Joseph House Tuition

Name	
Date	
Score	/ 50

GCSE PHYSICS · QUESTION PACK

Required practicals

Higher tier · resistance, springs, acceleration, waves, infrared, density, refraction, insulation

Suggested time: 1 hour · Total: 50 marks

You will need

- a black pen, a pencil and a ruler
- a scientific calculator

Instructions

- Answer **all** questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for each question are shown in brackets.
- Try to complete the pack in the suggested time, without your notes.

Marking your work

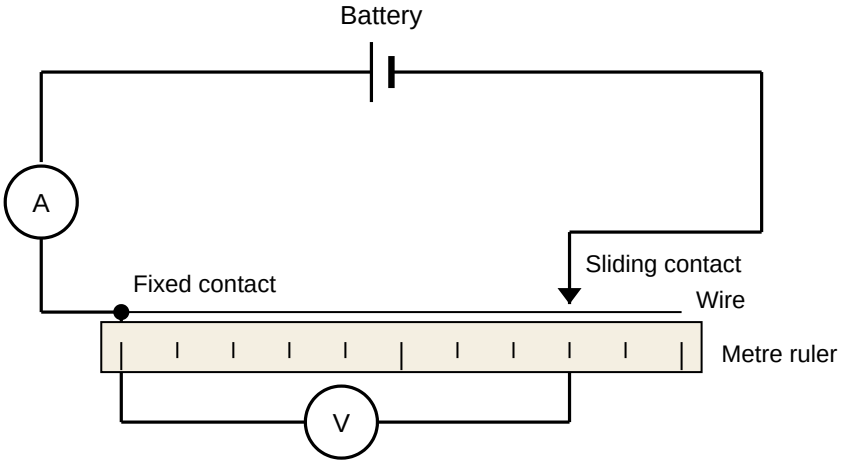
The mark scheme is at the back of this pack. Mark your answers in a different coloured pen, then go back over any questions where you lost marks.

Your marks	
Question	**Mark**
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	**/ 50**

Exam-style questions written by Joseph House Tuition in the style of AQA GCSE Physics (8463), Higher tier. Not an official AQA resource.

A student investigated how the resistance of a wire depends on its length.
Figure 1 shows the circuit used.

Figure 1



0 1 . 1 Describe a method the student could use for this investigation.

[6 marks]

0 1 . 2 Table 1 shows the student's results.

Length in cm	20	40	60	80
Resistance in Ω	0.9	1.8	2.7	3.6

Table 1

Describe the relationship between the length of the wire and its resistance.

Use data from Table 1 in your answer.

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[2 marks]

A student investigated how the extension of a spring depends on the force applied to it.
The student hung weights on the spring and measured the extension.

0 2 . 1 What is the independent variable in this investigation?

.....

[1 mark]

0 2 . 2 Table 2 shows the results.

Force in N	0	1.0	2.0	3.0	4.0	5.0
Extension in cm	0	2.5	5.0	7.5	10.0	13.5

Table 2

Which force in Table 2 caused the spring to go beyond its limit of proportionality?

Answer ..... N

[1 mark]

0 2 . 3 Use Table 2 to calculate the spring constant of the spring in N/m.

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Answer ..... N/m

[3 marks]

0 2 . 4 Suggest **one** way the student could make the extension measurements more accurate.

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.....

[1 mark]

0 2 . 5 Suggest **one** safety precaution for this investigation.

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.....

[1 mark]

A student investigated how the acceleration of a trolley depends on the resultant force acting on it. The trolley was pulled along a bench by a string attached to a hanging mass. Light gates were used to measure the acceleration.

0 3 . 1 Name the independent variable and the dependent variable.

Independent variable

.....

Dependent variable

.....

[2 marks]

0 3 . 2 To change the force, the student moved masses from the trolley to the hanging mass holder, rather than adding new masses.

Explain why.

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[2 marks]

0 3 . 3 With a resultant force of 0.50 N, the acceleration was 0.40 m/s².

Calculate the total mass that was accelerated.

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Answer ..... kg

[2 marks]

0 3 . 4 Give **one** advantage of using light gates rather than a stopwatch.

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[1 mark]

A student used a ripple tank to investigate water waves.

0 4 . 1 Describe how the student could measure the frequency of the water waves.

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[2 marks]

0 4 . 2 The frequency of the waves was 12 Hz.

The student measured the distance across 10 wavelengths as 0.15 m.

Calculate the speed of the water waves.

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Answer ..... m/s

[3 marks]

0 4 . 3 Explain why the student measured across 10 wavelengths rather than measuring one wavelength.

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[2 marks]

A Leslie cube is a hollow metal cube. Each of its four vertical faces has a different surface, such as matt black, shiny black, matt white and shiny silver.

0 5 . 1 Describe how a Leslie cube could be used to investigate how the type of surface affects the amount of infrared radiation emitted.

Your answer should include how you would make it a fair test.

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[6 marks]

This question is about measuring density.

0 6 . 1 A rectangular metal block measures 2.0 cm × 3.0 cm × 5.0 cm. Its mass is 81 g.

Calculate the density of the block in g/cm³.

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Answer ..... g/cm³

[3 marks]

0 6 . 2 Describe how a displacement can and a measuring cylinder can be used to find the volume of an irregularly shaped object.

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[3 marks]

A student used a ray box and a rectangular glass block to investigate refraction.

0 7 . 1 The angles of incidence and refraction are measured from a line drawn at 90° to the surface of the block.

What is the name of this line?

.....

[1 mark]

0 7 . 2 Which piece of equipment should the student use to measure the angles?

.....

[1 mark]

0 7 . 3 When the angle of incidence was 40°, the angle of refraction was 25°.

Explain why the ray bends towards the line as it enters the glass.

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[2 marks]

0 7 . 4 Suggest why the student used a narrow ray of light.

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[1 mark]

A student investigated how well different materials insulate a beaker of hot water.
Table 3 shows some of the results.

0 8 . 1 Give **two** control variables for this investigation.

1

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2

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[2 marks]

0 8 . 2

Beaker	Start temperature in °C	Temperature after 10 minutes in °C
Wrapped in wool	80	64
No insulation	80	52

Table 3

Which beaker was better insulated? Explain your answer.

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[2 marks]

END OF QUESTIONS

Mark scheme

GCSE Physics question pack · Required practicals

Joseph House Tuition

How to use this mark scheme

- Mark in a different coloured pen to the one you wrote your answers in.
- For calculations, a correct final answer scores full marks even if no working is shown. If the final answer is wrong, award marks for each correct step of working.
- **ecf** (error carried forward): if you got an earlier part wrong, you can still get full marks for a later part that correctly uses your earlier answer.
- **allow** means the answer is also acceptable. **ignore** means the words do not gain or lose marks. **do not accept** means the answer scores no marks.
- For 6-mark questions, decide which level your answer fits best, then award the higher mark in that level if your answer is at the top of it.

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO</th></tr>
<tr><td>01.1</td><td>Level of response question. Indicative content:

connect the circuit as shown, with the wire attached alongside a metre ruler
attach the fixed contact at the zero mark of the ruler
place the sliding contact at a measured length, e.g. 20 cm
switch on and record the readings on the ammeter and voltmeter
calculate the resistance using R = V / I
move the sliding contact to a new length, e.g. in 20 cm steps up to 100 cm, and repeat
switch off between readings so the wire does not heat up (temperature is a control variable)
use a low potential difference / current to avoid heating
repeat each length and calculate a mean
plot a graph of resistance against length

<table>
<tr><th>Level</th><th>Descriptor</th><th>Marks</th></tr>
<tr><td>Level 3</td><td>A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant scientific techniques and procedures. The steps are in a logical order. The method would lead to the production of valid results.</td><td>5–6</td></tr>
<tr><td>Level 2</td><td>The bulk of a method is described with mostly relevant detail. The method may not be in a completely logical sequence and may be missing some detail.</td><td>3–4</td></tr>
<tr><td>Level 1</td><td>Simple statements are made. The response may lack a logical structure and would not lead to the production of valid results.</td><td>1–2</td></tr>
<tr><td></td><td>No relevant content.</td><td>0</td></tr>
</table></td><td></td><td>6</td><td>AO1</td></tr>
</table>

Question	Answers	Extra information	Mark	AO
01.2	resistance is directly proportional to length supported by data, e.g. when the length doubles from 20 cm to 40 cm, the resistance doubles from 0.9 Ω to 1.8 Ω	allow 'as length increases, resistance increases' for 1 mark only	1 1	AO3
02.1	the force (weight) applied		1	AO1
02.2	5.0 (N)		1	AO3
02.3	extension = 10.0 cm = 0.100 m (or any valid pair) k = 4.0 / 0.100 k = 40 (N/m)	an answer of 0.4 (N/m) (cm not converted) scores 2 marks	1 1 1	AO2
02.4	any one from: • read the ruler at eye level to avoid parallax error • attach a pointer to the bottom of the spring • use a set square to line up the reading		1	AO3
02.5	any one from: • wear eye protection in case the spring snaps • clamp the stand to the bench so it does not fall over • keep feet away from beneath the masses		1	AO1
03.1	independent: (resultant) force dependent: acceleration		1 1	AO1
03.2	to keep the total mass (of the trolley and hanging masses) constant so that only the force changes (mass is a control variable)		1 1	AO3
03.3	m = 0.50 / 0.40 m = 1.25 (kg)	allow 1.3 (kg)	1 1	AO2
03.4	removes the effect of human reaction time	allow more accurate timing / more precise readings	1	AO3
04.1	count the number of waves passing a fixed point in a measured time (e.g. 10 s) divide the number of waves by the time		1 1	AO1
04.2	wavelength = 0.15 / 10 = 0.015 (m) v = 12 × 0.015 v = 0.18 (m/s)	an answer of 0.18 (m/s) scores 3 marks an answer of 1.8 (m/s) scores 2 marks	1 1 1	AO2
04.3	a single wavelength is very small, so it is difficult to measure accurately measuring across 10 wavelengths reduces the (percentage) uncertainty / gives a more accurate mean value		1 1	AO3

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO</th></tr>
<tr><td>05.1</td><td>Level of response question. Indicative content:
• fill the Leslie cube with hot water (from a kettle)
• place an infrared detector (or thermometer with a blackened bulb) facing one surface
• keep the detector at the same distance from each surface
• wait a set time for the reading to settle, then record the reading
• rotate the cube so the detector faces each surface in turn and record each reading
• keep the water temperature the same for each reading (measure quickly, or top up with hot water)
• repeat and calculate a mean
• the surface with the highest reading emits the most infrared (expected: matt black)
• safety: take care with hot water
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</table></td><td></td><td>6</td><td>AO1</td></tr>
<tr><td>06.1</td><td>V = 2.0 × 3.0 × 5.0 = 30 (cm³)
ρ = 81 / 30
ρ = 2.7 (g/cm³)</td><td>an answer of 2.7 (g/cm³) scores 3 marks</td><td>1
1
1</td><td>AO2</td></tr>
<tr><td>06.2</td><td>fill the displacement can with water until it drips from the spout
carefully lower the object into the can and collect the displaced water in the measuring cylinder
the volume of water collected is equal to the volume of the object</td><td></td><td>1
1
1</td><td>AO1</td></tr>
<tr><td>07.1</td><td>the normal</td><td></td><td>1</td><td>AO1</td></tr>
<tr><td>07.2</td><td>protractor</td><td></td><td>1</td><td>AO1</td></tr>
<tr><td>07.3</td><td>light slows down when it enters the glass
(because glass is more optically dense than air) so it bends towards the normal</td><td></td><td>1
1</td><td>AO1</td></tr>
<tr><td>07.4</td><td>so the centre of the ray (and the angles) can be traced / measured precisely</td><td></td><td>1</td><td>AO3</td></tr>
</table>

Question	Answers	Extra information	Mark	AO
08.1	any two from: • volume (mass) of water • starting temperature of the water • size / type of beaker • thickness of the insulating layer • time between readings		1 1	AO3
08.2	the beaker wrapped in wool its temperature fell by 16 °C compared with 28 °C, so it transferred less energy to the surroundings	the second mark must include the data or a comparison	1 1	AO3

Total: 50 marks