Stop Losing Marks! FREE SAMPLE

10 GCSE Physics mistakes from the full book of 100

In plain English: Each mistake shows an exam-style question, a student's answer and the marks they got. On your own paper, say what the student got wrong and write an answer that would get full marks. The answers and mark schemes are at the back of this sample.

Mistake 5	Energy · 4.1.1.2	Combined and Separate	Type: Units and conversions

A spring has a spring constant of 80 N/m. It is stretched by 5.0 cm. The limit of proportionality is not exceeded.
Calculate the elastic potential energy stored in the spring. **[3 marks]**

Chloe's answer

$E_e = 1/2 \times k \times e^2$

$E_e = 0.5 \times 80 \times 5^2$

$= 0.5 \times 80 \times 25$

$= 1000$ J

*Chloe scored **2 out of 3**. **(a)** What mistake did Chloe make? **(b)** Write an answer that would get full marks.*

Mistake 14	Electricity · 4.2.1.3	Combined and Separate	Type: Units and conversions

The potential difference across an LED is 3.0 V. The current in the LED is 20 mA.
Calculate the resistance of the LED. Give the unit. **[3 marks]**

Kofi's answer

20 mA $= 0.2$ A

$V = I R$

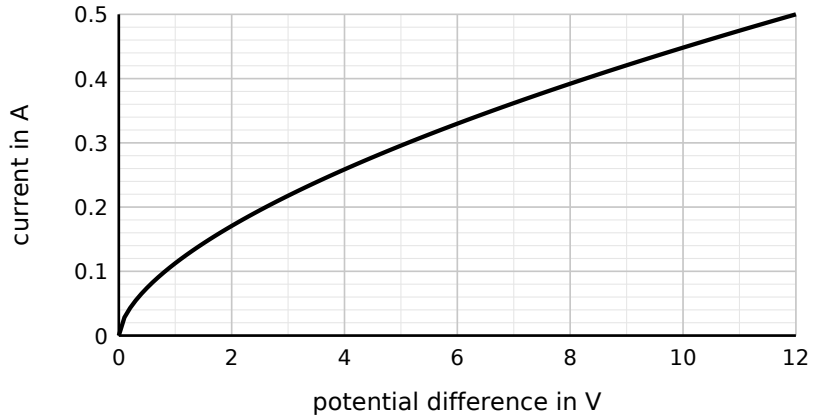
$3.0 = 0.2 \times R$

$R = 3.0 \div 0.2 = 15$ unit: Ω

*Kofi scored **2 out of 3**. **(a)** What mistake did Kofi make? **(b)** Write an answer that would get full marks.*

Mistake 22	Electricity · 4.2.1.4	Combined and Separate	Type: Explanation missing a step

The graph shows how the current in a filament lamp changes with the potential difference across it.
Explain why the resistance of the lamp increases as the potential difference increases. **[3 marks]**



Noah's answer

As the p.d. goes up, more current flows, so the filament gets hotter.

So the resistance goes up and the line curves.

*Noah scored **1 out of 3**. **(a)** What mistake did Noah make? **(b)** Write an answer that would get full marks.*

Mistake 33	Particle Model of Matter · 4.3.3.1	Combined and Separate	Type: Explanation missing a step

A sealed metal can contains air. The can is heated. The volume of the can does not change.
Explain, in terms of particles, why the pressure of the air in the can increases. **[3 marks]**

Aisha's answer

When you heat the air the particles get more energy so they move faster.

This means there are more collisions so the pressure increases.

*Aisha scored **1 out of 3**. **(a)** What mistake did Aisha make? **(b)** Write an answer that would get full marks.*

Mistake 45	Atomic Structure · 4.4.2.4	Combined and Separate	Type: Terminology

Some surgical instruments are sterilised by irradiating them with gamma rays.
(a) Explain why the instruments are safe to use straight after irradiation. (1 mark)
(b) Explain why it would be dangerous if the instruments became **contaminated** with a radioactive isotope. (2 marks) **[3 marks]**

Tom's answer

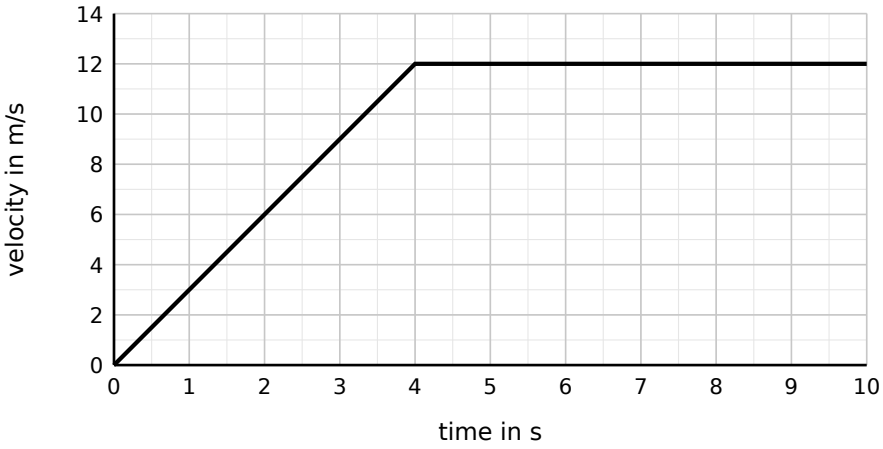
(a) The radiation goes straight through them and then it's gone, so they are safe.

(b) If radiation got onto the instruments it would stay on them and keep giving out radiation into the patient.

*Tom scored **1 out of 3**. **(a)** What mistake did Tom make? **(b)** Write an answer that would get full marks.*

Mistake 57	Forces · 4.5.6.1.5	Combined and Separate	Type: Graph reading

The graph shows how the velocity of a car changes during the first 10 s of its journey.
Determine the distance travelled by the car in the first 10 s. **[3 marks]**



Dev's answer

distance = speed × time

= 12 × 10

= 120 m

*Dev scored **0 out of 3**. **(a)** What mistake did Dev make? **(b)** Write an answer that would get full marks.*

Mistake 67	Forces · 4.5.6.1.5	Combined and Separate	Type: Calculation slip

A car travelling at 12 m/s accelerates at 1.5 m/s² over a distance of 40 m. Calculate the final velocity of the car. **[3 marks]**

Harry's answer

$v^2 - u^2 = 2as$

$v^2 - 12^2 = 2 \times 1.5 \times 40$

$v^2 = 120 + 144 = 264$

$v = 264$ m/s

*Harry scored **2 out of 3**. **(a)** What mistake did Harry make? **(b)** Write an answer that would get full marks.*

Mistake 73	Waves · 4.6.1.2	Combined and Separate	Type: Units and conversions

A local radio station broadcasts radio waves with a frequency of 96 MHz. Radio waves travel at 3.0×10^8 m/s. Calculate the wavelength of the radio waves. **[3 marks]**

Ravi's answer

$v = f\lambda$ so $\lambda = v \div f$

$\lambda = 300\,000\,000 \div 96$

$\lambda = 3\,125\,000$ m

*Ravi scored **1 out of 3**. **(a)** What mistake did Ravi make? **(b)** Write an answer that would get full marks.*

Mistake 86	Magnetism and Electromagnetism · 4.7.1.1	Combined and Separate	Type: Misconception

A student has three metal bars that look the same. One is a permanent magnet, one is iron and one is aluminium. She also has a bar magnet.
Describe how she can use the bar magnet to identify each bar. **[3 marks]**

Isla's answer

Hold the bar magnet near each bar.

The aluminium bar won't do anything because aluminium isn't magnetic.

The magnet and the iron will both be attracted, so the one that is attracted most strongly is the permanent magnet.

*Isla scored **1 out of 3**. **(a)** What mistake did Isla make? **(b)** Write an answer that would get full marks.*

Mistake 96	Space Physics · 4.8.2	**SEPARATE PHYSICS ONLY**	Type: Terminology

Light from most distant galaxies shows red-shift.
Explain what red-shift is and what it tells astronomers about these galaxies. **[3 marks]**

Mo's answer

Distant galaxies give out light with a longer wavelength,
so the light is shifted towards the red end of the spectrum.
This shows that the galaxies are moving.

*Mo scored **1 out of 3**. **(a)** What mistake did Mo make? **(b)** Write an answer that would get full marks.*

Answers

Mistake 5	Energy · 4.1.1.2	Combined and Separate	Type: Units and conversions

Question: *A spring has a spring constant of 80 N/m. It is stretched by 5.0 cm. The limit of proportionality is not exceeded.*
Calculate the elastic potential energy stored in the spring. [3]

The mistake: Chloe put the extension into the equation in centimetres. The equation needs the extension in metres (5.0 cm = 0.050 m), so Chloe's answer is 10 000 times too big. A small spring storing 1000 J (enough to lift a 100 kg person 1 m) should have rung alarm bells.

