Chemistry Assessment 1: Reflective Laboratory Log

Assessment component	Reflective Laboratory Log (portfolio)
Portfolio size	Approximately 2,000 words equivalent
Total marks	100
Assessment set	Sample 2026

STAFF ONLY · Award one best-fit raw percentage /100 for the complete log. Teacher observation is evidence within the holistic judgement and must not be separately weighted.

Apply AO2 and AO3 together to identify the overall best-fit band and raw percentage for the complete log. Teacher observation is supporting evidence and is not separately weighted.

Performance level	Mark range / anchors	AO2 · Application, practice and data **Holistic** Applies chemistry knowledge in practical contexts; plans and conducts work safely; records, processes and interprets data; identifies error and justifies improvements.	AO3 · Analysis, evaluation and reflection **Holistic** Explains and applies chemistry principles; interprets experimental evidence; relates theory to context; makes supported judgements; communicates procedures, results and conclusions clearly and accurately.
A*	**80-100**	• Apply comprehensive chemistry knowledge with exceptional precision and independence in unfamiliar practical contexts; design and conduct work judiciously and safely; process and interpret complex data accurately; evaluate uncertainty and justify well-targeted improvements.	• Integrate fundamental chemistry principles with experimental evidence to produce perceptive, well-supported interpretations and judgements; evaluate alternative explanations and limitations; communicate procedures, results and conclusions with exceptional clarity and precision.
A	**70-79**	• Apply thorough and comprehensive chemistry knowledge consistently in practical contexts; plan and conduct work judiciously and safely; record, process and interpret data accurately; identify error and justify improvements.	• Precisely explain and apply fundamental chemistry principles; interpret experimental evidence, relate theory to context, make well-supported judgements and communicate procedures, results and conclusions clearly and accurately.
B	**60-69**	• Apply a wide and deep knowledge of chemistry with competence and precision; plan and conduct practical work safely; record, process and interpret data accurately to reach informed conclusions.	• Explain and apply chemistry principles; draw inferences and predict outcomes from data; relate theory to real situations and communicate practical procedures, results and conclusions reliably using accurate terminology.
C	**50-59**	• Apply knowledge clearly in familiar practical contexts; use appropriate chemical apparatus, including volumetric, calorimetric and analytical equipment competently; maintain appropriate conditions and record, process and interpret data to draw conclusions.	• Draw valid inferences from data, relate chemistry concepts to some applications and explain complex ideas clearly using generally accurate scientific terminology.

Performance level	Mark range / anchors	AO2 · Application, practice and data **Holistic** Applies chemistry knowledge in practical contexts; plans and conducts work safely; records, processes and interprets data; identifies error and justifies improvements.	AO3 · Analysis, evaluation and reflection **Holistic** Explains and applies chemistry principles; interprets experimental evidence; relates theory to context; makes supported judgements; communicates procedures, results and conclusions clearly and accurately.
D	**40-49**	• Attempt to apply knowledge in practical contexts; use equipment safely, manage conditions and usually record, process and interpret data to inform possible conclusions.	• Attempt reasonable inferences from data and links to real applications; explain some complex ideas and sometimes use appropriate scientific terminology.
E	**30-39**	• Show some practical knowledge and apply it with guidance; work safely and sometimes record, process and interpret data.	• Show awareness of possible interpretations of data; attempt to explain some processes and concepts and use some appropriate scientific terminology.
U	**0-29**	• Show insufficient evidence of safe, meaningful practical application or data handling.	• Show only limited awareness of chemistry concepts, evidence and scientific processes, with insufficient analysis or evaluation for a pass.

Application guidance

- Credit accurately recorded observations and data even where an experimental outcome differs from an expected value, unless the record itself is inaccurate or fabricated.
- Use the practical-bank version and teacher-observation evidence to distinguish method execution from data recording, processing, analysis and evaluation.
- Credit valid alternative scientific approaches that meet the approved practical and assessment objectives.

Applying the portfolio judgement

Apply the full seven-band rubric to the complete portfolio. Select the best-fitting band from the sustained quality of practical application, data handling, analysis, evaluation and reflection, then justify a single mark within that band. Do not assign equal points per entry or invent separate AO2/AO3 percentages.

Use dated teacher observations to corroborate performance, independence and support. Distinguish absence of recorded evidence from evidence of weak performance. Record any authenticity or missing-evidence issue through the centre process; do not fabricate a result or invent an automatic mark cap.

Assess the learner’s actual evidence. Unexpected or inconclusive results can support strong analysis when recorded honestly and evaluated well. The indicative scientific guidance is not a compulsory script or a substitute for the holistic descriptors.

