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A-Level Physics

Common Mistakes · Examiner Tips

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The mistakes that cost marks in A-Level Physics - and how to fix each one, from examiner reports.

Calculations

Missing or wrong units on a final answer	A numerical answer with no unit, or the wrong unit, is rarely awarded the final mark even when the figure is correct. Decide the unit from the quantity itself - a force is in N, a field strength in N C^{-1} or V m^{-1}, a flux linkage in Wb-turns - and write it every time, not just on the last line.
Rounding too early in a multi-step calculation	Rounding an intermediate value to 2 or 3 figures and feeding it back in shifts the final answer outside the accepted range. Keep full calculator precision in the machine throughout and round only the quantity you actually quote, so a small early error never compounds into a lost mark.
Forgetting powers of ten in unit conversions	Treating kN as N, MeV as eV, ms as s, or nm as m drops or adds factors of 10^3, 10^6 or 10^9. Convert every quantity to base SI units before substituting, and write the power of ten next to each value so the conversion is visible and checkable.
Not converting to base SI before substituting	Centimetres, grams, minutes and degrees pushed straight into a formula give answers that are out by orders of magnitude. Standardise on metres, kilograms, seconds and radians first; mixing a length in cm with a mass in kg is one of the most frequent sources of an answer that is otherwise method-perfect.
Quoting an answer to too many significant figures	Writing 8 figures from the calculator display implies a precision the data never had. Match the significant figures of the answer to the least precise piece of data given - usually 2 or 3 - and never quote the result more precisely than the numbers it came from.
Calculator left in degrees for radian work	Wave, oscillation and circular-motion expressions assume the angle is in radians. With the calculator in degree mode, sin and cos of a phase or angular displacement come out wildly wrong. Check the mode indicator before any trigonometric or angular calculation and switch deliberately when the question demands it.
Dropping a power when rearranging an equation	Rearranging an inverse-square or squared relationship and forgetting to take the root, or to square, is a classic slip - for example solving for r from $F \propto 1/r^2$ without the square root. Rearrange symbolically first, check the power on every variable, then substitute numbers.
Sign errors in energy, work and potential	Work done on versus by a gas, gravitational potential being negative, and the direction of a field all carry signs that decide the mark. State the convention you are using, watch the sign on Δ quantities, and remember that gravitational potential energy and potential are negative because the zero is set at infinity.
Using g inconsistently or with the wrong value	Switching between 9.8, 9.81 and 10 m s^{-2} within one paper, or using the rounded value where precision matters, can move an answer out of range. Use the value printed on the data sheet throughout, and keep it consistent across every part of a multi-part question.
Mishandling exponential decay equations	Radioactive decay, capacitor discharge and damping all use $N = N_0e^{-\lambda t}$ style relationships, yet candidates often forget the natural log when solving for time, or confuse the decay constant with the half-life. Take ln of both sides cleanly, and remember $\lambda = \ln 2 \div t_{½}$.

Explanations and extended response

Describing when the question asks you to explain	Describe means say what happens; explain means say why it happens. Listing observations when the command word is explain leaves the reasoning marks unclaimed. Read the command word first and, for explain, build a chain of cause and effect rather than a list of features.
Vague language where precise physics terms are needed	Words like amount, thing or it lose marks where the mark scheme wants force, current, charge or field. Name the physical quantity explicitly every time and avoid pronouns that hide which quantity you mean, especially in a long answer with several variables in play.
Stating a law without applying it to the situation	Quoting Lenz's law or Newton's third law in the abstract earns little; the marks are for applying it to the specific scenario in the question. After stating the principle, write a sentence that ties it directly to the magnet, coil or pair of bodies described.
Missing steps in a logical chain	Extended-response marks are awarded for a connected sequence of reasoning, not isolated true statements. Jumping from cause to final effect without the intermediate links breaks the chain. Spell out each step - this causes that, which leads to the next - so an examiner can follow the whole argument.
Confusing correlation with cause in evaluations	Saying two quantities change together is not the same as explaining the physical mechanism that links them. State the mechanism - how a change in one quantity physically produces the change in the other - rather than simply noting that they rise or fall in step.
Answering a different question than the one asked	Under time pressure candidates explain a related idea they revised rather than the one in front of them. Reread the question after writing your answer and check that every sentence addresses what was actually asked, not the topic in general.
Contradicting yourself within one answer	A long response that says the force increases in one line and decreases in another cannot be credited, because the examiner cannot tell which you mean. Decide your position, commit to it, and check the answer reads consistently from start to finish before moving on.
Ignoring the mark allocation when planning depth	A six-mark question needs roughly six distinct creditable points; two sentences will never reach that. Let the marks in brackets set the length and number of separate ideas, and make sure you offer at least as many points as there are marks available.
Leaving definitions imprecise or incomplete	Definitions are marked strictly: specific charge, the volt, and electric field strength each need every clause. Missing per unit charge, per unit mass or per unit length forfeits the mark. Learn definitions word-tight and include the full per-unit phrasing.

