| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
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| 6 | |
| 7 | |
| 8 | |
| 9 | |
| TOTAL | |

AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

# Physics

**Unit Physics P3**

**PH3FP**

**F**

Monday 19 May 2014 1.30 pm to 2.30 pm

**For this paper you must have:**
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

**Time allowed**
- 1 hour

A

**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.

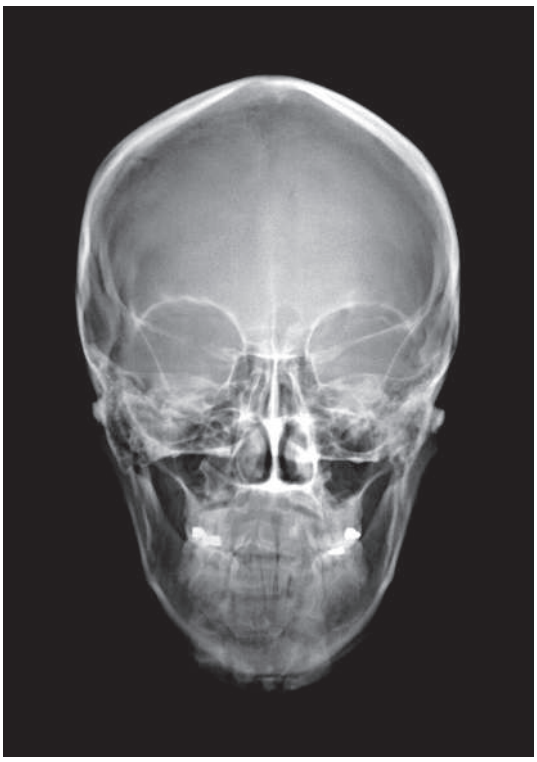
**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9(a) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

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

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

**1** **Figure 1** shows an X-ray image of a human skull.

**Figure 1**



**1 (a)** Use the correct answers from the box to complete the sentence.

**[2 marks]**

| | | | |
|---|---|---|---|
| **absorbs** | **ionises** | **reflects** | **transmits** |

When X-rays enter the human body, soft tissue ..... X-rays and bone ..... X-rays.

**1 (b)** Complete the following sentence.

**[1 mark]**

The X-rays affect photographic film in the same way that ..... does.

**1 (c)** **Table 1** shows the total dose of X-rays received by the human body when different parts are X-rayed.

**Table 1**

| Part of body X-rayed | Dose of X-rays received by human body in arbitrary units |
|---|---|
| Head | 3 |
| Chest | 4 |
| Pelvis | 60 |

Calculate the number of head X-rays that are equal in dose to one pelvis X-ray.

**[2 marks]**

.....

.....

.....

Number of head X-rays = .....

**1 (d)** Which **one** of the following is another use of X-rays?

Tick (✓) **one** box.

**[1 mark]**

Cleaning stained teeth ☐

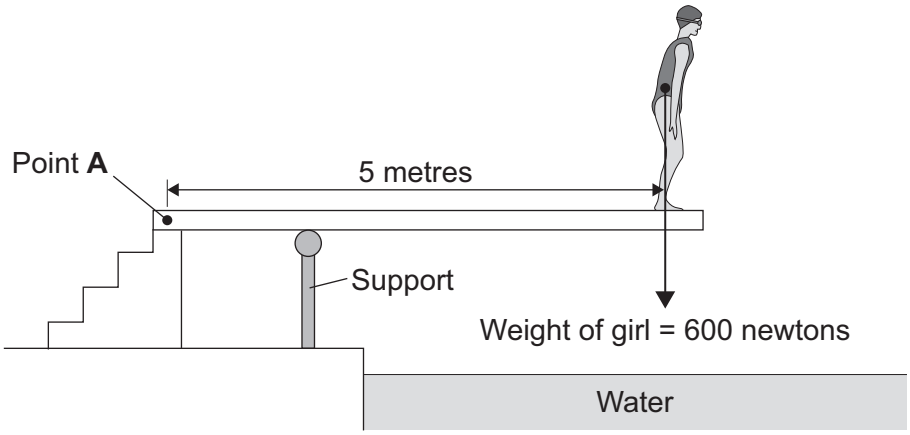
Killing cancer cells ☐

Scanning of unborn babies ☐

6

**2** **Figure 2** shows a girl standing on a diving board.

**Figure 2**




**2 (a)** Calculate the moment of the girl's weight about Point **A**.

Use the correct equation from the Physics Equations Sheet.

