Indicator Chemistry Questions with Solutions

Q-1: Which of the following is not an acid base indicator?

a) Safranin T
b) Alizarin Blue S
c) P-nitrophenol
d) Thymol blue

Answer: a) Safranin T

Explanation: An acid-base indicator can be defined as a weak acid or weak base that changes colour as the concentration of hydrogen (H^+) or hydroxide (OH^-) ions in an aqueous solution changes.

Except for Safranin T, all others are acid-base indicators. Safranin T is an indicator for redox reactions.

Q-2: What do you mean by redox indicators? Give some examples.

Answer: A redox indicator is a compound that changes colour in response to specific potential differences. A redox indicator compound must have different coloured reduced and oxidised forms, and the redox process must be reversible.

The molecule 2,2'-Bipyridine, for example, is a redox indicator. At an electrode potential of 0.97 V, it changes from light blue to red in solution.

Q-3: Which of the following is the most commonly used natural indicator for determining soil pH?
a) Anthraquinone
b) Methyl Red
c) Fluorescein
d) Hydrangeas

Answer: d) Hydrangeas

Explanation: Hydrangeas are the natural indicators that can also tell you whether something is acidic or basic. Hydrangeas turn blue in acidic soil, purple in neutral soil, and pink in basic soil. The intensity of the colour is determined by the amount of acid and base in the soil.

All other indicators are synthetic indicators.

Q-4: The best suitable indicator for titration of metal ions with EDTA in a slightly acidic medium is
a) Eriochrome Black-T

b) Alizarin
c) Xylenol orange
d) None of the above

Answer: c) Xylenol orange

Q-5: Which of the following indicators is used in complexometric titrations?

a) Curcumin
b) Malachite green
c) Methyl red
d) m-cresol purple

Answer: a) Curcumin

Explanation: Complexometric indicators are used in complexometric titrations. Murexide, curcumin, and xylenol orange are some of the complexometric indicators used in complexometric titrations.

Other than curcumin, the given indicators are used in acid-base titrations.

Q-6: Predict the colour change in their acid and base form for the following acid-base indicators.

a) Alizarin Blue S
b) Malachite green
c) Methyl orange

Answer: In order to predict pH changes, acid base indicators change colour.

The table below depicts the colour change of various acid base indicators in their acid and base forms:

Indicator	**Colour change in acid form**	**Colour change in base form**
Alizarin Blue S	Green	Blue
Malachite green	Green	Colourless
Methyl orange	Red	Yellow

Q-7: The suitable pH range for methyl red for its action is

a) 10-13
b) 4.2-6.3
c) 8-9.6

d) 11-13

Answer: b) 4.2-6.3

Explanation: Methyl red is a pH indicator; it is red when the pH is less than 4.2, yellow when the pH is greater than 6.2, and orange when the pH is between. As a result, its pH range of action is 4.2-6.2.

Q-8: The indicator used in the titration of Mohr's salt with potassium dichromate is

a) Solochrome Black-T
b) Xylenol orange
c) Diphenylamine
d) Phenolphthalein

Answer: c) Diphenylamine

Explanation: A redox titration is performed between Mohr's salt and potassium dichromate. As a result, a redox indicator will be used. Only diphenylamine is a redox indicator among the available indicators.

The table below categorises indicators according to their type:

Indicator Name	Type of Indicator
Solochrome Black-T	Complexometric
Xylenol orange	Complexometric
Diphenylamine	Redox
Phenolphthalein	Acid-Base

Q-9: In titration of EDTA with metal ions, if we don't have a metal indicator, then

a) We can use acid base indicator
b) We can use redox indicator
c) We can use both acid base as well as redox indicator
d) We can't titrate without a metal indicator

Answer: a) We can use acid base indicator

Q-10: A complexometric indicator is also known as

a) pH indicators
b) Conductometric indicators
c) pM indicators
d) Metallochromic indicators

Answer: c) and d)

Q-11: Complete the following table:

pH independent Redox indicators	**Colour of oxidised form**	**Colour of reduced form**
a) Diphenylamine	_____	Colourless
b) 2,2' Bipyridine(Ru complex)	_____	Yellow
c) Nitro Phenanthroline (Fe complex)	_____	_____

Answers: a) Violet
b) Colourless
c) Cyan,Red

Q-12: How does phenolphthalein aid in determining whether a solution is acidic or basic?

Answer: In acid-base titration, phenolphthalein is used as an indicator. In alkaline solutions, it turns pink and in acid solutions, it is colourless.

Q-13: Which of the indicators is best for titration of HCl vs NaOH, if the HCl is in a burette and NaOH in a conical flask?

a) Phenolphthalein
b) Methyl orange
c) EBT
d) Congo red

Answer: b) Methyl orange

Explanation: One must select the indicator that will produce a sharp colour change at the equivalence point. The best indicator would be one with a colour change interval that brackets the pH at the titration's equivalence point.The pH range for the action of methyl orange is 3.1(red)-4.4(yellow).The titration between HCl and NaOH is in the same pH range.

Q-14: Why is it necessary to use freshly prepared starch solution as an indicator?

Answer: The presence of iodine in the solution is easily identified by the addition of starch. The starch solution used as an indicator should be freshly prepared because old solutions decompose and reduce the sensitivity of the solution. As a result, the outcomes will be inaccurate.

Q-15: Iodometric titration involves the use of _____ indicator.

a) China rose
b) Starch
c) Methylene Blue
d) Neutral red

Answer: b) Starch

Practise Questions on Indicator

Q-1: Neutral red is a pH dependent redox indicator. What is the colour of its oxidised form?

a) Red violet
b) Red
c) Violet
d) Blue

Answer: b) Red

Explanation: The reduced and oxidised forms of a redox indicator are coloured differently. Neutral red has a red colour when oxidised and is colourless when reduced.

Q-2: The buffer used for the operation of the xylenol orange indicator in a metal EDTA titration is

a) NH_4OH - NH_4Cl
b) Hexamine
c) CH_3COOH-CH_3COONa
d) All of the above

Answer: b) Hexamine

Q-3: The indicator used in a titration of Mohr's salt with $KMnO_4$ can be

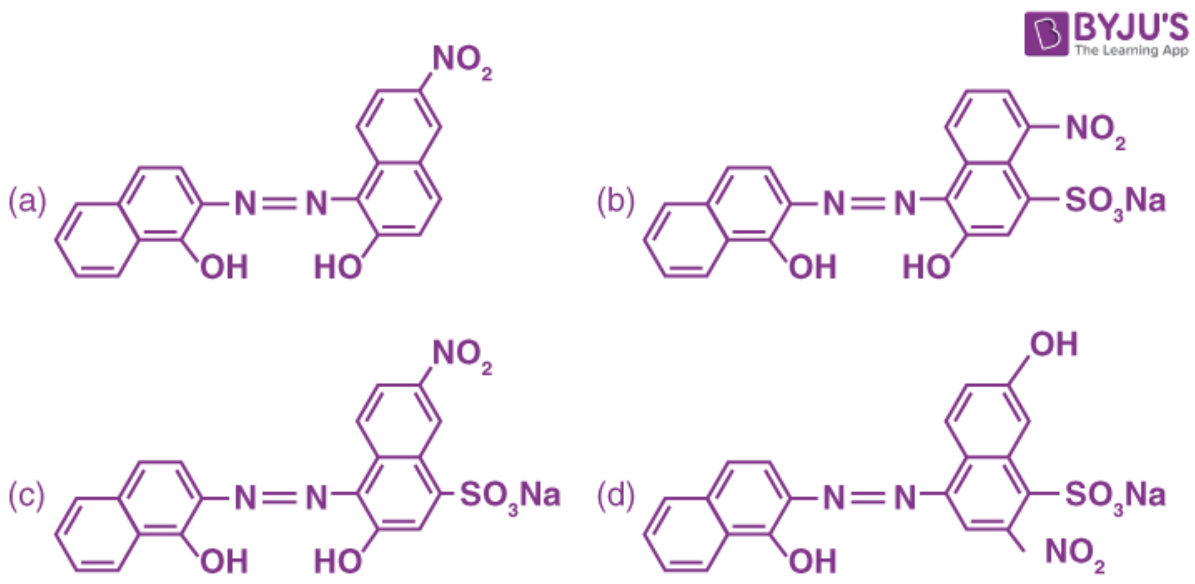
a) Methyl orange
b) Methyl red
c) $KMnO_4$ itself can act as indicator
d) Mohr's salt can act as indicator

Answer: c) $KMnO_4$ itself can act as indicator

Explanation: It is a redox titration between Mohr's salt and potassium permanganate. This is a self indicator titration. The reaction progresses from colourless to permanently light pink.

Because of its intense purple colour, $KMnO_4$ will act as a self indicator in this case. The endpoint is marked when the solution changes from colourless to permanent pink.

Q-4: The structure of Eriochrome Black-T is



Answer: c)

Q-5: Which of the following is an external indicator?

a) Alizarin
b) Potassium Ferricyanide
c) Methyl red
d) Salochromic Black-T

Answer: b) Potassium Ferricyanide

Explanation: External indicators are those that are introduced externally into the chemical reaction but do not act as reactants.
When ammonium iron sulphate reacts with potassium dichromate, potassium ferrocyanide acts as an external indicator. Potassium ferricyanide produces a blue colour due to ferro ferricyanide formation in this reaction titration.