Write your name here

Surname	Other names

Edexcel Certificate
Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics

Unit: KPH0/4PH0
Paper: 2P

Wednesday 16 January 2013 – Afternoon
Time: 1 hour

Paper Reference
KPH0/2P
4PH0/2P

Materials required for examination.
Ruler, calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 3 3 3 0 A 0 1 2 4

PEARSON

EQUATIONS

You may find the following equations useful.

energy transferred = current × voltage × time $E = I \times V \times t$

pressure × volume = constant $p_1 \times V_1 = p_2 \times V_2$

$$\text{frequency} = \frac{1}{\text{time period}} \qquad f = \frac{1}{T}$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2 \times \pi \times r}{T}$$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant} \qquad \frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time taken}}$$

Where necessary, assume the acceleration of free fall, $g = 10\ \text{m/s}^2$.

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Answer ALL questions.

1 There are different types of ionising radiation.

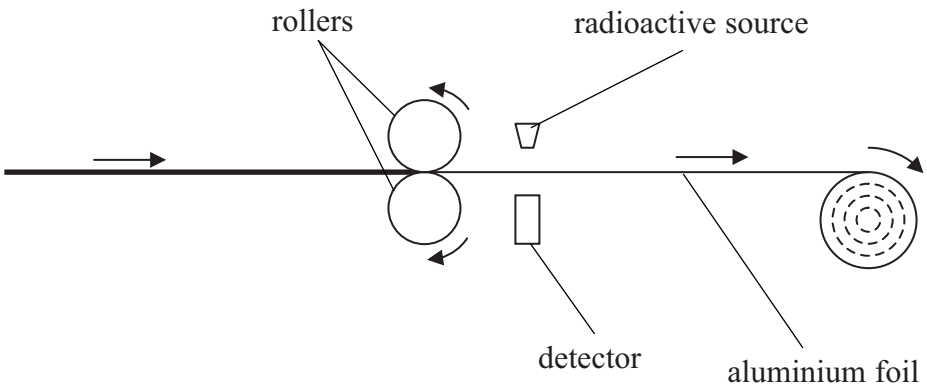
(a) Complete the table to show the properties of each type.

(2)

Type of ionising radiation	Charge	Emitted by
alpha particle		unstable nuclei
beta particle	– 1	unstable nuclei
gamma ray	0	

(b) The diagram shows a machine which makes aluminium foil.

The machine uses a radioactive source to measure the thickness of the foil.



The radioactive source emits beta particles.

The output from the detector indicates the thickness of the foil.

Explain why beta particles are used, rather than alpha particles or gamma rays.

(3)

(c) The radioactive source contains strontium-90.

A strontium-90 nucleus emits a beta (β^-) particle.

(i) Complete the equation to show how strontium-90 decays.

(1)

$$^{90}_{38}\text{Sr} \longrightarrow \text{.....}\,\text{Y} + {}^{0}_{-1}\beta^-$$

(ii) Which of these describes what happens to the strontium-90 nucleus when it emits a beta (β^-) particle?

(1)

☒ **A** the number of protons stays the same

☒ **B** the number of protons increases

☒ **C** the number of neutrons stays the same

☒ **D** the number of neutrons increases

(Total for Question 1 = 7 marks)

2 A coal-fired power station and a wind turbine both produce electrical power.

The power station produces 1200 MW and the wind turbine produces 1.5 MW.

(a) Give **one** advantage of using wind turbines instead of a coal-fired power station to produce electricity.

(1)

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(b) Coal-fired power stations are still in general use.

Explain why wind turbines have not replaced them.

(4)

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(Total for Question 2 = 5 marks)

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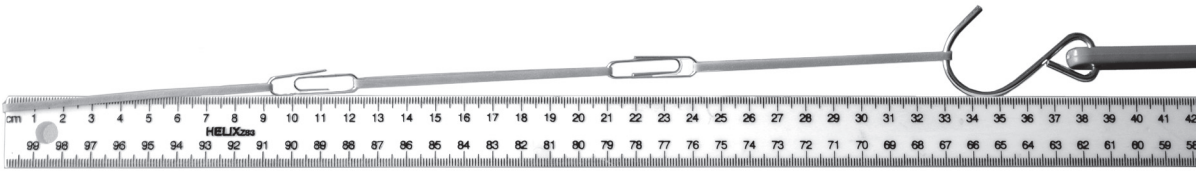
3 A student makes chains of elastic bands by joining them together with paperclips.

He uses a newtonmeter to stretch each chain along a metre rule, as shown in photograph **A**.



Photograph A

For each chain, he records

- the number of elastic bands
- the length when the tension is 2 N
- the length when the tension is 1 N

Then he calculates the difference in length for each chain.

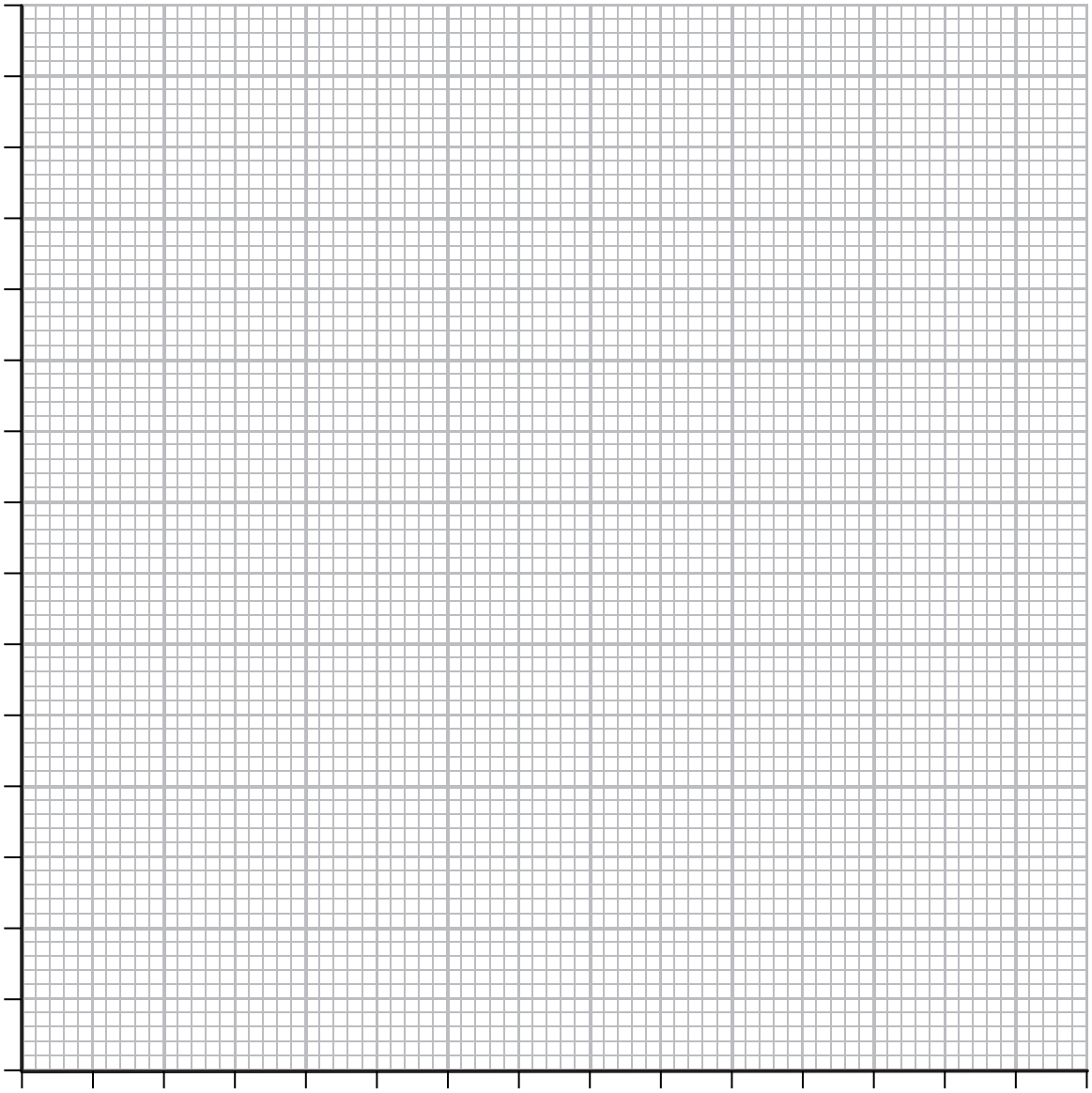
(a) (i) Complete the table by calculating the missing value.

(1)

Number of elastic bands	Length in cm		Difference in length in cm
	When tension = 2 N	When tension = 1 N	
1	8.1	7.5	0.6
2	20.2	18.2	2.0
3	31.7	29.3	2.4
4	43.7	40.3	3.4
5	56.3	51.6	4.7
6	67.6	62.5	

(ii) Use the grid to plot a graph to show the relationship between the number of elastic bands and the difference in length.

(5)



(iii) Describe your line of best fit.

(2)

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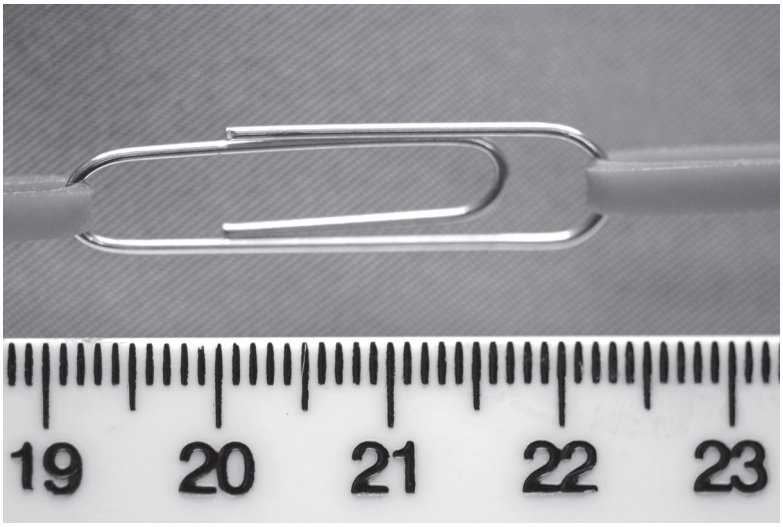
(b) Photograph **B** shows a paperclip in one of the chains against the same metre rule.



Photograph B

Use photograph **B** to estimate the length of this paperclip.

(2)

Length = ... cm

(c) Look again at photograph **A**.

Suggest two ways that the student could improve his measuring technique.

(2)

1 .....

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2 .....

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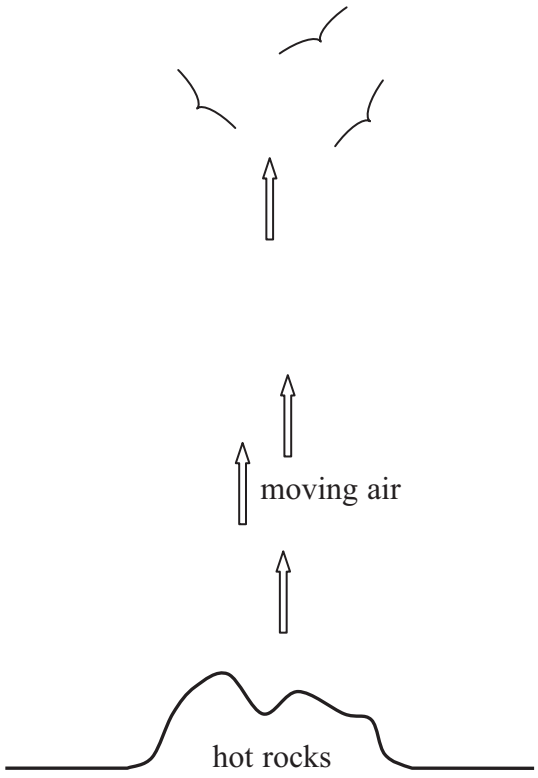
(Total for Question 3 = 12 marks)

4 On sunny days, birds can use a column of moving air to help them rise.

The diagram shows one of these air columns rising from hot rocks.



Describe how the process of convection causes this air movement.

(3)

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(Total for Question 4 = 3 marks)

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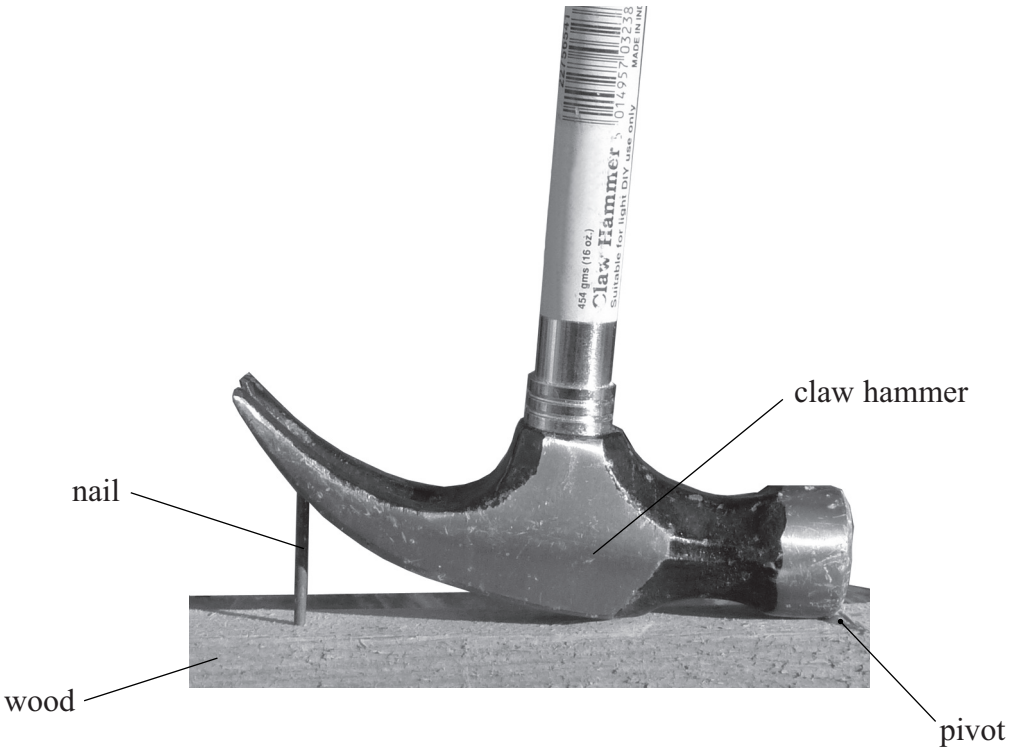
5 Photograph **C** shows how a student can use a claw hammer to pull a nail from a piece of wood.



Photograph C

(a) The mass of the hammer is 0.454 kg.

(i) Calculate the weight of the hammer.

(2)

Weight = ... N

(ii) From what point does this weight act?

(1)

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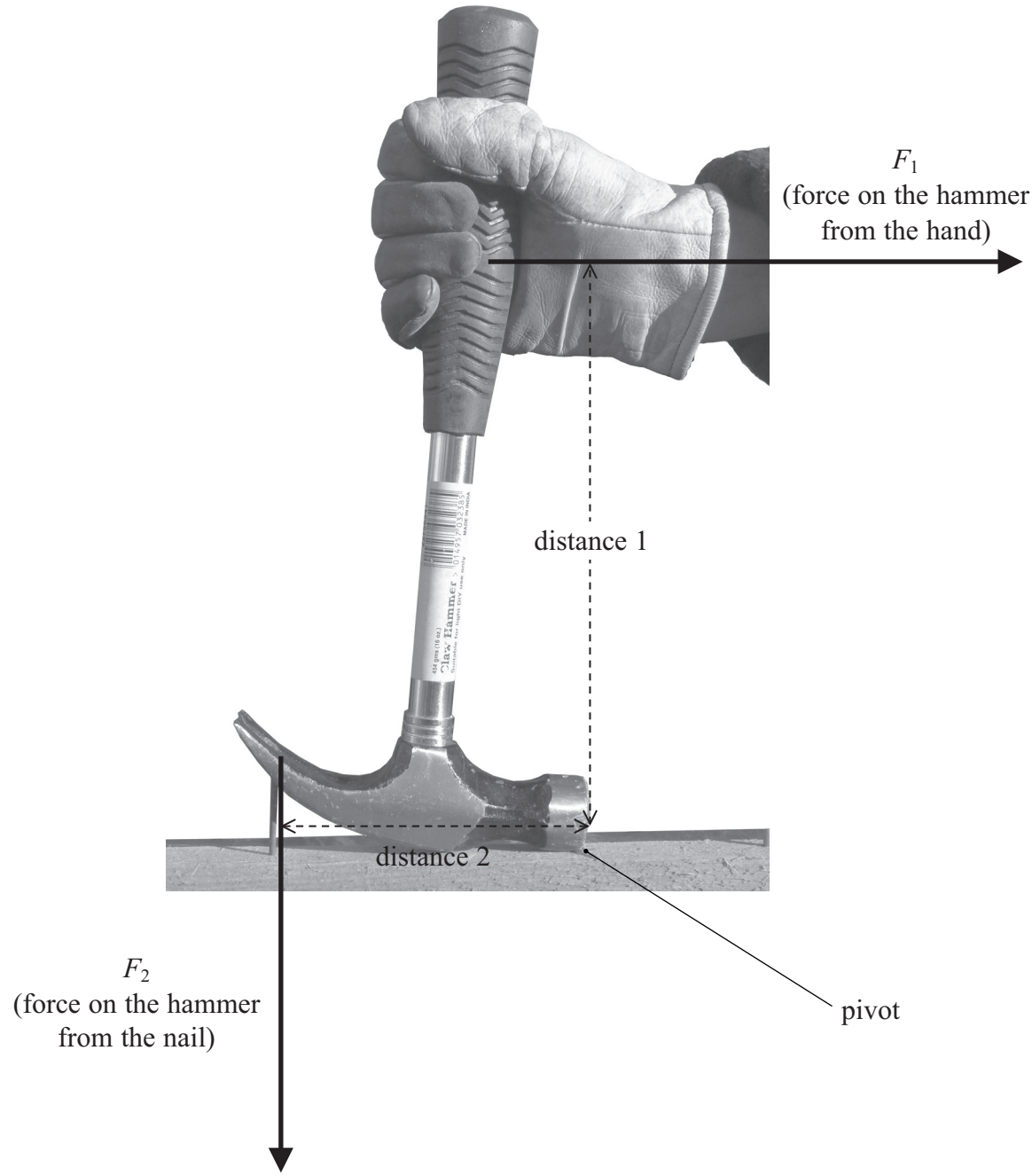
(b) Photograph **D** shows the directions of two other forces on the hammer.



Photograph D

(i) Draw an arrow on photograph **D** to show the force on the nail from the hammer.

(2)

(ii) Suggest **two** ways that the student could increase the moment on the hammer.

(2)

1 .....

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2 .....

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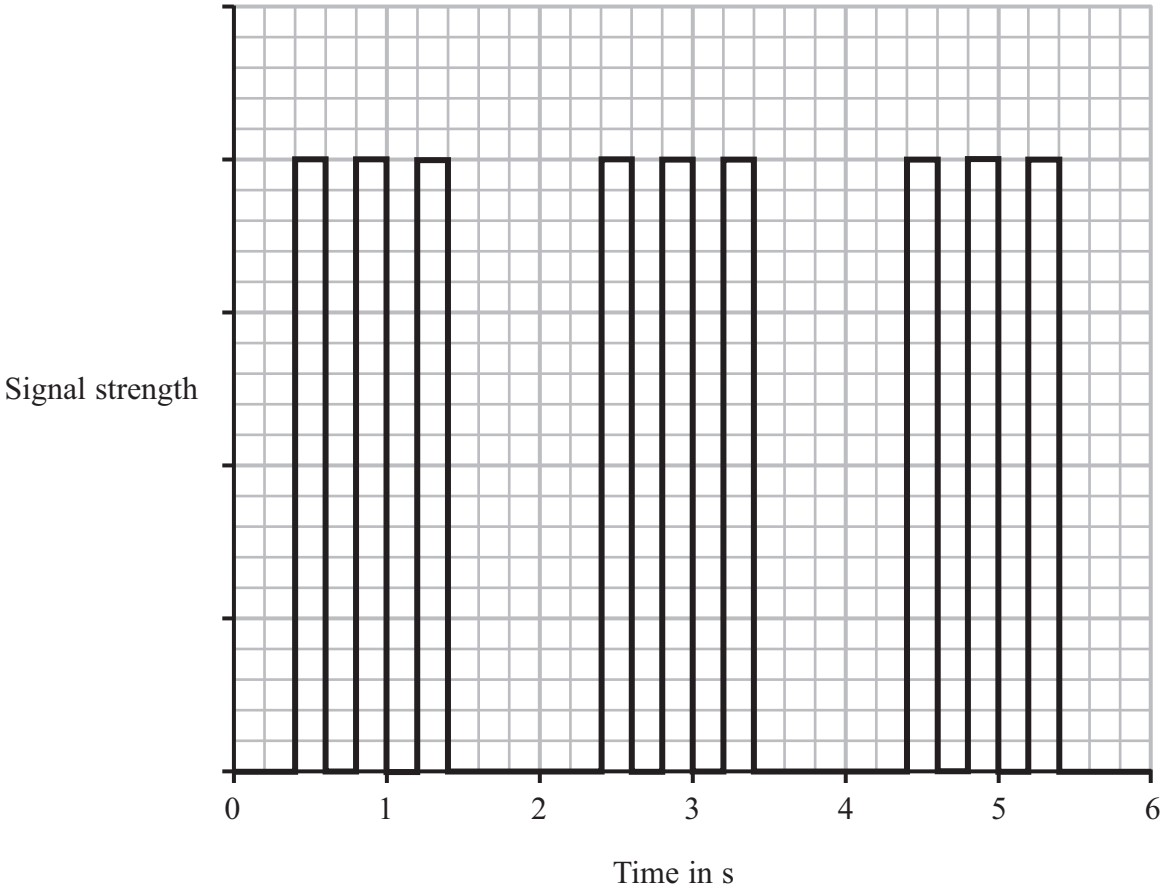
(Total for Question 5 = 7 marks)

6 In 1901, Marconi received the first radio signal across the Atlantic Ocean.

The signal was the letter S in Morse code (three 'dots') sent over and over again.

Each letter S was produced by quickly turning an electric spark on and off three times.

The graph shows how the strength of the signal changed with time.



(a) (i) The graph shows a digital signal.

Explain what is meant by a digital signal.

(2)

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(ii) Suggest **two** ways that this signal could be made to carry more information.

(2)

1 .....

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2 .....

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(b) The frequency of Marconi's radio wave was 820 kHz and the wavelength was 366 m.

(i) State the equation linking wave speed, frequency and wavelength for radio waves.

(1)

(ii) Calculate the speed of the radio waves Marconi received.

(2)

Speed of radio waves = ... m/s

(c) Some people do not believe that Marconi received 820 kHz radio waves.

They think that the frequency was really twice as much: 1640 kHz.

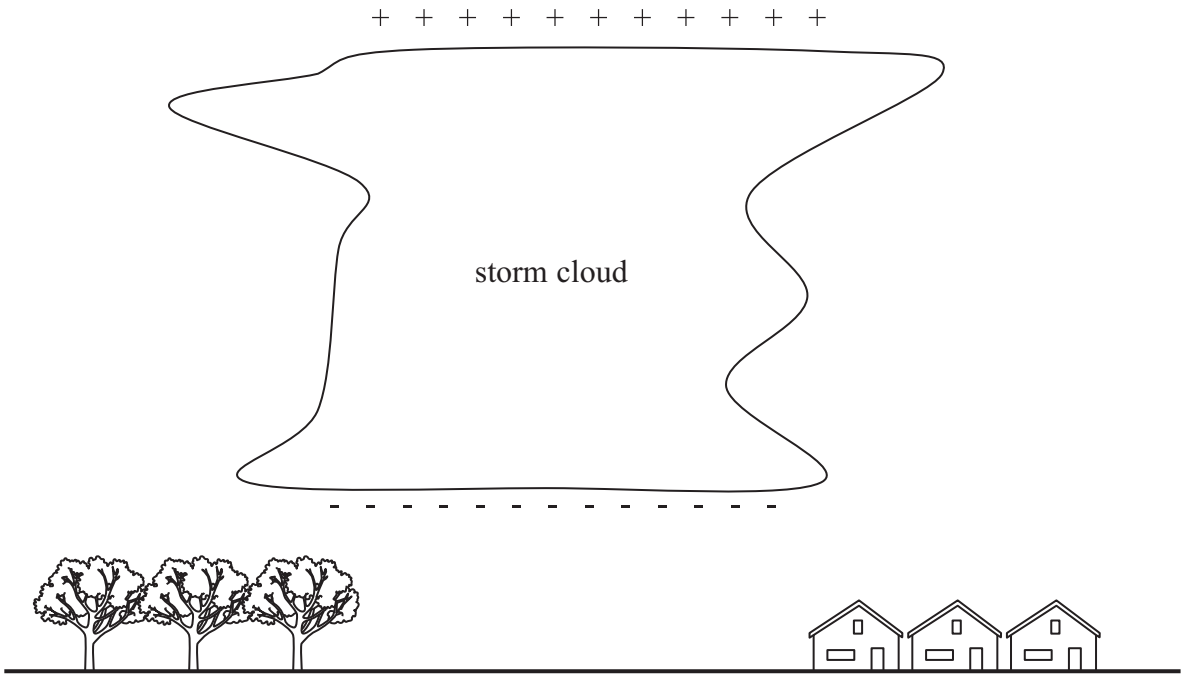
If these people are correct, what wavelength radio waves did Marconi receive?

(1)

Wavelength = ... m

(d) Other people do not think Marconi received a radio signal across the Atlantic Ocean at all.

They think the radio waves he received were really caused by electrostatic discharges from storm clouds.



Explain what happens when a storm cloud discharges.

(3)

(Total for Question 6 = 11 marks)

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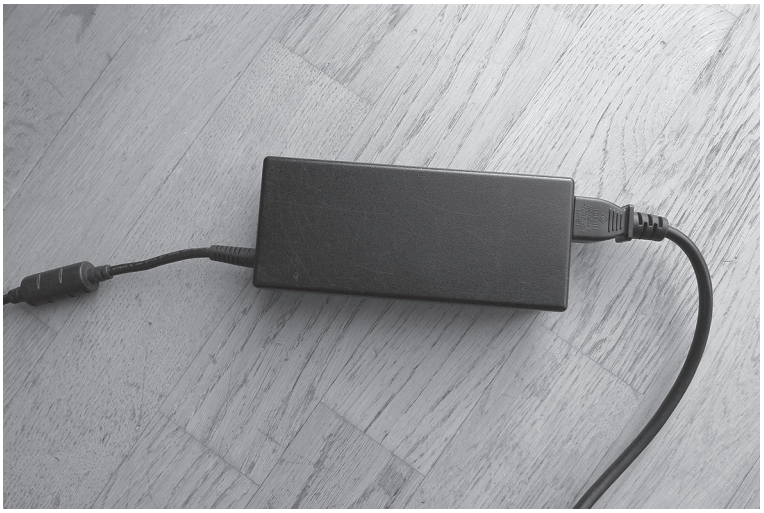
7 A laptop battery charger contains a step-down transformer.



(a) The number of turns on the primary coil of a step-down transformer is

(1)

- ☒ **A** the same as the number of secondary turns
- ☒ **B** more than the number of secondary turns
- ☒ **C** less than the number of secondary turns
- ☒ **D** zero

(b) This transformer is designed to reduce the voltage from 230 V to 12 V.

The primary current is 0.25 A.

(i) State the equation linking primary voltage, primary current, secondary voltage and secondary current for a transformer.

(1)

(ii) Calculate the secondary current, assuming that the transformer is 100% efficient.

(2)

Secondary current = ... A

(c) A student notices that the charger becomes warm when it is working.

Suggest how this will affect the output of the transformer.

(2)

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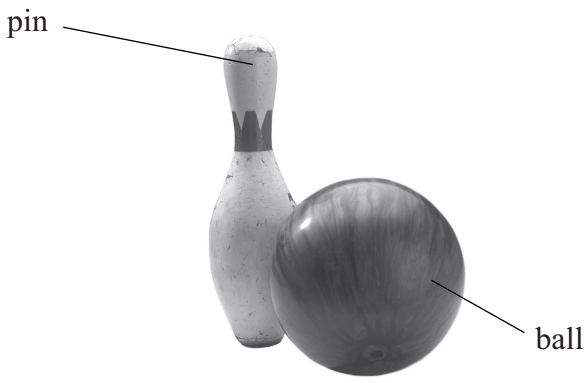
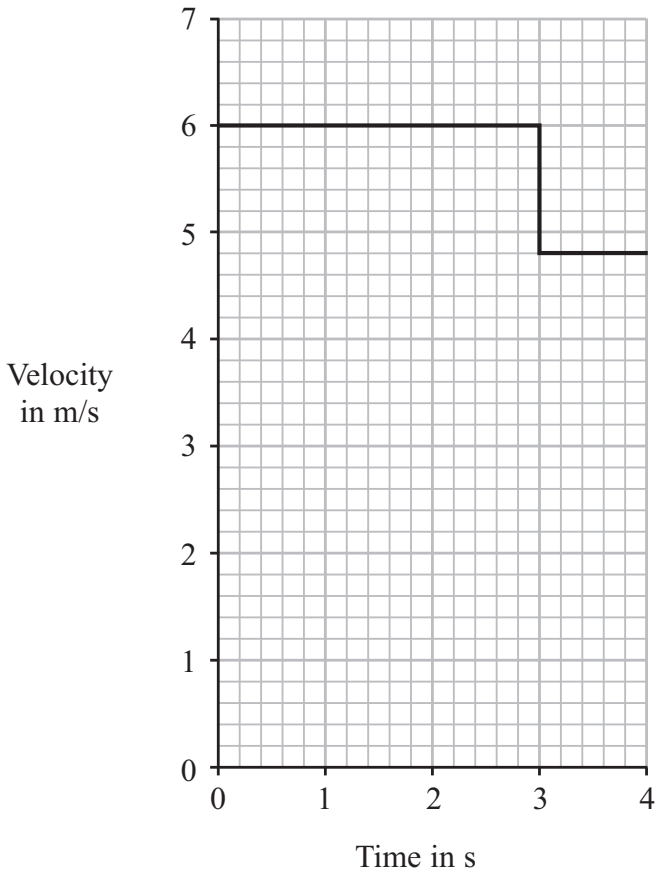
(Total for Question 7 = 6 marks)

8 A bowling ball rolls for 3 s and hits a pin.



The graph shows how the velocity of the ball changes with time.



(a) How can the graph be used to find the distance that the ball rolls before it hits the pin?

(1)

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(b) The mass of the ball is 6.4 kg.

(i) State the equation linking momentum, mass and velocity.

(1)

(ii) Calculate the momentum of the ball before it hits the pin.
Give the unit.

(3)

Momentum = ... Unit .....

(c) (i) What is the velocity of the ball after it hits the pin?

(1)

Velocity = ... m/s

(ii) After the collision, the ball and the pin have the same velocity.

Calculate the mass of the pin.

(3)

Mass = ... kg

(Total for Question 8 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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