



General Certificate of Secondary Education  
2011

Centre Number

71

Candidate Number

## Science: Double Award (Non-Modular)

Paper 3  
Foundation Tier

[G8403]



WEDNESDAY 25 MAY, MORNING

### TIME

1 hour 30 minutes.

### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.  
Answer **all fifteen** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 110.

Quality of written communication will be assessed in  
Question **15(c)(i)**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Details of calculations should be shown.

Units must be stated in numerical answers where appropriate.

For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

Total  
Marks



- 1 The table gives a list of renewable and non-renewable energy sources. For each source tick (✓) the box to show whether it is renewable or non-renewable. The first one has been done for you.

Energy source	Renewable	Non-renewable
Nuclear		✓
Wind		
Biomass		
Coal		
Hydroelectric		

[4]

- 2 A football travelling through the air has two main types of energy.



Ground

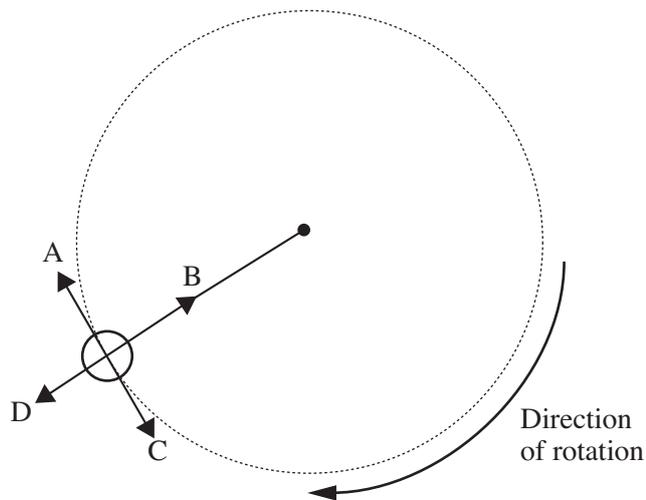
- (i) What are these two types of energy?

\_\_\_\_\_ energy and \_\_\_\_\_ energy. [2]

- (ii) When the ball hits the ground some of its energy is changed into sound energy and some into another type of energy. What is this other type of energy?

\_\_\_\_\_ energy. [1]

- 3 The diagram shows a bird's eye view of a conker being whirled in a horizontal circle.



Four directions, A, B, C and D are shown on the diagram.

- (i) Which letter A, B, C or D gives the direction of the force which keeps the conker moving in a circle?

Letter \_\_\_\_\_ [1]

- (ii) Which letter A, B, C or D gives the direction of the conker's velocity at the position shown?

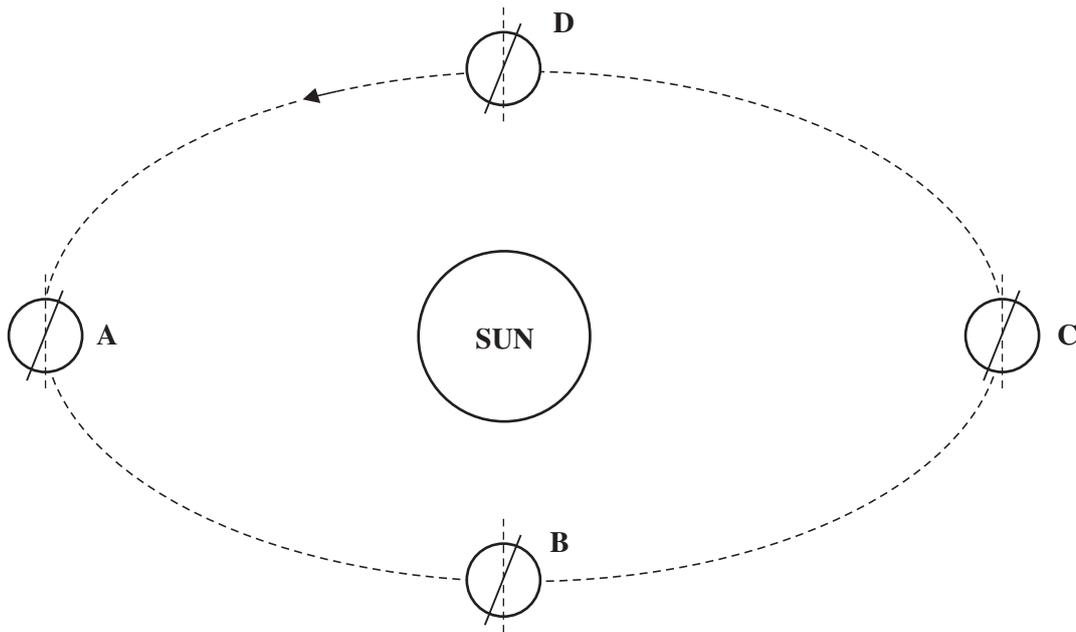
Letter \_\_\_\_\_ [1]

- (iii) In which direction A, B, C or D will the conker move if the string breaks?

Letter \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

4 The orbit of the Earth round the Sun is shown in the following diagram.



(a) (i) In which position **A**, **B**, **C** or **D** is winter experienced in the Northern hemisphere?

\_\_\_\_\_ [1]

(ii) Give a reason for your answer to (i).

\_\_\_\_\_ [1]

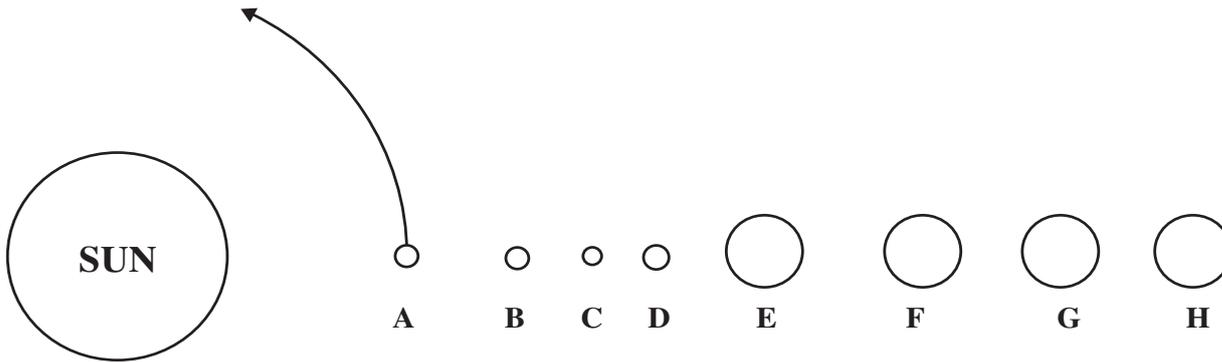
(b) Shade the part of the Earth that is in darkness in position **A**. [1]

(c) What is the name of the force which causes the Earth to orbit the Sun?

Force is called \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

5 Below is a diagram of the Solar System. It is not to scale.



(a) Name planets **B** and **H**.

**B** \_\_\_\_\_ **H** \_\_\_\_\_ [2]

(b) Draw a curved arrow to indicate the direction of motion of planet **C** round the Sun. [1]

Planet **A** has a “year” equal to 88 days and a “day” equal to 58.6 days.

(c) (i) What does planet **A** do every 88 days?

\_\_\_\_\_ [1]

(ii) What does planet **A** do every 58.6 days?

\_\_\_\_\_ [1]

(d) The above diagram shows the present model of the Solar System. What scientific theory existed before the Sun-centred model?

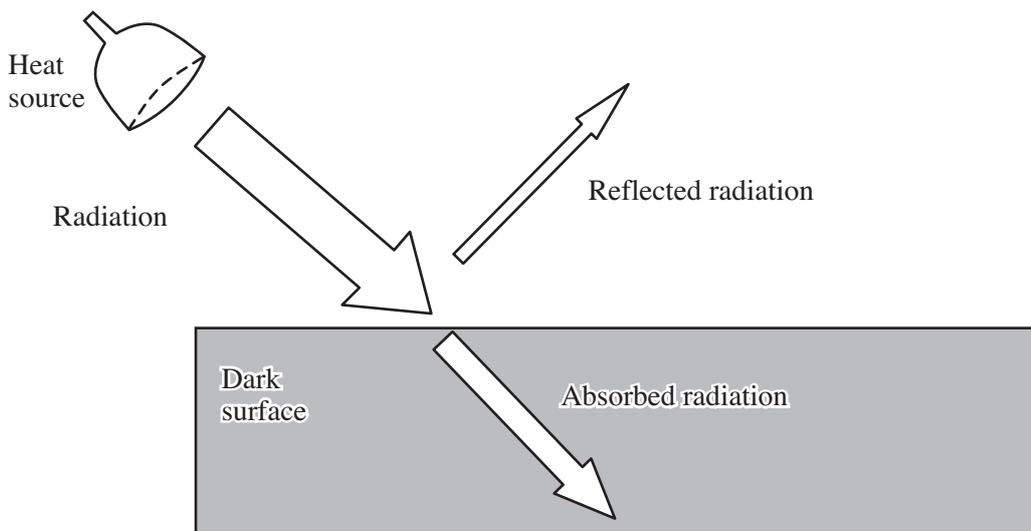
\_\_\_\_\_ [1]

(e) Our Sun is a member of a galaxy. What is the name of this galaxy?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

- 6 The following diagram shows radiation from a hot object striking a dark surface.



37% of the radiation is reflected.

- (a) What percentage of radiation is absorbed by the dark surface?

\_\_\_\_\_ % [1]

- (b) How would the percentage of reflected radiation change if the dark surface were replaced by a light coloured surface of the same material?

\_\_\_\_\_ [1]

- (c) Underground hot water pipes are often insulated to prevent heat loss.

- (i) Name a suitable material for insulating the water pipes.

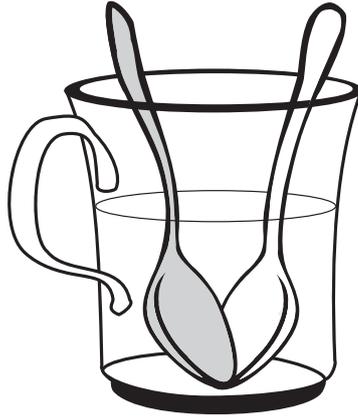
\_\_\_\_\_ [1]

- (ii) Why is this material suitable?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

7 Coffee can be stirred with a metal spoon or a plastic spoon.



(a) Name the method of heat transfer through these spoons.

\_\_\_\_\_ [1]

(b) Which particles are mainly responsible for the transfer of heat along the metal spoon?

\_\_\_\_\_ [1]

(c) Describe how heat passes through the plastic spoon.

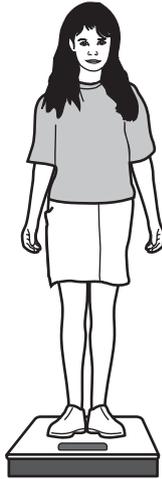
\_\_\_\_\_  
 \_\_\_\_\_ [2]

(d) How can heat loss from the top surface of a cup of coffee be reduced?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

- 8 Beth stands on a set of bathroom scales which gives a reading of 82 kg.



- (i) What is Beth's weight?

Weight = \_\_\_\_\_ N [1]

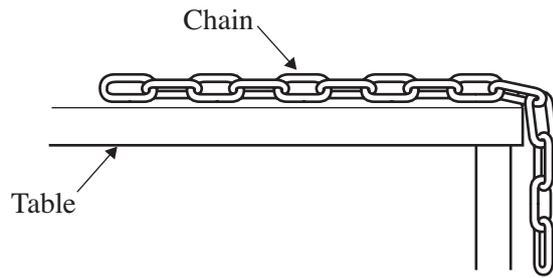
The total area of Beth's feet in contact with the bathroom scales is  $164 \text{ cm}^2$ .

- (ii) Calculate the pressure Beth exerts on the bathroom scales.  
Remember to include the unit.  
**You are advised to show your working out.**

Pressure = \_\_\_\_\_ [4]

Examiner Only	
Marks	Remark
○	○

- 9 A chain hangs at rest over the edge of a table. The links hanging over the edge produce a force which tries to pull the chain off the table.



- (a) What is the name of the force trying to pull the chain off the table?

Name of force \_\_\_\_\_ [1]

The chain remains at rest because another force is acting.

- (b) (i) What is the name of this force?

Name of force \_\_\_\_\_ [1]

- (ii) What is the direction of the force? Circle the correct direction.

Force is to the right

Force is downwards

Force is to the left

Force is upwards

[1]

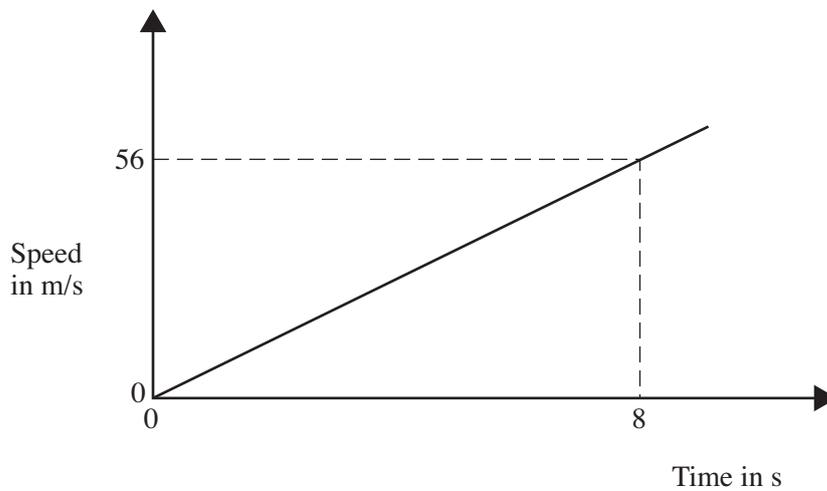
The total weight of the links hanging over the edge of the table is 0.8N.

