CHEMISTRY YEAR 12 - MODULE 6 - LESSON 13

Buffers — Mechanism, Calculations & Natural Systems

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 patient in diabetic ketoacidosis has a blood pH of 7.10 — just 0.30 units below normal. Without the bicarbonate buffer system, that same metabolic acid load would drive blood pH to around 6.80, causing cardiac arrest within minutes. The buffer system bought the patient enough time to reach hospital.

- A buffer resists significant pH change when small amounts of acid or base are added
- The molecular mechanism: HA reacts with added OH^-, A^- reacts with added H^+

2. Success Criteria

By the end, you should be able to:

- A buffer resists significant pH change when small amounts of acid or base are added
- Buffer components: weak acid (HA) and its conjugate base (A^-)
- The Henderson-Hasselbalch equation: pH = pKa + log([A^-]/[HA])

3. Key Terms

Dynamic equilibrium
A state where forward and reverse reaction rates are equal.

Le Chatelier's Principle
A system at equilibrium shifts to minimise applied disturbances.

Equilibrium constant (Keq)
The ratio of product to reactant concentrations at equilibrium.

Reaction quotient (Q)
The ratio of product to reactant concentrations at any instant.

Closed system
A system where neither matter nor energy can escape to surroundings.

Reversible reaction
A reaction that can proceed in both forward and reverse directions.

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: "A buffer resists significant pH change when small amounts of acid or base are added". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "Buffer components: weak acid (HA) and its conjugate base (A^-)". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Buffers — Mechanism, Calculations & Natural Systems: "The Henderson-Hasselbalch equation: pH = pKa + log([A^-]/[HA])".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Buffers — Mechanism, Calculations & Natural Systems 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 Buffers — Mechanism, Calculations & Natural Systems?

☐ 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 Buffers — Mechanism, Calculations & Natural Systems?

☐ 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: A buffer resists significant pH change when small amounts of acid or base are added

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: Buffer components: weak acid (HA) and its conjugate base (A^-)

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The Henderson-Hasselbalch equation: $pH = pKa + \log([A^-]/[HA])$

BAND 5 4 MARKS

One thing I still need help with: