
INTERNATIONAL GCSE CORE PHYSICS

9223

Paper 1

Specimen paper

07:00 GMT

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator
- a protractor
- the Physics Equations Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this answer book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you worked out your answer.

Information

- The maximum mark for this paper is 100.
- The marks for each question are shown in brackets.
- You are expected to use a calculator where appropriate.

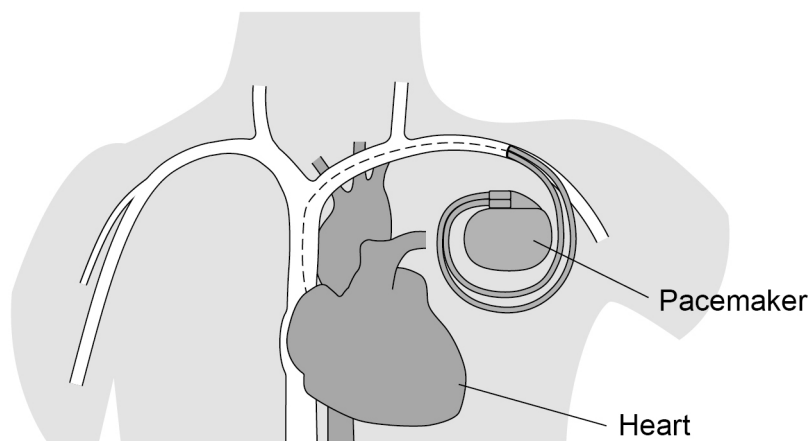
0 1

A pacemaker helps to control the rate at which a person's heart beats.

Figure 1 shows a pacemaker attached to a person's heart.

In the past, radioactive sources were used to power pacemakers. The radioactive sources emitted alpha particles.

Figure 1



0 1 . 1

What is an alpha particle?

Tick (✓) **one** box.

[1 mark]

An electron

☐

A neutron.

☐

A proton

☐

Two neutrons and two protons

☐

0 1 . 2

A source has a half-life of 87.7 years.

Why is a source with a half-life of 87.7 years suitable for use in a pacemaker?

[1 mark]

0 1 . 3 What is a beta particle?

Tick (✓) **one** box.

[1 mark]

An electron emitted from an energy level of the atom.

☐

An electron emitted from the nucleus.

☐

A neutron emitted from the nucleus.

☐

Two neutrons and two protons emitted from the nucleus.

☐

0 1 . 4 The source is contained in a plastic case.

Explain why a source that emitted beta particles would **not** be suitable as a power source for pacemakers.

[2 marks]

0 1 . 5 Modern pacemakers contain electrical cells.

Give **one** advantage and **one** disadvantage of using electrical cells instead of radioactive sources to power a pacemaker.

[2 marks]

Advantage

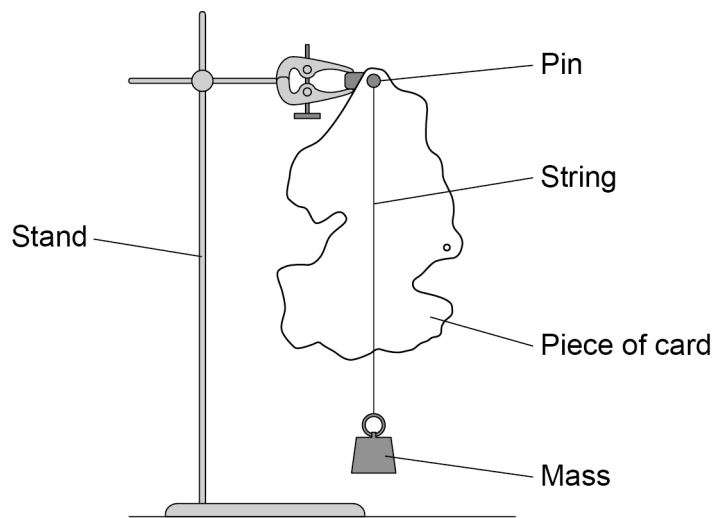
Disadvantage

0 2

A student wants to find the centre of mass of a large, thin piece of card.

Figure 2 shows the apparatus the student used.

Figure 2



This method is used:

1. Attach a mass to a piece of string.
2. Hang the piece of string from a pin that passes through the card.
3. Draw a line on the piece of card to mark the position of the string.

0 2 . 1

Which statement correctly describes the centre of mass of the piece of card?

Tick (✓) **one** box.

[1 mark]

The point at which all of the mass is located.

☐

The point at which most of the mass is located.

☐

The point at which the mass is a maximum value.

☐

The point at which the mass may be thought to be concentrated.

☐

0 2 . 2 Where is the centre of mass of the piece of card located?

Tick (✓) **one** box.

[1 mark]

Above the pin

☐

At the position of the pin

☐

Directly below the pin

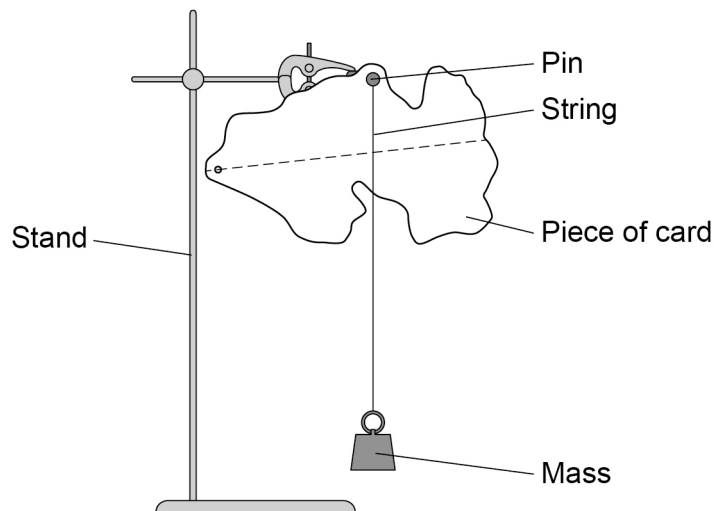
☐

To the left of the pin

☐

0 2 . 3 Then the student hung the piece of card from a different point as shown in **Figure 3**.

Figure 3



The student marked the new position of the string.

How can the student use the two lines drawn on the card to find the centre of mass of the card?

[1 mark]

0 2 . 4

Which of the following suggestions would improve the investigation?

Tick (✓) **one** box.

[1 mark]

Find the centre of mass of the same shape made from different materials

☐

Hang the card from another point and mark the position of the string again.

☐

Repeat the experiment with a different card shape and compare the results.

☐

Vary the mass attached and hang the card shape from the same point.

☐

0 2 . 5

Figure 4 shows a different piece of thin card.**Figure 4**

Show how you can find the position of the centre of mass of this piece of card.

Draw your answer on **Figure 4**.

[1 mark]

7

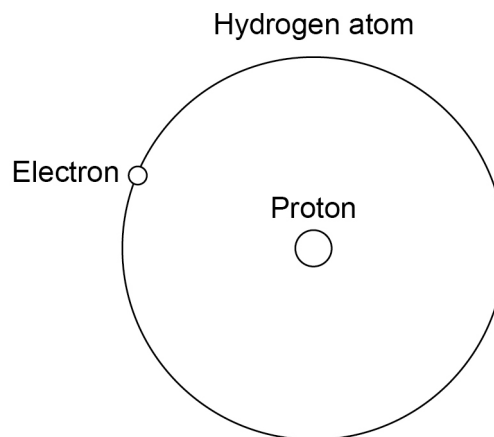
0 3

There are more atoms of hydrogen in the human body than of any other element.

0 3 . 1

Figure 5 shows an atom of hydrogen.

Figure 5



Explain why an atom of hydrogen has no overall electric charge.

[2 marks]

0 3 . 2

Complete the sentence.

[1 mark]

Choose the answer from the boxes.

ions	isotopes	neutral	radioactive
------	----------	---------	-------------

Hydrogen atoms that lose an electron become _____.

0 3 . 3 Most atoms are made up of three different types of particles.

Complete **Table 1**.

[2 marks]

Table 1

Particle	Relative mass	Relative charge
proton		1
neutron	1	
electron	very small	

0 3 . 4 Most of the mass of a human body comes from two elements, carbon (C) and oxygen (O).

The elements are shown in **Figure 6**.

Figure 6



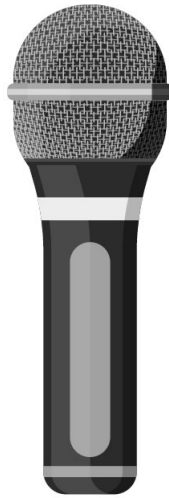
Describe the differences between the atoms of the two elements in **Figure 6**.

[4 marks]

0 4

Figure 7 shows a wireless microphone.

Figure 7



The microphone detects sound waves and emits electromagnetic waves

0 4 . 1

Describe **two** differences and **two** similarities between the properties of sound waves and electromagnetic waves.

[4 marks]

Differences

1 _____

2 _____

Similarities

1 _____

2 _____

0 4 . 2

The microphone emits radio waves with a frequency of 750 MHz.

Speed of radio waves = 300 000 000 m/s

Calculate the wavelength of the radio waves.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

Wavelength = _____ Unit _____

0 4 . 3

The microphone can detect frequencies of sound up to 24 000 Hz.