Graphs, practicals and uncertainties

Reading a gradient off two close points	Taking the slope from points only a few squares apart magnifies reading error and gives an unreliable gradient. Use a large triangle spanning most of the line, read coordinates from convenient grid crossings, and show the rise and run clearly in your working.
Plotting points without thinking about the scale	Choosing a scale that squeezes the data into a corner wastes the graph and loses plotting and scale marks. Spread the points across at least half of each axis, use sensible scale intervals you can subdivide easily, and avoid awkward factors like 3 per square.
Confusing precision, accuracy and resolution	These are distinct: accuracy is closeness to the true value, precision is the spread of repeats, and resolution is the smallest division an instrument can show. Examiners penalise using one term for another, so define which you mean and match the word to the idea.
Forgetting to combine uncertainties correctly	Percentage uncertainties add when quantities are multiplied or divided, and the uncertainty on a squared term is doubled. Skipping these rules gives the wrong overall uncertainty. Work in percentages, add them for products and quotients, and multiply by the power for indices.

Drawing a line of best fit that ignores the spread	Forcing the line through the origin or through the first and last points only, rather than balancing all the data, distorts the gradient. Draw a smooth straight or curved line with roughly equal numbers of points either side, and do not assume it must pass through zero.
Omitting error bars or the worst acceptable line	Where uncertainty is assessed, the marks need error bars plotted and a worst acceptable line drawn to find the uncertainty in the gradient. Leaving these out caps the score. Add error bars to each point and draw the steepest or shallowest line that still passes through them.
Not identifying systematic versus random errors	A zero error on an instrument is systematic and shifts every reading the same way; scatter in repeats is random. Treating them as the same leads to the wrong fix. Name the type, explain how it affects the data, and give the matching correction - recalibrate or zero versus repeat and average.
Vague improvements like be more careful	Be more accurate or take more care scores nothing because it is not a specific procedural change. Suggest a concrete improvement tied to the apparatus - use a vernier scale, measure over more oscillations, use a data logger, or repeat and average - that genuinely reduces the named uncertainty.
Ignoring anomalies instead of addressing them	Quietly drawing the line straight through an obvious outlier loses marks. Identify the anomalous point, exclude it from the line of best fit, and state that it should be rechecked or repeated rather than pretending it is not there.
Mislabelling axes or leaving off units	Axes without a quantity and a unit, or labelled with the wrong unit, lose the labelling marks and make the gradient meaningless. Label each axis with the quantity and its unit, and remember the gradient then carries the unit of the y-quantity divided by the x-quantity.

Exam strategy

Not showing working on a calculation	A bare wrong answer scores zero, but clear working can earn method marks even when the final figure is off. Set out the equation, the substitution and the result on separate lines so each stage is visible and individually creditable.
Ignoring the command word	State, describe, explain, calculate, derive and show that each demand a different kind of answer and a different depth. Misreading calculate as estimate, or show that as calculate, wastes effort and misses marks. Identify the command word first and answer to its exact requirement.
Spending too long on low-mark questions	Pouring ten minutes into a one-mark part leaves the high-mark questions rushed at the end. Pace yourself against the marks - roughly a minute per mark - and move on once a part is reasonably complete, returning later if time allows.
Leaving show that questions without reaching the value	In a show that the answer is approximately question, you must work to more figures than the quoted value and arrive at it explicitly. Stopping short, or just restating the target, gains nothing. Carry an extra significant figure and finish by writing the value you have shown.
Not using the data and formulae sheet	Time is lost trying to recall constants and equations that are printed for you. Turn to the data and formulae booklet for permitted relationships and exact constant values rather than relying on memory, and quote them as given.
Skipping multi-part questions after one hard part	Many later parts can be answered independently, or by using a value given in the stem, even if an earlier part defeated you. Move on and attempt every remaining part; an error carried forward is often still credited, so a blank costs more than an attempt.