc20kIa)

Q55 JEE Main 2024 · 30 Jan · Shift 2

The pH of an aqueous solution containing 1M benzoic acid ($\text{pK}_a = 4.20$) and 1M sodium benzoate is 4.5. The volume of benzoic acid solution in 300mL of this buffer solution is _____ mL. (given : $\log 2 = 0.3$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/tlyQCg1iOC](https://www.prepwiser.in/questions/tlyQCg1iOC)

Q56 JEE Main 2023 · 13 Apr · Shift 2

20 mL of 0.1MNaOH is added to 50mL of 0.1M acetic acid solution. The pH of the resulting solution is _____ $\times 10^{-2}$ (Nearest integer)

Given : $\text{pK}_a(\text{CH}_3\text{COOH}) = 4.76$

$\log 2 = 0.30$

$\log 3 = 0.48$

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4SI05Ns4eT](https://www.prepwiser.in/questions/4SI05Ns4eT)

Q57 JEE Main 2023 · 25 Jan · Shift 1

A litre of buffer solution contains 0.1 mole of each of NH_3 and NH_4Cl . On the addition of 0.02 mole of HCl by dissolving gaseous HCl, the pH of the solution is found to be _____ $\times 10^{-3}$ (Nearest integer)

[Given : $\text{pK}_b(\text{NH}_3) = 4.745$

$\log 2 = 0.301$

$\log 3 = 0.477$

$T = 298\text{K}$]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/w52WWo2LNK](https://www.prepwiser.in/questions/w52WWo2LNK)

Q58 JEE Main 2023 · 24 Jan · Shift 1

The dissociation constant of acetic acid is $x \times 10^{-5}$. When 25 mL of 0.2 M CH_3COONa solution is mixed with 25 mL of 0.02 M CH_3COOH solution, the pH of the resultant solution is found to be equal to 5. The value of x is _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/RzTxZLec3u](https://www.prepwiser.in/questions/RzTxZLec3u)

Q59 JEE Main 2022 · 26 Jul · Shift 2

Class XII students were asked to prepare one litre of buffer solution of pH 8.26 by their Chemistry teacher: The amount of ammonium chloride to be dissolved by the student in 0.2 M ammonia solution to make one litre of the buffer is :

(Given: $pK_b(\text{NH}_3) = 4.74$

Molar mass of $\text{NH}_3 = 17\text{g mol}^{-1}$

Molar mass of $\text{NH}_4\text{Cl} = 53.5\text{g mol}^{-1}$)

(A) 53.5 g

(B) 72.3 g

(C) 107.0 g

(D) 126.0 g

[Step-by-step solution ► prepwiser.in/questions/mA-g3EOV2k](https://www.prepwiser.in/questions/mA-g3EOV2k)

Q60 JEE Main 2022 · 28 Jun · Shift 2

A student needs to prepare a buffer solution of propanoic acid and its sodium salt with pH 4. The ratio of $\frac{[\text{CH}_3\text{CH}_2\text{COO}^-]}{[\text{CH}_3\text{CH}_2\text{COOH}]}$ required to make buffer is _____.

Given : $K_a(\text{CH}_3\text{CH}_2\text{COOH}) = 1.3 \times 10^{-5}$

(A) 0.03

(B) 0.13

(C) 0.23

(D) 0.33

[Step-by-step solution ► prepwiser.in/questions/ihGgU2vd3s](https://www.prepwiser.in/questions/ihGgU2vd3s)

Q61 JEE Main 2022 · 26 Jun · Shift 1

50 mL of 0.1 M CH_3COOH is being titrated against 0.1 M NaOH. When 25 mL of NaOH has been added, the pH of the solution will be _____ $\times 10^{-2}$. (Nearest integer)

(Given : $pK_a(\text{CH}_3\text{COOH}) = 4.76$)

$\log 2 = 0.30$

$\log 3 = 0.48$

$\log 5 = 0.69$

$\log 7 = 0.84$

$\log 11 = 1.04$

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Y2u5K9BiVm](https://www.prepwiser.in/questions/Y2u5K9BiVm)

Q62 JEE Main 2021 · 18 Mar · Shift 1

In order to prepare a buffer solution of pH 5.74, sodium acetate is added to acetic acid. If the concentration of acetic acid in the buffer is 1.0 M, the concentration of sodium acetate in the buffer is _____ M. (Round off to the Nearest Integer). [Given : $pK_a(\text{acetic acid}) = 4.74$]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/-6PHKUZYHh](https://www.prepwiser.in/questions/-6PHKUZYHh)

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 solutions $\frac{1}{2}$ mL of 5 M NaOH is added. The pH of the solution is _____.

[Given : pKa of acetic acid = 4.75, molar mass of acetic of acid = 60 g/mol, $\log 3 = 0.4771$] Neglect any changes in volume.

Numerical answer — enter the value.

Step-by-step solution ► prepwiser.in/questions/Kh-ZmoPgY0

Answer key — Ionic Equilibrium

Numbers match the question numbers above. For full working, open the solution link under each question.

1	A	2	3	3	25	4	D	5	A	6	7	7	B	8	9000
9	186	10	5	11	C	12	B	13	27	14	C	15	D	16	11
17	37	18	A	19	10	20	B	21	C	22	C	23	D	24	C
25	C	26	9	27	5	28	C	29	233	30	13039	31	282	32	0
33	D	34	D	35	D	36	50	37	B	38	141	39	2	40	C
41	C	42	A	43	7	44	A	45	7	46	B	47	B	48	B
49	C	50	D	51	D	52	B	53	48	54	C	55	100	56	458
57	9079	58	10	59	C	60	B	61	476	62	10	63	5		

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