Marking point	Got it?	Why
Extension converted: 5.0 cm = 0.050 m	✗	Chloe used 5, not 0.050.
Substitution: $E_e = 0.5 \times 80 \times 0.050^2$ (allow their extension)	✓	ECF: Chloe substituted the unconverted extension correctly and remembered to square it.
$E_e = 0.10$ J (allow a correct evaluation of their substitution)	✓	ECF: $0.5 \times 80 \times 5^2 = 1000$ is worked out correctly, so this mark is usually allowed. The only mark lost is the conversion.

Chloe scored 2 out of 3.

Full-mark answer:

e = 5.0 cm = 0.050 m

$E_e = 0.5 \times 80 \times 0.050^2$

$E_e = 0.10$ J

Remember: Before you put any number into an equation, check its unit. Extension must be in **metres**: divide cm by 100. Then ask: is my answer sensible for a small spring?

Mistake 14	Electricity · 4.2.1.3	Combined and Separate	Type: Units and conversions

Question: *The potential difference across an LED is 3.0 V. The current in the LED is 20 mA.*
Calculate the resistance of the LED. Give the unit. [3]

The mistake: Kofi knew the milliamps had to be changed to amps, but divided by 100 instead of 1000. There are 1000 mA in 1 A, so 20 mA = 0.020 A. Kofi's answer is 10 times too small.

Marking point	Got it?	Why
Current converted: 20 mA = 0.020 A	✗	Kofi used 0.2 A instead of 0.020 A
R = 3.0 ÷ 0.020 = 150 (allow a correct evaluation with their current)	✓	ECF: 3.0 ÷ 0.2 = 15 is worked out correctly from Kofi's own current

Marking point	Got it?	Why
Unit: Ω (ohms)	✓	The unit mark does not depend on the number, so Kofi keeps it

Kofi scored 2 out of 3.

Full-mark answer:

20 mA = 20 ÷ 1000 = 0.020 A

3.0 = 0.020 × R

R = 3.0 ÷ 0.020 = 150 Ω

Remember: milli means one **thousandth**: 1000 mA in 1 A, just like 1000 mm in 1 m. It is **centi** that means ÷ 100. Write the conversion out in full: 20 ÷ 1000 = 0.020.

Mistake 22

Electricity · 4.2.1.4 | Combined and Separate | Type: Explanation missing a step

Question: *The graph shows how the current in a filament lamp changes with the potential difference across it.*
Explain why the resistance of the lamp increases as the potential difference increases. [3]

The mistake: Noah linked the bigger current to the filament getting hotter, but then jumped straight to 'resistance goes up'. Noah never said **why** a hotter filament has more resistance: the ions vibrate more, so the electrons collide with them more often.

Marking point	Got it?	Why
bigger current makes the filament hotter / temperature increases	✓	Noah said this clearly
the ions (atoms) in the filament vibrate more	✗	Missing
so electrons collide with the ions more often, so the resistance increases	✗	Missing

Noah scored 1 out of 3.

Full-mark answer:

As the p.d. increases, the current increases and the filament gets hotter.

The ions in the metal filament vibrate more.

The electrons collide with the ions more often, so it is harder for charge to flow: the resistance increases.

Remember: Explain like a chain: more current → hotter filament → ions vibrate more → electrons bump into them more → bigger resistance. Each link is a mark.

Mistake 33	Particle Model of Matter · 4.3.3.1	Combined and Separate	Type: Explanation missing a step

Question: *A sealed metal can contains air. The can is heated. The volume of the can does not change.*
Explain, in terms of particles, why the pressure of the air in the can increases. [3]

The mistake: "More collisions" is not enough. Aisha needed to say the particles hit the **walls** of the can **more often** (more collisions per second), and that each collision exerts a bigger force on the walls.

Marking point	Got it?	Why
Particles move faster (have more kinetic energy)	✓	Aisha said this.
Particles collide with the walls more often / more collisions with the walls per second	✗	"More collisions" doesn't say with what, or how often.
Each collision exerts a greater force on the walls, so the force per unit area (pressure) increases	✗	Aisha did not mention force at all.

