CCEA GCSE DOUBLE AWARD SCIENCE

SCIENCE



EXAM QUESTION PACK

PHYSICS UNIT P2 FOUNDATION TIER GSD61 PAPERS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Foundation Tier

GSD61

[GSD61]

MONDAY 20 JUNE, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

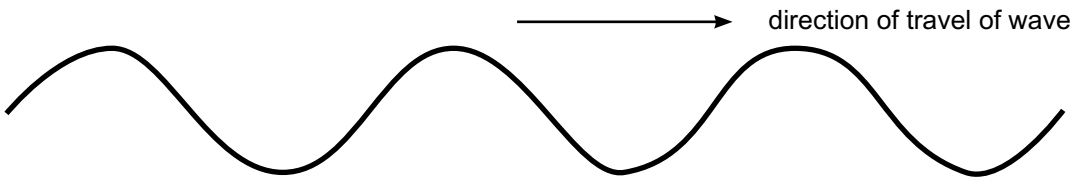
INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9(b)**.

10043

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1 A child jumps into a swimming pool and creates a series of waves.



(a) What do the waves transfer as they cross the pool?

_____ [1]

(b) Describe the movement of the water particles.

_____ [1]

(c) Which **one** of the following words best describes a water wave?
Circle the correct answer.

Longitudinal Transverse Ultrasound

[1]

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2 Some members of the electromagnetic spectrum are missing from the following list.

Gamma rays	X-rays			Infrared rays		Radio

(a) Fill in the missing radiations. [3]

(b) Which radiation shown in the list has the longest wavelength?

_____ [1]

(c) State **one** danger of infrared radiation and **one** danger of gamma rays.

Infrared: _____

Gamma: _____ [2]

(d) State **one** use of X-rays.

_____ [1]

(e) From the list below, select **three** properties of all electromagnetic waves.
Tick (✔) the correct boxes.

Transverse ☐

Cannot travel in a vacuum ☐

Travel in a vacuum ☐

Can all be reflected ☐

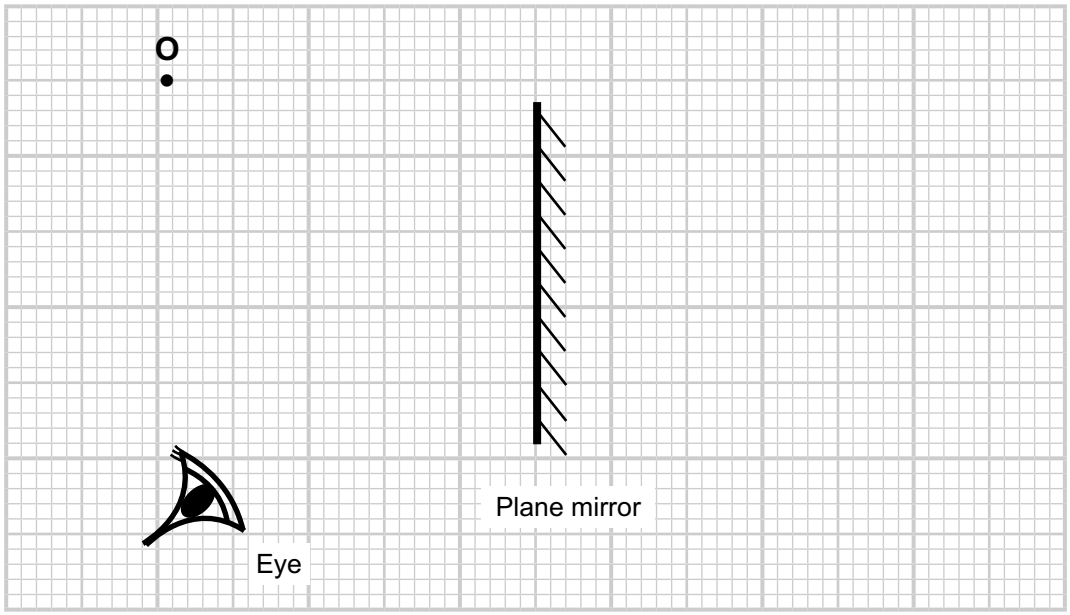
Longitudinal ☐

[3]

[Turn over

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3 Jamie looks at an image in a plane mirror.



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(a) Draw an incident ray and a reflected ray to show how the image of point **O** is viewed by the eye in the mirror. Draw arrows on your rays. [4]

(b) State **three** properties of the image in a plane mirror.

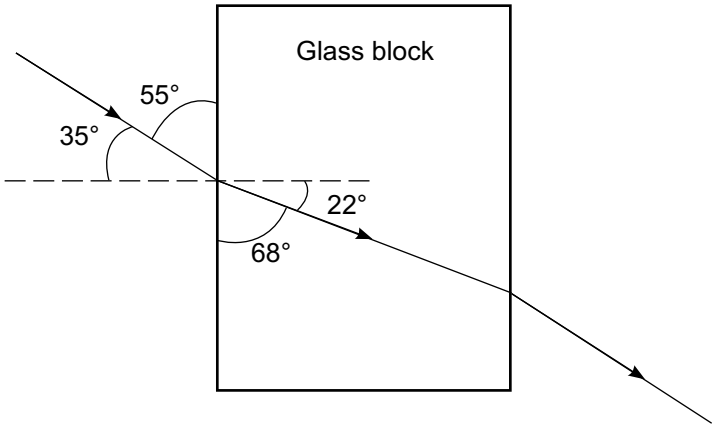
1. _____

2. _____

3. _____ [3]

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(c) Jamie sends a ray of light through a glass block.



(i) What is the angle of incidence?

_____ ° [1]

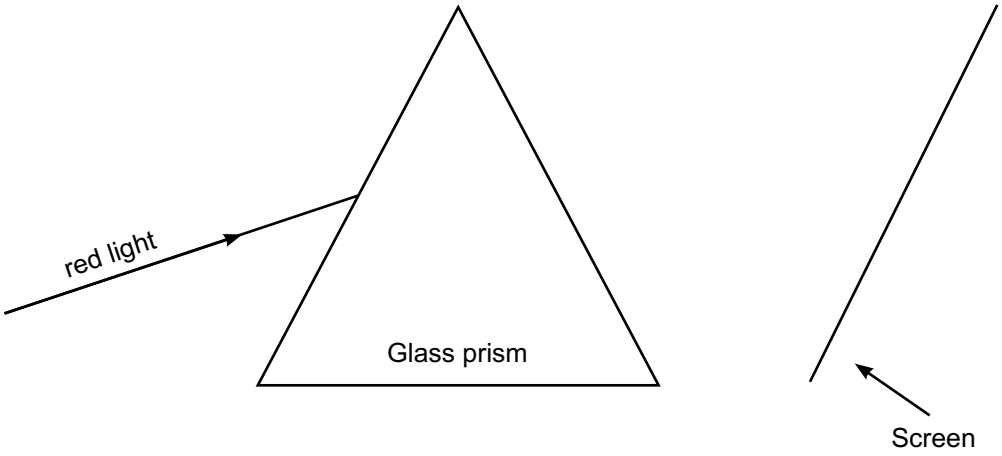
(ii) What is the angle of refraction of the light ray in the glass block?

_____ ° [1]

[Turn over

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(d) A ray of red light enters a glass prism.



Continue the ray through the glass prism to the screen. [2]

(e) When white light passes through a glass prism it splits into its component colours.
What is this process called?

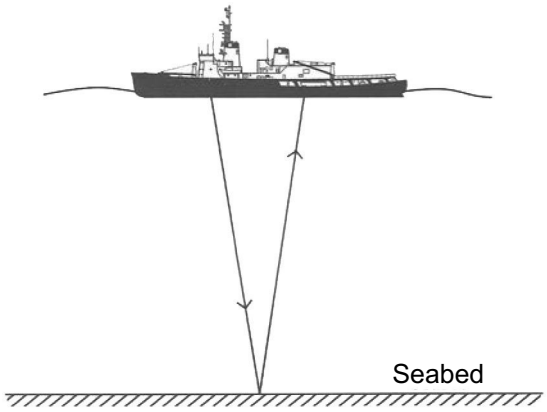
_____ [1]

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4 Ultrasound waves are used by fishing trawlers.

(a) A ship sends out a pulse of ultrasound waves and detects the reflection from the seabed 1.6 s later. The depth of the seabed is 1200 m.
Calculate the speed of ultrasound waves in water.

You are advised to show your working out.



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Speed = _____ m/s [4]

(b) **(i)** State an industrial use of ultrasound waves.

_____ [1]

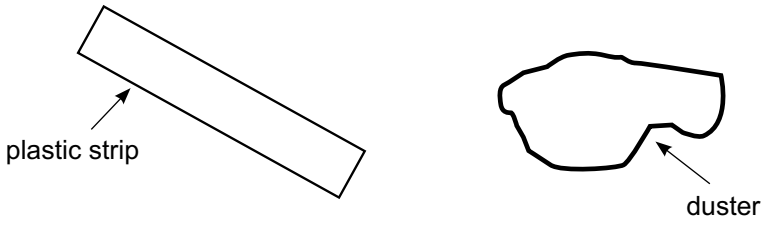
(ii) State a medical use of ultrasound waves.

_____ [1]

[Turn over

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5 George rubs a plastic strip with a duster and the strip becomes **positively** charged.



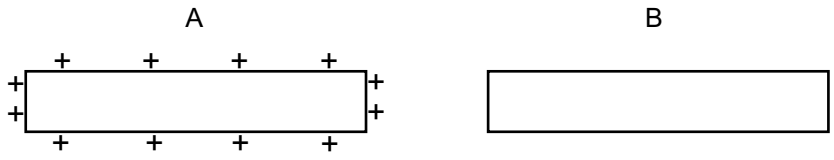
(a) (i) Choose words from the list to complete the sentence below.

protons duster electrons neutrons plastic

_____ move from the _____ to the _____

[3]

The positively charged plastic strip, A, is now brought up to, but not touching, a second **uncharged** plastic strip, B.



(ii) Use + (positive) and – (negative) to show how the charges are arranged on strip B. Insert a charge at each end of B. [2]

(iii) How would you describe the force, if any, between the two strips? Choose from the statements below by placing a tick (✔) in the correct box.

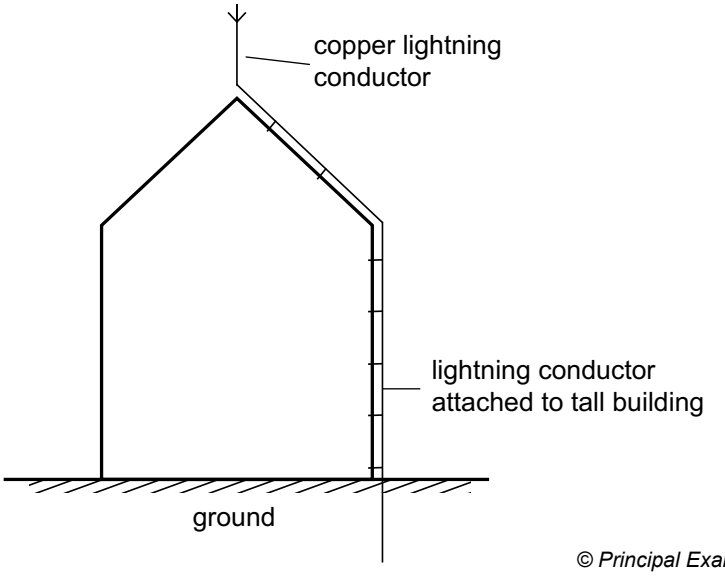
The strips attract ☐

No force is exerted ☐

The strips repel ☐ [1]

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Tall buildings such as churches often have a lightning conductor fitted.



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(b) (i) Describe fully what could happen if a lightning conductor was **not** fitted.

_____

_____ [2]

(ii) Describe how the lightning conductor works if lightning strikes.

_____

_____ [2]

Current electricity is really the flow of charge.

(c) (i) Write an equation in the box connecting current, I, charge Q, and time t.

[1]

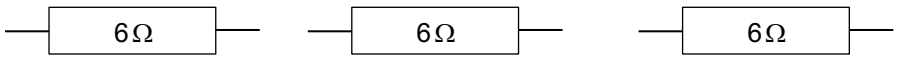
(ii) What unit do we use for the charge, Q?

Write the word _____ [1]

[Turn over

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6 You are given three identical 6 Ω resistors.



(a) In each box below draw an arrangement of resistors to produce the resistance shown in the box. You may use **two or three** resistors in each case.

(i) 12 Ω

(ii) 18 Ω

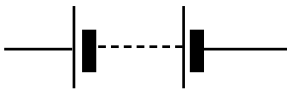
(iii) 3 Ω

(iv) 9 Ω

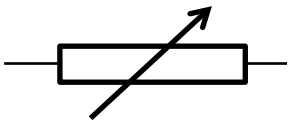
[4]

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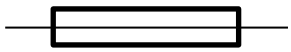
(b) Electrical symbols are used to draw electric circuits. Identify each of the following symbols.



_____



_____



_____ [3]

A current of 200 mA flows through a bulb of resistance 4 Ω.
Remember 1 mA = 0.001A.

(c) Calculate the voltage across the bulb.

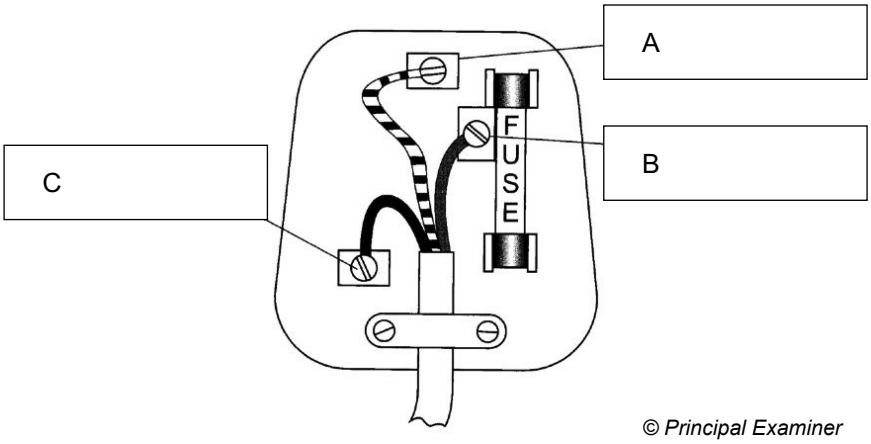
You are advised to show your working out.

Voltage = _____ V [4]

[Turn over

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7 An electric plug is shown.



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(a) (i) In the boxes, A, B and C label the terminals live, neutral or earth. [3]

The plug is attached to an appliance which uses a current of 6 A.

(ii) What current flows in the wire connected to

the live terminal? current = _____ A

the neutral terminal? current = _____ A

the earth terminal? current = _____ A [3]

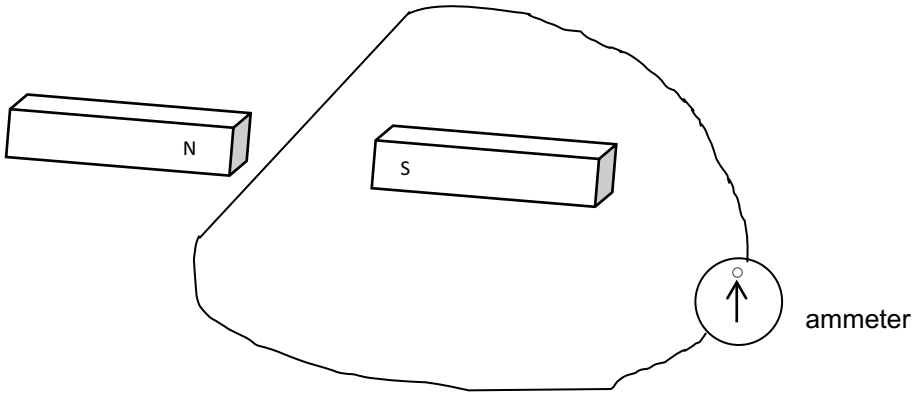
(b) An appliance rated at 840 W is connected to the mains electricity supply of 240 V.

Calculate the current flowing through the appliance.

You are advised to show your working out.

Current = _____ A [3]

8 The arrangement below is set up in a school laboratory. The wire is held stationary between the poles of the magnet.



(a) (i) Explain why the reading on the ammeter is zero, when the wire is stationary.

