Physics Assessment 1: Reflective Laboratory Log

STAFF ONLY · Marking rubric and guidance

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 physics 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 physics principles; interprets experimental evidence; relates theory to context; makes supported judgements; communicates procedures, results and conclusions clearly and accurately.
A*	**80-100**	• Apply comprehensive physics 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 physics 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 physics 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 physics 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 physics with competence and precision; plan and conduct practical work safely; record, process and interpret data accurately to reach informed conclusions.	• Explain and apply physics principles; draw inferences and predict outcomes from data; relate theory to real situations and communicate practical procedures, results and conclusions reliably using accurate terminology.

Performance level	Mark range / anchors	AO2 · Application, practice and data **Holistic** Applies physics 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 physics principles; interprets experimental evidence; relates theory to context; makes supported judgements; communicates procedures, results and conclusions clearly and accurately.
C	**50-59**	• Apply knowledge clearly in familiar practical contexts; use appropriate physics equipment, including oscilloscopes, multimeters and data loggers competently; maintain appropriate conditions and record, process and interpret data to draw conclusions.	• Draw valid inferences from data, relate physics concepts to some applications and explain complex ideas clearly using generally accurate scientific terminology.
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 physics concepts, evidence and scientific processes, with insufficient analysis or evaluation for a pass.

Application guidance

- Phones, tablets and smart watches are not permitted during the assessed laboratory-log activities.
- 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, physical equations, calculations, sensible precision, axes, gradients, treatment of repeats and conclusions against raw data. Credit scientifically valid alternative methods approved for delivery. Repeated readings of one setup and independently resetting and repeating a trial provide different evidence about uncertainty.

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.

P01 · Density by dimensions and displacement

For a cylinder, $V = \pi d^2 L/4$ and $\rho = m/V$; for a cuboid, $V = abc$. Displacement volume is final minus initial reading. Convert cm^3 to m^3 using $1\ cm^3 = 10^{-6}\ m^3$; $1\ g\ cm^{-3} = 1000\ kg\ m^{-3}$.

For a cylindrical dimensional model, an approximate maximum fractional uncertainty is $\Delta m/m + 2\Delta d/d + \Delta L/L$, under the stated addition convention. Displacement involves two volume readings. Trapped air can overestimate volume and underestimate density. Two close answers do not prove accuracy if the same mass measurement is biased.

P02 · Specific heat capacity of a metal block

If power is effectively constant, $E = VIt$; otherwise sum measured power multiplied by interval duration. For θ plotted against E, gradient $s = \Delta\theta/\Delta E \approx 1/(mc)$, hence $c = 1/(ms)$. A temperature change has the same numerical value in kelvin and degrees Celsius.

If all electrical energy is attributed to the block despite heat loss or heating of unaccounted apparatus, the estimated c is commonly too high. Credit justified corrections using measured evidence; do not require learners to invent a heat-loss correction or a known value for the block.

P03 · Momentum in trolley collisions

$p(\text{before}) = m_1u_1 + m_2u_2$; for a coupled pair $p(\text{after}) = (m_1 + m_2)v$. Kinetic energy uses squared speeds and is non-negative; momentum uses signed velocities. Include the second trolley's initial motion if it was not exactly stationary.

Momentum conservation requires negligible external impulse over the collision interval. Coupling gives a perfectly inelastic collision; kinetic energy decreases even when momentum is conserved. Agreement within uncertainty supports the model rather than proving that all external forces vanish.

P04 · Resistivity of a metal wire

A = πd²/4, R = V/I and R = ρL/A. For R plotted against L, gradient s = ρ/A, so ρ = sA in Ω m. Use diameter in metres; confusing diameter with radius produces a factor-of-four error.

For small uncertainties, the fractional area uncertainty is approximately twice the fractional diameter uncertainty. A non-zero intercept may indicate an approximately fixed additional resistance, but contacts can vary between readings. Rising temperature changes metal resistivity; a straight-line fit alone does not establish constant temperature.

P05 · Internal resistance of a cell

V = ε − Ir. On a V-versus-I graph, the vertical intercept estimates ε and the gradient is −r. Internal resistance is the positive magnitude of a negative gradient. Electrical power dissipated internally is I²r under the model.

The intercept is an extrapolation unless an open-circuit reading is included. Drift in ε or r during the sequence can produce curvature or a misleading gradient. Credit honest departures from the simple model and evidence-based discussion of measurement order or rest periods.

P06 · Capacitor discharge and the time constant

For ideal discharge, $V = V_0\exp(-t/RC)$. τ = RC and $V(\tau) = V_0/e \approx 0.368V_0$. A plot of $\ln(V/V_0)$ against t has gradient −1/τ, hence C = −1/(R × gradient). Use a dimensionless voltage ratio inside the logarithm.

A finite meter input resistance acts in parallel with the discharge resistor and reduces the effective resistance. If it is ignored, the inferred C can be too small. Only take logarithms of positive readings above the justified noise threshold; retain excluded raw readings and explain the selection.

P07 · Speed of sound from successive resonances

For adjacent resonances of a column closed at one end, $\Delta L = \lambda/2$, hence $v = 2f\Delta L$. The closed end is a displacement node and the open end approximately a displacement antinode. Distinguish displacement nodes from pressure nodes.

The difference method uses two readings and therefore includes both reading uncertainties. It reduces dependence on the choice of length origin. The guide does not require the concept or calculation of end corrections; do not make that concept a marking requirement. Credit it if volunteered accurately, but no extra marks exist outside the holistic rubric.

P08 · Photoelectric stopping potential and frequency

Using stopping-potential magnitude V_s, $eV_s = hf - \varphi$. For V_s plotted against f, slope = h/e and intercept = $-\varphi/e$. Thus h = e × slope and φ in joules = $-e$ × intercept; the numerical work function in eV equals the negative intercept in volts.

At fixed frequency above threshold, increasing intensity ideally raises photocurrent without changing maximum photoelectron kinetic energy or stopping potential. A fitted intercept can be biased by contact potentials or the stopping criterion; a negative or implausible inferred work function should prompt evaluation, not alteration of raw readings. If equipment is unavailable, select other approved bank options; do not invent measured data.