Aisha scored 1 out of 3.

Full-mark answer:

Heating increases the kinetic energy of the particles, so they move faster.

So they collide with the walls of the can more often (more collisions per second).

Each collision also exerts a bigger force on the walls, so the force on each square metre of wall increases, which means the pressure increases.

Remember: Gas pressure checklist: **faster** particles, hit the **walls more often**, with **more force**. Every link earns a mark.

Mistake 45	Atomic Structure · 4.4.2.4	Combined and Separate	Type: Terminology

Question: *Some surgical instruments are sterilised by irradiating them with gamma rays.*
(a) Explain why the instruments are safe to use straight after irradiation. (1 mark)
*(b) Explain why it would be dangerous if the instruments became **contaminated** with a radioactive isotope. (2 marks) [3]*

The mistake: Tom treated radiation as a substance that can 'get onto' things. Irradiation does not make an object radioactive. Contamination means radioactive atoms (material) are on or in the object, and those atoms keep decaying.

Marking point	Got it?	Why
(a) Irradiated objects do not become radioactive (so they do not emit radiation afterwards)	✗	'The radiation is gone' just repeats that they are safe. The reason is that the instruments do not become radioactive, and Tom did not say that.

Marking point	Got it?	Why
(b) Contamination means radioactive atoms (material) are on the instruments	✗	Radiation cannot 'get onto' things; radioactive material can.
(b) The radioactive atoms keep decaying and emitting radiation, so the patient keeps being exposed	✓	'Keep giving out radiation into the patient' is enough for this mark.

Tom scored 1 out of 3.

Full-mark answer:

(a) Irradiating the instruments does not make them radioactive, so they do not emit any radiation afterwards.

(b) Contamination means radioactive atoms are on (or in) the instruments. These atoms keep decaying and emitting radiation, so the patient is exposed for as long as the material is there, and it could even get inside the patient's body.

Remember: Irradiated = exposed to radiation; it does not become radioactive (like an X-ray doesn't make you glow). **Contaminated** = radioactive **stuff** is on you or in you, and it keeps decaying.

Mistake 57

Forces · 4.5.6.1.5 | Combined and Separate | Type: Graph reading

Question: *The graph shows how the velocity of a car changes during the first 10 s of its journey. Determine the distance travelled by the car in the first 10 s. [3]*

The mistake: Dev used distance = speed × time with the top speed, but the car was only at 12 m/s for the last 6 s. On a velocity–time graph, distance travelled = area under the graph.

Marking point	Got it?	Why
Distance = area under the graph (seen or implied)	✗	Dev used the top speed for the whole time
Area of triangle ½ × 4 × 12 = 24 (m) and area of rectangle 12 × 6 = 72 (m)	✗	No areas calculated
Distance = 96 m	✗	120 m is too big

Dev scored 0 out of 3.

Full-mark answer:

Distance = area under the velocity–time graph

0 to 4 s (triangle): ½ × 4 × 12 = 24 m

4 s to 10 s (rectangle): 12 × 6 = 72 m

Total distance = 24 + 72 = 96 m

Remember: On a velocity–time graph, **area = distance**. Split the shape into triangles and rectangles. Only use distance = speed × time when the speed stays the same the whole time.

Mistake 67	Forces · 4.5.6.1.5	Combined and Separate	Type: Calculation slip

Question: *A car travelling at 12 m/s accelerates at 1.5 m/s² over a distance of 40 m. Calculate the final velocity of the car. [3]*

The mistake: Harry found v² correctly but forgot to take the square root, so the 'velocity' is 264 m/s (about 590 mph!). The last step is v = √264.

Marking point	Got it?	Why
$v^2 - 12^2 = 2 \times 1.5 \times 40$	✓	Correct substitution
$v^2 = 264$	✓	Correct
v = 16 m/s (accept 16.2 m/s)	✗	Square root not taken

Harry scored 2 out of 3.

Full-mark answer:

$v^2 - u^2 = 2\ a\ s$

$v^2 - 12^2 = 2 \times 1.5 \times 40$

$v^2 = 120 + 144 = 264$

$v = \sqrt{264} = 16$ m/s (16.2 m/s)

Remember: The equation gives you **v²**, not v. Finish with the square root, then sense-check: a car that starts at 12 m/s won't reach 264 m/s in 40 m.

Mistake 73	Waves · 4.6.1.2	Combined and Separate	Type: Units and conversions

Question: *A local radio station broadcasts radio waves with a frequency of 96 MHz. Radio waves travel at 3.0 × 10^8 m/s. Calculate the wavelength of the radio waves. [3]*

The mistake: Ravi did not convert the frequency from MHz to Hz. 96 MHz is 96 000 000 Hz, so Ravi's answer is a million times too big.

Marking point	Got it?	Why
Converts 96 MHz = 96 000 000 Hz (9.6×10^7 Hz)	✗	Ravi used 96.
Correct rearrangement λ = v ÷ f with v = 3.0×10^8 m/s	✓	Ravi rearranged correctly.
λ = 3.1 m (accept 3.125 m)	✗	Ravi's answer is 1 000 000 times too large.

Ravi scored 1 out of 3.

Full-mark answer:

f = 96 MHz = 96 000 000 Hz

λ = v ÷ f = 300 000 000 ÷ 96 000 000

λ = 3.1 m

Remember: M = mega = million (× 1 000 000), k = kilo = thousand, G = giga = billion. Change to Hz first. Sense-check: an FM radio aerial is about a metre long, not 3000 km!

Mistake 86	Magnetism and Electromagnetism · 4.7.1.1	Combined and Separate	Type: Misconception

Question: *A student has three metal bars that look the same. One is a permanent magnet, one is iron and one is aluminium. She also has a bar magnet.*
Describe how she can use the bar magnet to identify each bar. [3]

The mistake: Isla used attraction to find the magnet. Iron is attracted to a magnet too (it becomes an induced magnet), and 'most strongly' can't be judged reliably. Only a permanent magnet can be **repelled**, so repulsion is the test.

Marking point	Got it?	Why
aluminium is not attracted or repelled (it is not a magnetic material)	✓	Isla said this
the bar that is repelled (by one pole of the bar magnet) is the permanent magnet	✗	Isla relied on attraction, which iron shows too
the bar attracted by both poles / at both ends (never repelled) is iron	✗	Isla had no way to tell the iron from the magnet

Isla scored 1 out of 3.

Full-mark answer:

Bring the N pole and then the S pole of the bar magnet near each end of each bar.

The bar that is repelled at one end is the permanent magnet (like poles repel).

The bar that is always attracted, by both poles, is iron. The bar that is not affected is aluminium.

Remember: Attraction doesn't prove something is a magnet: iron is attracted too. Repulsion is the only proof.

Mistake 96	Space Physics · 4.8.2	**SEPARATE PHYSICS ONLY**	Type: Terminology

Question: *Light from most distant galaxies shows red-shift.*
Explain what red-shift is and what it tells astronomers about these galaxies. [3]

The mistake: The galaxies do not give out different light. The **observed** wavelength is longer than the wavelength measured from the same source on Earth because the galaxy is moving away. Mo also said 'moving' without saying which way.

Marking point	Got it?	Why
Increase in the observed wavelength of light (from the galaxy)	✗	The galaxies don't give out longer wavelengths: the wavelength we observe is longer
(Light / spectral lines) shifted towards the red end of the spectrum	✓	Correct
The galaxies are moving away from us (receding)	✗	'Moving' has no direction

Mo scored 1 out of 3.

Full-mark answer:

Red-shift is an increase in the observed wavelength of light from a galaxy, so the light (and its spectral lines) is shifted towards the red end of the spectrum. It tells astronomers that the galaxy is moving away from Earth.

Remember: The galaxy sends out normal light. **We observe** it stretched to a longer wavelength because the galaxy is moving **away**. Always say 'observed' and 'away'.

Want all 100?

This free sample comes from **Stop Losing Marks! 100 GCSE Physics Mistakes and How to Fix Them**. The full book covers every topic of AQA GCSE Physics and Combined Science:

- Topic 1: Energy
- Topic 2: Electricity
- Topic 3: Particle Model of Matter
- Topic 4: Atomic Structure
- Topic 5: Forces
- Topic 6: Waves
- Topic 7: Magnetism and Electromagnetism
- Topic 8: Space Physics

Every mistake comes with a mark-by-mark answer showing exactly where marks are gained and lost, plus a 20-question check at the end to measure improvement.

Find it at thephysicsquestionbank.com