Titration Chemistry Questions with Solutions

Q1. Which of the following is used as an indicator in titrating a strong acid with a weak base?

(a) Methyl orange
(b) Methyl red
(c) Sodium hydroxide
(d) Phenolphthalein

Answer: (a), Methyl orange is used as an indicator in titrating a strong acid with a weak base.

Q2. Which of the following is used as an indicator in titrating a weak acid with a strong base?

(a) Methyl orange
(b) Methyl red
(c) Sodium hydroxide
(d) Phenolphthalein

Answer: (d), Phenolphthalein is used as an indicator in titrating a weak acid with a strong base.

Q3. What is the role of an indicator in a reaction?

(a) To detect the end point of the titration
(b) Assist reactants to react quickly
(c) To provide a surface for the reaction
(d) To increase the rate of a reaction

Answer: (a), The role of an indicator in a reaction is to detect the end point of the titration.

Q4. What is the primary objective of titration?

(a) To find the concentration of an unknown acid or base
(b) To find the volume of an unknown acid or base
(c) To find the pH of an unknown acid or base
(d) To find the pressure of an unknown acid or base

Answer: (a), The primary objective of titration is to find the concentration of an unknown acid or base.

Q5. What is an equivalence point?

(a) It is the point at which the pressure of titrant equals the pressure of analyte
(b) It is the point at which the pH of titrant equals the pH of analyte
(c) It is the point at which the volume of titrant equals the volume of analyte
(d) It is the point at which the quantity of titrant equals the quantity of analyte

Answer: (d), An equivalence point is a point at which the quantity of titrant equals the quantity of analyte.

Q6. What is titration?

Answer: Titration is an analytical method primarily used in estimating the concentration of an unknown analyte solution using a standard solution whose concentration is known.

Q7. What is a standard solution?
Answer: A solution whose concentration is known is known as a standard solution. It is also known as a titrant in titration.

Q8. What is the principle of volumetric analysis?
Answer: The principle of volumetric analysis is to determine the concentration of an unknown analyte solution using a standard solution whose concentration is known.

Q9. Why should not we rinse a titration flask?
Answer: We should not rinse a titration flask because some of the liquid sticks to the titration flask. Therefore, the pipetted volume taken in the titration flask will increase.

Q10. What is the end point in $KMnO_4$ titrations?
Answer: The end point in $KMnO_4$ titration is from colourless to light pink.

Q11. What is acidimetry or alkalimetry?
Answer: Acidimetry or alkalimetry is the branch of volumetric analysis that deals with acid-base titration to estimate the alkaline concentration using a standard acid or acidic concentration using a standard base.

Q12. What are the various kinds of titration?
Answer: Various kinds of titrations are enlisted below.

- Acid-base titration
- Complexometric titration
- Redox titration
- Iodometric titration
- Precipitation titration
- Permanganate titration

Q13. What are the differences between a back titration and a direct titration?
Answer:

S. No.	Back Titration	Direct Titration
1.	It is used to determine an unknown concentration using an excess amount of a standard solution.	It involves a reaction between an unknown compound and the standard solution.
2.	In it, two chemical reactions occur.	In it, only one chemical reaction occurs.

3.	It is performed with two known compounds.	It is performed with only one known compound.
4.	In it, titrand is the remaining amount of reagent added in excess.	In it, titrand is the unknown compound.
5.	It can determine the exact end point with a sharp colour change.	It is used when the end point of titration can be easily obtained.

Q14. Match the following titrations with the indicators used in them.

Column 1	Column 2
NaOH vs CH_3COOH	K_3 [$Fe(CN)_6$] as an external indicator
$KMnO_4$ vs $H_2C_2O_4$	Starch
I_2 vs $Na_2S_2O_3$	$KMnO_4$
$K_2Cr_2O_7$ vs $FeSO_4$	Phenolphthalein

Answer:

Column 1	Column 2
NaOH vs CH_3COOH	Phenolphthalein
$KMnO_4$ vs $H_2C_2O_4$	$KMnO_4$
I_2 vs $Na_2S_2O_3$	Starch
$K_2Cr_2O_7$ vs $FeSO_4$	K_3 [$Fe(CN)_6$] as an external indicator

Q15. What are the differences between an end point and an equivalence point?

Answer:

S. No.	End Point	Equivalence Point
1.	It is the point at which the indicator changes its colour.	It is the point at which the amount of titrant is chemically equivalent to the analyte in the sample.
2.	It comes after the equivalence point.	It comes before the end point.

3.	**Weak acids have only one endpoint.**	**Weak acids have multiple equivalence points.**

Practise Questions on Titration

Q1. Why is it customary to read the lower meniscus in colourless and transparent solutions and the upper meniscus in highly coloured solutions?
Answer: It is customary to read the lower meniscus in colourless and transparent solutions and the upper meniscus in highly coloured solutions because it is easier to read the lower meniscus in colourless solutions and the upper meniscus in coloured solutions. In the presence of coloured solutions, the lower meniscus is not clearly visible.

Q2. Why is dilute sulphuric acid added while preparing a standard ferrous ammonium sulphate solution?
Answer: Dilute sulphuric acid is added while preparing a standard ferrous ammonium sulphate solution to prevent hydrolysis of ferrous sulphate. Excessive heating is avoided while dissolving the salt mixture in water. This is for preventing the conversion of Fe^{2+} ions (light green) to Fe^{3+} ions (yellow).

Q3. Why, in the redox titration of $KMnO_4$ vs oxalic acid, do we heat oxalic acid solution before starting the titration?
Answer: In the redox titration of $KMnO_4$ vs oxalic acid, we heat oxalic acid solution because it is a slow process without heating because a reaction requires more energy than the activation energy. To increase the energy, the temperature must be raised, which can only be accomplished by heating the oxalic acid solution.

Q4. Why do we heat oxalic acid solution and sulphuric acid up to 50–60°C in the permanganate titration?
Answer: We heat oxalic acid solution and sulphuric acid up to 50–60°C in the permanganate titration because the reaction between oxalic acid and potassium permanganate in an acidic medium is extremely slow at normal temperature, heating to 50 – 60°C keeps oxalic acid in a decomposed state to facilitate better interaction between oxalate and potassium permanganate.

Q5. What is the function of sulphuric acid in the titration of mohr salt against $KMnO_4$?
Answer: The function of sulphuric acid in the titration of mohr salt against $KMnO_4$ is to prevent the hydrolysis of the ferric ion (Fe^{2+}) because the titration occurs in the presence of $KMnO_4$ or $K_2Cr_2O_7$, both of which are good oxidising agents.