Surname

Other Names

Candidate Signature

AQA

General Certificate of Secondary Education
Foundation Tier
June 2012

Physics

PHY3F

Unit Physics P3

F

Written Paper

Wednesday 30 May 2012   1.30 pm to 2.15 pm

For this paper you must have:
● a ruler.
You may use a calculator.

Time allowed
● 45 minutes

Instructions
● Use black ink or black ball-point pen.
● Fill in the boxes at the top of this page.
● Answer **all** questions.
● You must answer the questions in the spaces provided. Do not write
  outside the box around each page or on blank pages.
● Do all rough work in this book. Cross through any work you do not want
  to be marked.

Information
● The marks for questions are shown in brackets.
● The maximum mark for this paper is 45.
● You are expected to use a calculator where appropriate.
● You are reminded of the need for good English and clear presentation in
  your answers.

Advice
● In all calculations, show clearly how you work out your answer.

PHY3F

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Answer **all** questions in the spaces provided.

1 A student has drawn six ray diagrams, **A**, **B**, **C**, **D**, **E** and **F**.

Only three of the ray diagrams are correct.

Put a tick (✓) in the box under each of the **three** correctly drawn ray diagrams.

Glass block

Glass prism

Light spectrum

Glass lens

A

B

C

Glass lens

Glass block

Plane mirror

D

E

F
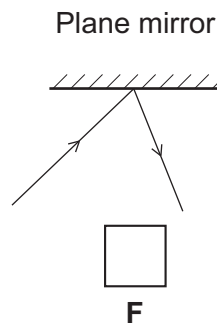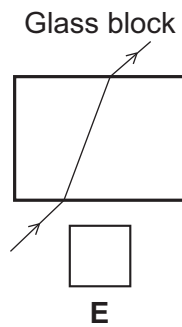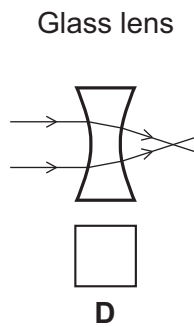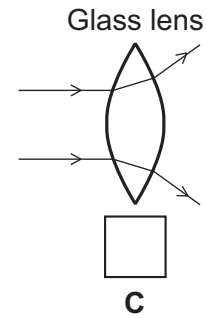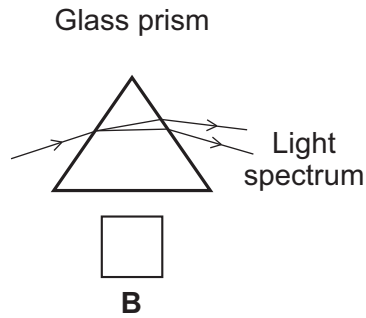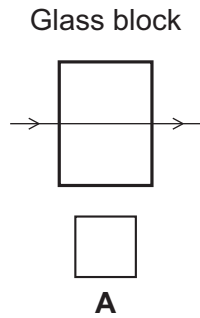
(3 marks)

3

Turn over for the next question

Turn over ▶

2 When you look into a mirror, you see an image of yourself.
The diagram shows how the image of a near object is produced by one type of mirror.
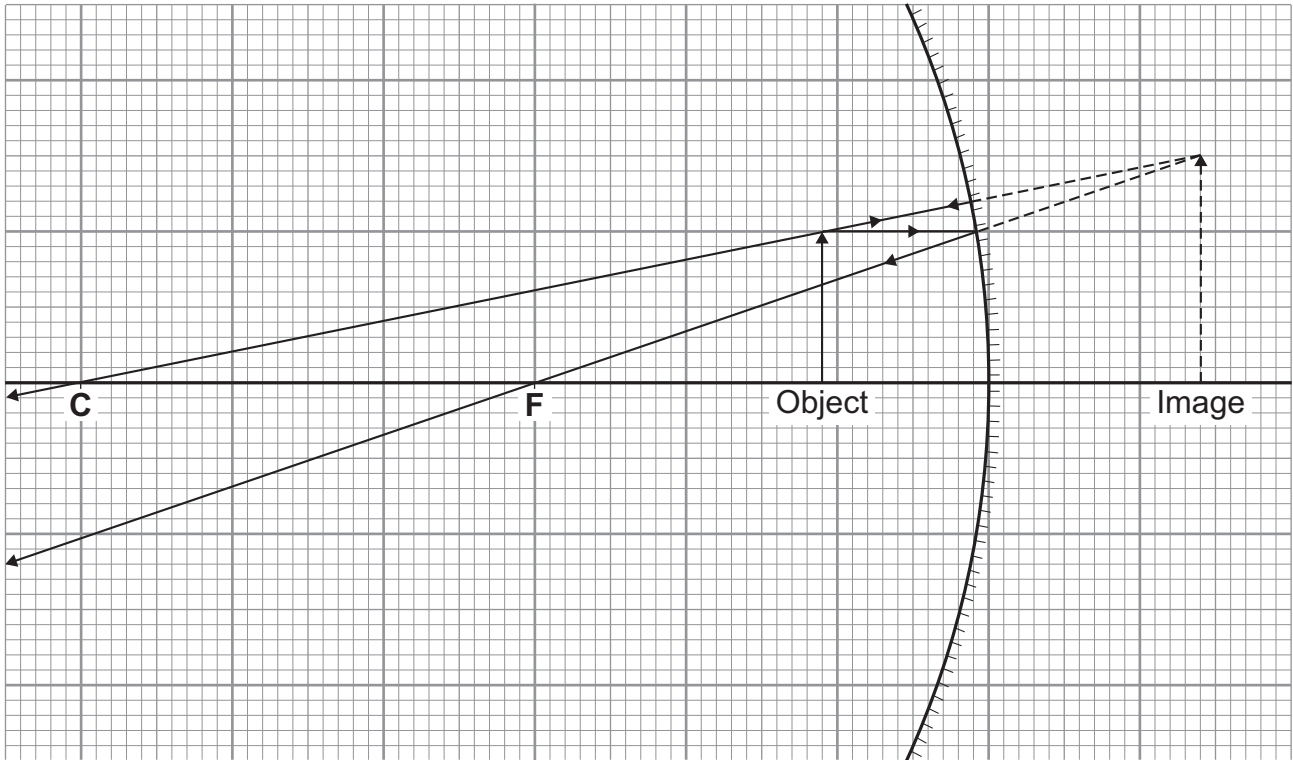
2 (a) What type of mirror is shown in the diagram?

Draw a ring around your answer.

concave **convex** **plane**

(1 mark)

2 (b) Use the equation in the box to calculate the magnification produced by the mirror.

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

Show clearly how you work out your answer.

....

....

Magnification = ...

(2 marks)

2 (c) Which **two** of the following words can be used to describe the image?

Put a tick (✓) in the box next to each of your **two** answers.

inverted ☐

real ☐

upright ☐

virtual ☐

(1 mark)

2 (d) Suggest **one** practical use for this type of mirror.

....

....

(1 mark)

5

Turn over for the next question

Turn over ▶

3 (a) The diagram shows a simple transformer made by a student. The student has designed the transformer to light a 3.0 V lamp using a 1.0 V power supply.
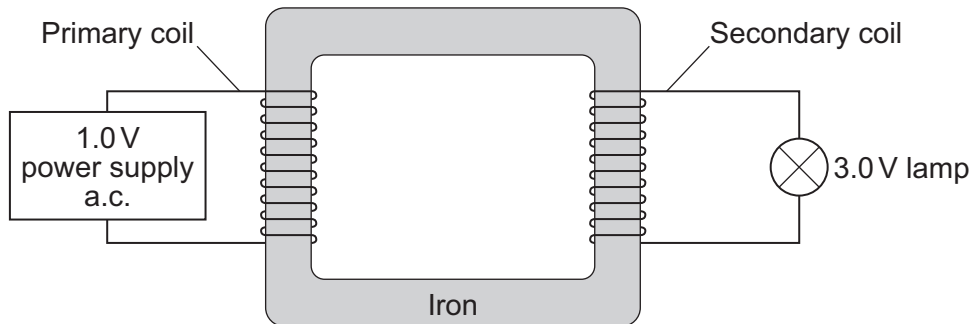
3 (a) (i) What name is given to the part of the transformer that is made of iron?

Draw a ring around your answer.

centre   **connector**   **core**

(1 mark)

3 (a) (ii) When the power supply is switched on, the lamp is not very bright.

Suggest **one** change that the student can make to increase the brightness of the lamp. The 1.0 V power supply cannot be changed.

....

....

(1 mark)

3 (b) The diagram shows part of the National Grid system. The transformers, **J**, **K**, **L** and **M**, are an essential part of the system.
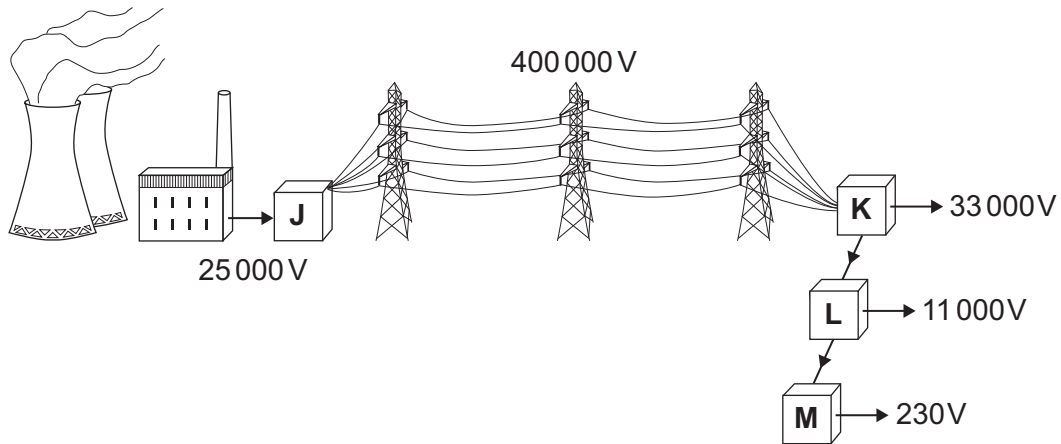
3 (b) (i) Which transformer, **J**, **K**, **L** or **M**, is a step-up transformer?

Write your answer in the box.

(1 mark)

3 (b) (ii) Some scientists claim to have found evidence to suggest that children living near to overhead power lines are more likely to develop leukaemia. However, the scientists are not sure that the power lines are the cause of the problem.

The evidence from this and other investigations may worry some people.

What do you think scientists should do?

Put a tick (✓) in the box next to your answer.

Scientists should always publish the evidence from investigations immediately.

Scientists should ignore any evidence from investigations that may worry people.

Scientists should publish the evidence from an investigation only when they have found out as many facts as possible.

(1 mark)

4

Turn over ▶

4 The diagram shows someone starting to lift the end of a heavy wooden pole.

Axis of rotation

2.5 m

Weight = 500 N
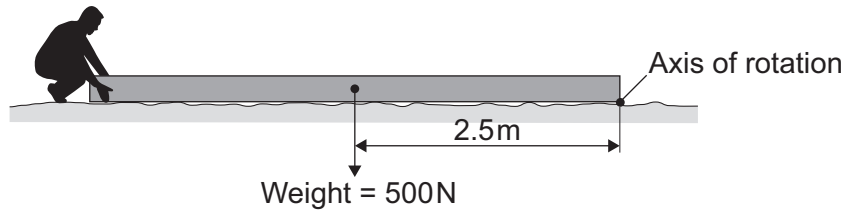
4 (a) Use the equation in the box to calculate the moment produced by the weight of the pole.

moment	=	force	× perpendicular distance from the line of action of the force to the axis of rotation

....

....

Moment = ... Nm

(2 marks)

4 (b) (i) Complete the following sentence by drawing a ring around the correct line in the box.

bigger than

The smallest force needed to lift the end of the pole will be   the same as

smaller than

the weight of the pole.

(1 mark)

4 (b) (ii) Give a reason for your answer to part **(b)(i)**.

....

....

(1 mark)

4 (c) How could the person lifting the end of the pole increase the moment?

....

....

(1 mark)

5

Turn over for the next question

Turn over ▶

5 (a) The diagrams show the waveform for a musical note played on two different instruments. The notes have the same frequency.
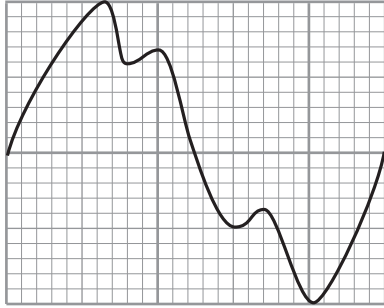
Complete the following sentences by drawing a ring around the correct word in the box.

5 (a) (i) Having the same frequency means that the two notes also have the same

amplitude.
loudness.
pitch.

(1 mark)

5 (a) (ii) Having different waveforms means that the two notes also have a different

amplitude.
quality.
wavelength.

(1 mark)

5 (b) The diagram shows an electric bell inside an airtight glass jar. When the bell is switched on, someone near to the glass jar can hear the bell ringing.

Connections to
low voltage power supply

Electric bell

Airtight glass jar
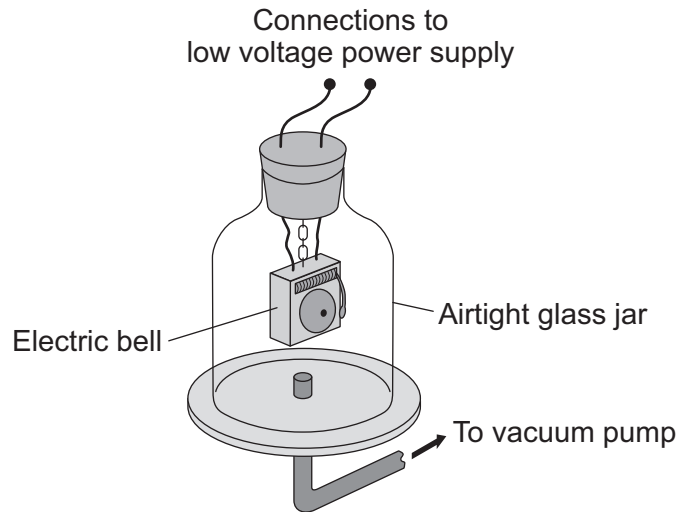
To vacuum pump

The vacuum pump is now used to remove the air from inside the glass jar.

What happens to the sound from the bell after the air has been removed from the glass jar?

....

Give a reason for your answer.

....

....

(2 marks)

Question 5 continues on the next page

Turn over ▶

5 (c) Loud sounds can damage a person's hearing.

The graphs show the quietest sounds that three people, **A**, **B** and **C**, can hear at particular frequencies.
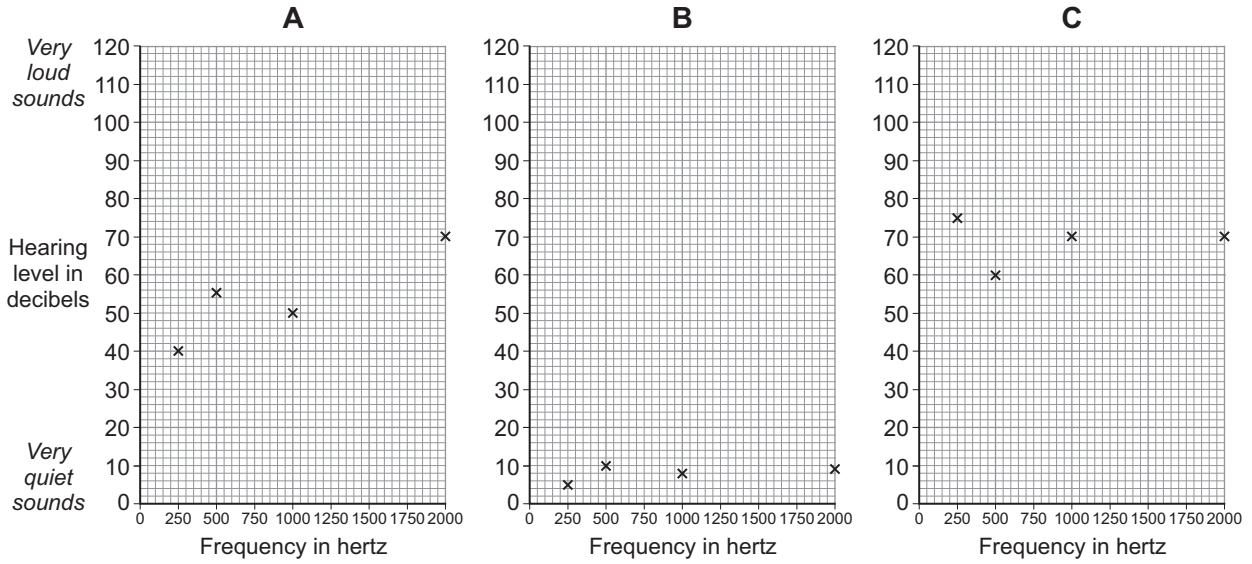
5 (c) (i) Only one of the three people has good hearing.

Which **one** of the people, **A**, **B** or **C**, has good hearing?

Write your answer in the box.

Give a reason for your answer.

....

....

(2 marks)

5 (c) (ii) The table gives the typical frequency and loudness for four sounds.

Sound	Frequency in hertz	Loudness level in decibels
Dog barking	250	65
Lawnmower	250	100
Loud shout	1000	80
Telephone ringing	2000	60

Look at the graph for person **C**.

Which **two** sounds, given in the table, is person **C** able to hear?

Draw a ring around each of your **two** answers.

dog barking　　　**lawnmower**　　　**loud shout**　　　**telephone ringing**

(2 marks)

5 (d) Research has shown that many teenagers are now showing signs of damaged hearing. There is a strong suggestion that listening to loud music through earbuds is partly to blame, but this has not been proved.
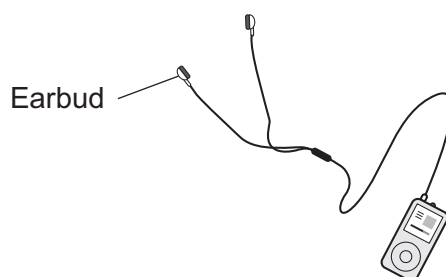
Earbud

Suggest what teenagers who listen to music through earbuds should do to protect their hearing.

....

....

(1 mark)

9

Turn over ▶

6 The diagram shows a simple home-made anemometer.

An anemometer measures wind speed.
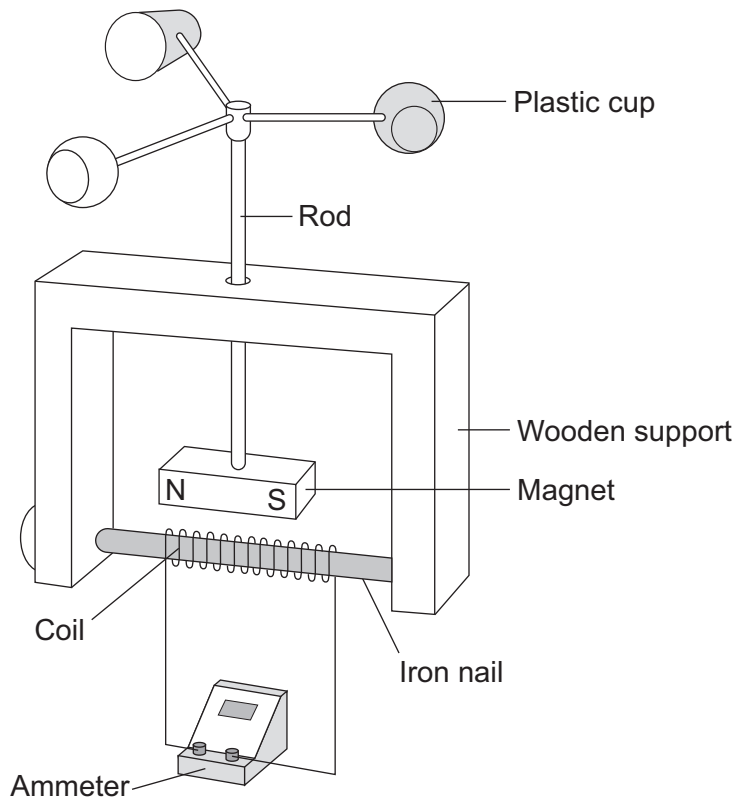
6 (a) When the wind blows, the ammeter gives a reading.

Use the correct words from the box to complete the explanation as to why this happens.

coil	induced	magnet	produced	rod

When the wind blows, the plastic cups turn.

This makes the rod and .... turn.

The magnetic field cuts through the ....

A current is .... in the coil.

This gives a reading on the ammeter.

(3 marks)

6 (b) (i) Complete the following sentence by drawing a ring around the correct line in the box.

When the wind speed increases, the reading on the ammeter will go

down.

to zero.

up.

(1 mark)

6 (b) (ii) Give a reason for your answer to part **(b)(i)**.

....

....

(1 mark)

5

Turn over for the next question

Turn over ▶

7 The diagram shows the apparatus used by two students to find out how the centripetal force acting on an object affects the speed of the object.
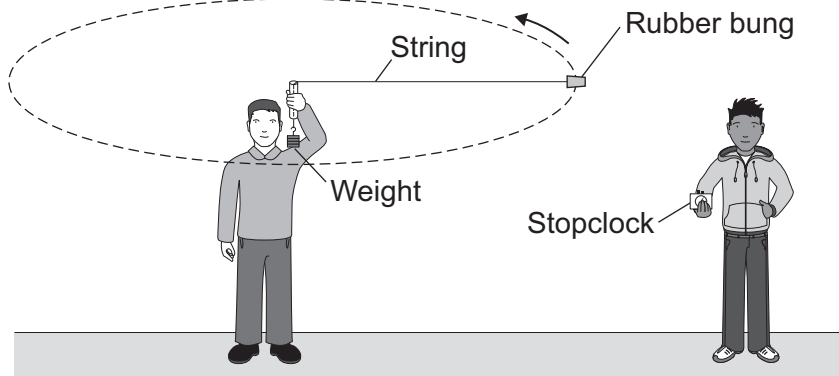
7 (a) (i) In which direction does the centripetal force act on the rubber bung?

....

(1 mark)

7 (a) (ii) In this investigation, what provides the centripetal force?

....

....

(1 mark)

7 (b) One student swung the rubber bung around in a circle at constant speed. The second student timed how long it took the rubber bung to complete 10 rotations. The students then calculated the speed of the rubber bung, using the radius of the circle and the time to complete one rotation. The students repeated this for several different values of centripetal force.

7 (b) (i) During the investigation, the radius of the circle and the mass of the rubber bung were not changed.

Explain why.

....

....

....

....

(2 marks)

7 (b) (ii) One of the variables in this investigation was the time taken by the rubber bung to complete 10 rotations.

Which **two** words can be used to describe this variable?

Draw a ring around each of your **two** answers.

continuous   **control**   **dependent**   **independent**

(1 mark)

7 (b) (iii) The students timed 10 rotations of the rubber bung, rather than just one rotation.

Suggest why.

....

....

(1 mark)

7 (c) The graph shows the students' data.
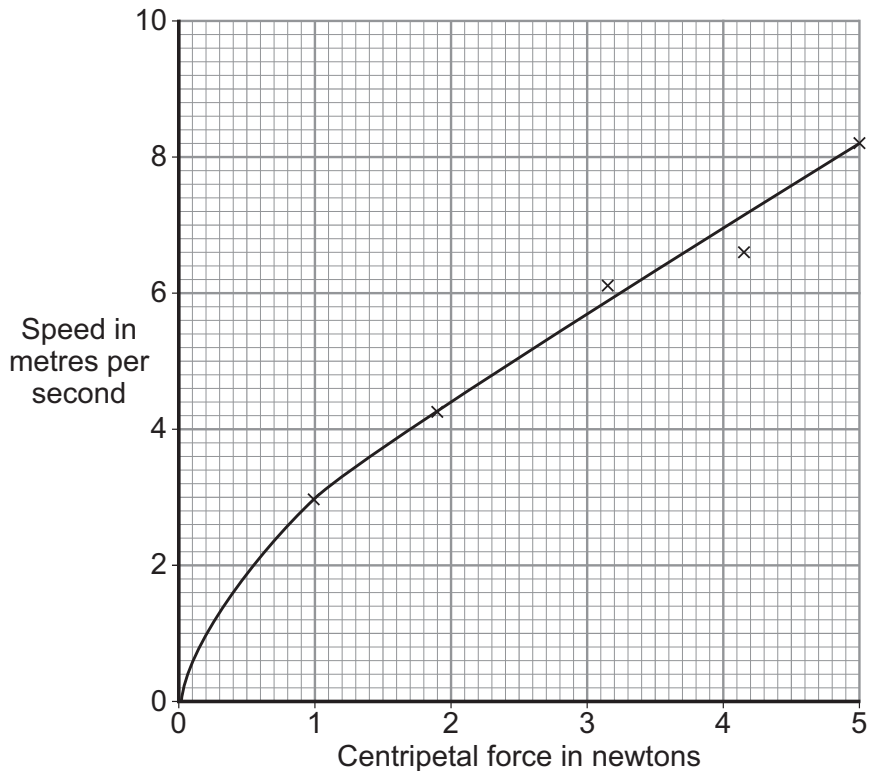
There is a relationship between the speed of an object moving in a circle and the centripetal force acting on the object.

What conclusion about this relationship can the students make from their data?

....

....

(1 mark)

Question 7 continues on the next page

Turn over ▶

7 (d) The diagram shows a satellite in a circular orbit above the Earth.
The satellite is part of the global positioning system (GPS).
The satellite orbits the Earth **twice** every 24 hours.

Orbit

Satellite

Not to scale
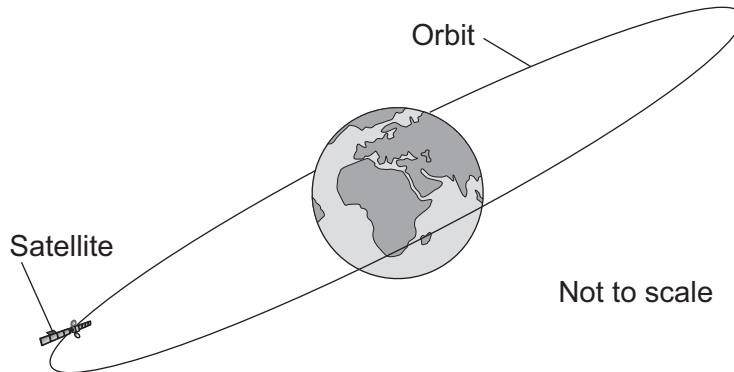
7 (d) (i) What provides the centripetal force needed to keep the satellite in its orbit around the Earth?

....

(1 mark)

7 (d) (ii) Is this satellite in a geostationary orbit?

Draw a ring around your answer.   **Yes**   **No**

Give a reason for your answer.

....

....

(1 mark)

9

Turn over for the next question

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Turn over ▶

8 A student was asked to find the centre of mass of a thin sheet of card. The diagram shows the result of the student's experiment. The student drew two lines onto the card. The centre of mass is where the two lines cross.
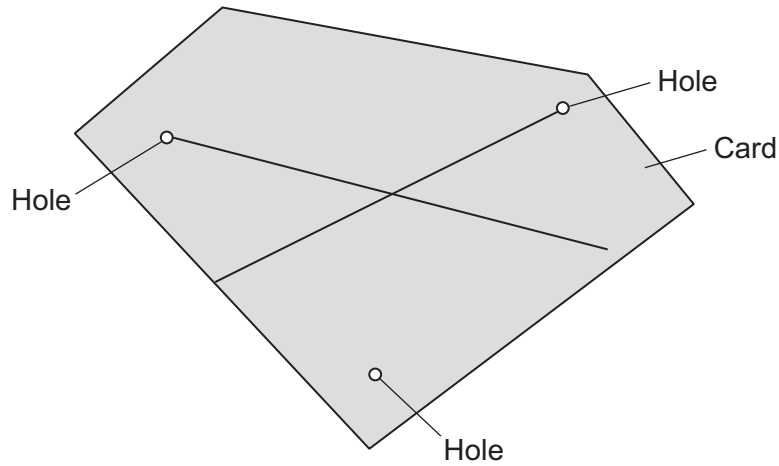
Hole

Card

Hole

Hole

8 (a) Describe how the student found the correct positions to draw the **two** lines. You may include a labelled diagram in your answer.

....

....

....

....

....

....

....

....

(3 marks)

8 (b) Explain how the student can check that the position found for the centre of mass is accurate.

....

....

....

....

(2 marks)

5

END OF QUESTIONS

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