**[2 marks]**

.....

.....

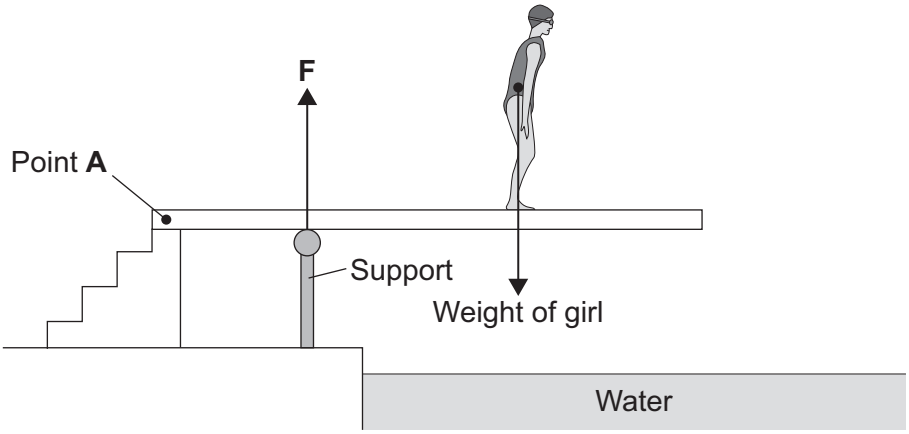
.....

Moment = ..... newton metres

**2 (b)** **Figure 3** shows the girl standing at a different place on the diving board.

The support provides an upward force **F** to keep the diving board balanced.

**Figure 3**




Complete the following sentence.

**[1 mark]**

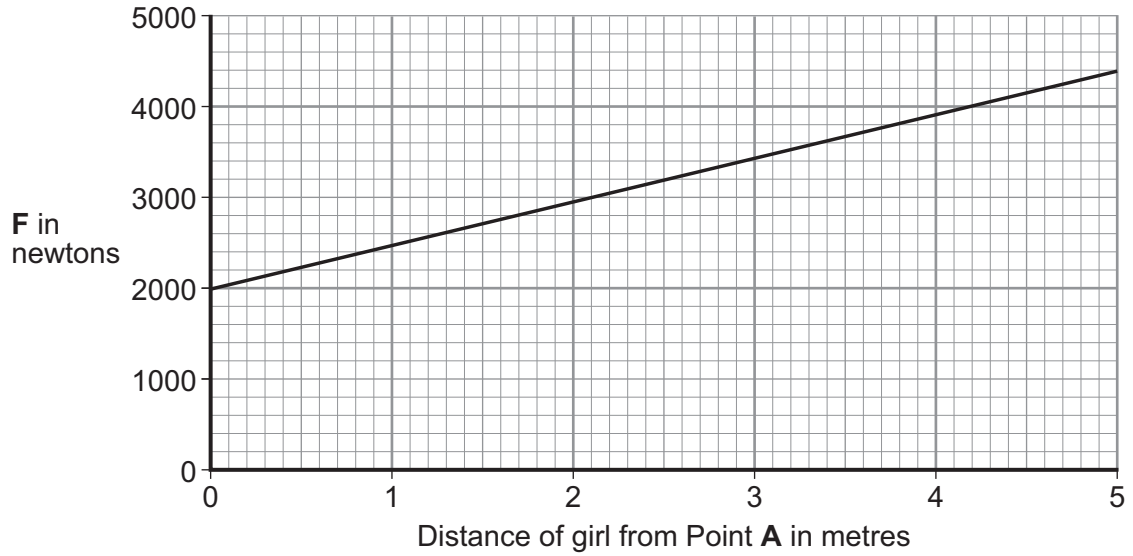
The diving board is not turning. The total clockwise moment is balanced

by the total ..... .

**Question 2 continues on the next page**

**2 (c)** **Figure 4** shows how the upward force **F** varies with the distance of the girl from Point **A**.

**Figure 4**




**2 (c) (i)** Use **Figure 4** to determine the upward force **F** when the girl is standing at a distance of 3 metres from point **A**.

**[1 mark]**

Upward force **F** = ..... newtons

**2 (c) (ii)** What conclusion should be made from **Figure 4**?

**[1 mark]**

.....

.....

.....

5

**3 (a)** Digital cameras and human eyes both form images.

Complete **Table 2** by putting a tick in the correct column(s) to show if the parts are found in the digital camera or in the human eye or in both.

The first part has been completed for you.

**[3 marks]**

**Table 2**

| Part | In a digital camera | In the human eye |
|---|---|---|
| Cornea | | ✓ |
| Lens | | |
| Pupil | | |
| Charge-coupled device (CCD) | | |

**Question 3 continues on the next page**

**3 (b)** Some humans are short-sighted.

Complete the following sentence.

**[1 mark]**

Short sight can be caused by the eyeball being too ..... .

**3 (c)** Spectacles can be worn to correct short sight.

**Table 3** gives information about three different lenses that can be used in spectacles.

**Table 3**

| | **Lens feature** | | |
|---|---|---|---|
| | **Material** | **Mass in grams** | **Type** |
| **Lens A** | Plastic | 5.0 | Concave (diverging) |
| **Lens B** | Glass | 6.0 | Convex (converging) |
| **Lens C** | Glass | 5.5 | Convex (converging) |

Which lens from **Table 3** would be used to correct short sight?

Draw a ring around the correct answer.

**Lens A** **Lens B** **Lens C**

Give the reason for your answer.

**[2 marks]**

.....

.....

**3 (d)** Every lens has a focal length.

Which factor affects the focal length of a lens?

Tick (✓) **one** box.

**[1 mark]**

The colour of the lens ☐

The refractive index of the lens material ☐

The size of the object being viewed ☐

**3 (e)** A lens has a focal length of 0.25 metres.

Calculate the power of the lens.

Use the correct equation from the Physics Equations Sheet.

**[2 marks]**

.....

.....

.....

Power of lens = ..... dioptres

**3 (f)** Laser eye surgery can correct some types of eye defect.

Which of the following is another medical use for a laser?

Tick (✓) **one** box.

**[1 mark]**

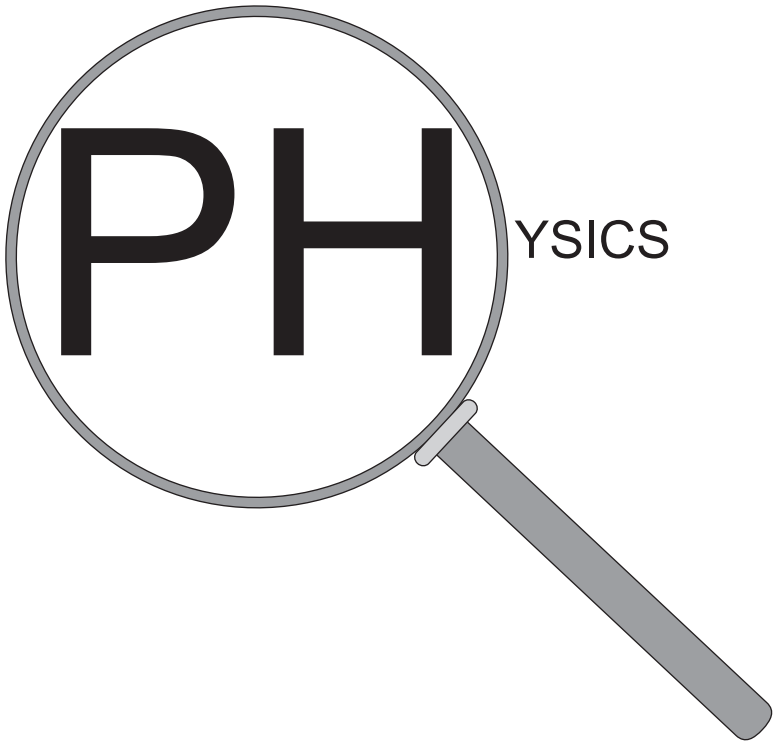
Cauterising open blood vessels ☐

Detecting broken bones ☐

Imaging the lungs ☐

**3 (g)** **Figure 5** shows a convex lens being used as a magnifying glass.

**Figure 5**




Not to scale

An object of height 14 mm is viewed through a magnifying glass.

The image height is 70 mm.

Calculate the magnification produced by the lens in the magnifying glass.

Use the correct equation from the Physics Equations Sheet.

**[2 marks]**

.....

.....

.....

Magnification = .....

12

**4 (a)** Use the correct answer from the box to complete the sentence.

**[1 mark]**

| | | |
|---|---|---|
| **concentrated** | **stored** | **pivoted** |

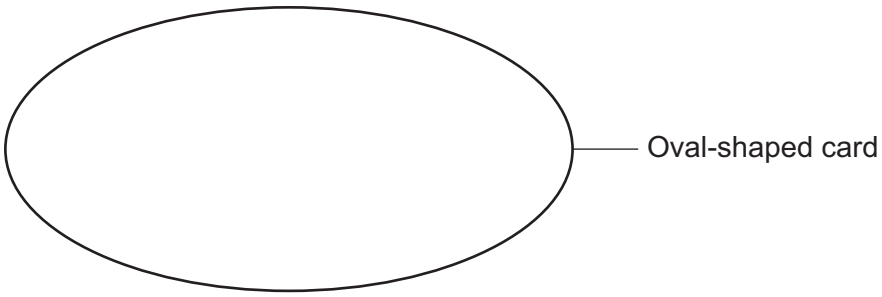
The centre of mass of an object is the point at which the mass of an object may be thought to be ..... .

**4 (b)** **Figure 6** shows an oval-shaped piece of card.

Draw an **X** on **Figure 6**, so that the centre of the **X** marks the centre of mass of the oval shape.

**[1 mark]**

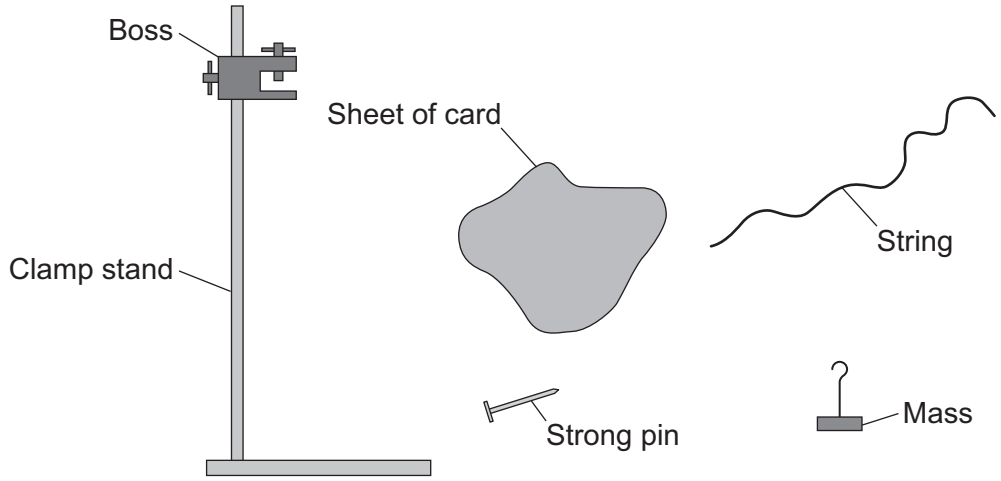
**Figure 6**




**Question 4 continues on the next page**

**4 (c)** **Figure 7** shows some apparatus and a sheet of card.

**Figure 7**




The sentences describe how to find the centre of mass of the sheet of card.

The sentences are in the wrong order.

**A** Tie the mass to one end of the string and then hang the string from the pin.

**B** Repeat this using the other hole. The centre of mass is where the two lines cross on the card.

**C** Put the pin through one of the holes in the card and hold the pin in the boss.

**D** Draw a line on the card marking the position of the string.

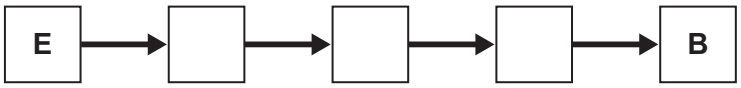
**E** Make two holes in the card, with each hole near to the edge of the card.

Put the sentences into the correct order to describe how to find the centre of mass of the card.

Start with **E** and end with **B**.

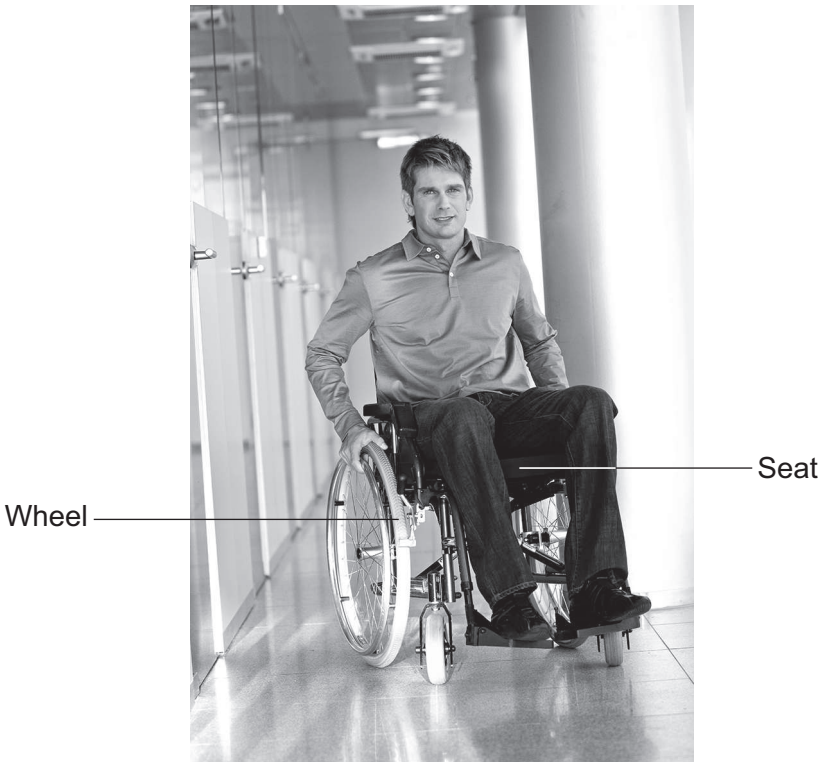
Write the correct order in these boxes.

**[2 marks]**



**4 (d)** **Figure 8** shows a person in a wheelchair.

**Figure 8**




Tipping the wheelchair at a large angle may cause it to become unstable and to topple over.

How could the design of this wheelchair be changed to make it less likely to be toppled over?

Tick (✓) **two** boxes.

**[2 marks]**

Lower the person's seating position ☐

Make the wheelchair from lighter materials ☐

Move the wheels further apart ☐

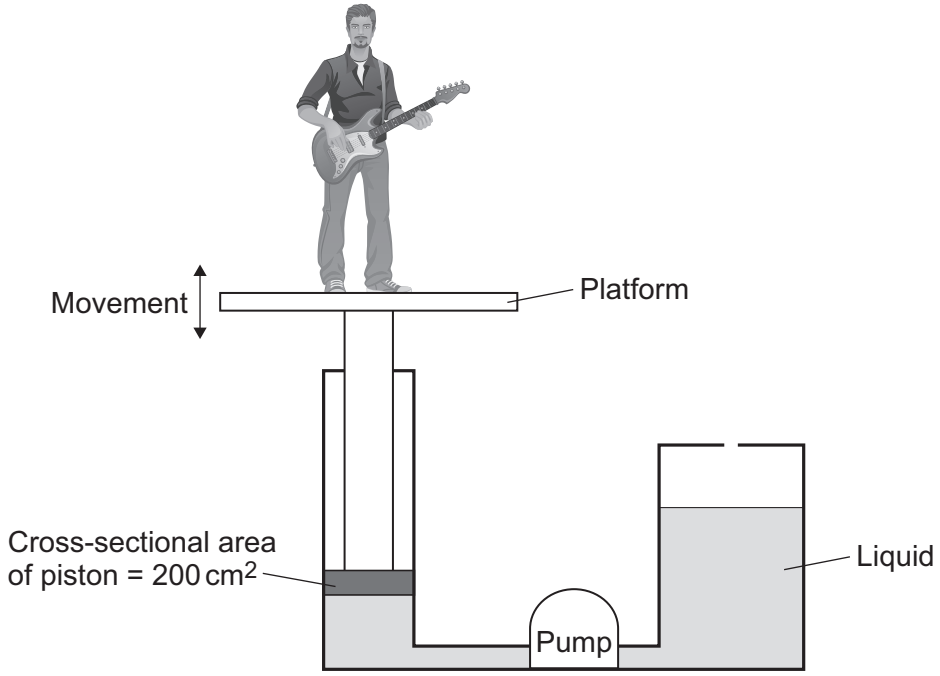
Use taller wheels ☐

6

**5** Musicians sometimes perform on a moving platform.

**Figure 9** shows the parts of the lifting machine used to move the platform up and down.

**Figure 9**




**5 (a)** What name is given to a system that uses liquids to transmit forces?

Draw a ring around the correct answer.