- (c) What is the size of the force you have named in (b)(i)?

Force = \_\_\_\_\_ N [1]

Examiner Only	
Marks	Remark
○	○

- 10 The following graph of speed against time shows the movement of a racing car as it starts from rest.



What is the acceleration of the car?  
**You are advised to show your working out.**

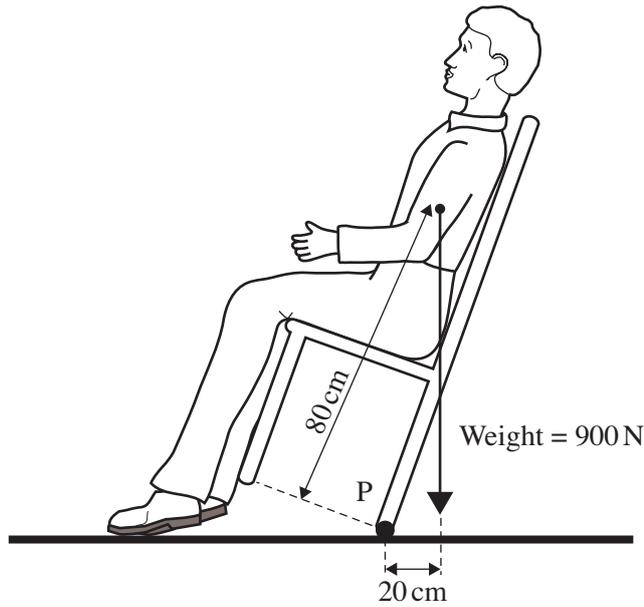
Acceleration = \_\_\_\_\_  $\text{m/s}^2$  [3]

- 11 A fork lift truck is used to lift a load of 500 N to a height of 3 m.  
 How much work is done in lifting the load?  
 Remember to include the unit.  
**You are advised to show your working out.**

Work done = \_\_\_\_\_ [4]

Examiner Only	
Marks	Remark
○	○
○	○

12 Roy leans back in his chair as shown.



Roy's weight of 900 N produces a moment about the point P which tends to tip him over.

- (i) What is the direction of the moment caused by Roy's weight about the point P?

\_\_\_\_\_ [1]

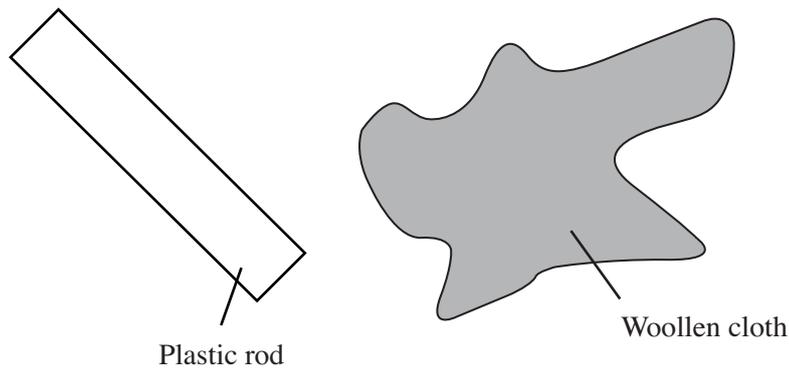
Two distances are shown on the diagram.

- (ii) Choose the correct distance and calculate this moment about point P.  
**You are advised to show your working out.**

Moment = \_\_\_\_\_ Ncm [3]

Examiner Only	
Marks	Remark
○	○

- 13 (a) When insulators are rubbed together static electricity is produced. A plastic rod becomes negatively charged when it is rubbed with a woollen cloth.



- (i) What charged particles move from the woollen cloth to the plastic rod?

\_\_\_\_\_ [1]

- (ii) What charge is left on the woollen cloth?

\_\_\_\_\_ [1]

- (b) Before a racing car is refuelled, a conducting metal strip is connected between the car and the ground. This is called “earthing”.



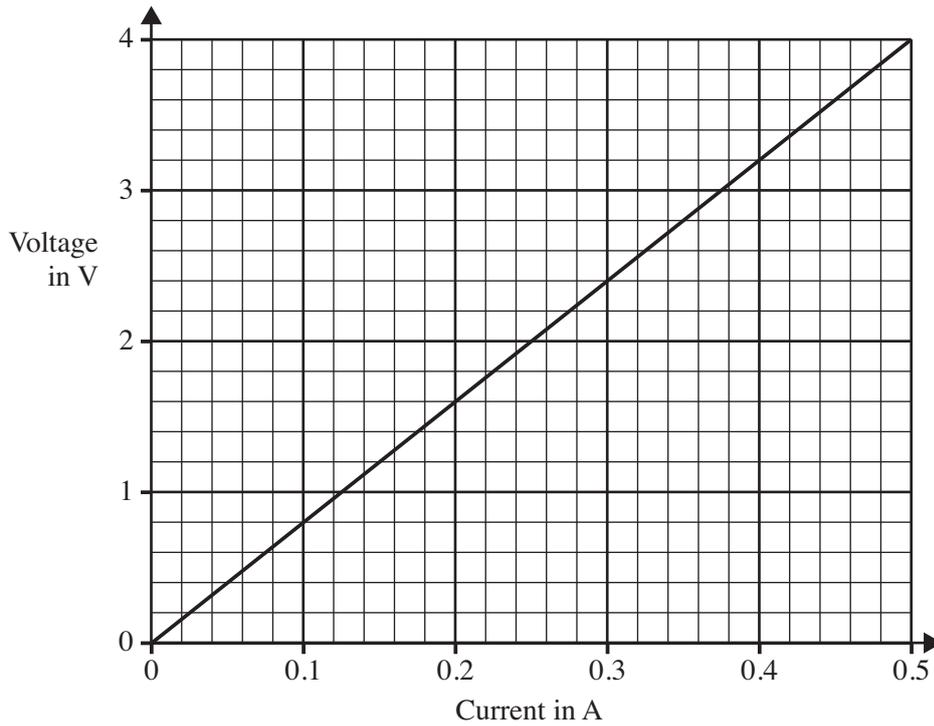
© Toyota Motorsport GmbH

Explain why it is essential to earth the racing car when refuelling.

\_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark
○	○

(c) A pupil plots a graph of voltage against current for a metal wire.



- (i) What is the voltage across the wire when the current flowing through it is 0.3 A?

\_\_\_\_\_ V [1]

- (ii) Calculate the resistance of the wire when the current is 0.5A.

**You are advised to show your working out.**

Resistance = \_\_\_\_\_  $\Omega$  [3]

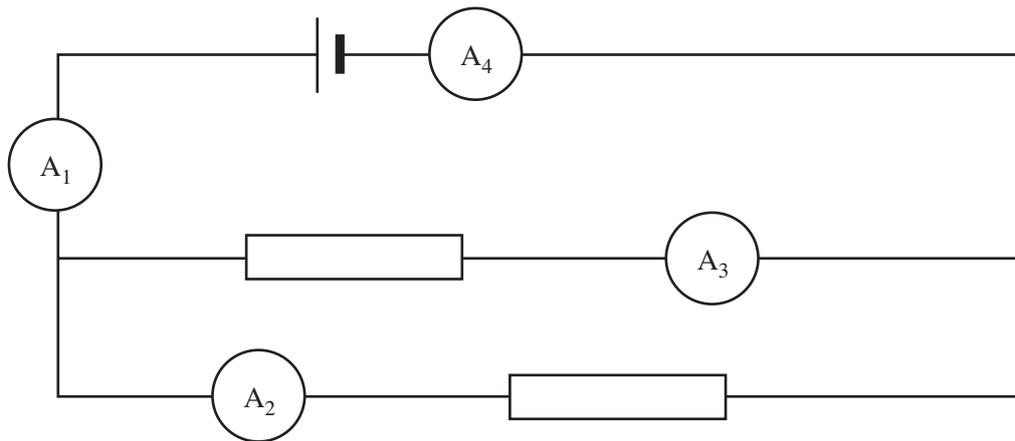
- (iii) Which two features of the graph show that the voltage is directly proportional to the current?

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

- (d) A pupil sets up the following circuit to measure currents through **identical** resistors.



Ammeter A<sub>1</sub> reads 40 mA. What are the readings on the other ammeters?

(i) Ammeter A<sub>2</sub> reads \_\_\_\_\_ mA

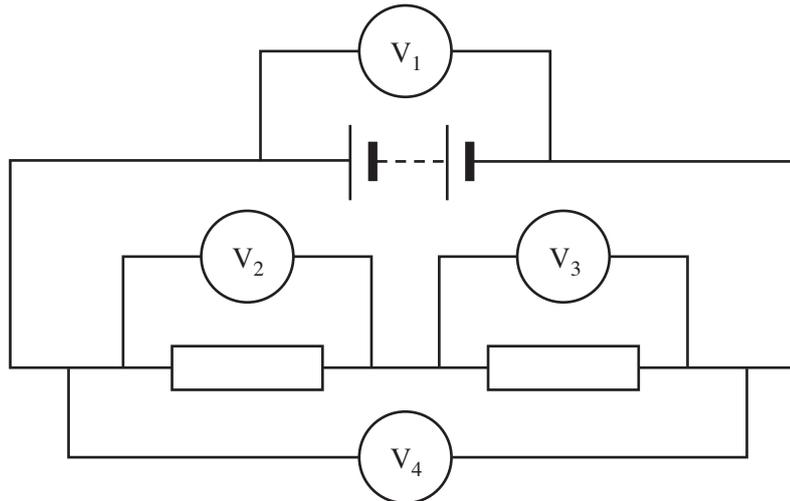
(ii) Ammeter A<sub>3</sub> reads \_\_\_\_\_ mA

(iii) Ammeter A<sub>4</sub> reads \_\_\_\_\_ mA

[3]

Examiner Only	
Marks	Remark

(e) The pupil now measures voltages across **identical** resistors.



Voltmeter  $V_1$  reads 8.0 volts. What are the readings on the other voltmeters?

- (i) Voltmeter  $V_2$  reads \_\_\_\_\_ V
- (ii) Voltmeter  $V_3$  reads \_\_\_\_\_ V
- (iii) Voltmeter  $V_4$  reads \_\_\_\_\_ V [3]

- (f) (i) The power of a vacuum cleaner is 1.25 kW.  
Calculate the number of units of electrical energy in kWh used by the vacuum cleaner in 2 hours.

**You are advised to show your working out.**

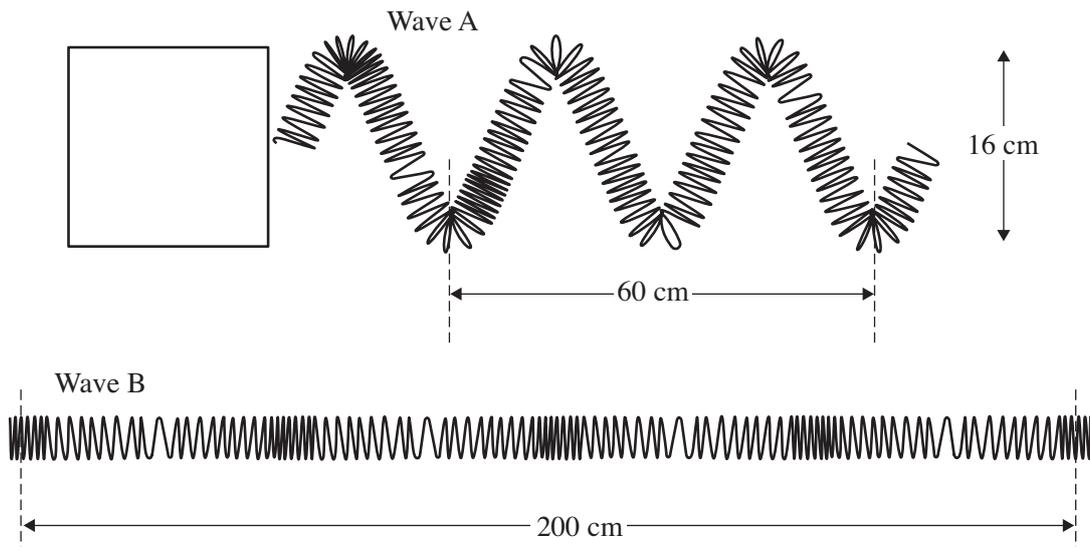
Energy used = \_\_\_\_\_ kWh [3]

- (ii) How much does it cost to operate the vacuum cleaner for 2 hours if 1 unit of electricity costs 12p?

Cost = \_\_\_\_\_ p [1]

Examiner Only	
Marks	Remark

14 (a) A stretched slinky spring can be used to demonstrate waves.



(i) What do both waves transfer as they move from left to right?

\_\_\_\_\_ [1]

(ii) In the box to the left of wave A indicate the direction of vibration of a particle in the spring. [1]

(iii) What types of wave are A and B?

Wave A \_\_\_\_\_ Wave B \_\_\_\_\_ [2]

(iv) What is the wavelength of wave A?

\_\_\_\_\_ cm [1]

(v) What is the wavelength of wave B?

\_\_\_\_\_ cm [1]

(vi) What is the amplitude of wave A?

\_\_\_\_\_ cm [1]

Examiner Only	
Marks	Remark
○	○

The end of wave B vibrates 40 times in 10 seconds.

(vii) How many times does the end of wave B vibrate in one second?

\_\_\_\_\_ [1]

(viii) What is the frequency of vibration of wave B?

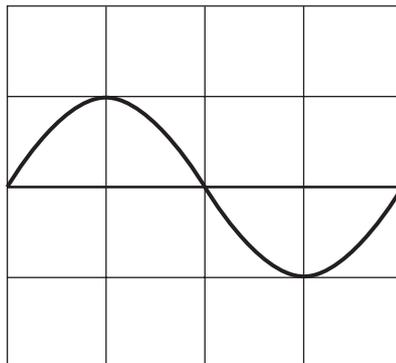
\_\_\_\_\_ Hz [1]

(b) A wave has a frequency of 6 Hz and a wavelength of 0.4 m.  
Calculate the speed of the wave.

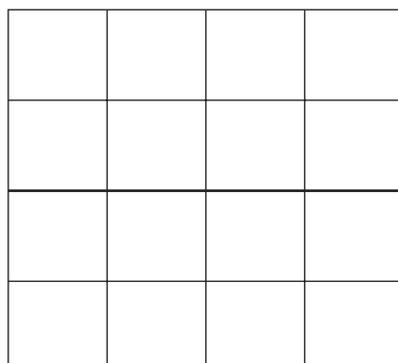
**You are advised to show your working out.**

Speed = \_\_\_\_\_ m/s [3]

(c) The sound wave produced by a tuning fork is displayed on a CRO.



In the space below draw the sound wave produced by a tuning fork of greater loudness and the same frequency.



[2]

Examiner Only	
Marks	Remark

(d) For each statement tick (✓) the box to show whether it is true or false.

Statement	Examiner Only	
	Marks	Remark
Sound and light travel at the same speed in air.		
Light can travel through a vacuum.		
Sound is a longitudinal wave motion.		

[3]

(e) (i) What damage can a long exposure to loud sound cause to the ears?

\_\_\_\_\_ [1]

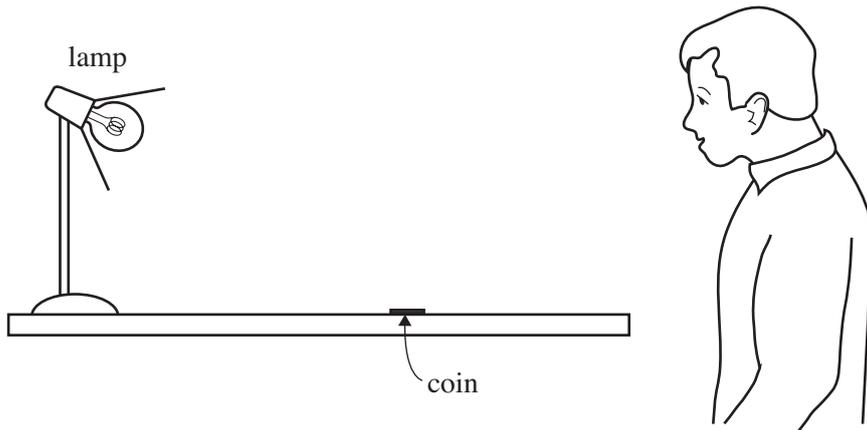
(ii) What precaution can people who operate very noisy machines take to reduce damage to their ears?

\_\_\_\_\_ [1]

(iii) What happens to the upper frequency limit of hearing with increasing age?

\_\_\_\_\_ [1]

15 John observes a coin sitting on a table.



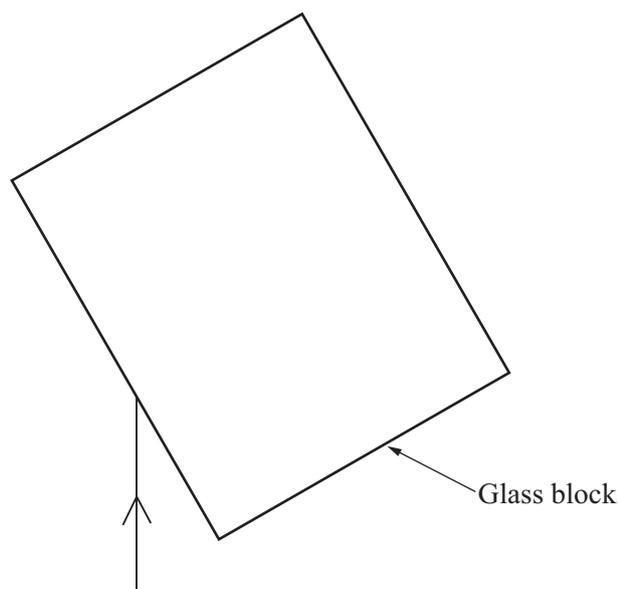
Examiner Only	
Marks	Remark
○	○

(a) (i) Draw an incident ray and a reflected ray to show how John sees the coin. Include an arrow to show the direction of the light. [3]

(ii) John sees the coin because of reflected light. Other objects are seen by the light they emit. Give an example of an object seen because of the light it emits.

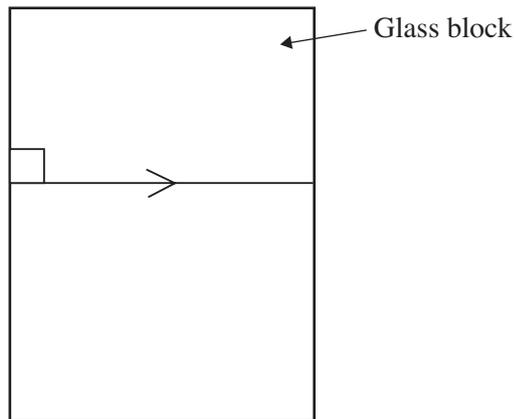
Name of object \_\_\_\_\_ [1]

A ray of light travels from air into glass. The incident ray is shown.



(b) (i) Draw in the normal and show the refracted ray inside the glass. [3]

- (ii) Draw in the incident ray which produces the ray inside the glass block as illustrated below.



[1]

- (iii) Choose the correct statement below to show what happens to light when it travels from air into glass. Tick (✓) the correct box.

The light travels faster in glass than in the air.

The light travels at the same speed in air and glass.

The light travels faster in air than in glass.

[1]

- (c) (i) Explain fully the meaning of the term **dispersion**.

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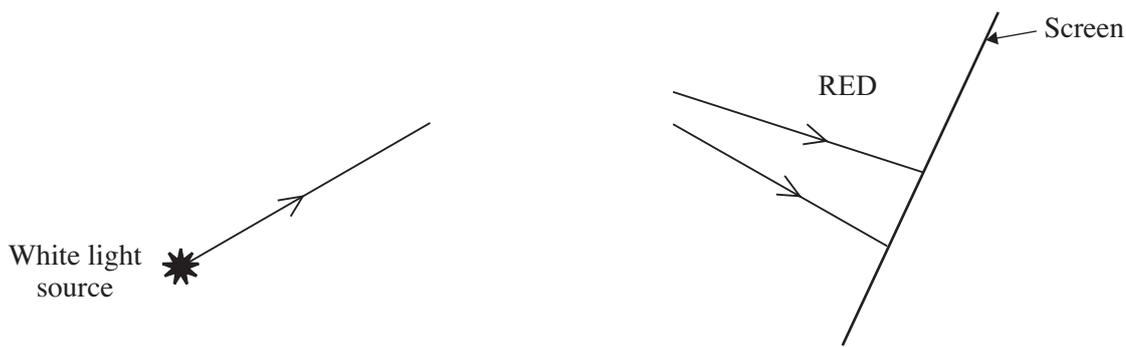
[2]

Quality of written communication

[1]

Examiner Only	
Marks	Remark

The diagram shows part of an arrangement which is used to demonstrate dispersion.



(ii) What piece of apparatus is missing?

\_\_\_\_\_ [1]

(iii) What is the name of the band of colours produced on the screen?

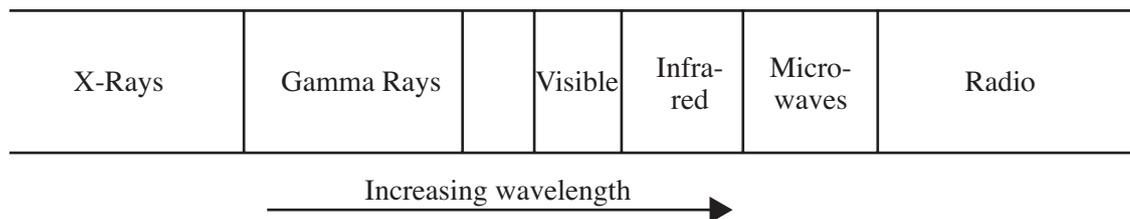
\_\_\_\_\_ [1]

(iv) State the colours, in order, starting with red in the diagram above.

Red, \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

Freda attempts to list the parts of the electromagnetic spectrum in order of increasing wavelength. However, one part is missing and another two parts have been interchanged.



**(d) (i)** Which part is missing?

\_\_\_\_\_ [1]

**(ii)** Which two parts have been interchanged?

\_\_\_\_\_ and \_\_\_\_\_ [1]

Different parts of the spectrum have different uses. Identify the following parts from the information given.

**(e) (i)** This part is used to check for broken bones.

\_\_\_\_\_ [1]

**(ii)** This part is used in communication when two people wave to each other.

\_\_\_\_\_ [1]

**(iii)** This part is emitted from hot bodies.

\_\_\_\_\_ [1]

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THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark



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