CHEMISTRY YEAR 12 - MODULE 6 - LESSON 8

pH and pOH — Calculations for Strong Acids & Bases

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

When a person hyperventilates, they expel CO_2 faster than their body produces it — blood pH rises above 7.45 within minutes, causing dizziness, tingling, and muscle cramps. Every calculation in this lesson is the mathematics behind why a shift of 0.1 pH units in blood has clinical consequences.

- $pH = -\log_{10}[H_3O^+]$ and $pOH = -\log_{10}[OH^-]$
- Why the pH scale is logarithmic (each unit = 10× change in $[H_3O^+]$)

2. Success Criteria

By the end, you should be able to:

- $pH = -\log_{10}[H_3O^+]$ and $pOH = -\log_{10}[OH^-]$
- $pH + pOH = 14.00$ at 25°C only
- Strong acids assumed 100% ionised; diprotic acids contribute 2 H^+ per molecule

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: "pH = $-\log_{10}[H_3O^+]$ and pOH = $-\log_{10}[OH^-]$". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "pH + pOH = 14.00 at 25°C only". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding pH and pOH — Calculations for Strong Acids & Bases: "Strong acids assumed 100% ionised; diprotic acids contribute 2 H^+ per molecule".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about pH and pOH — Calculations for Strong Acids & Bases 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 pH and pOH — Calculations for Strong Acids & Bases?

☐ 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 pH and pOH — Calculations for Strong Acids & Bases?

☐ 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: pH = $-\log_{10}[H_3O^+]$ and pOH = $-\log_{10}[OH^-]$

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: pH + pOH = 14.00 at 25°C only

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: Strong acids assumed 100% ionised; diprotic acids contribute 2 H^+ per molecule

BAND 5 4 MARKS

One thing I still need help with: