A-Level Physics

Every error below costs marks that the candidate had already earned by understanding the physics. They are ordered by how often they appear, not by how serious they look. 下列错误都不是不懂物理，而是把会的写丢了分。

Numbers, units and algebra

Leaving the unit off a final answer. This loses the last mark on a calculation however good the working – and it is the single most common lost mark in the subject.

Not converting a prefix before substituting: cm to m, g to kg, kN to N, µF to F, MeV to J. Substituting 5 cm as 5 puts the answer out by a factor of a hundred.

Rounding in the middle of a calculation and carrying the rounded value forward. Keep full precision in the calculator and round once, at the end.

Quoting ten significant figures from the calculator. Match the least precise data, usually two or three.

Forgetting that squaring a quantity doubles its percentage uncertainty, and that a square root halves it.

Treating g as 10 when the paper gives 9.81, and vice versa. Use the value on the data sheet.

Losing a minus sign in gravitational or electric potential. Potential is negative near a mass; potential energy of an electron near a nucleus is negative.

Mechanics

Writing ‘the forces are balanced’ when the question wants ‘the resultant force is zero’. Only the second is credited.

Confusing mass and weight. Mass is in kilograms and does not change; weight is a force in newtons and depends on g.

Using a v–t graph’s gradient when the question wants the area, or the area when it wants the gradient. Gradient is acceleration; area is displacement.

Assuming momentum is conserved in a collision where an external force acts, or assuming kinetic energy is conserved in a collision that is not stated to be elastic.

Taking both velocities as positive in a head-on collision. Momentum is a vector – assign a direction and give one velocity a negative sign.

Forgetting that the normal contact force is not always equal to the weight – on a slope it is $mg\cos\theta$, and in a lift it changes with the acceleration.

Calling the centripetal force an extra force. It is the resultant of the forces already present, not an additional one to be drawn on the diagram.

Waves and superposition

Saying two sources are coherent because they have the same amplitude. Coherence requires the same frequency and a constant phase difference; amplitude is irrelevant.

Writing that a stationary wave transfers energy. It does not – that is the defining difference from a progressive wave.

Confusing the path difference condition with the phase difference condition. Constructive interference needs a path difference of a whole number of wavelengths, which is a phase difference of $2\pi n$.

Saying light is polarised by refraction. Polarisation happens on reflection, by absorption in a filter, or by scattering – and only transverse waves can be polarised, which is why sound cannot.

Using d as the number of lines per metre in a diffraction grating question without inverting it. d is the SPACING, the reciprocal of the number per metre.

Electricity and fields

Saying a component 'obeys Ohm's law' when the I–V graph is not a straight line through the origin. A filament lamp does not obey Ohm's law.

Treating e.m.f. and terminal p.d. as the same. They differ by the p.d. lost across the internal resistance, and that difference is the whole point of the topic.

Adding resistances in parallel directly. The reciprocals add, and the answer is always smaller than the smallest resistance – check it against that.

Saying current is 'used up' in a circuit. Current is the same everywhere in a series circuit; it is energy that is transferred.

Confusing field strength with potential. Field strength is a vector and follows an inverse-square law; potential is a scalar and follows an inverse law.

Forgetting that the field inside a hollow charged conductor is zero while the potential inside is constant and non-zero.

Using Fleming's left-hand rule for induction. Left hand is for the motor effect; the right hand is for the generator effect.

Thermal, quantum and nuclear

Saying temperature is a measure of heat. Temperature measures the average kinetic energy of molecules; heat is energy transferred because of a temperature difference.

Using the Celsius temperature in a gas-law calculation. Every gas equation needs kelvin.

Forgetting that internal energy includes potential energy as well as kinetic – which is why melting takes energy at constant temperature.

Saying that increasing the intensity of light increases the kinetic energy of photoelectrons. Intensity increases the NUMBER emitted; only frequency increases their energy.

Writing that a nucleus 'decays because it is old'. Decay is spontaneous and random, and the probability per unit time is constant.

Confusing activity with count rate. The detector records only a fraction of the decays, and background must be subtracted.

Quoting a half-life from a graph without checking it is the same for a second halving. A constant half-life is the evidence for exponential decay.

Answering the question

Describing when the command word is ‘explain’. If your answer contains no because, so or therefore, you have almost certainly not explained.

Answering ‘state and explain’ with only the statement – half the marks, every time.

Writing ‘it increases’ without saying what and than what. Name the quantity and the comparison.

Drawing a graph without labelling the axes with quantity and unit.

Abandoning a multi-part question because an early part failed. Later parts are marked on correct use of YOUR value.

Answering with more points than the marks available, hoping one is right. A wrong statement alongside a right one can cancel the mark.