The pH scale: measuring and interpreting

Teacher / technician

YEAR 10 / LESSON 50 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Controlled buffer comparison, not a survey of household chemicals. No bleach, battery fluid, alcohol or surface cleaner.

Coverage and delivery

Shared core: 2.29–2.31. Approximate pH with universal indicator and the syllabus classification bands; pH does not alone identify acid strength or chemical identity.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklet / writing tools	1 per learner	30 sets
Sample wells / separate pipettes	5 of each per pair	75 wells; 75 pipettes
Eye protection	1 each	30
Five buffer standards	1 cm^3 each per pair	25 cm^3 each incl. spare
Indicator paper / matching chart	10 strips per pair	150 strips; chart per pair

Immediate safety

Wear eye protection. Treat acidic and alkaline standards according to their supplier labels; avoid skin/eye contact. Keep samples separate and report spills. No tasting, mixing or heating.

Preparation and delivery

Read alongside the student method

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1. Use school-approved aqueous buffer standards nominally pH 2, 4, 7, 9 and 12. Read the exact supplier SDS and local assessment; code A–E. Use a measured equivalent standard only if checked and relabelled by staff.

2. Each pair uses 1.0 cm^3 of each: 15 cm^3 each total; supply 25 cm^3 each with spare. Issue at least 10 paper strips per pair (150 total) to allow a repeat. Use the matching chart, not an internet colour scale.

3. Prepare 15 sets of five wells/cups and separate pipettes. Check actual standard values at the working temperature, expiry and paper suitability before class.

4. The old list of bleach, surface cleaner, alcohol and battery acid is removed. Sodium hydroxide solution is not the same substance as bleach. No unknown mixtures or electrical apparatus is needed.

5. Distinguish the syllabus words strongly/weakly acidic from acid dissociation strength. A diluted strong acid can have the same pH as a weak acid. Allow 10 minutes briefing, 20 testing, 20 reasoning and 10 cleanup.

Close of lesson

- Collect used paper and liquid residues as directed by staff; rinse equipment and wash hands.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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• Nominal A–E: pH 2 strongly acidic; 4 weakly acidic; 7 neutral; 9 weakly alkaline; 12 strongly alkaline. Accept a justified chart interval; investigate discrepancies.

• Colour matching, limited chart intervals, lighting, timing and contamination limit precision. An appropriate calibrated meter can improve measurement.

• No. pH depends on concentration and acid–base behaviour. Degree of ionisation defines acid strength; a sufficiently dilute strong acid can have pH 4.

• Equal concentrations of H^+ and OH^-. They are not absent; neutral pH depends on temperature.

• A two-unit decrease corresponds approximately to 100 times greater hydrogen-ion concentration in the dilute model: pH 3 has more than pH 5.

• Unknown compositions and concentrations may be harmful or react if mixed. Use selected, assessed standards only; bleach must not be mixed with acids.

References and provenance

Pearson Chemistry specification

RSC testing acids and bases on a microscale

RSC indicator-language cautions

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.