**[1 mark]**

**electromagnetic** **hydraulic** **ionising**

**5 (b)** To move the platform upwards, the liquid must cause a force of 1800 N to act on the piston.

The cross-sectional area of the piston is 200 $cm^2$.

Calculate the pressure in the liquid, in $N/cm^2$, when the platform moves.

Use the correct equation from the Physics Equations Sheet.

**[2 marks]**

.....

.....

.....

Pressure = ..... $N/cm^2$

**5 (c)** A new development is to use oil from plants as the liquid in the machine.

Growing plants and extracting the oil requires **less energy** than producing the liquid usually used in the machine.

Draw a ring around the correct answer to complete the sentence.

**[1 mark]**

Using the oil from the plants gives | an environmental / an ethical / a social | advantage over the liquid usually used.

4

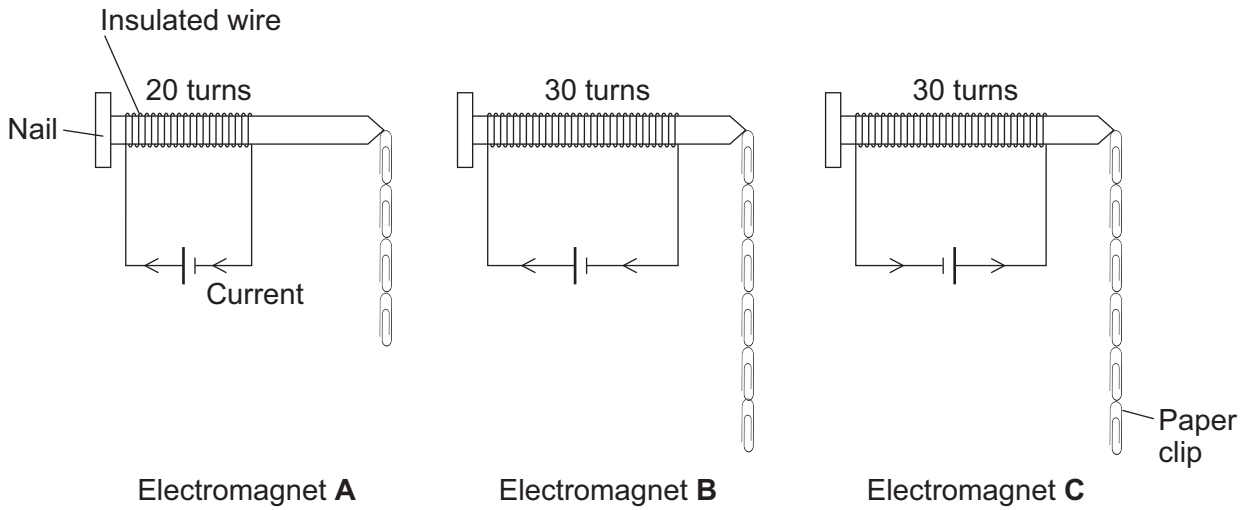
**Turn over for the next question**

**6** A student is investigating the strength of electromagnets.

**Figure 10** shows three electromagnets.

The student hung a line of paper clips from each electromagnet.

**Figure 10**




No more paper clips can be hung from the bottom of each line of paper clips.

**6 (a) (i)** Complete the conclusion that the student should make from this investigation.

**[1 mark]**

Increasing the number of turns of wire wrapped around the nail will .....

the strength of the electromagnet.

**6 (a) (ii)** Which **two** pairs of electromagnets should be compared to make this conclusion?

**[1 mark]**

**Pair 1**: Electromagnets ..... and .....

**Pair 2**: Electromagnets ..... and .....

**6 (a) (iii)** Suggest **two** variables that the student should control in this investigation.

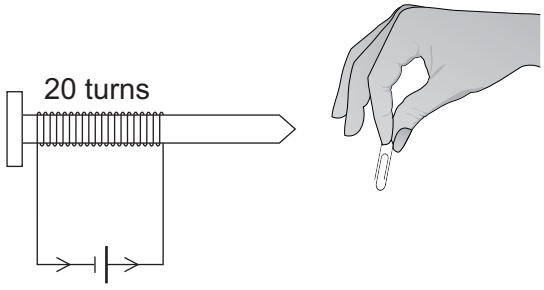
**[2 marks]**

1 .....

2 .....

**6 (b)** The cell in electromagnet **A** is swapped around to make the current flow in the opposite direction. This is shown in **Figure 11**.

**Figure 11**




What is the maximum number of paper clips that can now be hung in a line from this electromagnet?

Draw a ring around the correct answer.

**[2 marks]**

**fewer than 4** **4** **more than 4**

Give **one** reason for your answer.

.....

.....

.....

**6 (c)** Electromagnet **A** is changed to have only 10 turns of wire wrapped around the nail.

Suggest the maximum number of paper clips that could be hung in a line from the end of this electromagnet.

**[1 mark]**

Maximum number of paper clips = .....

7

**7 (a)** What is ultrasound?

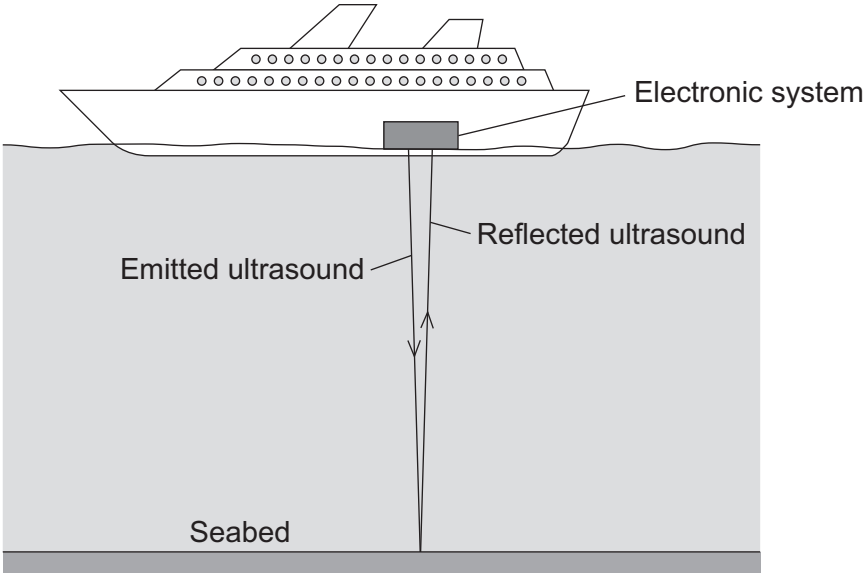
**[1 mark]**

.....

.....

**7 (b)** **Figure 12** shows how ultrasound is used to measure the depth of water below a ship.

**Figure 12**




A pulse of ultrasound is sent out from an electronic system on-board the ship.

It takes 0.80 seconds for the emitted ultrasound to be received back at the ship.

Calculate the depth of the water.

Speed of ultrasound in water = 1600 m/s

Use the correct equation from the Physics Equations Sheet.

**[3 marks]**

.....

.....

.....

.....

Depth of water = ..... metres

**7 (c)** Ultrasound can be used in medicine for scanning.

State **one** medical use of ultrasound scanning.

**[1 mark]**

.....

**7 (d)** Images of the inside of the human body can be made using a Computerised Tomography (CT) scanner. The CT scanner in **Figure 13** uses X-rays to produce these images.

**Figure 13**

State **one** advantage and **one** disadvantage of using a CT scanner, compared with ultrasound scanning, for forming images of the inside of the human body.

**[2 marks]**

Advantage of CT scanning .....

.....

.....

Disadvantage of CT scanning .....

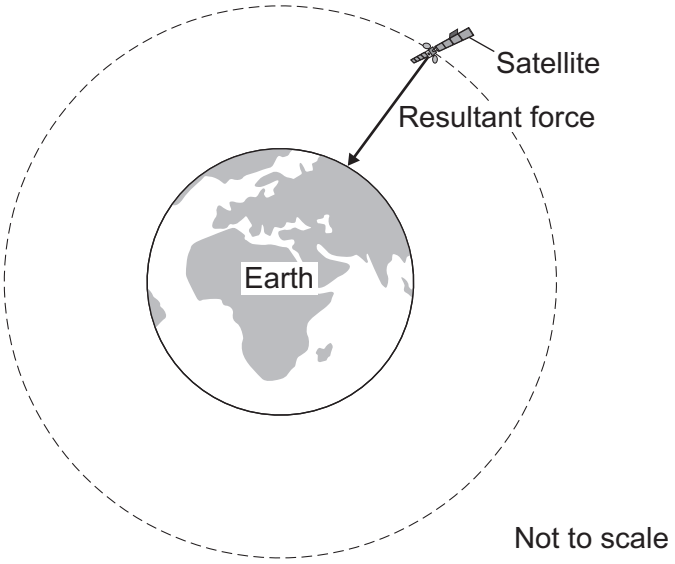
.....

.....

7

**8** Man-made satellites can orbit the Earth, as shown in **Figure 14**.

**Figure 14**




The satellite experiences a resultant force directed towards the centre of the orbit.

The resultant force is called the centripetal force.

**8 (a)** What provides the centripetal force on the satellite?

**[1 mark]**

.....

**8 (b)** State **two** factors that determine the size of the centripetal force on the satellite.

**[2 marks]**

1 .....

2 .....

**8 (c)** **Table 4** gives data for five different satellites orbiting the Earth.

**Table 4**

| Satellite | Average height above Earth's surface in kilometres | Time taken to orbit Earth once in minutes | Mass of satellite in kilograms |
|---|---|---|---|
| **A** | 370 | 93 | 419 000 |
| **B** | 697 | 99 | 280 |
| **C** | 827 | 103 | 630 |
| **D** | 5 900 | 228 | 400 |
| **E** | 35 800 | 1440 | 2 030 |

**8 (c) (i)** State the relationship, if any, between the height of the satellite above the Earth's surface and the time taken for the satellite to orbit the Earth once.

**[1 mark]**

.....

.....

**8 (c) (ii)** State the relationship, if any, between the time taken for the satellite to orbit the Earth once and the satellite's mass.

**[1 mark]**

.....

.....

**Question 8 continues on the next page**

**8 (d)** Over 300 years ago, the famous scientist Isaac Newton proposed, with a 'thought experiment', the idea of satellites.

Newton suggested that if an object was fired at the right speed from the top of a high mountain, it would circle the Earth.

Why did many people accept Isaac Newton's idea as being possible?

Tick (✓) **one** box.

**[1 mark]**

Isaac Newton was a respected scientist who had made new discoveries before. ☐

Isaac Newton went to university. ☐

It was a new idea that nobody else had thought of before. ☐

6

**9 (a)** **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

There are two types of traditional transformer; step-up and step-down.

Describe the similarities and differences between a step-up transformer and a step-down transformer.

You should include details of:

- construction, including materials used
- the effect the transformer has on the input potential difference (p.d.).

You should **not** draw a diagram.

**[6 marks]**

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Extra space .....

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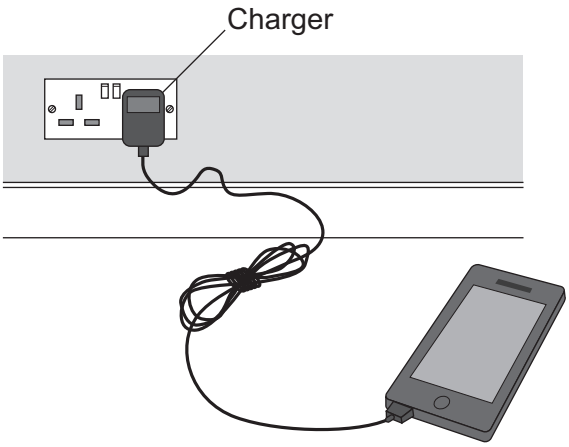
**Question 9 continues on the next page**

**9 (b)** **Figure 15** shows a mobile phone and charger.

**Figure 15**




Mobile phone chargers use a different type of transformer, which is smaller and lighter than a traditional transformer.

What name is given to the type of transformer used in a mobile phone charger?

**[1 mark]**

.....

7

**END OF QUESTIONS**