_____ [1]

(ii) Describe how to get a deflection while keeping the wire stationary.

_____ [1]

Two types of electric current are a.c. and d.c.

(b) (i) Describe a.c.

_____

_____ [2]

(ii) Name a piece of apparatus which produces a.c.

_____ [1]

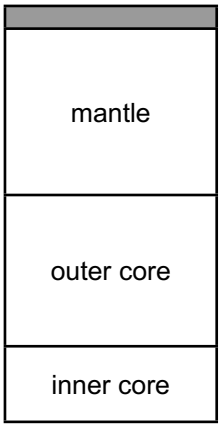
(iii) What type of current **cannot** be used in a transformer?

_____ [1]

[Turn over

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9 The diagram shows a cross section of the Earth.



(a) (i) Name a section which is completely liquid.

Answer _____ [1]

(ii) Name a section which is part solid and part liquid.

Answer _____ [1]

(iii) Name the shaded layer in the diagram above.

Answer _____ [1]

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(b) Describe how a star is formed.

Your answer should include

- the main element involved at the start;
- the force involved;
- a full description of the process.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

[Turn over

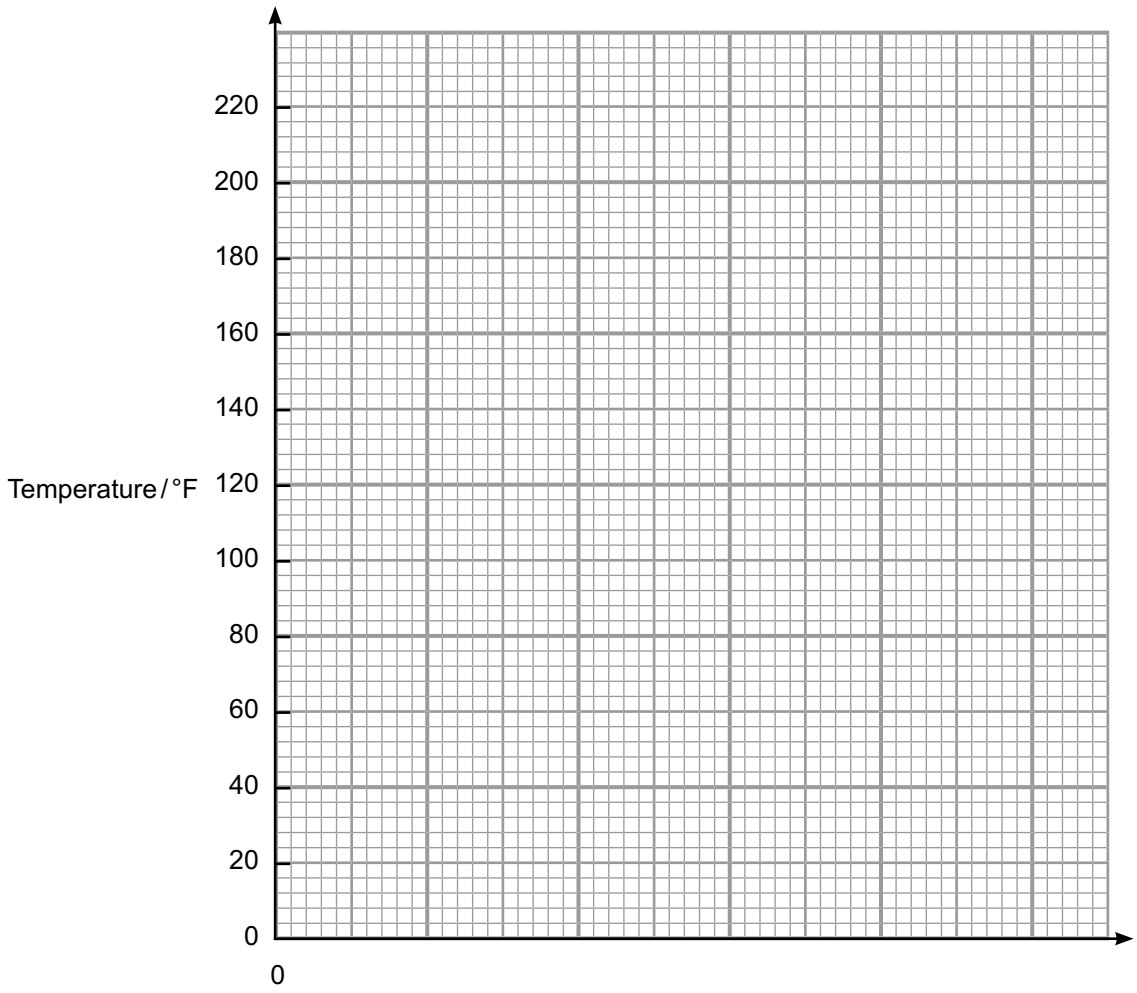
10 Temperature is measured in degrees Celsius (°C). An older temperature scale is called Fahrenheit (°F).

The table below gives temperatures in °C and the corresponding temperatures in °F.

Temp/°C	0	20	40	60	80	100
Temp/°F	32	68	104	140	176	212

The two temperature scales are related.

You are asked to plot a graph of temperature in Fahrenheit against temperature in Celsius.



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(i) Choose a suitable scale for the horizontal axis and label it. [2]

(ii) Plot the points on the grid. [2]

(iii) Draw the best fit line. [1]

Use your graph to answer the following questions:

(iv) The intercept on the vertical axis gives the temperature of melting ice. What is this temperature in °C?

Temperature of melting ice _____ °C [1]

(v) A type of alcohol boils at 194 °F. What is this temperature in °C?

_____ °C [1]

(vi) Calculate the gradient of your graph.

Remember to include the unit.

You are advised to show your working out.

Gradient = _____ [3]

Unit = _____ [1]

(vii) Does your graph show direct proportion? _____

Give a reason for your answer.

_____ [1]

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THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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2016

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Unit P2

Foundation Tier

[GSD61]

MONDAY 20 JUNE, MORNING

MARK SCHEME

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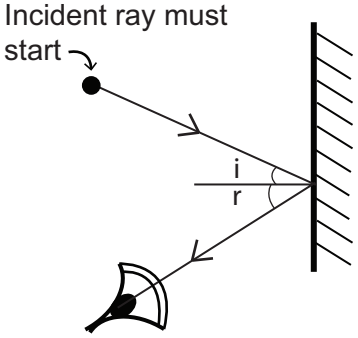
Subject-specific Instructions

In numerical problems, the marks for the intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the final correct answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote correct units for intermediate numerical quantities.

Note that this "correct answer" rule does not apply for formal proofs and derivations, which must be valid in all stages to obtain full credit.

Do not reward wrong physics. No credit is given for consistent substitution of numerical data, or subsequent arithmetic, **in a physically incorrect equation**. However, answers to subsequent stages of questions that are consistent with an earlier incorrect numerical answer, and are based on physically correct equation, must gain full credit. Designate this by writing **ECF** (Error Carried Forward) by your text marks.

The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer marks, but 10^n errors (e.g. writing 550 nm as 550×10^{-6} m) count only as arithmetical slips and lose the answer mark.

				AVAILABLE MARKS
1	**(a)**	Energy	[1]	
	(b)	Particles vibrate/(move) up and down/oscillate	[1]	
	(c)	Transverse	[1]	3
2	**(a)**	Ultraviolet rays, visible/light, micro(waves)	[3]	
	(b)	Radio	[1]	
	(c)	**Burning** [1] Cancer [1]	[2]	
	(d)	See **bones**/treat cancer	[1]	
	(e)	All transverse waves [1] travel through a vacuum [1] can all be reflected [1]	[3]	10
3	**(a)**	Incident ray must start  Mark independently { incident ray [1]; reflected ray [1]; correct arrow [1]; i = r [1] }	[4]	
	(b)	**Three** from: Same size **as object** [1] **virtual** [1] Erect/upright [1] **laterally inverted** [1] Same distance behind the mirror as the object is in front [1]	[3]	
	(c)	**(i)** 35°	[1]	
		(ii) 22°	[1]	
	(d)	Refraction in correct sense [1] Correct refraction for emergent ray [1] ← mark depends on first ray	[2]	
	(e)	Dispersion	[1]	12

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					AVAILABLE MARKS
4	**(a)**	Speed = distance/time [1] $= \frac{1200}{0.8}$ [1] or $\frac{2400}{1.6}$ [1] = 1500 m/s [1]		[4]	
	(b)	**(i)** Cleaning jewellery or electronics/detecting cracks		[1]	
		(ii) Scanning a child/breaking up kidney stones/breaking gallstones Scanning body organs, detecting tumours, detecting bones		[1]	6
5	**(a)**	**(i)** Electrons [1] Plastic [1] Duster [1]		[3]	
		(ii) – charge at LH end of B [1], + at RH end [1] Independent marking		[2]	
		(iii) The strips attract (✓)		[1]	
	(b)	**(i)** lightning/charge could **strike** the building [1] cause structural damage/injury/fire [1]	} Independent marking	[2]	
		(ii) (lightning conductor) to earth [1]	{ **conducts** charge [1] **conducts** current **conducts** electrons **conducts** electricity } Dependent marking	[2]	
	(c)	**(i)** I = Q/t or in words		[1]	
		(ii) coulomb		[1]	12
6	**(a)**	**(i)** 2 in series			
		(ii) 3 in series			
		(iii) 2 in parallel			
		(iv) 2 in parallel plus one in series		[4]	
	(b)	**battery** [1], variable resistor **or** Rheostat [1], fuse [1]		[3]	
	(c)	V = I R [1] = 0.2 × 4 [2] = 0.8 (V) [1]		[4]	11

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					AVAILABLE MARKS
7	**(a)**	**(i)**	A – earth [1] B – live [1] C – neutral [1]	[3]	
		(ii)	6 (A) 6 (A) 0 (A) [1] each	[3]	
	(b)		$I = \frac{P}{V}$ [1] or equivalent $= \frac{840}{240}$ [1] = 3.5 (A) [1]	[3]	9
8	**(a)**	**(i)**	No cutting of flux/No change in flux linkage/No field (line) cut	[1]	
		(ii)	Move magnets	[1]	
	(b)	**(i)**	(current) which changes direction [1] periodically [1] [dep. marking]	[2]	
		(ii)	(a.c.) generator/alternator/dynamo/transformer	[1]	
		(iii)	d.c. or direct	[1]	6
9	**(a)**	**(i)**	Outer core	[1]	
		(ii)	Mantle	[1]	
		(iii)	Crust Accept: Earth's crust	[1]	
	(b)		I.M. hydrogen [1] gravity [1] **or** gravitational coming **together** [1] **increase** in temp/density/pressure [1] $T \geqslant 1\,000\,000$ fusion [1] or fuse radiation (emitted)/light (emitted)/energy (emitted)/heat (emitted) [1] **or** EM waves	[6]	9

Response	**Marks**
Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]
Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms.	[3]–[4]
Candidates explain **1 or 2** of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

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				AVAILABLE MARKS
10	**(i)**	Scale at least half of axis [1] labelled with unit [1]	[2]	
	(ii)	5 points correctly plotted [2], 4 correct [1] ± 1 square	[2]	
	(iii)	Best fit line	[1]	
	(iv)	0 (°C)	[1]	
	(v)	90 (°C) Tolerance: ± 2 °C	[1]	
	(vi)	grad = rise /run (or alternative) [1] $= \frac{180}{100}$ [1] = 1.8 [1] allow 1.7 to 1.9 °F/°C [1]	[4]	
	(vii)	"No" is essential Does not pass through origin/(0,0)	[1]	12
			Total	**90**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015

Double Award Science: Physics

Unit P2

Foundation Tier

GSD61

[GSD61]

FRIDAY 12 JUNE, AFTERNOON

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

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You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9**.

24GSD6101

1 Static electricity can be very dangerous as well as being very useful.

(a) (i) State one danger of static electricity.

_____ [1]

(ii) State one use of static electricity.

_____ [1]

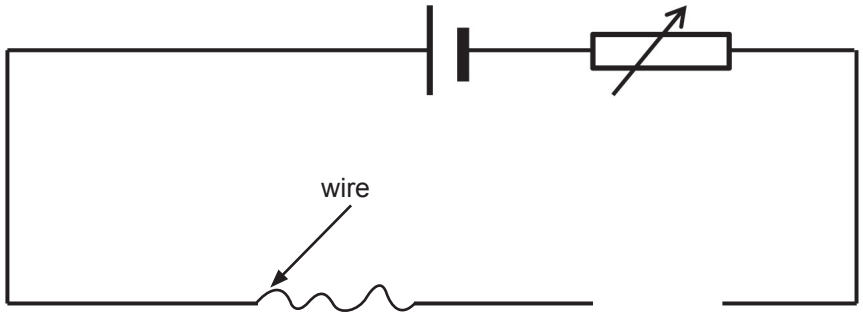
(b) A charge of 6 C passes through a resistor in 2 seconds.

What current passes through the resistor?

You are advised to show your working out.

Current = _____ A [3]

(c) Shauna sets up a circuit to find the resistance of a length of wire.



(i) Complete the circuit diagram by adding an ammeter and voltmeter to enable Shauna to calculate the resistance of the wire. [3]

(ii) What precaution should Shauna take to be sure her results are reliable?

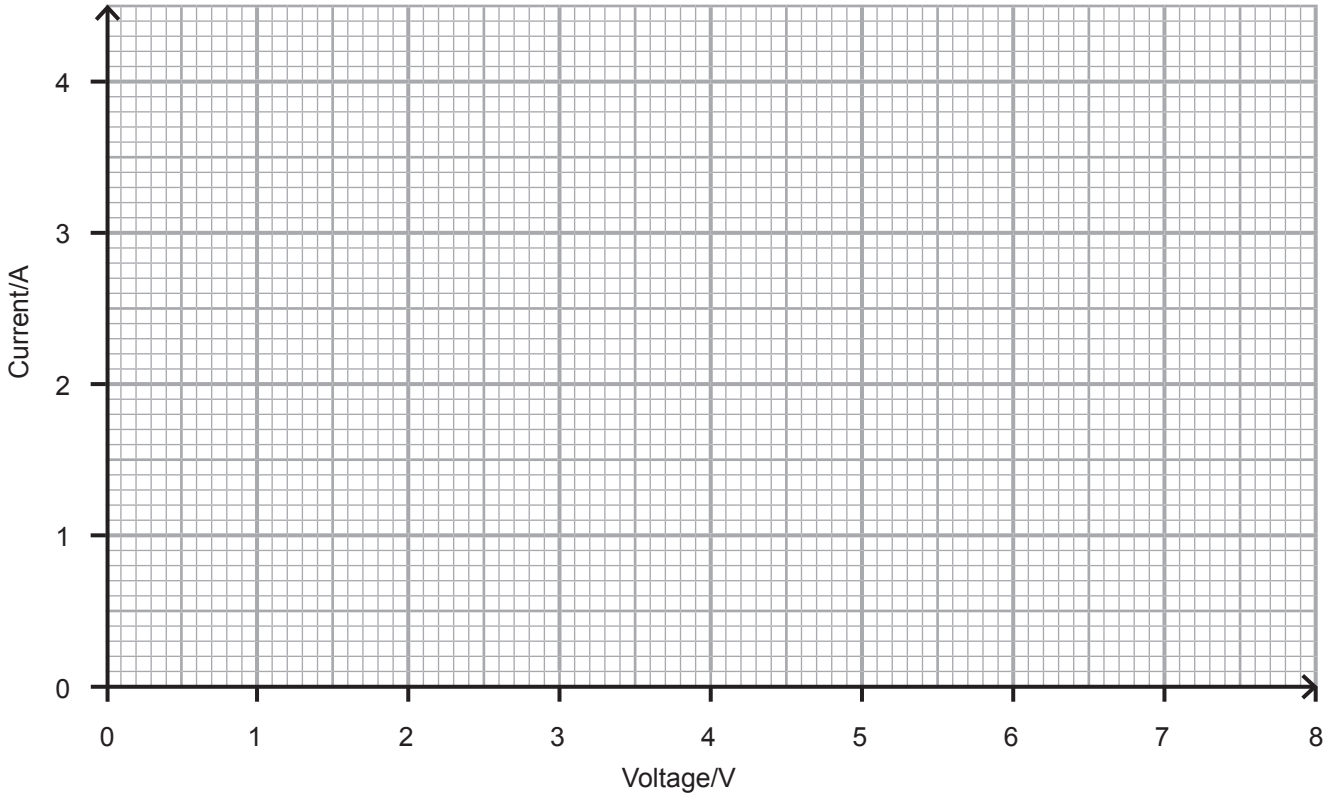
_____

_____ [1]

[Turn over

(d) Shauna obtained the following results.

Voltage/V	0	2	4	6	8
Current/A	0	1	2	3	4



(i) Plot the points on the grid. [2]

(ii) Draw a straight line through the points. [1]

(iii) Calculate the resistance of the piece of wire.

You are advised to show your working out.

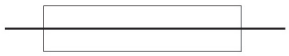
Resistance = _____ Ω [3]

[Turn over

2 What is meant by each of the following symbols?

Write your answers in the space provided. One has been done for you as an example.

(a)



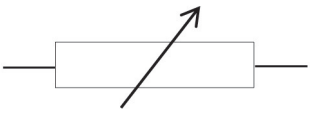
Fuse



_____



_____



_____

[3]

In the diagram below cells are combined to form a battery. Each cell has a voltage of 1.5 V.

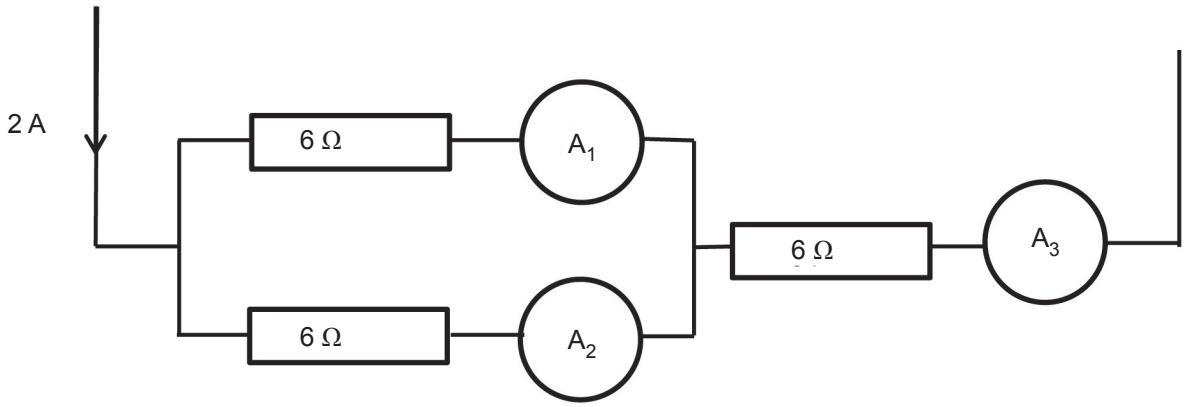


(b) (i) On the diagram mark the polarity of the battery in the boxes provided. [1]

(ii) What is the total voltage of the battery?

Voltage = _____ V [1]

The diagram below shows part of a circuit.



(c) State the readings on the three ammeters A_1, A_2 and A_3.

Reading on A_1 = _____ A Reading on A_2 = _____ A Reading on A_3 =_____ A

[3]

(d) (i) When we use electricity we pay for the number of units used.
Give another name for a 'unit of electricity'.

_____ [1]

(ii) An immersion heater, rated at 2.0 kW, is switched on for three hours.

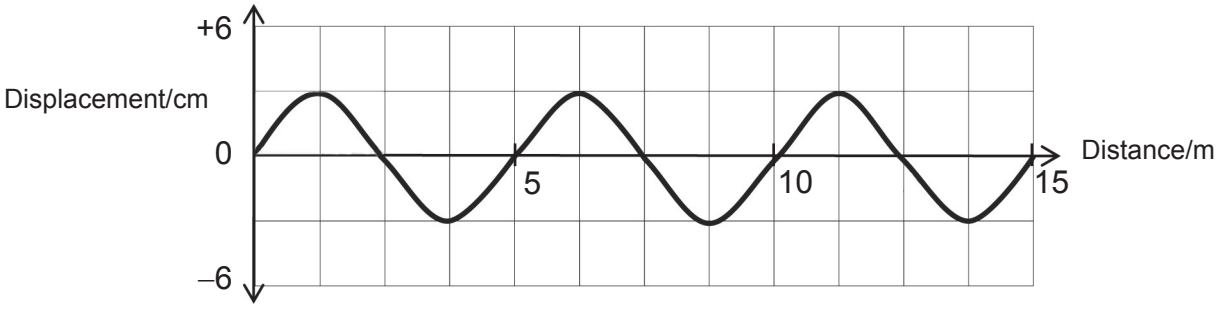
How much will this cost if one unit of electricity costs 16 p?

You are advised to show your working out.

Cost = _____ p [5]

[Turn over

3 The outline of a water wave is given below.



(i) What type of wave is a water wave?

Tick (✔) the appropriate box.

Transverse ☐

Longitudinal ☐

Electromagnetic ☐

[1]

(ii) What do water waves transfer as they move along?

_____ [1]

(iii) Use the graph to find the wavelength of the water wave.

Wavelength = _____ m [1]

(iv) The frequency of the wave is 2.0 Hz. Calculate the speed of the water waves.

You are advised to show your working out.

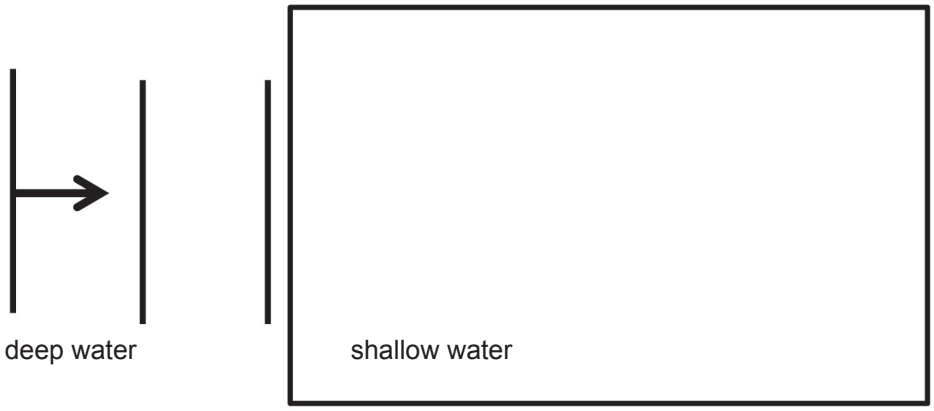
Speed = _____ m/s [3]

(v) Use the graph to find the amplitude of the water wave.

Amplitude = _____ cm [1]

[Turn over

4 The following diagram shows water waves entering shallow water.



(a) (i) Continue the waves in the shallow water by drawing three more waves. [3]

(ii) Is the speed of the waves in the shallow water greater than, less than or equal to the waves in the deep water?

Tick (✔) the appropriate box.

greater than ☐

less than ☐

equal to ☐

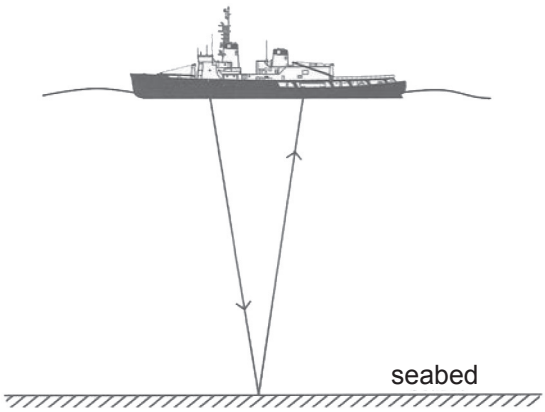
[1]

(b) Describe a medical use for ultrasound.

_____

_____ [1]

The speed of ultrasound waves in water is 1500 m/s. A ship sends out a pulse of ultrasound which is reflected from the seabed and is detected by the ship after 0.9 s.



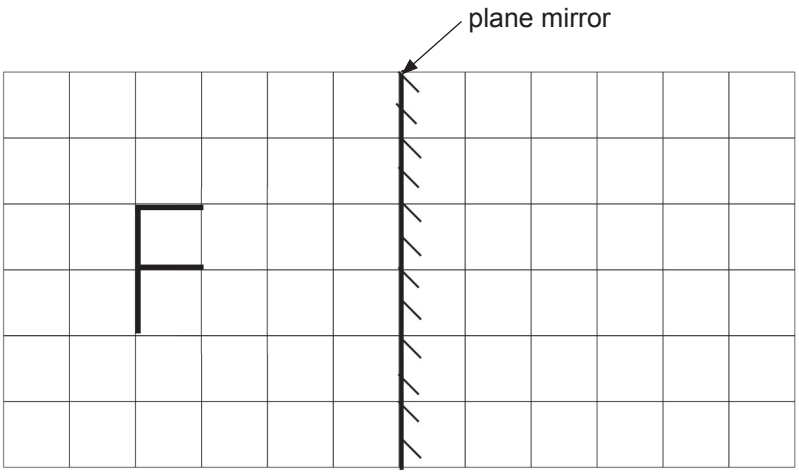
(c) Calculate the distance from the ship to the seabed.

You are advised to show your working out.

Distance = _____ m [4]

[Turn over

5 The letter F is placed in front of a plane mirror.



(a) (i) Draw the image of the letter F in the mirror. [3]

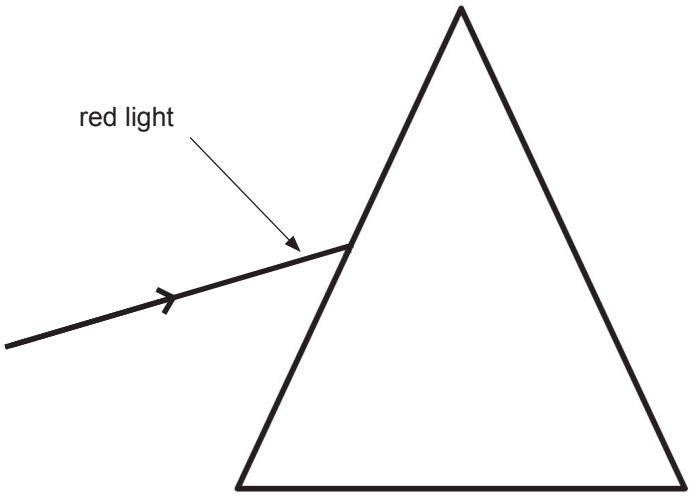
The letter F is 0.4 m from the mirror. The mirror is moved 0.1 m to the right.

(ii) How far is the letter F from its image?

You are advised to show your working out.

Distance = _____ m [2]

The diagram shows a ray of red light entering a glass prism.



(b) (i) Complete the path of the red ray through the glass and back into the air. [2]

(ii) Which colour is refracted most when **white** light is incident on the prism?

_____ [1]

(iii) Explain why different colours travel in different directions in the prism.

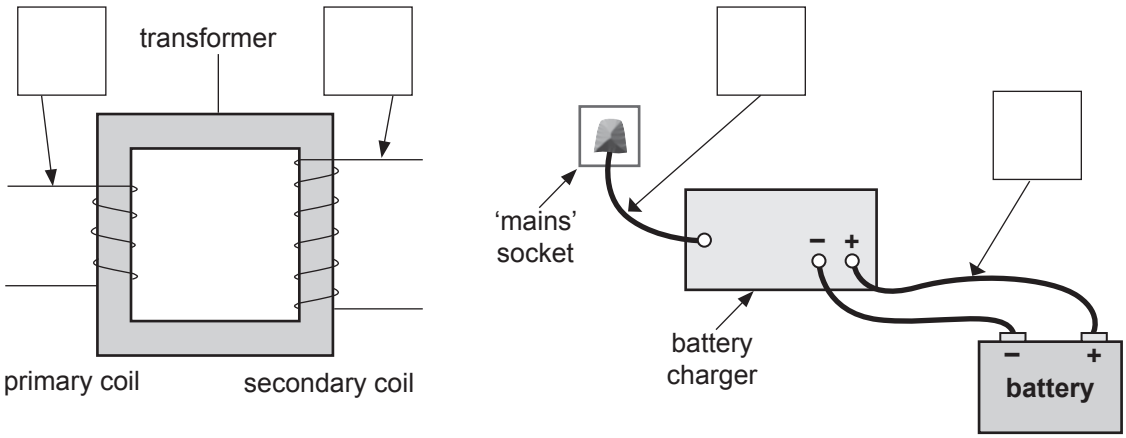
_____

_____ [1]

[Turn over

6 Electricity can be either direct current (d.c.) or alternating current (a.c.).

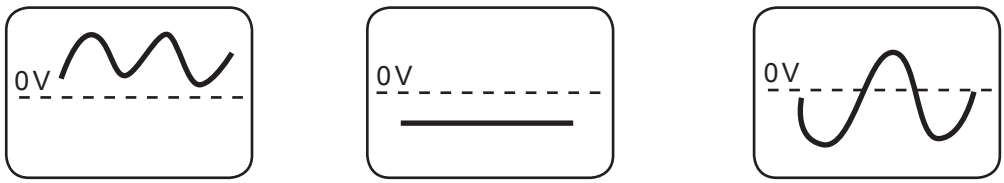
(a) (i) In the examples below, insert in the boxes, the letters d.c. or a.c. to indicate which type of electricity is flowing.



[4]

To test whether electricity is d.c. or a.c. we could connect the source to a cathode ray oscilloscope (CRO).

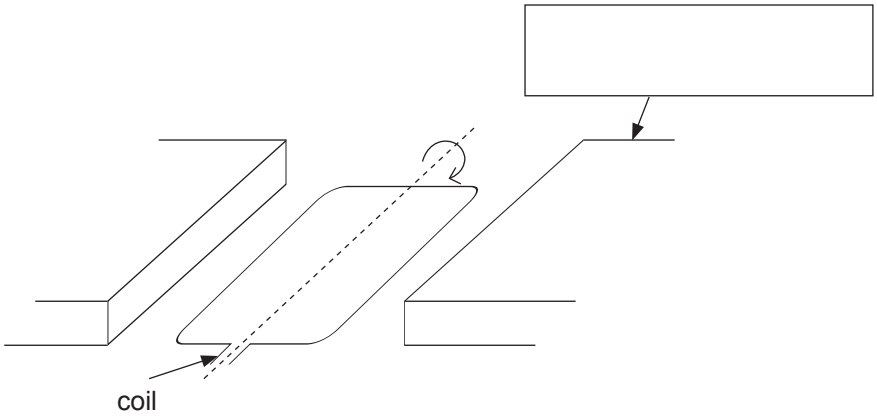
(ii) Under each diagram state whether the electricity is d.c. or a.c. The centre dotted line represents zero volts.



_____ _____ _____

[3]

The diagram shows a simple a.c. generator.



(b) (i) One part has been labelled. Label the other part in the box. [1]

(ii) What physical principle does the a.c. generator depend on?

Tick (✔) the correct box.

Electromagnetic waves ☐

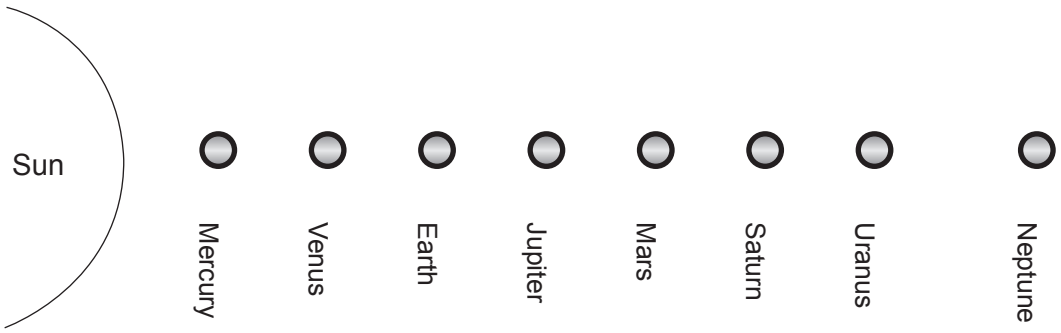
Electromagnetic induction ☐

Electromagnetic spectrum ☐

[1]

[Turn over

7 The diagram shows an **incorrect** view of the Sun and planets. The diagram is not to scale.



(a) (i) Two planets are in the wrong positions.

Name these two planets.

_____ and _____ [2]

(ii) Some planets are referred to as rocky planets and some as gas planets.

Give two examples of each.

Two rocky planets _____ and _____

Two gas planets _____ and _____ [4]

(iii) Give the names of two bodies other than planets which orbit the Sun.

_____ and _____ [2]

(iv) What force keeps the planets orbiting the Sun?

_____ [1]

There are two models of the Solar System.

(b) (i) What is the name of the earlier model?

_____ [1]

(ii) What is at the centre of the Solar System in this earlier model?

_____ [1]

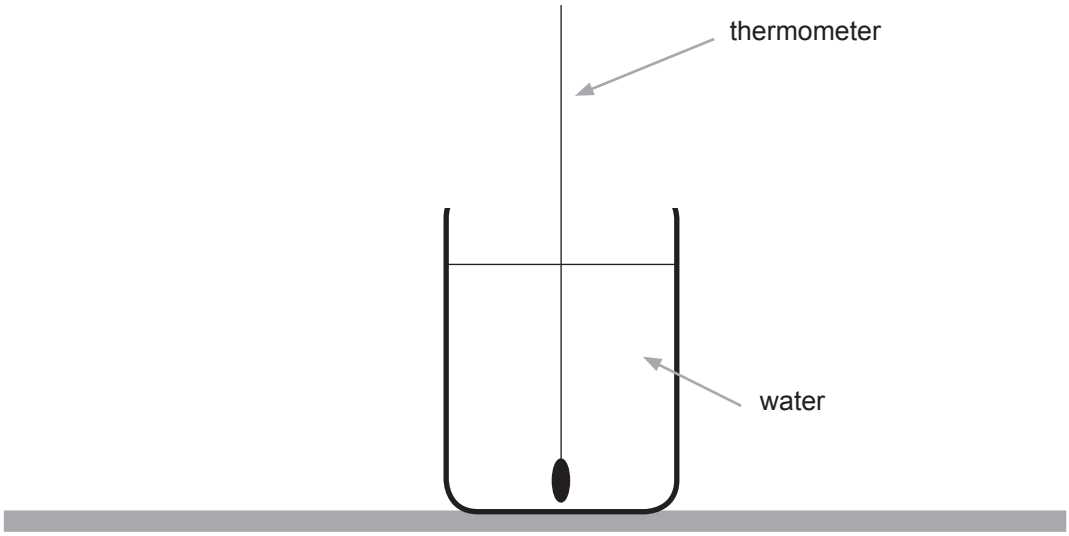
(iii) What is the name of the model with the Sun at the centre?

_____ [1]

[Turn over

8 Water is heated to 100 °C and then allowed to cool.

A thermometer allows the temperature of the water to be recorded every 5 minutes.



The table below shows the results of the experiment.

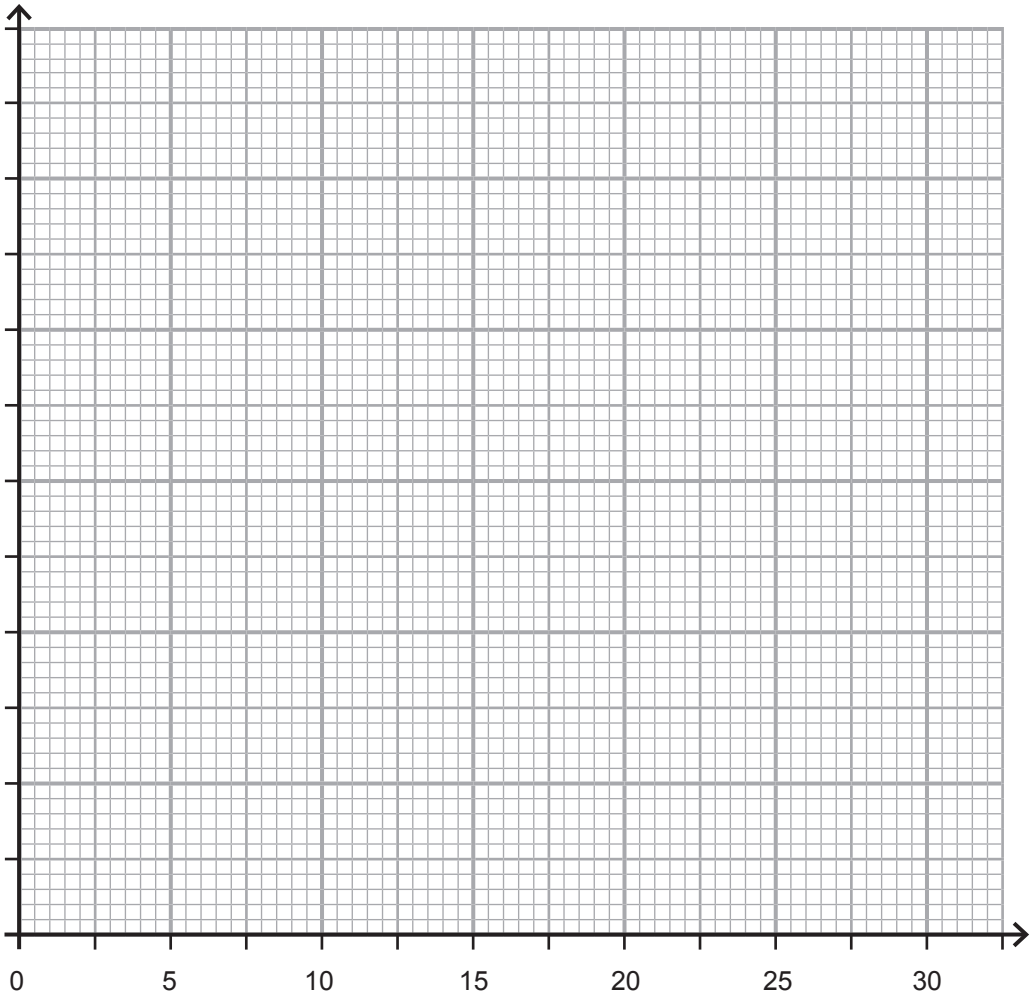
Temperature/°C	100	66	45	30	22	18	18
Time/min	0	5	10	15	20	25	30

You are asked to draw a graph of temperature against time for the cooling water.

(i) Choose a suitable scale for the temperature and label it. [2]

(ii) Plot the points on the grid. [2]

(iii) Draw the best fit curve. [1]



(iv) Why do you think the last two readings of temperature are the same?

_____ [1]

(v) Describe fully how the temperature of the water changes with time.

_____

_____ [2]

(vi) Use the graph to find the temperature of the water at 12 minutes.

_____ °C [1]

[Turn over

9 Many scientists believe that the Universe began a long time ago.

State and describe the modern scientific theory for the formation of the Universe.

Your description should include:

- the name of the theory and what happened initially;
- when the Universe began;
- the evidence and explanation for this theory.

You will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

FRIDAY 12 JUNE, AFTERNOON

MARK SCHEME

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Subject-specific Instructions

In numerical problems, the marks for the intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the final correct answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote correct units for intermediate numerical quantities.

Note that this “correct answer” rule does not apply for formal proofs and derivations, which must be valid in all stages to obtain full credit.

Do not reward wrong physics. No credit is given for consistent substitution of numerical data, or subsequent arithmetic, **in a physically incorrect equation**. However, answers to subsequent stages of questions that are consistent with an earlier incorrect numerical answer, and are based on physically correct equation, must gain full credit. Designate this by writing **ECF** (Error Carried Forward) by your text marks.

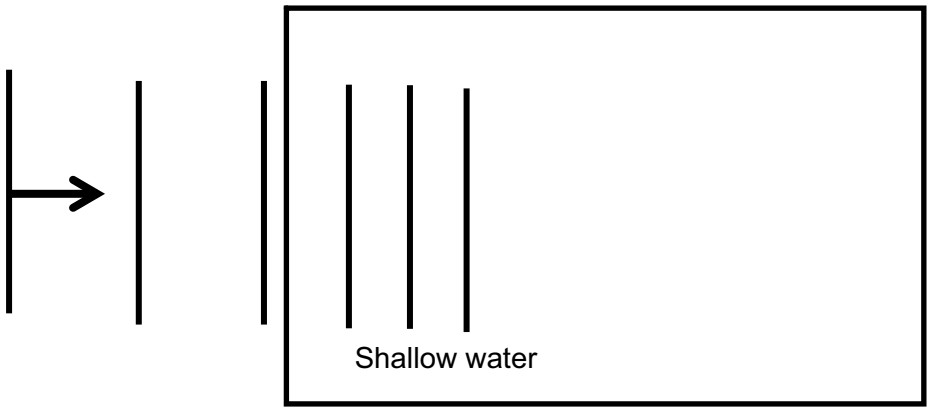
The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer marks, but 10^n errors (e.g. writing 550 nm as 550×10^{-6} m) count only as arithmetical slips and lose the answer mark.

					AVAILABLE MARKS
1	**(a)**	**(i)**	death/fire/explosion/electric shock/spark/lightning	[1]	
		(ii)	photocopying/paint spraying/printing/dust removal/light gas on a cooker	[1]	
	(b)		Current = charge/time or Q = It [1] current = 6/2 [1] current = 3 (A) [1]	[3]	
	(c)	**(i)**	Ammeter in series [1], voltmeter in parallel with wire [1] Correct symbols [1] stand-alone mark	[3]	
		(ii)	Repeat (or average) **or** plot a graph **or** keep temperature constant **or** switch off between readings	[1]	
	(d)	**(i)**	4 or 5 points correct [2], 3 points correct [1] (± 1 square)	[2]	
		(ii)	Best fit straight line through their points back to one of the axes	[1]	
		(iii)	Resistance = V/I [1] = 6/3 e.g. [1] = 2 [1] (Ω)	[3]	15
2	**(a)**		Lamp/bulb, switch, variable resistor/rheostat [1] each Ignore "open, closed" Reject: Potentiometer	[3]	
	(b)	**(i)**	+ and – **both** correct Reject "p and n"	[1]	
		(ii)	4.5 (V)	[1]	
	(c)		1 [1], 1 [1], 2 [1]	[3]	
	(d)	**(i)**	kilowatthour/kWh Reject: kW/h	[1]	
		(ii)	No. of units = P × t — Sight of "6" **or** Sight of "32" } gets [3]/[5] [1] = 2 × 3 [1] = 6 [1] Cost = 6 × 16 [1] = 96 (p) [1]	[5]	14
			or		
			Cost = 2 × 16 — Cost = 32 × 3 [1] **or** Cost = 16 × 6 [1] } 4th mark [2] [1] = 32 (p per h) Total cost = 32 × 3 [1] = 96 (p) "Cost = 2 × 3 × 16" on its own gets [4]/[5] [1]		

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					AVAILABLE MARKS
3	**(i)**	Transverse		[1]	
	(ii)	Energy		[1]	
	(iii)	λ = 5 (m)		[1]	
	(iv)	v = f λ	[1]		
		v = 2 × 5 allow ecf from **(iii)**	[1]		
		v = 10 (m/s)	[1]	[3]	
	(v)	3 (cm)		[1]	7

4



(a) **(i)** Consider only the first 3 wavefronts
Waves are vertical i.e. parallel to **incident waves** [1]
Waves have shorter wavelength than incident waves [1]
Equal spacing within shallow water, by eye [1]
} mark independently
[3]

(ii) Less [1]

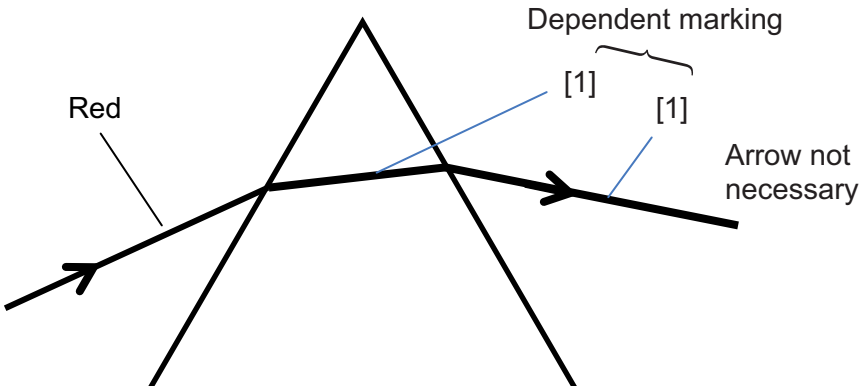
(b) Used to scan/see (unborn) babies/break up kidney stones/remove tartar from teeth/treat tissue damage or other suitable response
Used to detect/treat cancer (tumours) [1]

(c) Distance = Speed × Time (or equivalent) [1]
= 1500 × 0.9 [1]
= 1350 (m) [1]
Depth = 675 (m) [1] [4] 9

or

Depth = 1500 × 0.45 [3]
= 675 (m) [1] [4]

						AVAILABLE MARKS
5	**(a)**	**(i)**	Position of vertical line [1] laterally inverted [1] same size [1] mark independently		[3]	
		(ii)	New distance of F to mirror = 0.4 + 0.1 = 0.5 m	[1]		
			Distance of F to image = 0.5 + 0.5 = 1.0 (m)	[1]	[2]	
	(b)	**(i)**	both answers must show correct refraction			



[2]

		(ii)	Violet		[1]	
		(iii)	Travel at **different speeds**		[1]	9
6	**(a)**	**(i)**	ac, ac, ac, dc [1] each		[4]	
		(ii)	dc, dc, ac [1] each		[3]	
			} Accept "upper case"			
	(b)	**(i)**	magnet or magnetic pole		[1]	
		(ii)	electromagnetic induction		[1]	9
7	**(a)**	**(i)**	Mars and Jupiter [1] each		[2]	
		(ii)	**Two** from Mercury, Venus, Earth, Mars [1] each	[2]		
			Two from Jupiter, Saturn, Neptune, Uranus [1] each	[2]	[4]	
		(iii)	comets, asteroids [1] each Pluto/dwarf planet – does not get [2]		[2]	
		(iv)	Gravity/gravitational		[1]	
	(b)	**(i)**	geocentric		[1]	
		(ii)	Earth		[1]	
		(iii)	heliocentric		[1]	12

				AVAILABLE MARKS
8	**(i)**	Scale at least half [1], correct label with unit [1] scale does not have to start (0,0)	[2]	
	(ii)	plot points, 6 or 7 correct [2], 4 or 5 correct [1] [± 1 square]	[2]	
	(iii)	points joined in a curve "dot to dot" [0]/[1]	[1]	
	(iv)	(reached) room temperature	[1]	
	(v)	decreases [1] to a constant value [1] Dependent marking	[2]	
	(vi)	36(°C)–40(°C)	[1]	9

9 **Five** points from:
Big Bang [1]
Exploded/Explosion [1] – or "Singularity" Mark independently
12–15 billion years ago [1]
Light from other **galaxies** [1]
Shifted to the red end of the spectrum [1] **or** "red shift" on its own
Space expanding [1] **or** Universe expanding **or** distance **between** galaxies increasing
Reject: Galaxies moving away
Reject: distance between **stars** increasing

Response	Marks
Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]
Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms.	[3]–[4]
Candidates explain **1 or 2** of the of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

Total **90**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2014

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

GSD61

THURSDAY 12 JUNE 2014, MORNING

TIME

1 hour 15 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 nine** questions.

INFORMATION FOR CANDIDATES

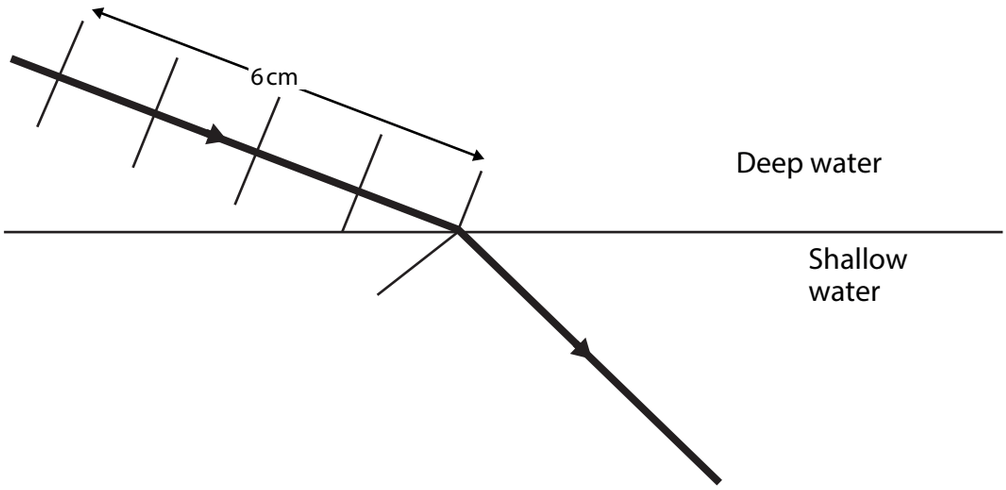
The total mark for this paper is 90.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **4(c)(ii)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 The following diagram (not to scale) shows water waves travelling through deep water.



(a) (i) Use the diagram to find the wavelength of the waves in deep water. Remember the diagram is not to scale.

Wavelength = _____ cm [1]

(ii) 10 waves are produced every 5 seconds. What is the frequency of the waves?
Remember to include the correct unit.

Frequency = _____ [2]

(iii) Use your answers to parts **(a)(i)** and **(a)(ii)** to calculate the speed of waves in deep water in cm/s.
You are advised to show your working out.

Speed = _____ cm/s [3]

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(b) The direction of the waves is shown in deep and in shallow water.

(i) Draw two wavefronts in the shallow water. [3]

(ii) What, if anything, happens to the speed and frequency of the waves as they enter **shallow** water?

Speed _____

Frequency _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

2 Ultrasound waves have frequencies which are too high to be detected by the human ear.

(a) What type of waves are sound and ultrasound waves?

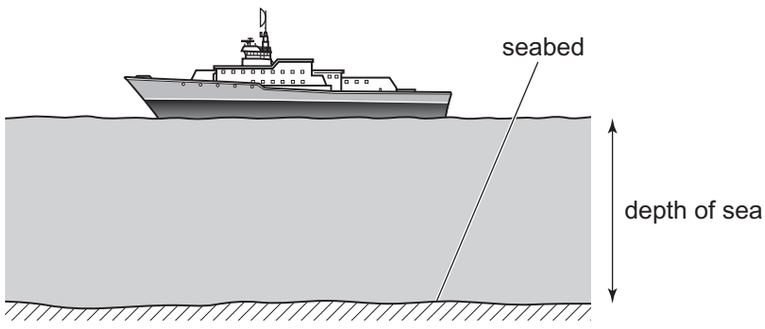
_____ [1]

(b) Describe a medical application of ultrasound waves.

_____

_____ [2]

Ultrasound waves are used to measure the depth of the sea.



The speed of ultrasound waves in water is 1500 m/s. The ship sends out a pulse of ultrasound and detects the reflection from the seabed 0.8 s after it is transmitted from the ship.

(c) Calculate the depth of the sea.
You are advised to show your working out.

Depth of the sea = _____ m [4]

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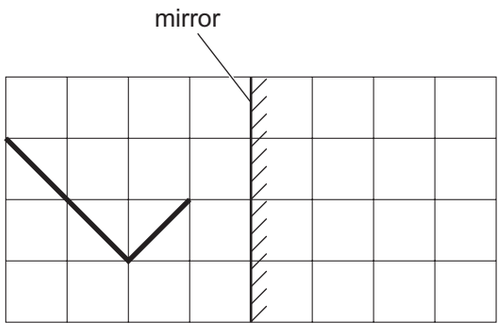
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(Questions continue overleaf)

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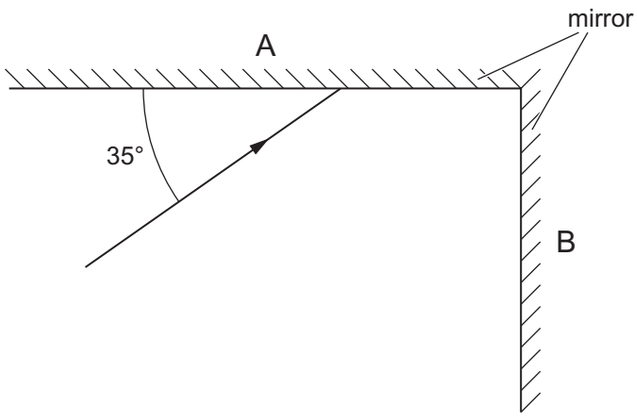
Examiner Only	
Marks	Remark

3 A letter L is placed in front of a mirror as shown below.



(a) Use the grid to draw the image of the letter L in the mirror. [2]

Two mirrors are arranged at 90° as shown below. A ray of light is incident on mirror A.



(b) **(i)** Draw a normal where the incident ray strikes mirror A. Label it N.

[1]

(ii) What is the angle of incidence at mirror A?

Angle of incidence = _____ [1]

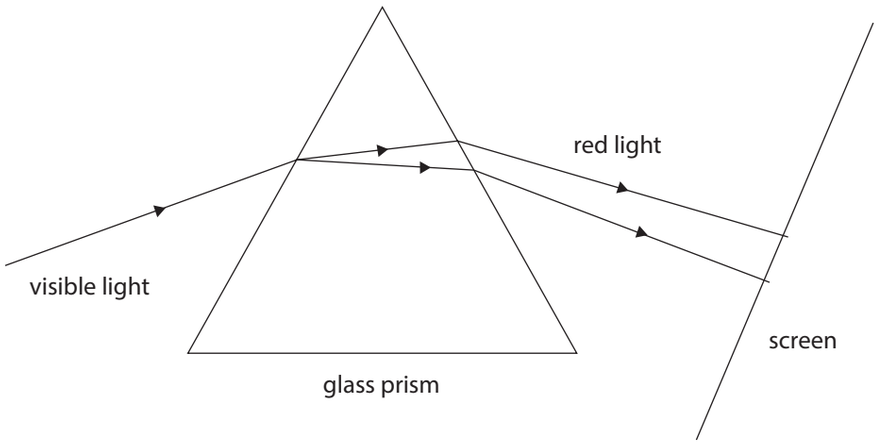
(iii) Continue the ray showing reflection at mirror B. [2]

(iv) Calculate the angle of reflection at mirror B.

Angle of reflection = _____ [2]

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(c) Visible light enters a glass prism.



The visible light is split into different colours.

(i) Name this process.

_____ [1]

(ii) Starting with red, list the colours, in order, that you would observe on the screen.

Red _____

_____ [1]

(iii) Visible light is a member of the electromagnetic spectrum. Name a member with a wavelength shorter and a member with a wavelength longer than visible light.

1. Shorter wavelength than visible light _____

2. Longer wavelength than visible light _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

4 Some solids are electrical conductors while others are insulators.

(a) Explain the difference between electrical conductors and insulators.

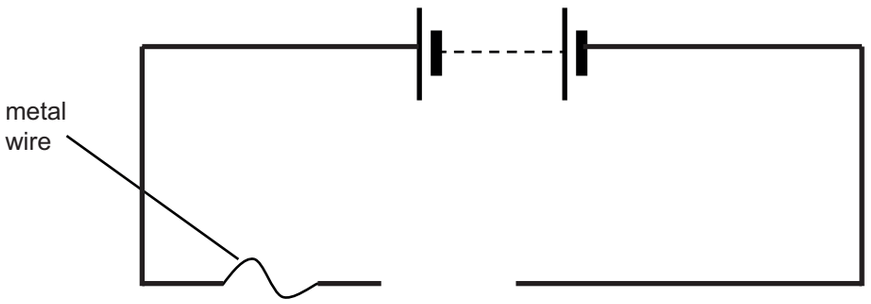
_____

_____ [1]

(b) A charge of 15 C passes through a resistor in a time of 50 s.
How much current flows through the resistor?
You are advised to show your working out.

Current = _____ A [3]

(c) Jenny sets up a circuit to measure the resistance of a metal wire.



(i) Complete the diagram of the circuit Jenny would set up to find the resistance of the metal wire. [3]

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(ii) Describe the experiment Jenny would carry out to investigate how the resistance of a wire would depend on its length. Your description should include:

- measurements to be taken,
- calculations to be made,
- the conclusion.

In this part of the question you will be assessed on your written communication skills, including the use of specialist scientific terms.

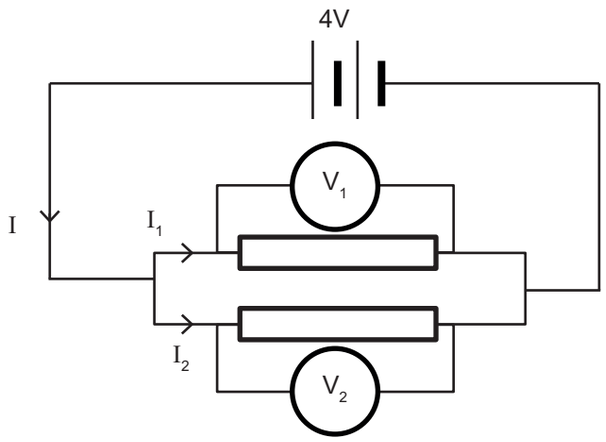
[6]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

5 A 4 V battery is connected to two equal resistors in parallel.



(a) **(i)** What is the reading on voltmeter V_1?

Voltmeter V_1 = _____ V [1]

(ii) What is the reading on voltmeter V_2?

Voltmeter V_2 = _____ V [1]

The battery supplies a total current I which divides into currents I_1 and I_2 as shown above.

Current I_1 is 0.4 A.

(iii) What is current I_2?

Current I_2 = _____ A [1]

(iv) What is current I?

Current I = _____ A [1]

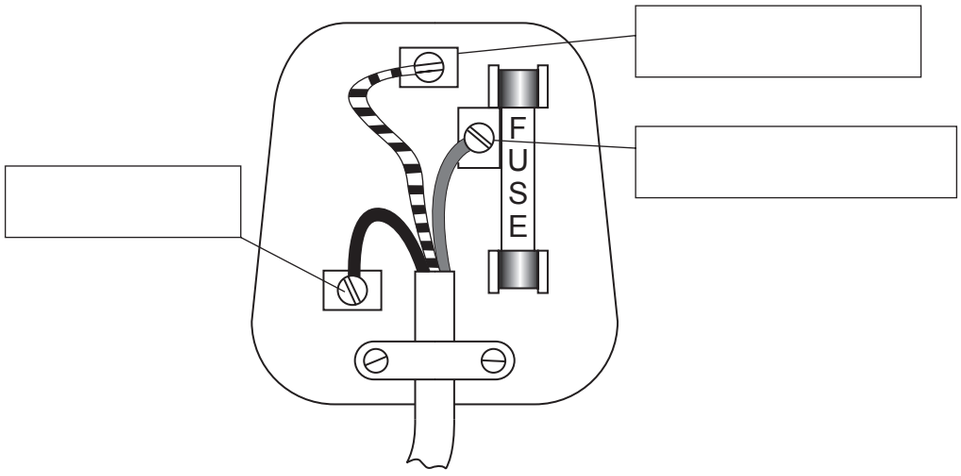
(v) Each resistor has a resistance of 10 Ω. Calculate their combined resistance.
You are advised to show your working out.

Combined resistance = _____ Ω [2]

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Marks	Remark

(b) (i) The diagram shows an electrical three pin plug.
In the boxes label the pins live, neutral or earth.



[3]

(ii) State the colour of the live wire.

Colour: _____ [1]

(iii) Wires are connected to the three pins. Which wire protects the user from electric shock?

_____ wire [1]

(iv) The plug is connected to a kettle and a current of 6.0A flows through the live wire. What current flows in the earth wire?

Current = _____ A [1]

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Examiner Only	
Marks	Remark

6 **(i)** What do you understand by the term “direct current”?

_____ [1]

(ii) Name a source of direct current.

_____ [1]

(iii) What do you understand by the term “alternating current”?

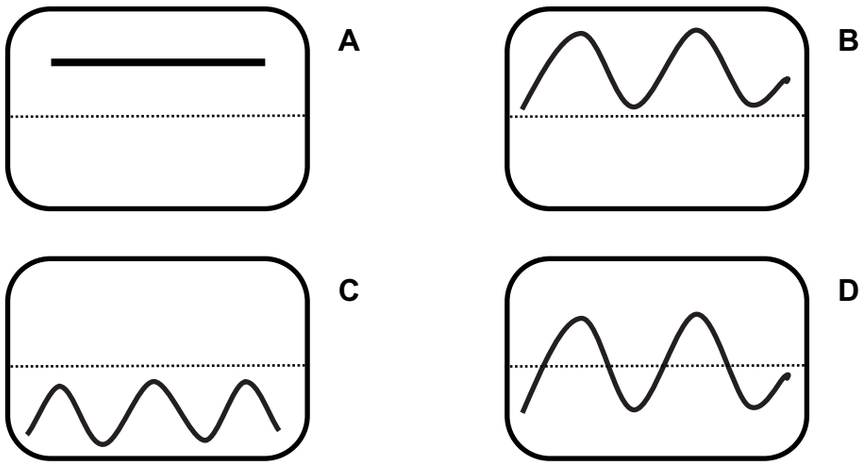
_____

_____ [2]

(iv) Name a source of alternating current.

_____ [1]

Four traces, A, B, C and D, are shown and the dotted line represents zero voltage.



(v) 1. Which trace (or traces) represent a.c.?

Trace(s): _____

2. Which trace (or traces) represent d.c.?

Trace(s): _____ [3]

(vi) What instrument would you use to display the above traces?

_____ [1]

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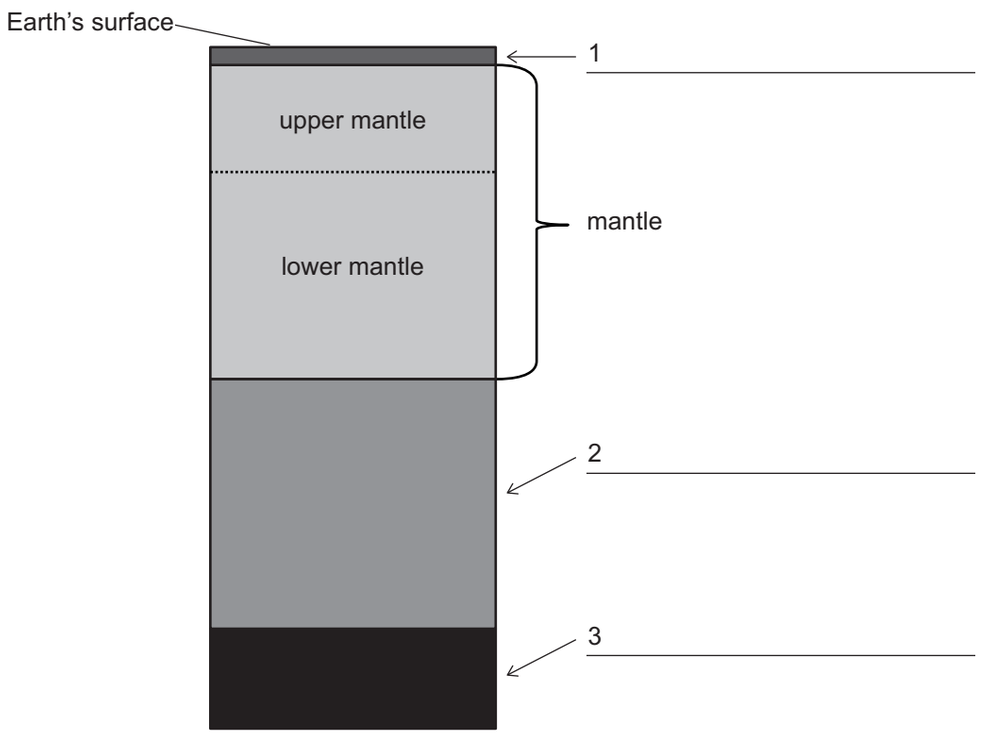
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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

7 The questions below are concerned with the structure of the Earth.
The diagram represents a cross section (not to scale) through the Earth.



(a) The mantle has been labelled for you. Label the layers 1, 2 and 3. [3]

(b) Name two major elements found below the mantle.

1. _____

2. _____ [2]

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The lithosphere is the layer of the Earth which is divided into plates, called tectonic plates.

Examiner Only	
Marks	Remark

(c) **(i)** What do you understand by the term “lithosphere”?

_____

_____ [2]

(ii) What allows the tectonic plates to move?

_____ [1]

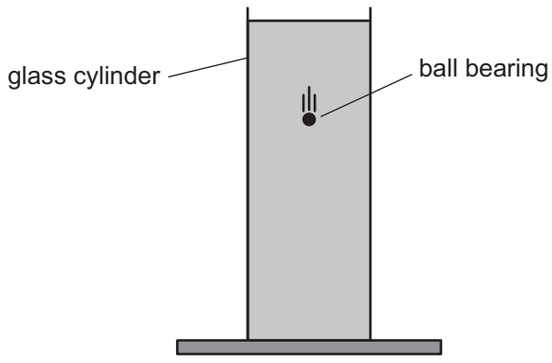
(iii) Name two large-scale processes which occur because of the movement of the plates that make up the lithosphere.

_____ and _____ [2]

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Examiner Only	
Marks	Remark

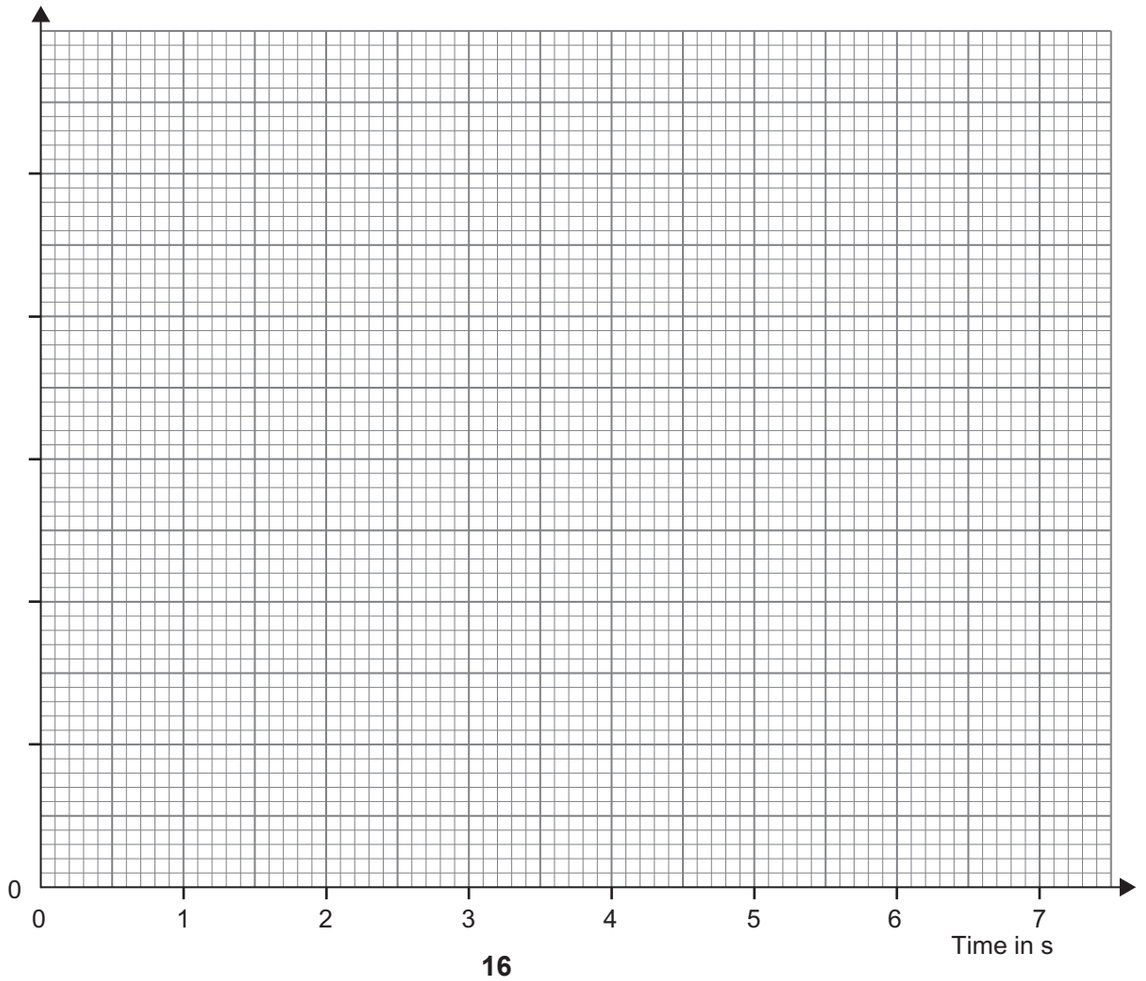
8 A ball bearing is released at the surface of a liquid contained in a tall glass cylinder.



Its velocity is measured every second as it falls through the liquid and the results are recorded in the table.

Time in s	0	1	2	3	4	5	6	7
Velocity in cm/s	0	0.2	0.4	0.6	0.8	1.0	1.0	1.0

(a) On the graph below choose and label a suitable scale on the vertical axis.
Plot points of velocity against time. [4]



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(b) Draw the graph. [2]

(c) **(i)** Over what time interval is there direct proportion between the two quantities?

_____ [1]

(ii) Explain the reason for your choice.

_____

_____ [2]

(iii) Find the gradient of the graph during the first four seconds and give its unit.

You are advised to show your working out.

Gradient = _____

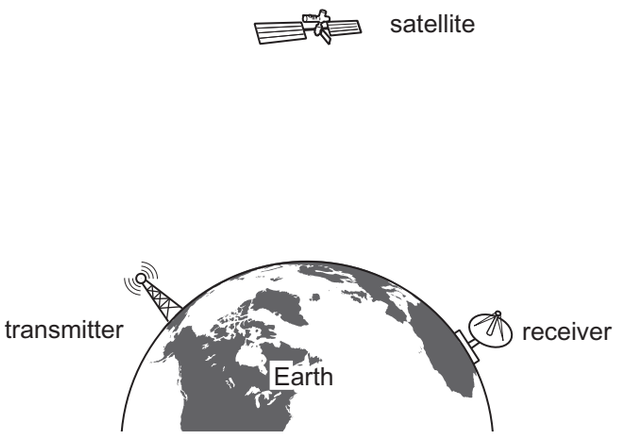
Unit = _____ [3]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

9 A satellite, situated in space, may be used to pass a microwave signal from one part of the Earth to the other as shown in the diagram.



(a) What two properties of microwaves allow the signal to travel from the transmitter to the satellite?

_____

_____ [2]

(b) Give two uses of artificial satellites, other than communications.

1. _____

2. _____ [2]

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THIS IS THE END OF THE QUESTION PAPER

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178014

Rewarding Learning

General Certificate of Secondary Education
2014

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

THURSDAY 12 JUNE 2014, MORNING

MARK SCHEME

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Subject-specific instructions

1 In numerical problems, the marks for intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the correct final answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote units for intermediate numerical quantities.

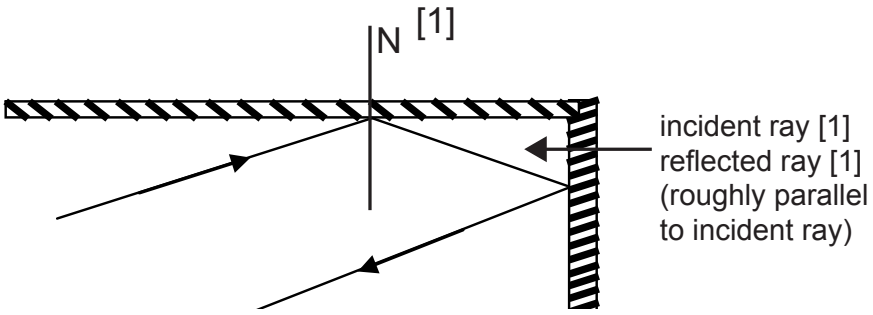
Note that this "correct answer" rule does not apply to formal proofs and derivations, which must be valid in all the stages shown in the mark scheme to obtain full credit.

2 Do not reward wrong physics. No credit is given for substitution of numerical data, or subsequent arithmetic, in a physically incorrect equation.

However, answers to later parts of questions that are consistent with an earlier incorrect numerical answer, and are based on a physically correct equation, must gain full credit.
Annotate this by writing **ECF** (Error Carried Forward) by your text marks.

3 The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer mark, but 10^n errors (e.g. writing 550 nm as 550×10^{-6} m) count only as arithmetical slips and lose the answer/unit mark.

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Wavelength = $\frac{6}{4}$ = 1.5 (cm)	[1]	
		(ii)	Frequency $\left(=\frac{10}{5}\right)$ = 2 [1] Hz [1]	[2]	
		(iii)	v = f × λ [1] v = 1.5 × 2 [1] **ECF** from **(a)(i)** and **(a)(ii)** v = 3.0 (cm/s) [1]	[3]	
	(b)	**(i)**	• smaller λ [1] • 2 parallel [1] parallel to each other and **touching** ray • right angles [1]	[3]	
		(ii)	**(**speed) decreases [1] (frequency) (remains the) same [1]	[2]	11
2	**(a)**		Longitudinal	[1]	
	(b)		Suitable application, e.g. foetal scan [1] to see the unborn child [1]	[2]	
	(c)		Distance = Speed × Time [1] **or** Distance = Speed × Time [1] Distance = 1500 × 0.8 [1] = 1500 × 0.4 [2] = 1200 (m) [1] = 600 (m) [1] d = 600 (m) [1]	[4]	7
3	**(a)**		Each part of image L correctly positioned [1] **each**	[2]	
	(b)	**(i)**	Normal in correct place and at right angles to mirror	[1]	
		(ii)	55°	[1]	
		(iii)		[2]	
		(iv)	90° – 55° [1] = 35 degrees [1] **allow ECF from (b)(ii)**	[2]	
	(c)	**(i)**	Dispersion Reject: dispersing, refraction	[1]	
		(ii)	Orange, Yellow, Green, Blue, Indigo and Violet	[1]	
		(iii)	X-rays **or** UV **or** gamma [1] IR **or** micro **or** radio [1] Reject: TV, Radar	[2]	12

		AVAILABLE MARKS

4 **(a)** Conductors have **free electrons** (insulators do not) [1]

(b) $I = Q/t$ [1] $= \frac{15}{50}$ [1] $= 0.3$ [1] [3]

(c) **(i)** Ammeter in series [1]
Voltmeter in parallel [1]
2 correct symbols [1] [3]

(ii) Indicative content
- Measure current and voltage [2]
- Use $R = \frac{V}{I}$ [1]
- Repeat or measure length [1]
- Draw a graph of R versus length or find ratio R/l [1]
- Conclusion: R proportional to l [1]

(Any **five** points)

Response	**Marks**
Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence 5 points shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms to discuss in logical sequence three or four points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use limited specialist terms to discuss one or two points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1]–[2]
Response not worthy of credit.	[0]

[6] 13

5 **(a)** **(i)** 4 (V) [1]

(ii) 4 (V) [1]

(iii) 0.4 (A) [1]

(iv) 0.8 (A) [1]

(v) R = 10/2 [1] **or** R = prod/sum **or** $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$
R = 5 (Ω) [1] [2]

(b) **(i)** Correct labels [1] each [3]

(ii) Brown [1]

(iii) Earth [1]

(iv) 0 [1] 12

				AVAILABLE MARKS
6	**(i)**	(Flows in) one **direction**	[1]	
	(ii)	battery/cell/battery charger/phone charger	[1]	
	(iii)	**Direction** reverses [1] periodically/regularly [1] – Dependent marking	[2]	
	(iv)	mains/transformer/generator/power station/alternator/dynamo	[1]	
	(v)	1. D 2. ABC for [2] and 2 correct for [1]	[3]	
	(vi)	CRO/oscilloscope	[1]	9
7	**(a)**	1 – crust [1] 2 – outer core [1] 3 – inner core [1]	[3]	
	(b)	Nickel [1] and iron [1] **or** Ni and Fe	[2]	
	(c) **(i)**	Crust [1] **solid** portion of **upper** mantle [1] – Independent marks	[2]	
	(ii)	Float on a liquid/on a liquid layer/convection current Reject: Magma	[1]	
	(iii)	Volcanoes [1] earthquakes [1] tsunami = earthquakes	[2]	10
8	**(a)**	Suitable scale [1] labelled correctly [1] 6 or more points correctly plotted [2] 5 points [1]	[4]	
	(b)	Best fit (by eye) lines – 2 aspects for [1] each Reject: dot-to-dot	[2]	
	(c) **(i)**	0 to 5 (seconds)	[1]	
	(ii)	Straight line [1] through origin [1] – Independent marks	[2]	
	(iii)	grad = rise/run or equivalent [1] **or** grad = $\frac{y_2 - y_1}{x_2 - x_1}$ **or** grad = accel **or** grad = $\frac{v}{t}$ = 0.20 [1] cm/s^2 [1]	[3]	12
		Mark **(i)** and **(ii)** independently		

				AVAILABLE MARKS
9	**(a)**	Travel through vacuum Travel in straight lines Can pass through the atmosphere Any **two**	[2]	
	(b)	Espionage = spying = observation = military use Weather (Sat.) Navigation – Google maps/mapping/Google Earth Astronomy Agriculture Any **two** [1] each	[2]	4
			Total	**90**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2013

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

GSD61

THURSDAY 13 JUNE, MORNING

TIME

1 hour 15 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 eight** questions.

INFORMATION FOR CANDIDATES

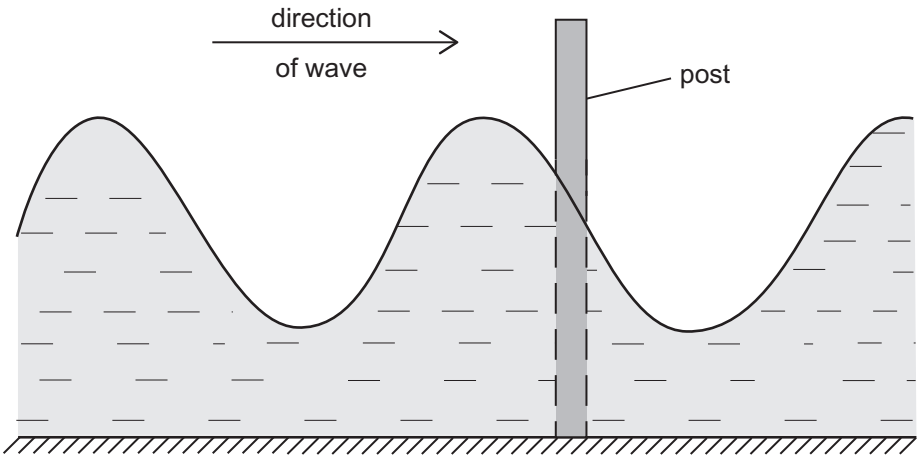
The total mark for this paper is 90.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7(b)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

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Examiner Only	
Marks	Remark

1 A stone is thrown into a pond and water waves are produced. These waves pass a post which projects out of the water.



In 4 seconds 12 waves pass the post.

(i) What piece of apparatus would be needed to measure how long it takes twelve waves to pass the post?

_____ [1]

(ii) What is the frequency of the wave?
Remember to include the unit.

Frequency = _____ [2]

(iii) What do the waves carry, from the point where the stone entered the water, to the post? Choose from the list below by placing a tick (✓) in the correct box.

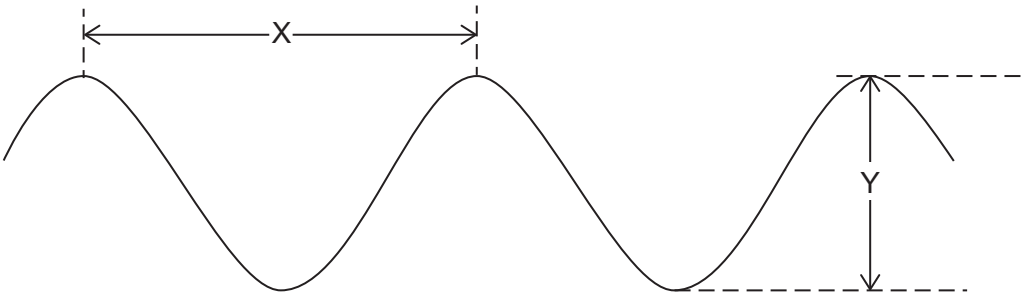
water	☐
sound	☐
energy	☐

[1]

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(iv) The amplitude of the wave is 3 cm and its wavelength is 5 cm. A part of the wave is illustrated below.

What are the distances "X" and "Y" marked on the diagram?



Distance X = _____ cm

Distance Y = _____ cm [2]

(v) Use your answer to part **(ii)** to calculate the speed of the water wave in cm/s. Remember the wavelength of the wave is 5 cm.

You are advised to show your working out.

Speed = _____ cm/s [3]

(vi) Water waves belong to a family of waves called transverse waves. Give two other examples of transverse waves.

1. _____

2. _____ [2]

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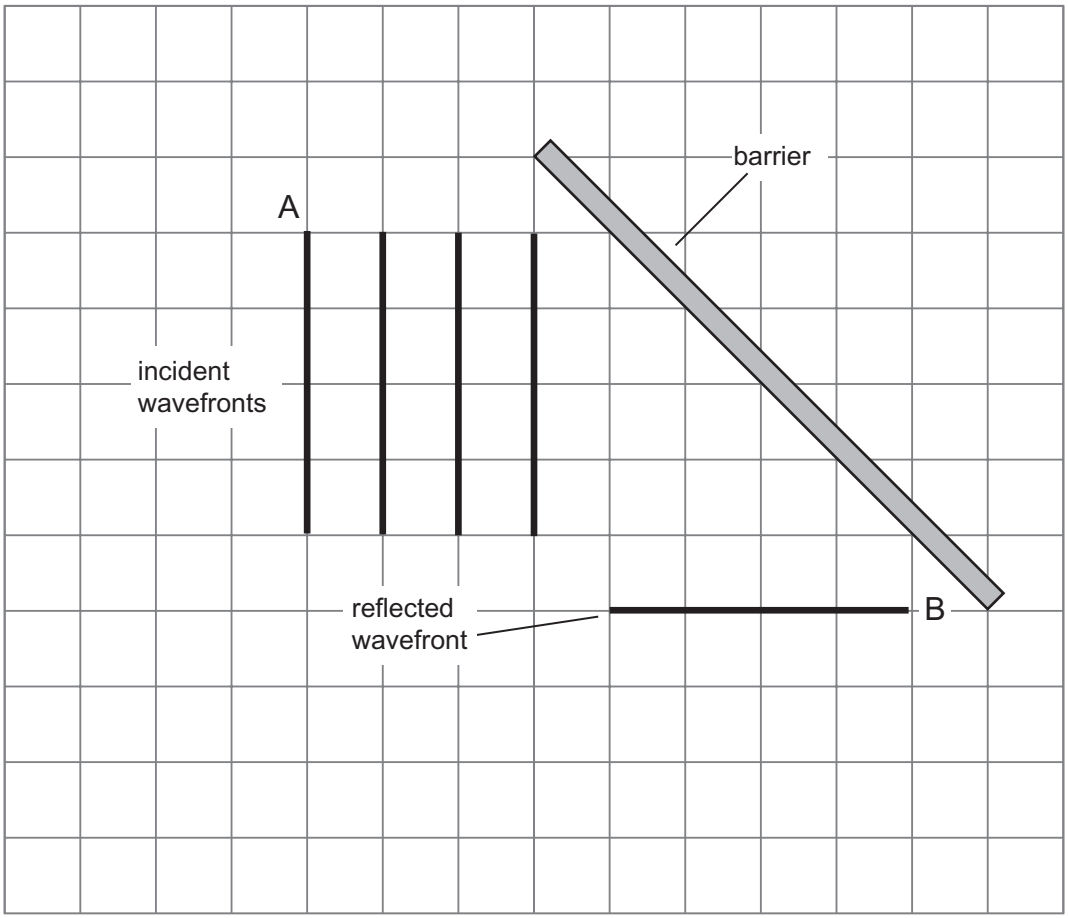
Marks	Remark

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Examiner Only	
Marks	Remark

2 Ripple tanks are sometimes used in the laboratory to show how water waves behave.

In one experiment plane waves strike a barrier which is set at an angle to the wavefronts as shown.



(a) (i) Draw an arrow on wavefront A to show its direction. [1]

(ii) Reflected wavefront B is shown in the diagram. Draw **two** further wavefronts below wavefront B. [3]

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(b) (i) Fill in the missing word in the sentence below.

Radio waves, infrared radiation and X-rays are all part of a family of waves called the _____ spectrum. [1]

(ii) Arrange the waves, referred to in **(b)(i)** in order of wavelength beginning with the **smallest** wavelength.

_____ _____ _____ [1]

(iii) Name a wave, **other than the three mentioned above**, which has a wavelength smaller than the wavelength of visible light.

_____ [1]

(c) State **one** use and **one** danger of infrared radiation.

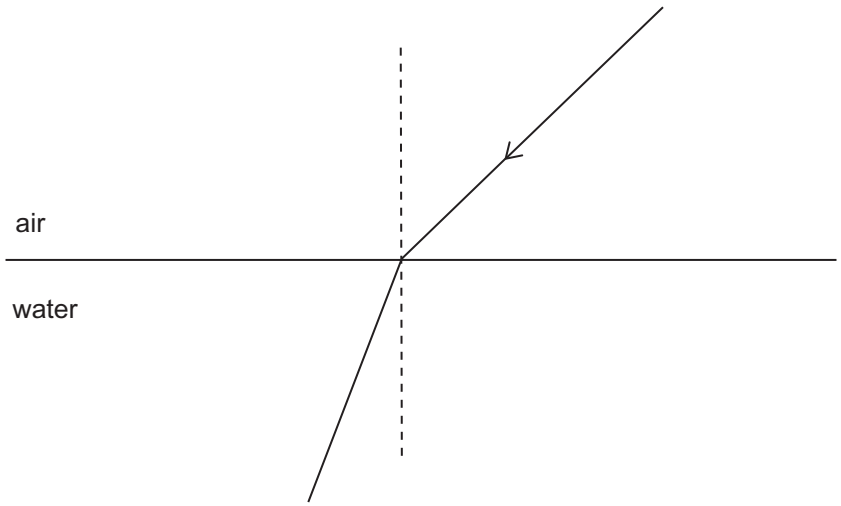
Use _____ [1]

Danger _____ [1]

Examiner Only

Marks	Remark

3 The diagram shows a ray of light passing from air into water.



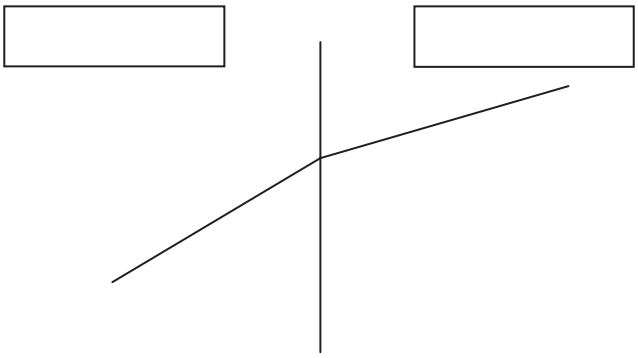
(a) **(i)** Label the angle of incidence with the letter i. [1]

(ii) Label the angle of refraction with the letter r. [1]

(iii) What is the dotted line called?

_____ [1]

(b) In another example of refraction a ray of light passes from glass into air.



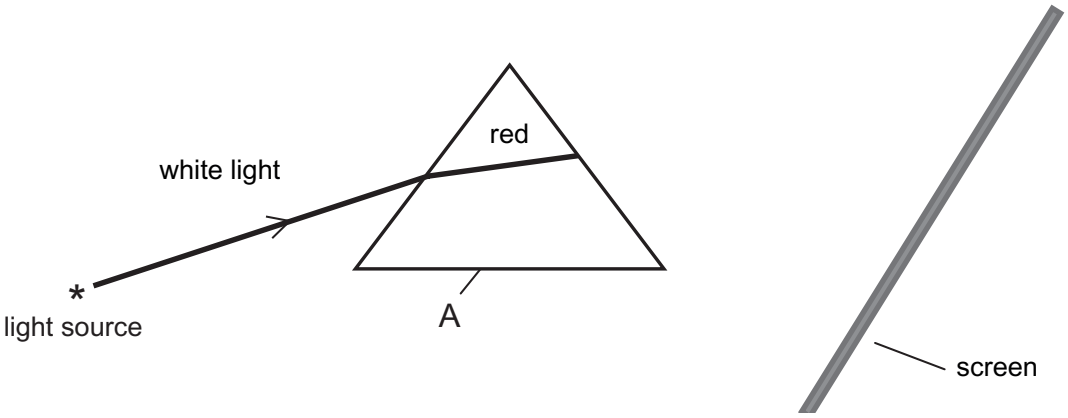
In the boxes label the air and the glass. [1]

Examiner Only

Marks	Remark

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The diagram below shows an arrangement which will allow white light to be split up into its different colours.



(c) (i) What is the name of component A?

A _____ [1]

(ii) Complete the path of the red ray to the screen. [1]

(iii) Draw the path for the violet ray through component A to the screen. [2]

(iv) Explain why white light is split by component A.

_____

_____ [2]

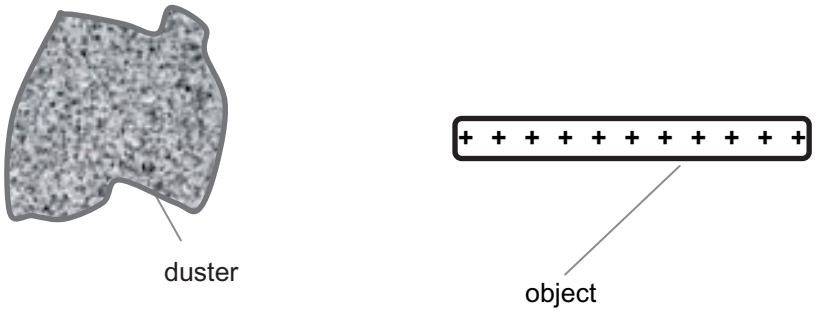
(v) What name do we give to the splitting of white light?

_____ [1]

Examiner Only

Marks	Remark

4 Julie charges an object by rubbing it with a duster. The object becomes positively charged.



(a) (i) Choose words from the list to complete the sentence below.

duster	**protons**	
atoms	**electrons**	**object**

The object becomes positively charged because

_____ have moved from the _____.
[2]

(ii) What charge is left on the duster?

Charge on the duster is _____. [1]

(iii) Give the name of a suitable material from which the object could be made.

_____ [1]

Examiner Only

Marks	Remark

Julie wants to investigate how the current through a filament lamp depends on the voltage across the lamp.

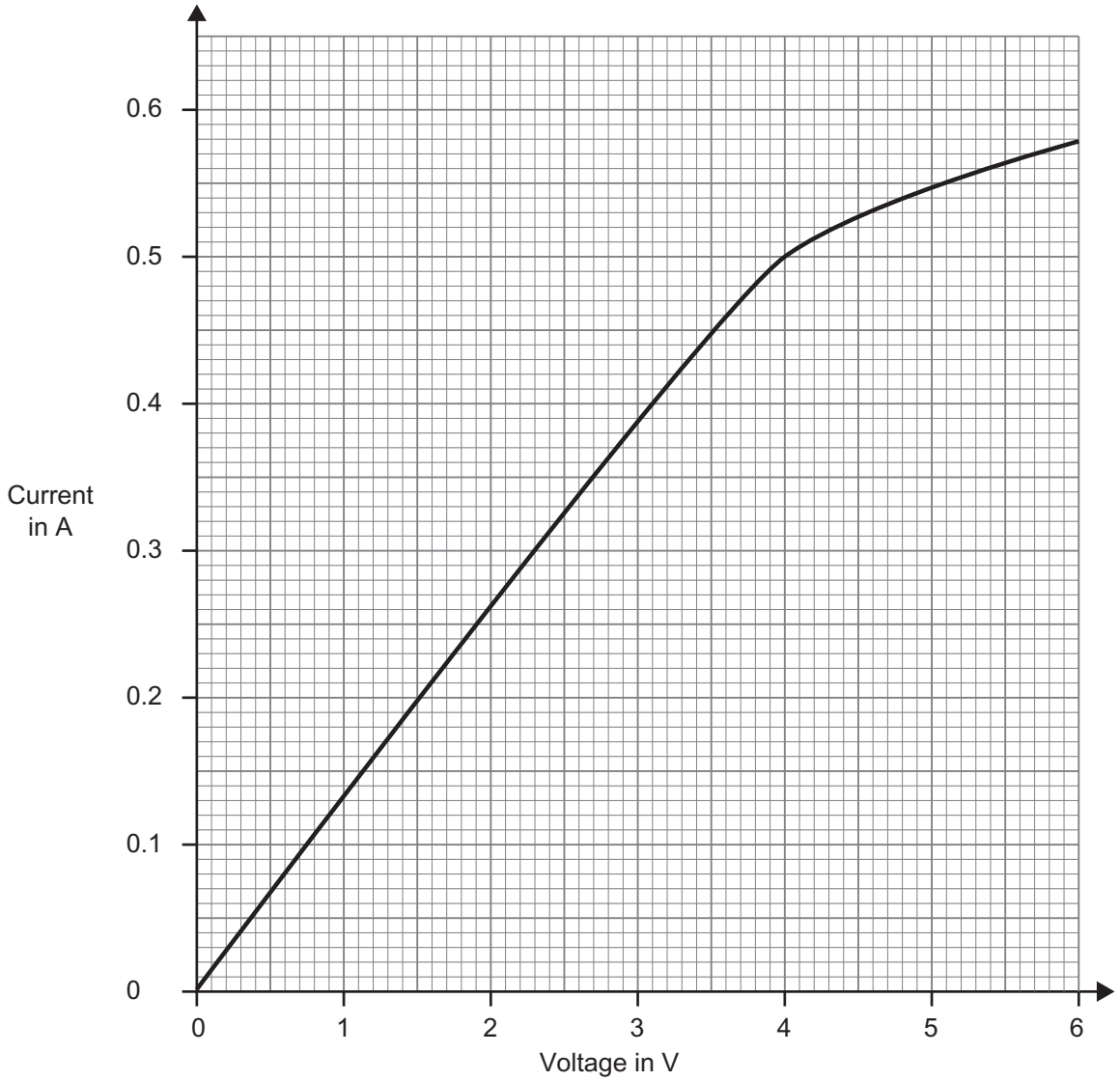
(b) (i) In the space below draw the circuit diagram of the apparatus she would use.

[5]

Examiner Only	
Marks	Remark

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Julie uses her results to plot a graph of current against voltage and this is shown below.



(ii) Use the graph to find the voltage across the lamp when the current is 0.5 A.

Voltage = _____ V [1]

(iii) Use your answer to part **(ii)** to find the resistance of the lamp when a current of 0.5 A flows. Remember to include the unit.

You are advised to show your working out.

Resistance = _____ [4]

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Marks	Remark

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

5 **(a)** A boy uses an electric iron for 2 hours. The power rating of the iron is 3.0 kW.

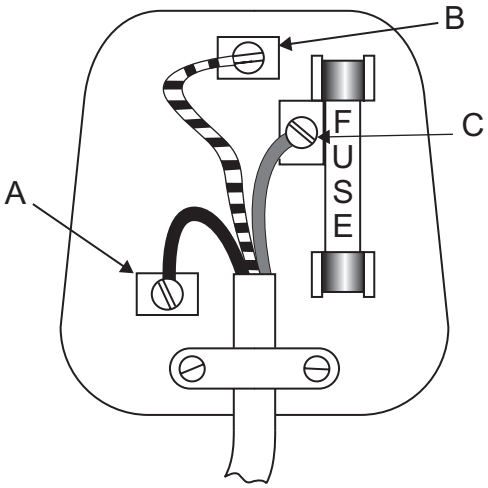
(i) How much electrical energy, in kWh, does the iron use in 2 hours?

Energy = _____ kWh [1]

(ii) How much does it cost to use the iron for 2 hours if one unit of electricity costs 13 p?

Cost = _____ p [1]

(b) The diagram shows a three-pin plug.



(i) Which pin A, B or C is the earth pin?

_____ [1]

(ii) What is the colour of the live wire?

_____ [1]

(iii) What is the colour of the neutral wire?

_____ [1]

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(c) The electric kettle has a metal casing.



Source: CCEA – Copyright: John Boyd

The wiring inside the kettle is faulty and the live wire is touching the metal casing.

(i) Explain fully what will happen when the kettle is switched on.

_____

_____

_____ [3]

(ii) A hairdryer does not have an earth connection.
Why is it still safe to use?

_____ [1]

(d) Another electric kettle has a power rating of 2800 W.

(i) What current flows through this kettle when it is plugged into the 250 V mains?

You are advised to show your working out.

Current = _____ A [3]

The following fuses are available: 1 A, 3 A, 5 A and 13 A.

(ii) Which fuse should be used for this kettle?

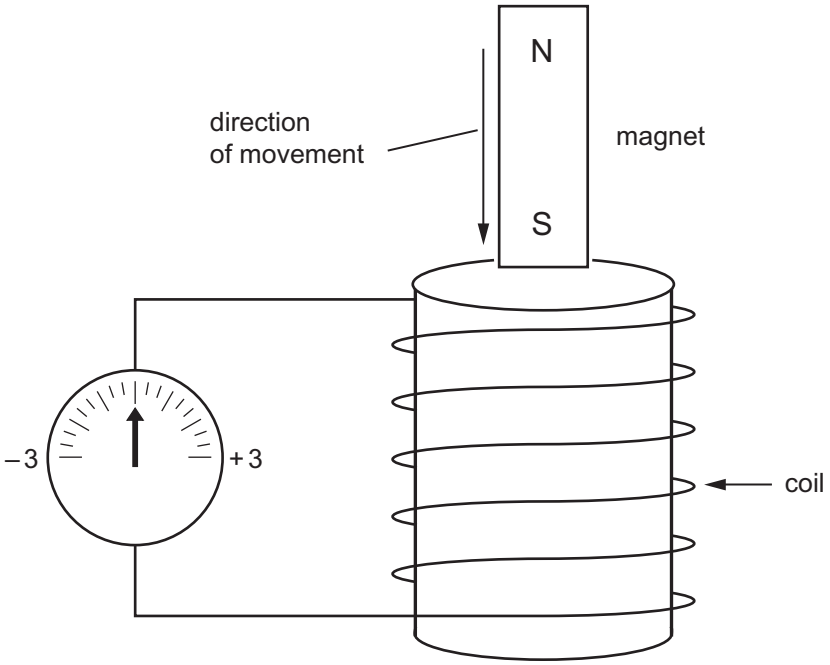
Fuse _____ A [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

6 A bar magnet is moved in the direction shown relative to a coil. The ends of the coil are connected to a centre-zero ammeter.



(a) When a pupil moves the magnet into the coil the needle on the ammeter moves to +2 and then returns to zero.

(i) What happens when the pupil removes the magnet from the coil?

_____ [1]

(ii) What would the pupil observe on the ammeter if the magnet is at rest inside the coil?

_____ [1]

(b) A transformer uses an alternating current.
Describe what is meant by an alternating current.

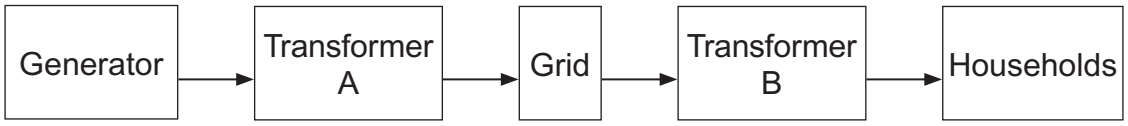
_____

_____ [2]

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Examiner Only	
Marks	Remark

(c) Transformers are used in the generation and transmission of electricity.



(i) What does transformer A do to the voltage from the generator?

_____ [1]

(ii) Describe fully the advantage of using transformer A.

_____

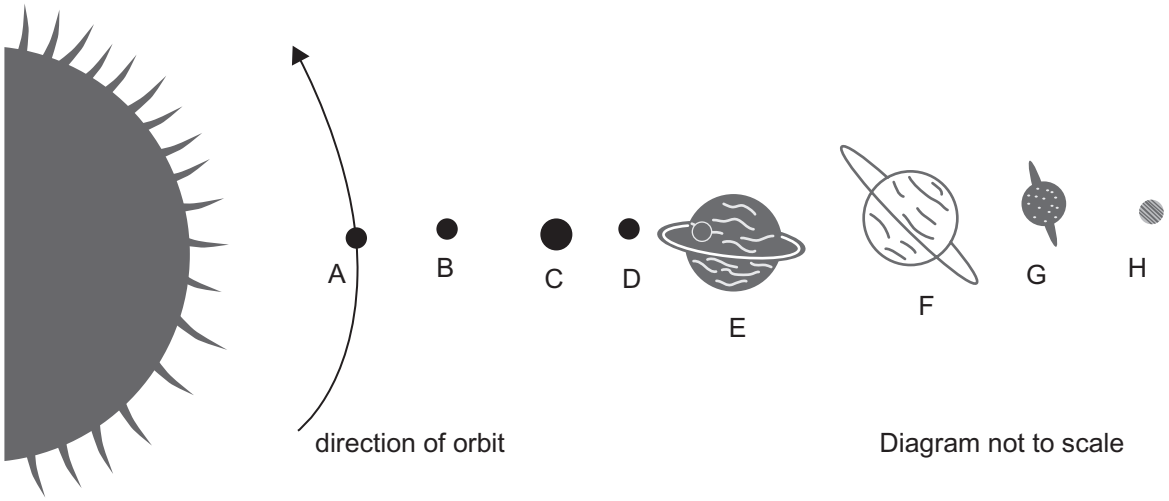
_____ [2]

(iii) Describe fully the use of transformer B.

_____

_____ [2]

7 The following diagram shows the planets in our Solar System.



(a) (i) Name planets C and D.

Planet C _____ [1]

Planet D _____ [1]

(ii) Use a curved arrow to indicate the direction of orbit of planet E. [1]

(iii) State the name of one of the gas planets.

_____ [1]

Examiner Only

Marks	Remark

(b) Scientists believe that the Solar System was formed from a cloud of gas and dust.

Describe the different stages in the formation of the Solar System.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(c) An artificial satellite orbits the Earth.

(i) Name the attractive force which keeps the satellite in orbit.

_____ [1]

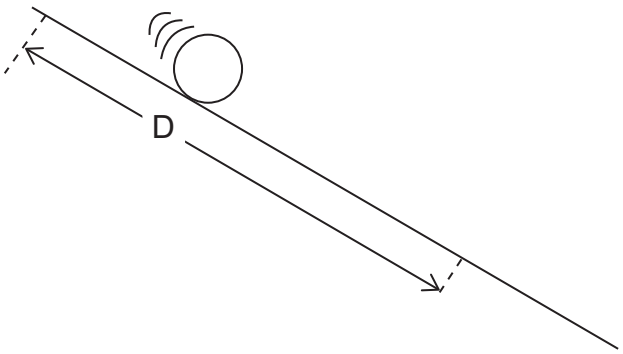
(ii) State two uses of artificial satellites.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

8 A pupil timed a ball moving down a slope.



The time taken for the ball to travel a distance D was measured on three occasions and the average time T was recorded. This was then repeated for different distances.

Distance D in m	0.0	0.5	1.0	1.5	2.0	2.5
Average time T in s	0.0	1.4	2.0	2.5	2.8	3.2
T^2 in s^2	0.0			6.3		

The pupil is told that distance D is related to time T by the equation

$$D = kT^2$$

where k is a constant.

(i) Complete the table by entering the missing values of T^2 to 1 decimal place. [2]

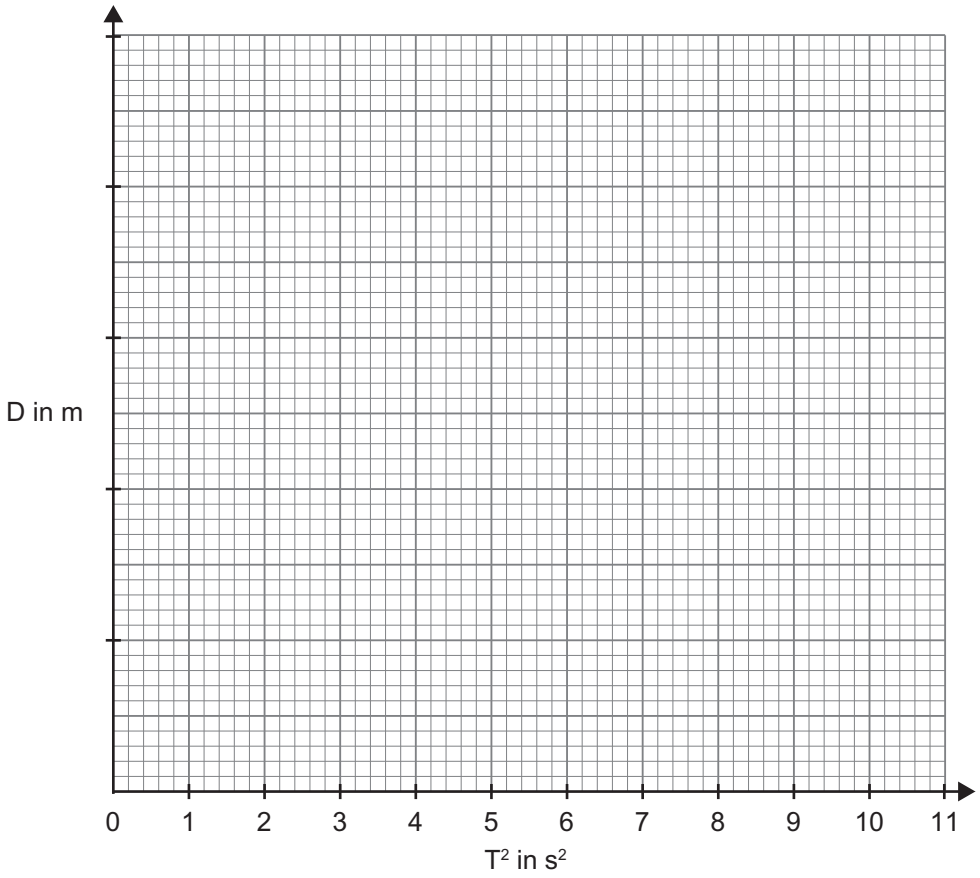
(ii) Choose a suitable scale and plot a graph of D on the vertical axis versus T^2 on the horizontal axis. [3]

(iii) Draw a straight line of best fit. [1]

Examiner Only

Marks	Remark

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(iv) Use your graph to determine the constant k.

Remember to include the units for k.

You are advised to show your working out.

k = _____

Units = _____ [4]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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113134

Rewarding Learning

General Certificate of Secondary Education
2013

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

THURSDAY 13 JUNE, MORNING

MARK SCHEME

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Subject-specific instructions

1 In numerical problems, the marks for intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the correct final answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote units for intermediate numerical quantities.

Note that this "correct answer" rule does not apply to formal proofs and derivations, which must be valid in all the stages shown in the mark scheme to obtain full credit.

2 Do not reward wrong physics. No credit is given for substitution of numerical data, or subsequent arithmetic, in a physically incorrect equation.

However, answers to later parts of questions that are consistent with an earlier incorrect numerical answer, and are based on a physically correct equation, must gain full credit.
Annotate this by writing **ECF** (Error Carried Forward) by your text marks.

3 The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer mark, but 10^n errors (e.g. writing 550 nm as 550×10^{-6} m) count only as arithmetical slips and lose the answer/unit mark.

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						AVAILABLE MARKS
1	**(a)**	**(i)**	Stopwatch/stopclock		[1]	
		(ii)	3 [1] Hz [1] Independent unit mark		[2]	
		(iii)	energy		[1]	
		(iv)	X = 5 (cm) Y = 6 (cm)		[2]	
		(v)	$v = f \times \lambda$	[1]		
			$= 3 \times 5$	[1]		
			= 15 (cm/s) Allow e.c.f. from **(ii)**	[1]	[3]	
		(vi)	Any **two** examples of E.M. or S-waves		[2]	11
2	**(a)**	**(i)**	Arrow perpendicular to wavefront A		[1]	
		(ii)	Wavefronts should be:			
			parallel,	[1]		
			equally spaced,	[1]		
			equal to incident wavelength	[1]	[3]	
	(b)	**(i)**	Electromagnetic		[1]	
		(ii)	X-rays, infrared, radio		[1]	
		(iii)	Gamma or ultraviolet		[1]	
	(c)		Use: cooking/remote control/etc.	[1]		
			Danger: burning	[1]	[2]	9
3	**(a)**	**(i)**	Angle correct		[1]	
		(ii)	Angle correct		[1]	
		(iii)	Normal		[1]	
	(b)		Air and glass labelled in correct order		[1]	
	(c)	**(i)**	(A –) Prism		[1]	
		(ii)	Red ray		[1]	
		(iii)	Violet ray (refraction at first surface [1] refraction at second surface [1]) Dependent marking		[2]	
		(iv)	**(**Different) colours or wavelengths refract by different amounts **or (**different) colours/wavelength/travel at different speeds	[2] or [0]	[2]	
		(v)	Dispersion		[1]	11

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						AVAILABLE MARKS
4	**(a)**	**(i)**	electrons [1] object [1] Dependent marking		[2]	
		(ii)	Negative		[1]	
		(iii)	Any suitable insulator		[1]	
	(b)	**(i)**	Circuit should include the following: 1. Battery and variable resistor or variable voltage supply [1] 2. Bulb, ammeter, voltmeter – for symbols [1] 3. Ammeter in series with bulb and battery [1] 4. Voltmeter in parallel with lamp [1] 5. Working circuit – which will cause the bulb to light [1]		[5]	
		(ii)	4 (V)		[1]	
		(iii)	R = V/I **or** equivalent formula [1] = 4/0.5 Allow e.c.f. from **(ii)** [1] = 8 [1] Ω – free-standing mark [1]		[4]	14
5	**(a)**	**(i)**	= 6 **or** 6.0 (kWh)		[1]	
		(ii)	Cost = 78 p – must be in pence Allow e.c.f. from **(a)(i)**		[1]	
	(b)	**(i)**	(Pin) B		[1]	
		(ii)	Brown		[1]	
		(ii)	Blue		[1]	
	(c)	**(i)**	A large current flows [1] to the earth wire [1] – dependent on first mark The fuse blows [1] – free-standing mark		[3]	
		(ii)	It has double insulation or it is encased in plastic		[1]	
	(d)	**(i)**	Current = Power/Voltage [1] = 2800/250 [1] = 11.2 (A) [1]		[3]	
		(ii)	Fuse = 13 (A) Allow e.c.f. from **(i)** If **(d)(i)** > 13 they forfeit mark for **(d)(ii)**		[1]	13

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					AVAILABLE MARKS
6	**(a)**	**(i)**	Ammeter gives a negative reading	[1]	
		(ii)	No current or Stays at zero	[1]	
	(b)		a.c. current changes **direction** [1] regularly/periodically [1] – Dependent mark	[2]	
	(c)	**(i)**	Increases the voltage	[1]	
		(ii)	Reduces the current [1] Reduces energy/heat loss [1]	[2]	
		(iii)	Reduces voltage [1] for safety reasons [1]	[2]	9
7	**(a)**	**(i)**	(Planet C) Earth [1] (Planet D) Mars [1]	[2]	
		(ii)	Curved arrow similar to A's	[1]	
		(iii)	Jupiter or Saturn or Uranus or Neptune	[1]	

(b)
- Gravity pulled (the gas and dust particles together).
- The cloud began to spin.
- The cloud was denser in the centre or pressure increases.
- The centre got so hot that it became a star or fusion began.
- Idea of accretion

Bands	Response	Marks
A	Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence **5 points** shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to discuss in logical sequence **three or four points** shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates use limited specialist terms to discuss **one or two points** shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

	(c)	**(i)**	Gravity/Gravitational force.	[1]	
		(ii)	Observation/weather/navigation/communication Any **two**, [1] each	[2]	13

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						AVAILABLE MARKS
8	**(i)**		2.0	4.0		7.8	10.2	
		[$\frac{1}{2}$] each, round down						[2]	
	(ii)	Suitable scale for D [1] 5 or 6 points for [2] 3 or 4 points for [1] } tolerance ± 1 square						[3]	
	(iii)	Straight line						[1]	
	(iv)	k = grad [1] k = $\frac{1}{4}$ from coordinates from graph [1] k = 0.25 [1] m/s^2 [1]						[4]	10
							Total		**90**

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