Check units, balanced equations, calculations, sensible precision, axes, treatment of repeats and conclusions against raw data. Credit scientifically valid alternative methods approved for delivery. A repeated instrument reading, a fresh aliquot and a new reaction mixture provide different kinds of replication.

At least five delivered activities are required. Record the actual entry count and identify any missing requirement for resolution before finalisation. The task bank samples the listed learning outcomes; it does not establish complete module coverage, and optional practicals do not prove that every learner has covered every listed outcome.

C01 · Water of crystallisation in a hydrated salt

Water mass is the decrease in sample mass; salt mass is final vessel-plus-residue mass minus empty-vessel mass. x = (water mass / 18.0) / (anhydrous $CuSO_4$ mass / 159.6) using these rounded molar masses, or the consistent values supplied at delivery.

Incomplete dehydration generally underestimates x; loss of solid can overestimate it by reducing the apparent salt mass and inflating apparent water loss. Constant mass supports completion under the chosen conditions but does not by itself establish residue identity. Credit a non-integer experimental ratio and a cautious conclusion.

C02 · Concentration of sulfuric acid by titration

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$. If base is in the burette, n(acid) = c(base) × mean base volume in dm^3 / 2; divide by the acid aliquot volume in dm^3 for concentration.

Use the centre concordance criterion consistently; exclude a rough trial because it is exploratory, not simply because a reading is inconvenient. For a titre found from two readings, account for both burette reading uncertainties under the stated convention. Distinguish apparatus resolution, tolerance and actual systematic error.

C03 · Enthalpy change of a displacement reaction

$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$. For an exothermic reaction the solution gains heat: q(solution) = m c ΔT; reaction enthalpy per mole is approximately −q(solution)/n reacted, with joules converted to kilojoules. Include a measured calorimeter heat capacity only where it is available and used consistently.

Do not silently assume every gram of excess zinc reacts. Heat loss and unaccounted calorimeter heating commonly reduce the measured temperature rise and underestimate the magnitude of an exothermic enthalpy change. A cooling correction needs defensible extrapolation, not an invented peak.

C04 · A Hess cycle using carbonate reactions

Let ΔH_1 refer to $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$, and ΔH_2 refer to $NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$. On these molar reaction bases the target enthalpy is $2\Delta H_2 - \Delta H_1$.

Check the direction and stoichiometric multiplier independently of the measured signs. Credit honest inconsistent results if processed correctly and evaluated. Hess's law is exact for specified states; differing solution concentrations and heat loss can limit the experimental estimate.

C05 · Acid concentration and magnesium reaction rate

$Mg + 2HCl \rightarrow MgCl_2 + H_2$. Rate from gas data is a volume change per unit time; an initial tangent and an average over a stated interval are different measures. If acid is in excess and magnesium amount is constant, final gas volume may be similar even when the rates differ.

A higher acid concentration often increases rate, but the evidence must be interpreted with surface condition and changing temperature in mind. A repeated reading on one run is not a fresh reaction replicate. Do not award a named reaction order without adequate quantitative evidence.

C06 · Weak-acid concentration and pH

For a weak monoprotic acid with initial concentration c and hydrogen-ion concentration x inferred from pH, $K_a \approx x^2/(c - x)$ when water autoionisation and activity effects can be neglected. The further approximation x^2/c requires x to be small relative to c.

pH is formally based on hydrogen-ion activity; concentration calculations here use the stated dilute-solution approximation. A weak acid is incompletely dissociated, not simply low in concentration. Repeated electrode readings do not test the accuracy of the prepared concentrations.

C07 · Titration curves and indicator choice

At half-equivalence in the weak-acid titration, equal amounts of acid and conjugate base give pH ≈ pKa under the model assumptions. The weak-acid/strong-base equivalence solution is alkaline because the conjugate base hydrolyses.

A suitable indicator changes within the steep part of the measured curve. The strong-acid/strong-base equivalence pH is neutral at the experimental temperature, approximately 7 at 25 °C. Do not impose exactly 7 for all temperatures or all acid-base systems.

C08 · Iron content by redox titration

$MnO_4^- + 8H^+ + 5Fe^{2+} \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$. Each mole of manganate(VII) corresponds to five moles of iron(II). Apply the aliquot-to-total-volume factor and divide by the actual number of tablets represented before converting iron amount to mass.

Oxidation of Fe^{2+} before titration can lower the measured iron(II) amount; other reducing substances can consume titrant and give an overestimate if attributed entirely to iron. Do not silently equate the assay of available Fe^{2+} with total elemental iron under every preparation method.