CHEMISTRY YEAR 12 - MODULE 6 - LESSON 15

💊 Indicators — Mechanism & Selecting the Right One

Use this worksheet after reading the lesson to practise the key ideas and prove you can meet the success criteria.

Name _____

Date _____

Class _____

1. Key Ideas

A pharmaceutical quality control technician selects phenolphthalein instead of methyl orange for a strong acid/weak base drug purity test. The endpoint occurs at pH 9 — long after the equivalence point at pH 5. The batch passes QC with a reported purity of 112%. Impossible. Undetected until patient harm occurs. Indicator selection is not a minor procedural detail.

- An indicator is a weak acid (HIn) with differently coloured acid and conjugate base forms
- Why the equivalence point pH depends on the salt formed (not always 7)

2. Success Criteria

By the end, you should be able to:

- An indicator is a weak acid (HIn) with differently coloured acid and conjugate base forms
- Methyl orange (3.1–4.4), bromothymol blue (6.0–7.6), phenolphthalein (8.3–10.0)
- The indicator range must bracket the equivalence point pH

3. Key Terms

Indicator
A weak acid (HIn) whose acid and conjugate base forms have different colours, used to signal the endpoint of a titration.

Methyl orange
An indicator with a colour change range of pH 3.1–4.4, suitable for strong acid/strong base and strong acid/weak base titrations.

Bromothymol blue
An indicator with a colour change range of pH 6.0–7.6, suitable for strong acid/strong base titrations where the equivalence point is near neutral.

Phenolphthalein
An indicator with a colour change range of pH 8.3–10.0, suitable for weak acid/strong base titrations.

Equivalence point
The point in a titration where stoichiometrically equivalent amounts of acid and base have reacted — the pH depends on the salt formed.

Endpoint
The point in a titration where the indicator changes colour, which should match the equivalence point for accurate results.

4. Activity: Build the Lesson Map

Use the lesson to complete the table. Keep answers brief but specific.

Prompt	Your answer
Main concept	
Important example	
Common mistake to avoid	
How this links to the next lesson	

5. Short Answer Questions

1. Explain this lesson goal in your own words: "An indicator is a weak acid (HIn) with differently coloured acid and conjugate base forms". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "Methyl orange (3.1–4.4), bromothymol blue (6.0–7.6), phenolphthalein (8.3–10.0)". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding 💊 Indicators — Mechanism & Selecting the Right One: "The indicator range must bracket the equivalence point pH".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about 💊 Indicators — Mechanism & Selecting the Right One but does not use evidence or reasoning.

Improve the answer by writing a stronger response that uses accurate terminology, a relevant example and a clear explanation.

7. Multiple Choice

1. What is the best first step when answering a question about 💊 Indicators — Mechanism & Selecting the Right One?

☐ A. Identify the key concept being tested

☐ B. Write every fact from memory

☐ C. Ignore the command word

☐ D. Skip examples and evidence

2. Which answer would show stronger understanding of 💊 Indicators — Mechanism & Selecting the Right One?

☐ A. An answer with accurate terms and reasoning

☐ B. A copied definition only

☐ C. A single-word response

☐ D. An answer with no example

3. What should you do if a question asks you to explain?

☐ A. Link the idea to a reason or cause

☐ B. List unrelated facts

☐ C. Only draw a diagram

☐ D. Write the shortest possible answer

8. Success Criteria Proof

Finish with evidence that you can do each success criterion.

SUCCESS CRITERION 1

Prove that you can: An indicator is a weak acid (HIn) with differently coloured acid and conjugate base forms

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: Methyl orange (3.1–4.4), bromothymol blue (6.0–7.6), phenolphthalein (8.3–10.0)

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The indicator range must bracket the equivalence point pH

BAND 5 4 MARKS

One thing I still need help with: