

INDICATORS – TOPIC TEST 1

QUESTION 1

Indicators are used to

- A determine when enough acid has been added to a base to reach a pH of 7
- B determine the pH at which the solution changes colour
- C approximate, as accurately as possible, when neutralisation has occurred
- D neutralise acids and bases

Refer to the following table to answer Questions 2 → 6

Name	pH range	Colour change		K_a
		Acid	Base	
Thymol blue	1.2–2.8	red	yellow	2×10^{-2}
Methyl orange	3.1–4.4	red	yellow	2×10^{-4}
Bromophenol blue	3.0–4.6	yellow	blue	6×10^{-5}
Methyl red	4.2–6.3	red	yellow	8×10^{-6}
Bromothymol blue	6.0–7.6	yellow	blue	1×10^{-7}
Phenol red	6.8–8.4	yellow	red	1×10^{-8}
Phenolphthalein	8.3–10.0	colourless	red	5×10^{-10}

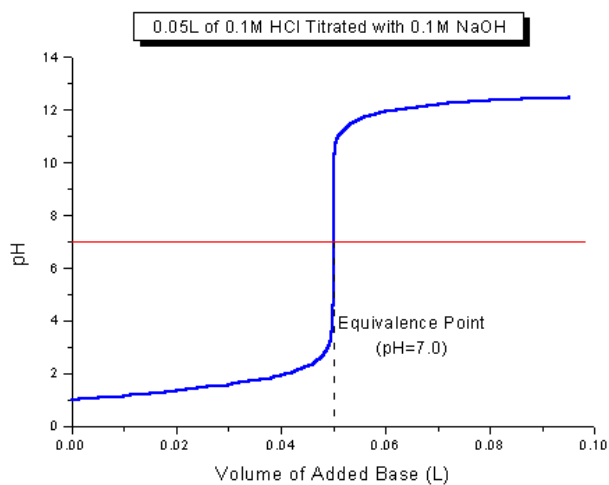
QUESTION 2

Which of the following indicators could be used to accurately determine the equivalence point of a strong acid and base?

- A thymol blue
- B methy orange
- C bromophenyl blue
- D phenol red

QUESTION 3

HCl was titrated against NaOH using bromothymol blue. The titration curve for this reaction is shown below.



- A The indicator will change from yellow to blue when the acid is in excess
- B The indicator will change from yellow to blue when the base is in excess
- C The indicator will change from blue to yellow when the acid is in excess
- D The indicator will change from blue to yellow when the base is in excess

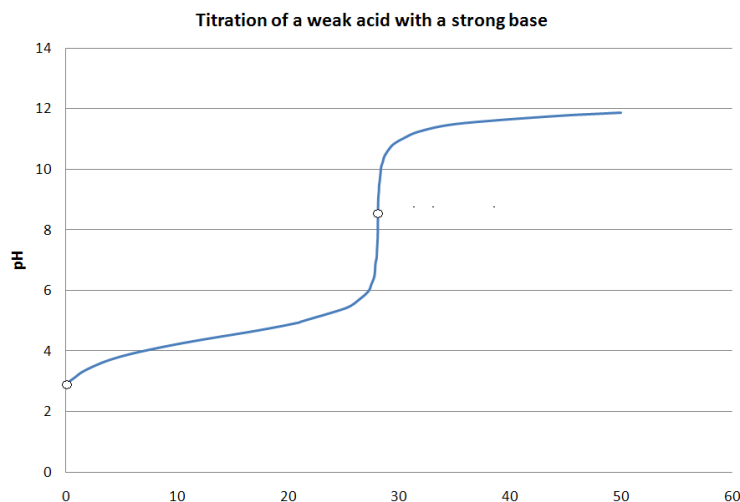
QUESTION 4

A solution turned red when tested with phenolphthalein. If another sample of this solution was tested with bromothymol blue, what colour would it be?

- A Colourless
- B Red
- C Blue
- D Yellow

QUESTION 5

Use the titration curve below to determine which indicators could be used for the titration of a weak acid and a strong base.



- A bromothymol blue and phenol phthalein
- B bromothymol blue and thymol blue
- C phenol phthalein and methyl orange
- D thymol blue and methyl orange

QUESTION 6

The equivalence point for a reaction between 0.1003 M NaOH and an approximately 0.1M solution of CH_3COOH , using methyl orange indicator (pH range 3.1 –4.5), would occur:

- A Before the end point of the reaction.
- B When exactly the same volume of each solution had been added.
- C After the end point of the reaction.
- D When an excess of the NaOH had been added from the burette.

QUESTION 7

Phenolphthalein changes colour between a pH of 8.3 – 10.0. Why can it be accurately used to determine the end point of a titration between NaOH and HCl, which has an equivalence point at a pH of 7?

Solution

QUESTION 8

Why don't any indicators change colour at precisely the same pH of the equivalence point?

Solution

QUESTION 9

Why doesn't the addition of an indicator affect the amount of acid or base needed to reach the equivalence point?

Solution

ANSWERS

QUESTION 1 Answer is C

QUESTION 2 Answer is D

QUESTION 3 Answer is A

QUESTION 4 Answer is C

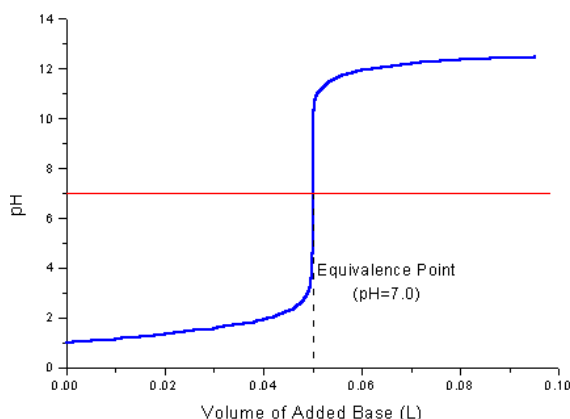
QUESTION 5 Answer is A

QUESTION 6 Answer is C

QUESTION 7

The titration curve for the titration is shown below. Once 50mL of base has been added, it only takes a miniscule amount of extra base to cause a huge change in the pH. The extra amount of base need for the pH to change from 7 (the equivalence point) to 8.3 (when phenol phthalein changes colour – the end point) is insignificant. Therefore phenol phthalein can be used for this titration.

Note: Any indicator that changes colour across the vertical section of the graph (pH of 4-11) will accurately determine the equivalence point.



QUESTION 8

Indicators need a slight excess of acid or base to change colour and therefore they will not change colour exactly at the equivalence point since this is when there is exactly the right amount of acid and base to neutralise each other.

QUESTION 9

Indicators do not take part in the reaction and do not change the amount of acid or base reacting in the titration.