What is the difference between 24 000 Hz and the highest frequency that a human can hear?

[2 marks]

Difference in frequency = _____ Hz

0 5

A protostar is the first stage in the life cycle of a star

0 5 . 1

A protostar is made from a cloud of dust and gas.

Which force pulls together dust and gas to make a protostar?

Tick (✓) **one** box.

[1 mark]

Air resistance

☐

Friction

☐

Gravity

☐**0 5 . 2**

Which statement describes a main sequence star?

Tick (✓) **one** box.

[1 mark]

Chemical reactions happen inside the core of the star to release energy.

☐

Energy is released by the fusion of hydrogen nuclei to make helium nuclei.

☐

The forces inside a main sequence star are unbalanced.

☐

Question 5 continues on the next page

Describe the similarities and the differences between the life cycle of the Sun and the life cycle of the star Betelgeuse.

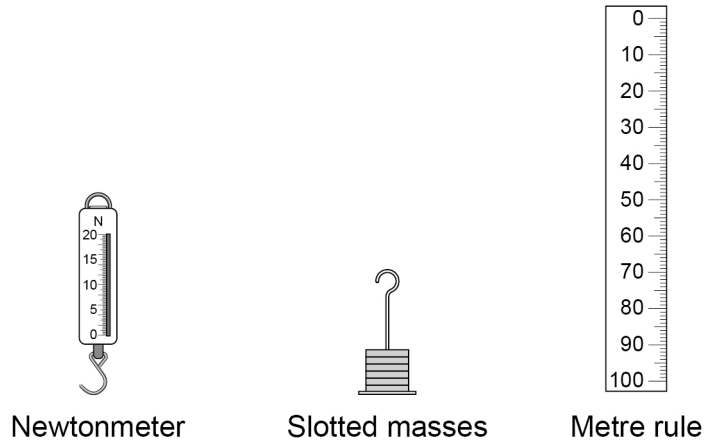
[illegible]

0 6

Figure 8 shows some equipment, including a newtonmeter.

The newtonmeter contains a spring.

Figure 8



0 6

1

The spring constant of the spring is given by the gradient of a force-extension graph for the spring.

Describe an experiment to find the spring constant of the spring using the equipment in **Figure 8**.

[4 marks]

A student measured the mass and weight of a metal block five times.

The student used the measurements to calculate the gravitational field strength, g .

Table 2 shows the results.

Table 2

Reading	1	2	3	4	5	Mean
g in N/kg	10.1	9.3	10.2	10.0	10.1	X

0 6 . 2 Give the range of the values for g in **Table 2**.

[1 mark]

Range = _____ to _____ N/kg

0 6 . 3 The student made a random error.

Explain how the data in **Table 2** shows that the student made a random error.

[2 marks]

0 6 . 4 Calculate value **X** in **Table 2**.

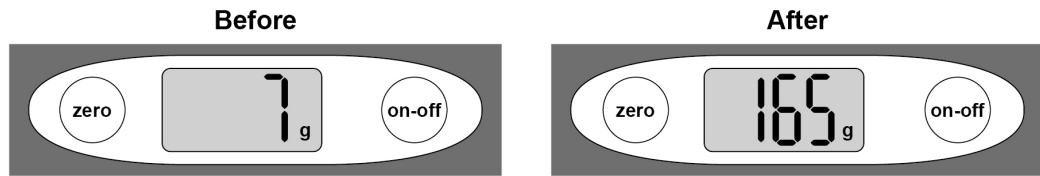
[2 marks]

X = _____ N/kg

A student used a top pan balance to determine the weight of a mobile phone.

Figure 9 shows the readings on a top pan balance before and after placing the phone on it.

Figure 9



0 6 . 5

What should the student have done to the top pan balance in **Figure 9** before placing the mobile phone on it?

[1 mark]

0 6 . 6

Determine the weight of the mobile phone.

Gravitational field strength = 9.8 N/kg

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

[4 marks]

Weight (2 significant figures) = _____ N

0	7
---	---

A student investigated some electrical components.

0	7	.	1
---	---	---	---

Give the names of the devices used to measure current and potential differences.

[2 marks]

Current _____

Potential
differences _____

0	7	.	2
---	---	---	---

The student investigated how current varies with potential difference for a fixed resistor.

Draw a circuit diagram for the circuit that could be used.

[3 marks]

0 7 . 3

When the potential difference across the fixed resistor was 3.6 V, the current in the fixed resistor was 160 mA.

Calculate the resistance of the fixed resistor.

[4 marks]

Resistance = _____ Ω

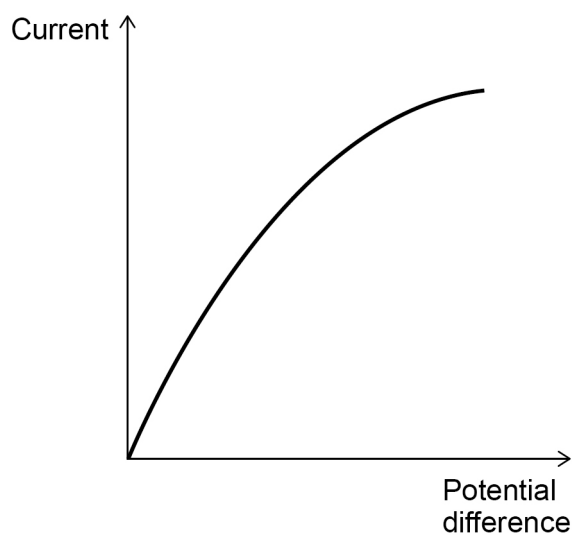
Question 7 continues on the next page

The student then investigated how current varies with potential difference for a filament lamp.

0 7 . 4

Figure 10 shows the relationship for a filament lamp.

Figure 10



Explain the shape of the graph.

[4 marks]

0	8
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A drag race is a car race in a straight line, for a short distance.

Figure 11 shows a drag car used in a drag race. The car has parachutes at the back which open at the end of the race when the brakes are applied.

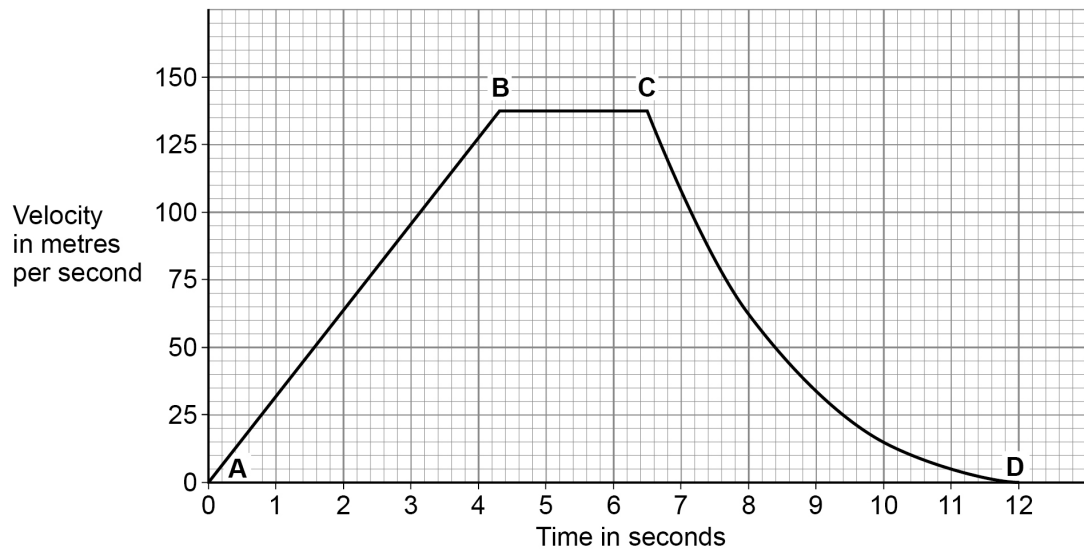
Figure 11



Question 8 continues on the next page

Figure 12 shows a velocity-time graph for the drag car during the race.

Figure 12



0 8 . 1 Explain the shape of the different sections of the graph in **Figure 12**.

Use ideas about forces in your answer.

[6 marks]

Section
A to B

Section
B to C

Section
C to D

0 8 . 2

Determine the acceleration of the drag car during the first 1.4 s of the race.

Give the unit.

[3 marks]

Acceleration = _____ Unit _____

0 8 . 3

Determine the distance travelled by the drag car until the parachutes are opened.

[4 marks]

Distance travelled = _____ m

0 9

A kettle is a device used to boil water.

Figure 13 shows two electric kettles with different casings.

Figure 13



Kettle with plastic casing



Kettle with metal casing

0 9 . 1

A fuse is used as a safety device inside the plug of each kettle.

Explain how the fuse prevents the kettle becoming damaged if there is a fault.

[3 marks]

0 9 . 2

A circuit breaker is another type of safety device.

Give **two** advantages of using a circuit breaker rather than a fuse.

[2 marks]

1

2

0 9 . 3

Explain why the kettle with the plastic casing does **not** need an earth wire.

[2 marks]

0 9 . 4

Water in an electric kettle is heated by a heating element.

Explain why the heating element is positioned at the bottom of an electric kettle.

[3 marks]

Question 9 continues on the next page

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