CCEA GCSE DOUBLE AWARD SCIENCE

SCIENCE



EXAM QUESTION PACK

PHYSICS UNIT P2 HIGHER TIER GSD62 PAPERS

STEMUP

These questions belong to CCEA, not to us.

The examination questions, mark schemes and examiner reports in this pack were written and published by CCEA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with CCEA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. CCEA has not endorsed, approved or been involved in the production of it. CCEA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

CCEA publishes its past papers, mark schemes and examiner reports free of charge. Always check the current specification at ccea.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

GSD62

MONDAY 20 JUNE, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

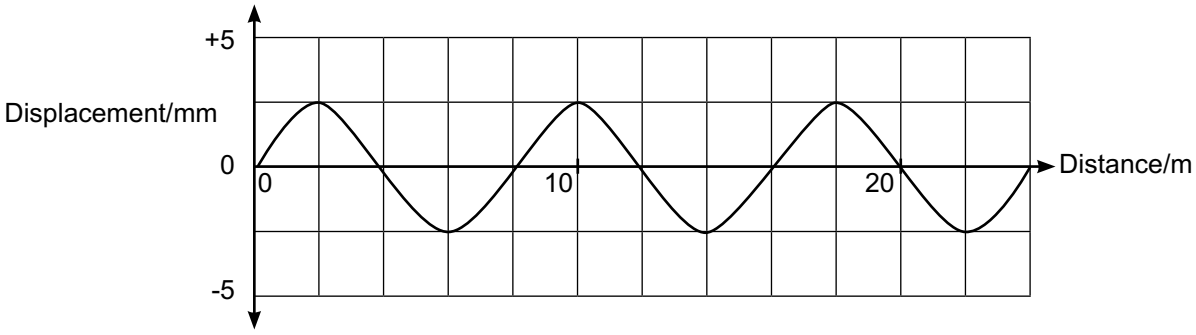
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all eight** 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 **3(b)** and **5(a)**.

STEMUP.CO.UK

1 **(a)** A graph of displacement against distance for a wave passing through air is given below.



(i) State the amplitude of the waves.

Amplitude = _____ mm [1]

(ii) State the wavelength of the waves.

Wavelength = _____ m [1]

(b) Radio waves are part of the electromagnetic spectrum. They travel through air at 3.0×10^8 m/s.

The frequency of a radio wave is 2×10^6 Hz.
Calculate its wavelength.

You are advised to show your working out.

Wavelength = _____ m [3]

STEMUP.CO.UK
24GSD6202

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

Infrared: _____

Gamma: _____ [2]

(d) Describe fully how the particles move in a water wave as it passes a fixed point.

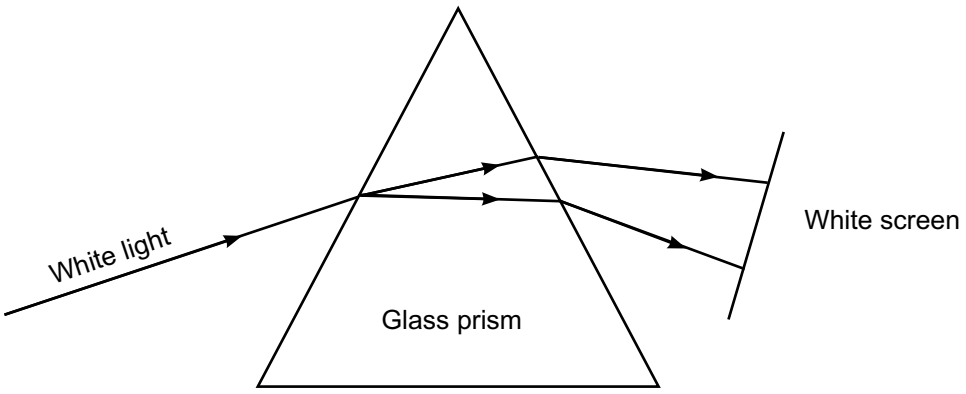
_____

_____

_____

_____ [3]

(e) When light enters a glass prism it is dispersed into its constituent colours.



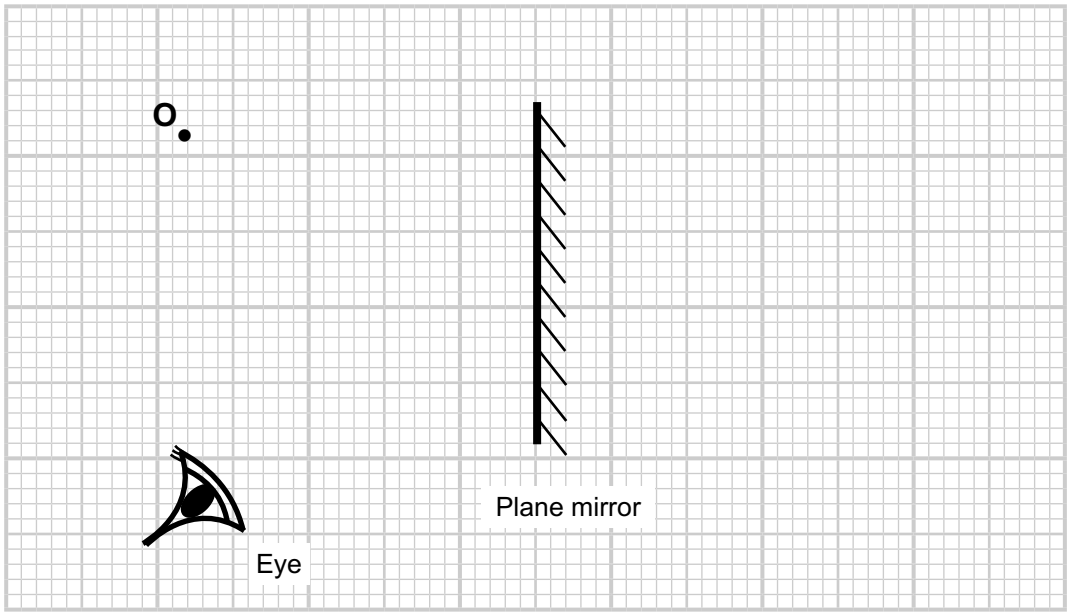
Which colour is refracted the most?

_____ [1]

[Turn over

STEMUP.CO.UK
24GSD6203

2 Jamie looks at an image in a plane mirror.



© Principal Examiner

(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.

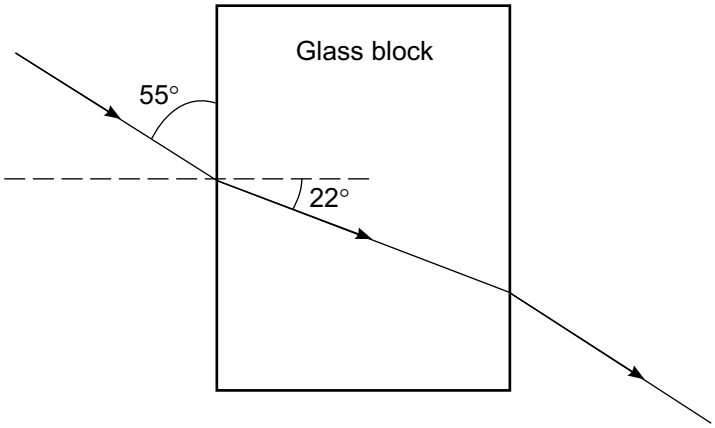
1. _____

2. _____

3. _____ [3]

STEMUP.CO.UK
24GSD6204

Jamie sends a ray of light through a glass block.



(c) (i) What is the angle of incidence?

_____ ° [1]

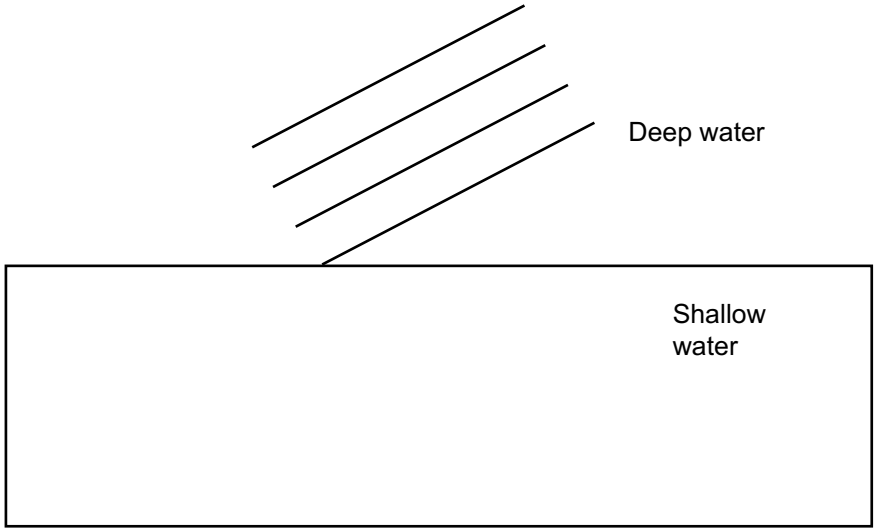
(ii) What is the angle of refraction of the light ray in the glass block?

_____ ° [1]

[Turn over

STEMUP.CO.UK
24GSD6205

(d) Water waves pass from deep water to shallow water in a ripple tank.



(i) Draw an arrow to indicate the direction of travel of the waves in the deep water.

Your arrow should end at the boundary between deep and shallow water. [1]

(ii) Draw an arrow to show the direction of travel of the water waves in the shallow water.

Your arrow should begin at the point where the arrow drawn in **(i)** ends. [1]

(iii) What happens, if anything, to the speed of the waves as they enter the shallow water?

_____ [1]

(iv) What, if anything, happens to the wavelength of the waves as they enter the shallow water?

_____ [1]

STEMUP.CO.UK
24GSD6206

BLANK PAGE

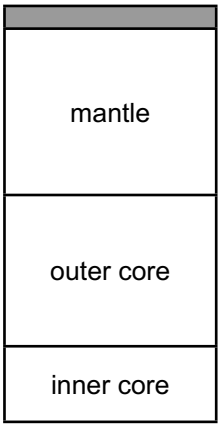
DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

STEMUP.CO.UK

3 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 layer shaded in the diagram above.

Answer _____ [1]

STEMUP.CO.UK
24GSD6208

(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

STEMUP.CO.UK
24GSD6209

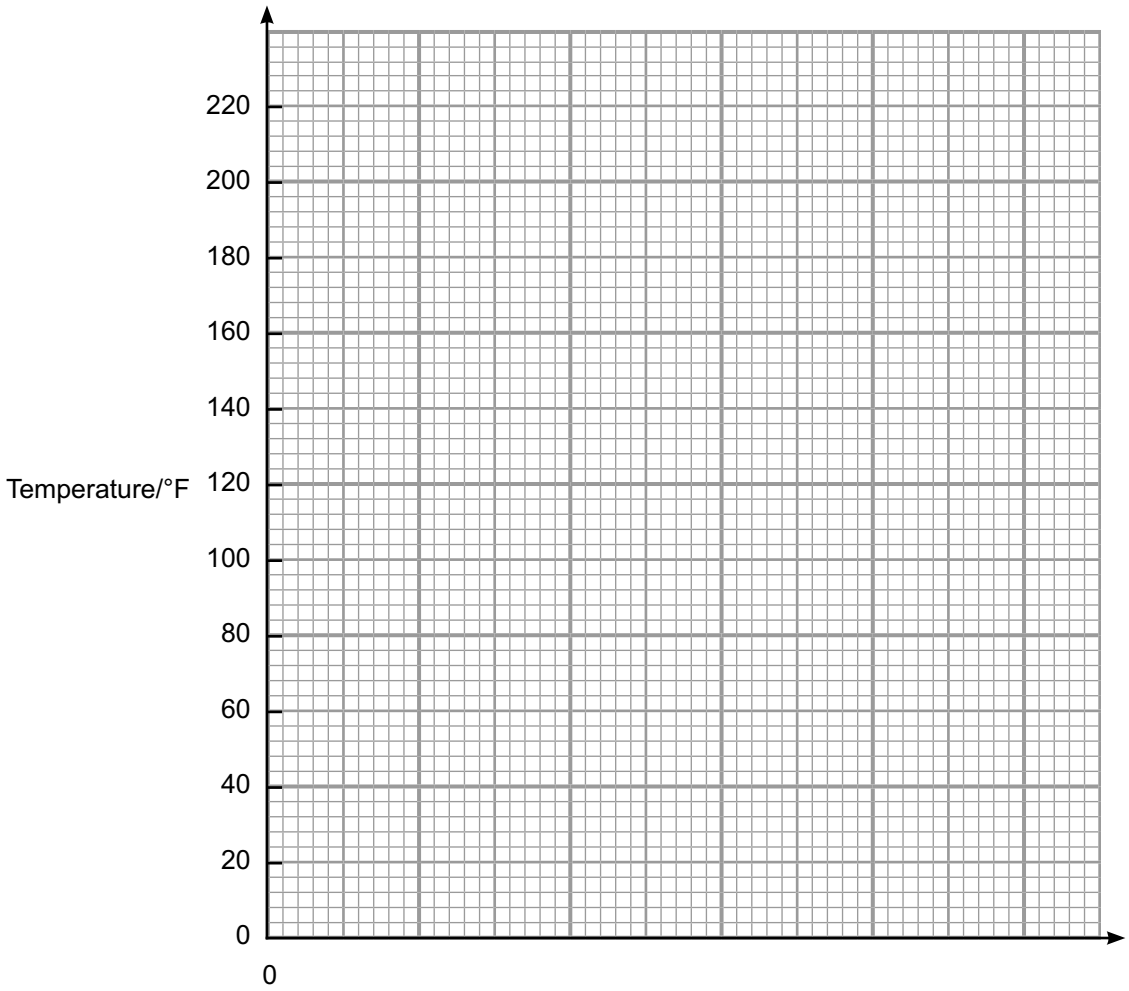
4 Temperature is measured in degrees Celsius (°C). An older temperature scale is called Fahrenheit (°F).

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.



(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? _____

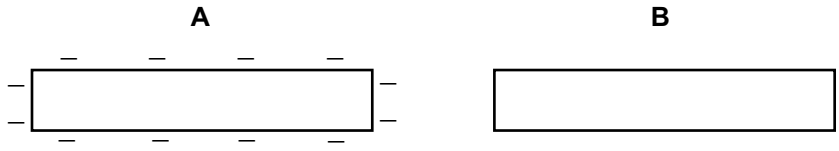
Give a reason for your answer.

_____ [1]

[Turn over

STEMUP.CO.UK

5 A plastic rod **A** is negatively charged. It is brought close to, but not touching, a second uncharged plastic rod, **B**.



(a) Explain fully in terms of charges why the rods attract each other.

In your answer you must:

- describe how rod **A** may have become charged;
- describe, in terms of charges, why the rods attract each other.

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

[6]

STEMUP.CO.UK

Lightning is a sudden flow of electricity.



© Balazs Kovacs / iStock / Thinkstock

(b) A flash of lightning lasts 2×10^{-4} s during which 15 C of charge is transferred from a charged cloud to earth.

Calculate the average current.

You are advised to show your working out.

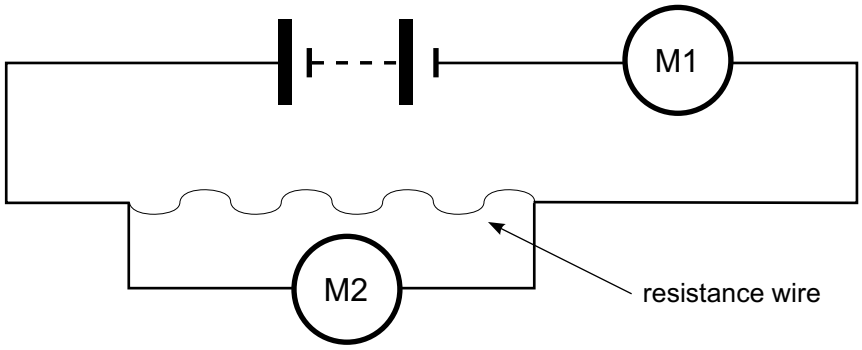
Current = _____ A [3]

[Turn over

STEMUP.CO.UK
24GSD6213

6 Julie wants to find out how the resistance of a piece of resistance wire depends on its length. She can vary the length of the wire.

She sets up the circuit shown to get enough readings to plot a graph.
M1 and M2 represent electrical meters.



(i) What does meter M1 measure? M1 measures _____

What does meter M2 measure? M2 measures _____ [2]

(ii) What additional component should Julie have included in the circuit?

_____ [1]

(iii) Why should she have included this component?

_____ [1]

(iv) Name **two** factors that must be kept constant during the experiment to make the test fair.

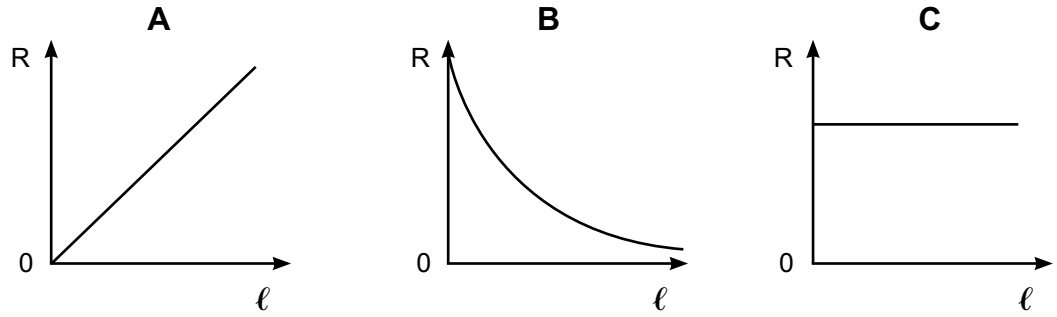
1. _____

2. _____ [2]

STEMUP.CO.UK
24GSD6214

(v) Which of the following graphs, **A**, **B** or **C**, correctly shows how the resistance R changes with the length ℓ?

Put a circle around the correct letter below.



[1]

(vi) Julie has a piece of resistance wire. It is 90 cm long and has a resistance of 6 Ω. However she only needs a resistance of 5 Ω. What length of resistance wire will she use?

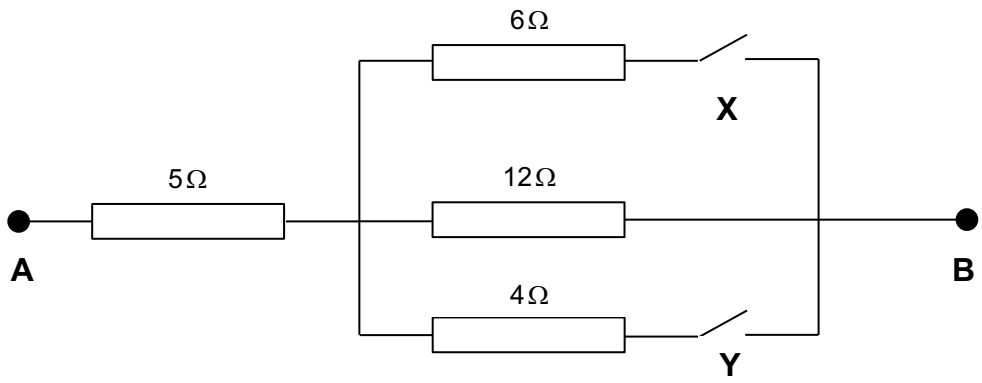
You are advised to show your working out.

Length = _____ cm [3]

[Turn over

STEMUP.CO.UK
24GSD6215

7 Four resistors are arranged in the following pattern.



(a) (i) Complete the table to show the total resistance between **A** and **B** for the different switch settings.

Switch X	Switch Y	Resistance between A and B/Ω
Open	Open	
Closed	Open	

[2]

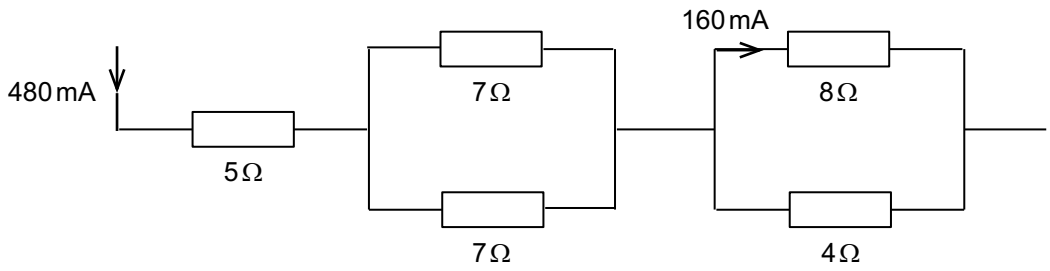
(ii) Calculate the total resistance between **A** and **B** when both switches are closed.

You are advised to show your working out.

Resistance = _____ Ω [4]

STEMUP.CO.UK
24GSD6216

A current of 480 mA flows through the 5 Ω resistor in the circuit below.



(b) Complete the table to show the currents flowing through the different resistors.

Resistor	Current flowing/mA
5 Ω	480
7 Ω	
4 Ω	

[2]

(c) What is the voltage across the 5 Ω resistor when a current of 480 mA flows through it?

You are advised to show your working out.

Voltage = _____ V [4]

[Turn over

STEMUP.CO.UK
24GSD6217

(d) What is the power developed in a different resistor if the current through it is 0.02 A when the voltage across it is 6.0 V?
Remember to include the unit.

You are advised to show your working out.

Power = _____ [4]

STEMUP.CO.UK
24GSD6218

BLANK PAGE

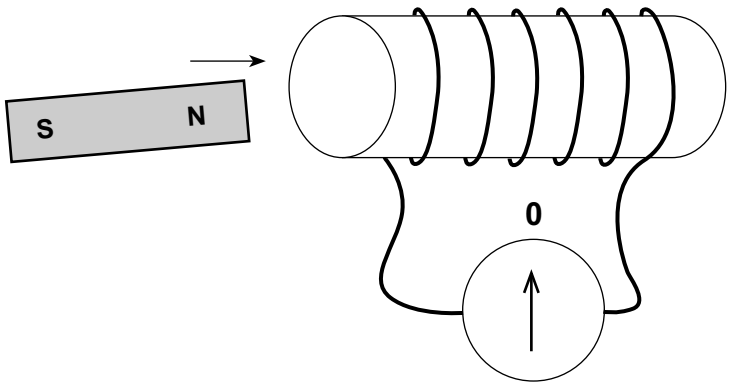
DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

STEMUP.CO.UK

8 The diagram below shows a coil, a sensitive centre-zero ammeter and a bar magnet.



(a) When the North pole of the bar magnet is moved into the coil the ammeter gives a momentary deflection to the left.

(i) What, if anything, is observed on the centre-zero ammeter when the magnet is at rest inside the coil?

_____ [1]

(ii) The magnet is now withdrawn from the coil. What, if anything, is observed on the centre-zero ammeter as the magnet is moved away from the coil?

_____

_____ [2]

STEMUP.CO.UK
24GSD6220

(b) The input voltage to a transformer is 240 V.
There are 2000 turns on the primary coil and 100 turns on the secondary coil.

Calculate the output voltage of the transformer.

You are advised to show your working out.

Output voltage = _____ V [3]

(c) Transformers play an important role in the distribution of electricity.

(i) Where is the step-up transformer used?

_____ [1]

(ii) Explain fully its use in the transmission system.

_____

_____

_____ [3]

THIS IS THE END OF THE QUESTION PAPER

STEMUP.CO.UK
24GSD6221

BLANK PAGE

DO NOT WRITE ON THIS PAGE

STEMUP.CO.UK
24GSD6222

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

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

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

Rewarding Learning

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

MONDAY 20 JUNE, MORNING

MARK SCHEME

STEMUP.CO.UK

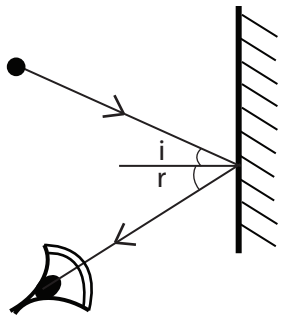
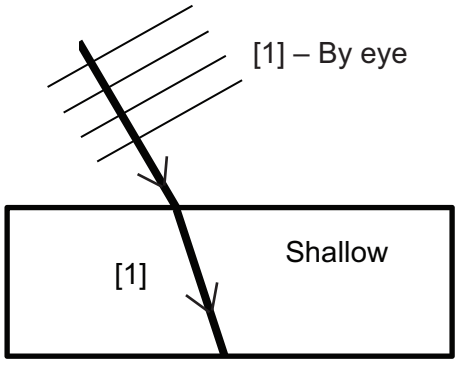
Subject-specific Instructions

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)** 2.5 (mm) [1]		
	(ii) 8 (m) [1]		
	(b) λ		
	$v = f \times \lambda$ [1]		
	$\lambda = \frac{3 \times 10^8}{2 \times 10^6}$ [1]		
	= 150 (m) [1]	[3]	
	(c) **Burning** [1] Cancer [1]	[2]	
	(d) Particles vibrate [1] at right angles [1] – Independent marking to the direction of the wave motion [1]	[3]	
	(e) violet [1]		11
2	**(a)**  Mark independently { incident ray [1]; reflected ray [1]; correct arrow [1]; i = r [1] }	[4]	
	(b) **Three** from: The image is: same size or height as object [1] **virtual** [1] upright or erect [1] **laterally inverted** [1] Reject: Laterally virtual Same distance behind the mirror as object is in front [1]	[3]	
	(c) **(i)** 35° [1]		
	(ii) 22° [1]		
	(d) **(i)** [1] – By eye	[1]	
	(ii) 	[1]	
	(iii) (Speed) decreases [1]		
	(iv) (Wavelength) decreases [1]		13

STEMUP.CO.UK

					AVAILABLE MARKS
3	**(a)**	**(i)**	Outer core	[1]	
		(ii)	Mantle	[1]	
		(iii)	Crust Accept Earth's crust	[1]	
	(b)	hydrogen [1] gravity [1] coming together [1] increase in temp/density/pressure [1] fusion [1] fuse radiation (emitted)/light emitted/heat energy (emitted) [1]		Mark independently [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]

4	**(i)**	1 cm = 10° C 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] °F/°C [1] Allow 1.7 to 1.9		[4]	
	(vii)	No Does not pass through origin/(0,0)		[1]	12

			AVAILABLE MARKS
5	**(a)**	Friction [1] electrons move [1] onto rod A [1] repel electrons in B [1] leaving B positive [1] opposite = unlike charges attract [1] [6]	

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]

	(b)	$I = Q/t$ [1] $= \frac{15}{2 \times 10^{-4}}$ [1] = 75 000 (A) [1] or 7.5×10^4 [3]	9
6	**(i)**	M1 – current [1] M2 – voltage [1] [2]	
	(ii)	**Variable resistor or Rheostat** [1]	
	(iii)	allows more than one set of results [1]	
	(iv)	csa, temperature, material – any **two** [2]	
	(v)	A [1]	
	(vi)	$\frac{1}{6}$ of 90 [1] $\frac{5}{6}$ of 90 [1] 75 (cm) [1] **or** $1\Omega = \frac{90}{6\ (cm)}$ [1] 1Ω = 15 (cm) [1] 5Ω = 75 (cm) [1] [3]	10

Dependent marking

				AVAILABLE MARKS
7	(a) (i)			

Switch X	Switch Y	Resistance between A and B/Ω
Open	Open	17
Closed	Open	9

[2]

(ii) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ [1]

$\left(\frac{1}{R_T}\right) = \frac{1}{6} + \frac{1}{12} + \frac{1}{4}$ [1]

$R_T = 2\,(\Omega)$ [1]

$R_{AB} = 7\ (\Omega)$ [1] [4]

(b)

Resistor	Current flowing/mA
5Ω	480
7Ω	**240**
4Ω	**320**

[2]

(c) V = IR [1] = 0.48 [1] × 5 [1] = 2.4 (V) [1] [4]

(d) Power = IV [1] = 0.02 × 6.0 [1] = 0.12 [1] (W) [1] or Js^{-1} [4] 16

8 **(a)** **(i)** no deflection/stays the same/needle doesn't move [1]

(ii) (momentary) deflection [1] to right [1] Independent marking [2]

(b) $\frac{N_S}{N_P} = \frac{V_S}{V_P}$ [1] or equivalent

$\frac{100}{2000} = \frac{V_S}{240}$ [1]

$V_S = 12\,(V)$ [1] [3]

(c) **(i)** at power station [1]

(ii) It steps up the voltage [1] which reduces the current [1] which reduces heat loss in the cables [1] } Independent marking [3] 10

Total **90**

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

FRIDAY 12 JUNE, AFTERNOON

GSD62

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

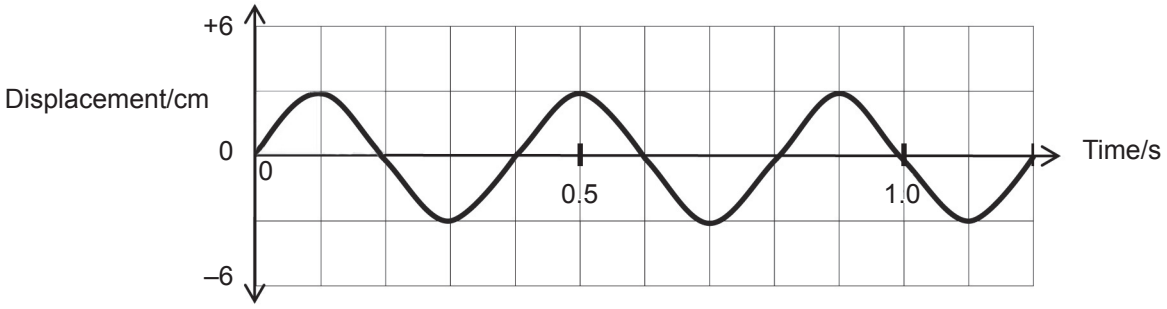
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all nine** 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 Questions **5** and **9(b)**.

20GSD6201

1 The outline of a water wave is given below.



(a) (i) Use the graph to find the amplitude of the wave.

_____ cm [1]

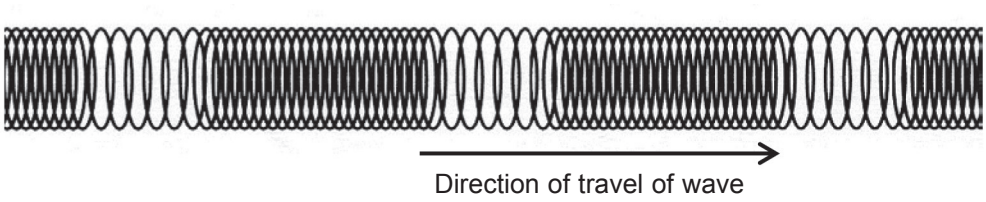
(ii) Use the graph to find the frequency of the wave.

You are advised to show your working out.

Frequency = _____ Hz [3]

(iii) On the same diagram draw a **single wavelength of a new wave** which has twice the amplitude and twice the frequency of the above wave. [2]

(b) The diagram shows how waves can be generated on a slinky.



In what direction do particles of the spring vibrate as waves pass?

_____ [1]

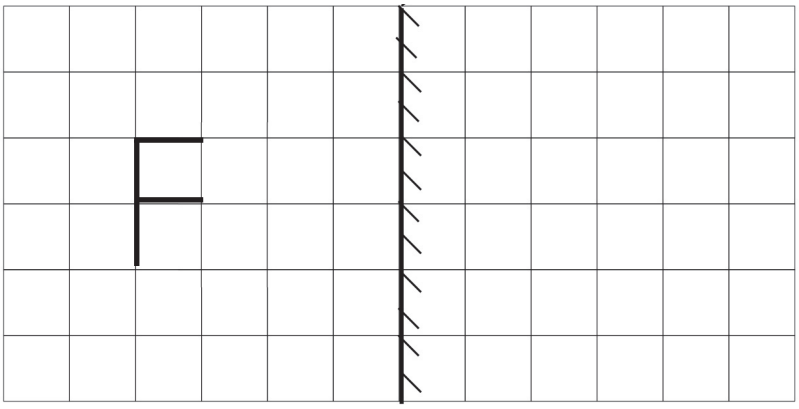
(c) Microwaves travel through space at 3.0×10^8 m/s.
If their frequency is 1.5×10^{10} Hz, what is their wavelength?

You are advised to show your working out.

Wavelength = _____ m [3]

[Turn over

2 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.

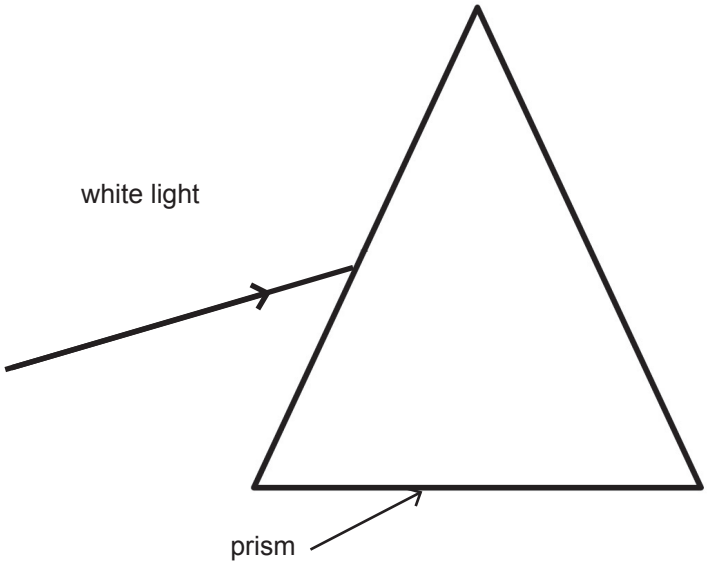
(ii) How far is the letter F from its image?

You are advised to show your working out.

Distance = _____ m [2]

White light can be dispersed into its different colours.

(b) (i) Complete the diagram below to show how white light can be dispersed to produce red and violet light. Label the red and violet rays.



[3]

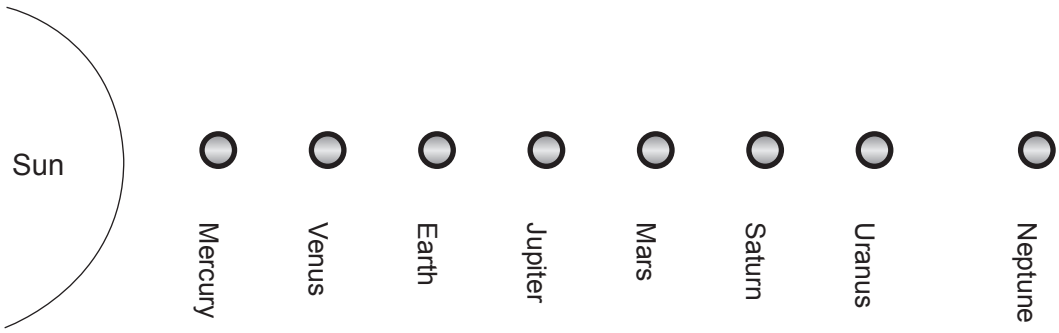
(ii) Explain why different colours travel in different directions in the prism.

_____

_____ [1]

[Turn over

3 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]

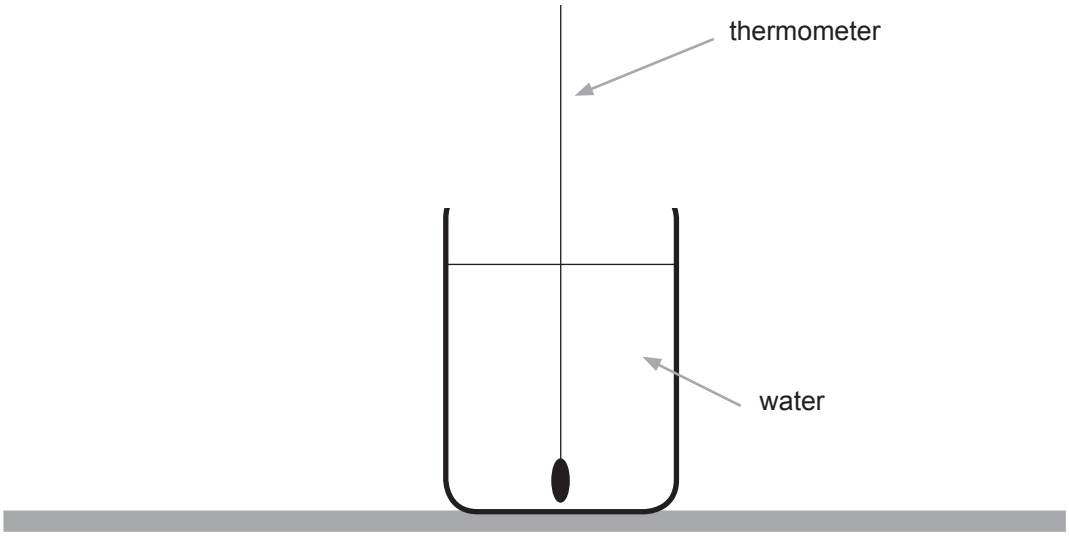
(iii) What is the name of the model with the Sun at the centre?

_____ [1]

[Turn over

4 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.

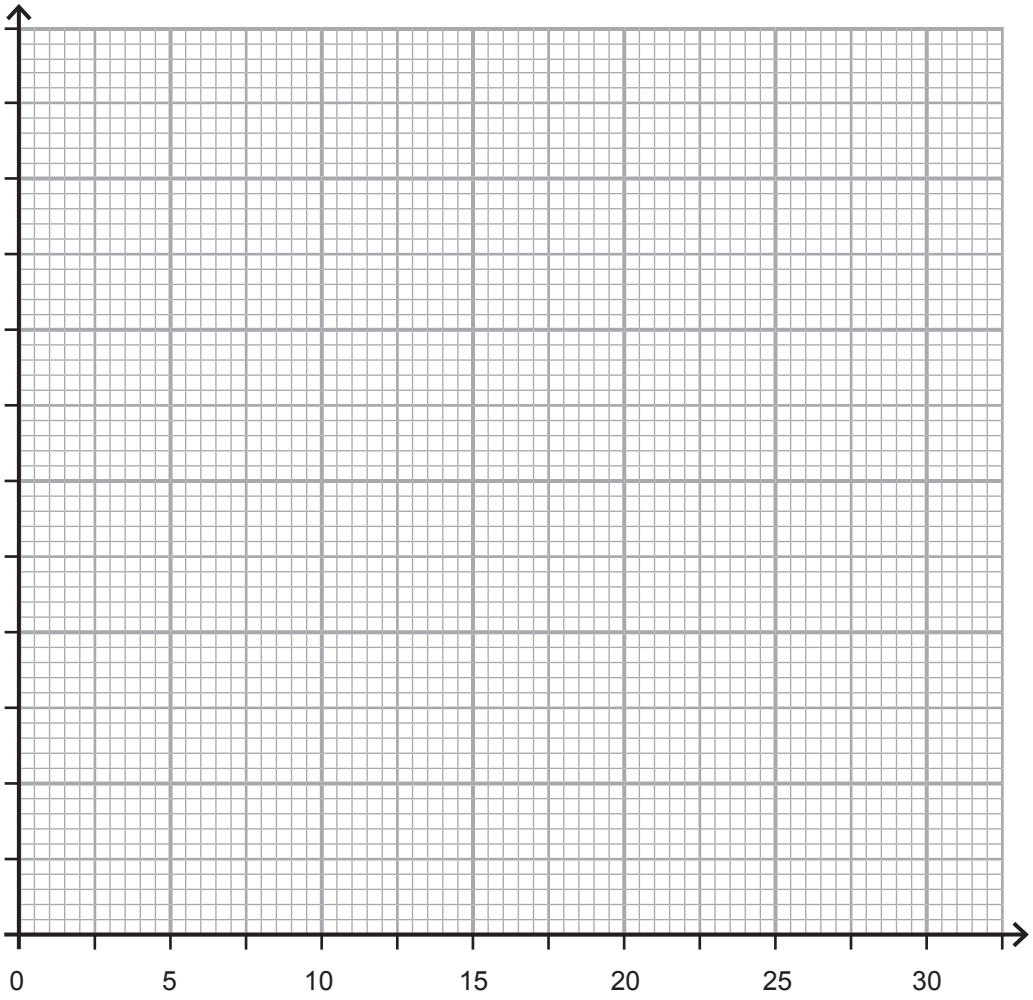
Temperature/°C	100	66	45	30	22	18	18
Time/min	0	5	10	15	20	25	30

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

5 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]

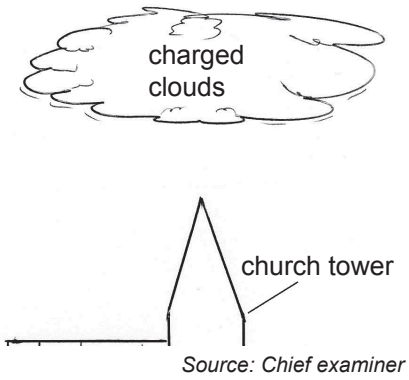
BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

6 Charged thunderclouds can cause damage to tall buildings.



Source: Chief examiner

(a) (i) How do the clouds become charged?

_____ [1]

(ii) What phenomenon could the charge on the clouds lead to?

_____ [1]

(iii) How can this damage to tall buildings be reduced?

_____

_____ [1]

(b) A current of 20 mA flows through a resistor. How much charge passes in 5 minutes? Remember 1 mA = 0.001A.

You are advised to show your working out.

Charge = _____ C [4]

Samuel wants to find the relationship between the resistance and the area of cross section of a piece of resistance wire.

He measures the resistance of different thicknesses of a metal wire and obtains the following results.

Area of cross section of wire, A/mm^2	0.5	1.0	2.0	3.0	4.0
Resistance of wire, R/Ω	24.0	12.0	6.0	4.0	3.0
Product of resistance and area of cross section/Ω mm^2			12.0		

(c) (i) How would Samuel make this a fair test, assuming he keeps the temperature of the wire constant?

_____ [1]

(ii) Complete the third row of the table above. One entry has been done for you. [1]

(iii) Use the results to state the **general** relationship between area of cross section and resistance.

_____

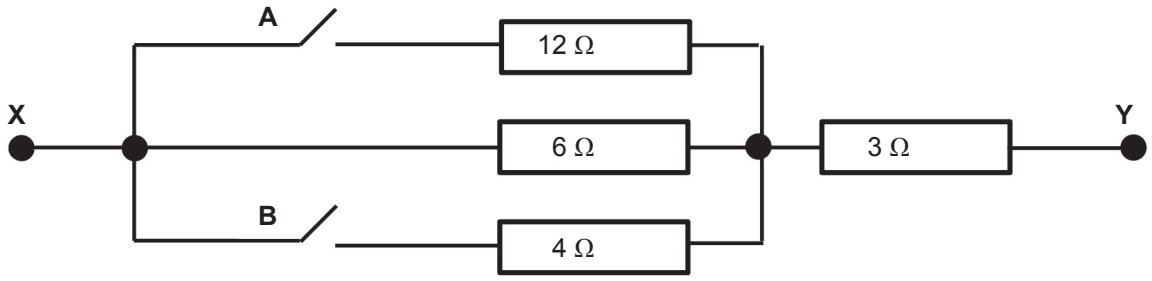
_____ [1]

(iv) Calculate the resistance of this wire if its area of cross section is 1.5 mm^2.

Resistance = _____ Ω [1]

[Turn over

7 Four resistors are connected between **X** and **Y** as shown below.



(a) (i) Complete the following table to show the effective resistance between **X** and **Y** for the different switch settings.

SWITCH		**Resistance between X and Y /Ω**
A	**B**	
Open	Open	
Closed	Open	
Open	Closed	

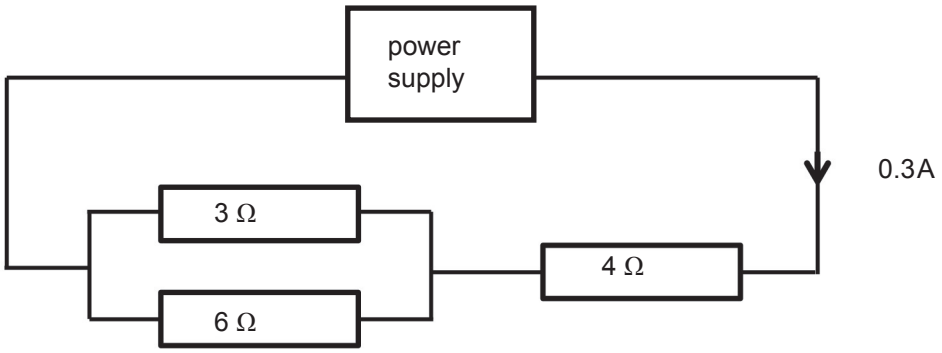
[3]

(ii) Calculate the total resistance between **X** and **Y** when both switches are closed.

You are advised to show your working out.

Total resistance = _____ Ω [4]

In the following circuit a current of 0.3A flows through the 4 Ω resistor.



(b) (i) What currents flow through the other two resistors?

Current through 3 Ω resistor = _____ A

Current through 6 Ω resistor = _____ A [2]

(ii) Calculate the voltage across the 4 Ω resistor.

You are advised to show your working out.

Voltage across 4 Ω resistor = _____ V [3]

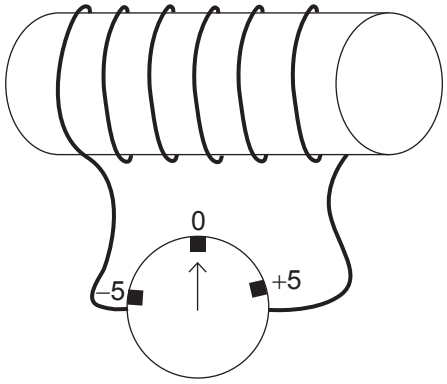
(iii) Calculate the power developed in the 4 Ω resistor.

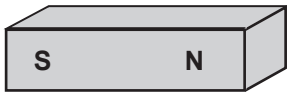
You are advised to show your working out.

Power in the 4 Ω resistor = _____ W [3]

[Turn over

8 A sensitive zero centred ammeter is connected to a coil of wire as shown.





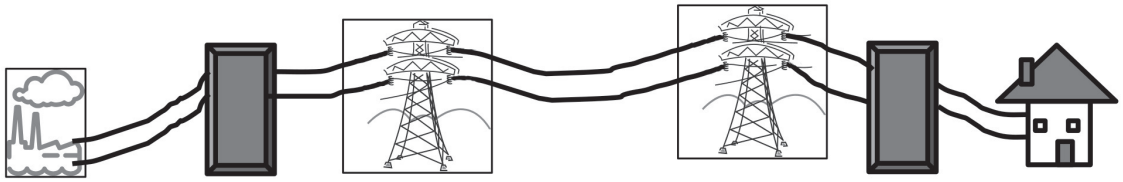
A magnet is moved towards the coil and the ammeter gives a momentary deflection to the left, as shown in the table.

(a) Complete the table.

PROCEDURE	OBSERVATION
S Pole of magnet enters the coil	Momentary deflection to the left
S Pole of magnet now withdraws from the coil	Momentary deflection to the _____
N Pole of magnet enters the coil	Momentary deflection to the _____
N Pole of magnet now withdraws from the coil	Momentary deflection to the _____

[3]

(b) The following diagram shows the main stages in the generation and transmission of electricity.



generator in power station | transformer **A** | transformer **B** | home

(i) In what way does transformer **A** alter the current?

_____ [1]

(ii) What is the function of transformer **B**?

_____ [1]

(iii) Explain, briefly, how heat is generated in the cables when they carry an electric current.

_____ [1]

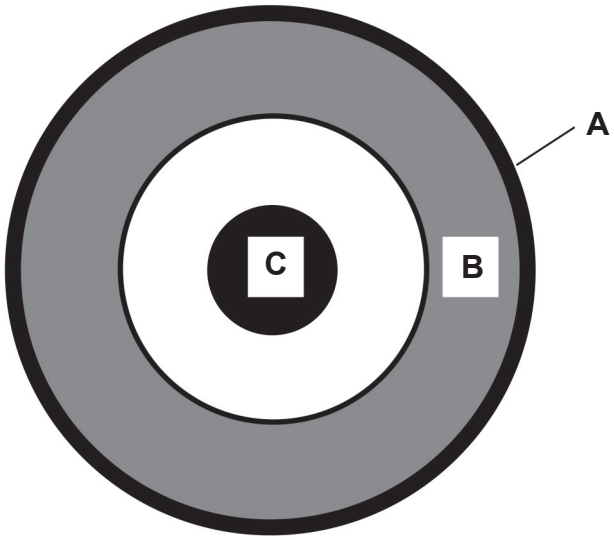
(c) A transformer for a printer reduces the voltage from 240 V to 36 V. If the primary coil has 1800 turns, how many turns are on the secondary coil?

You are advised to show your working out.

Number of turns = _____ [3]

[Turn over

9 The structure of the Earth is drawn below.



(a) Name parts **A**, **B** and **C**.

A _____

B _____

C _____ [3]

(b) Describe and explain the causes of earthquakes and volcanoes.

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

Earthquakes

Volcanoes

[6]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

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

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

Rewarding Learning

General Certificate of Secondary Education
2015

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

FRIDAY 12 JUNE, AFTERNOON

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

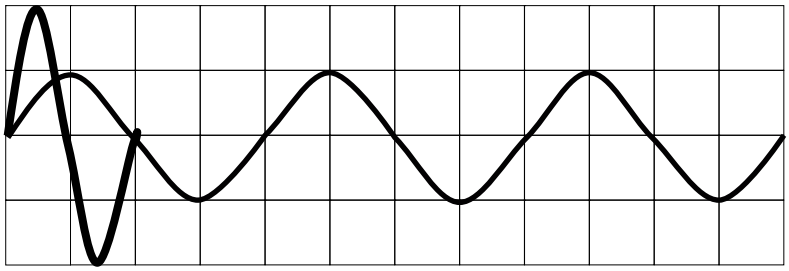
The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

1 **(a)** **(i)** 3 (cm) [1]

(ii) f = 1/T or equivalent [1]
Frequency = 1/0.4 [1] Frequency = 2.5 (Hz) [1] [3]

(iii) Correct amplitude [1] correct frequency [1] [2]
Negative sine or cosine wave acceptable



(b) Horizontally **or** backwards and forwards **or** left and right [1]

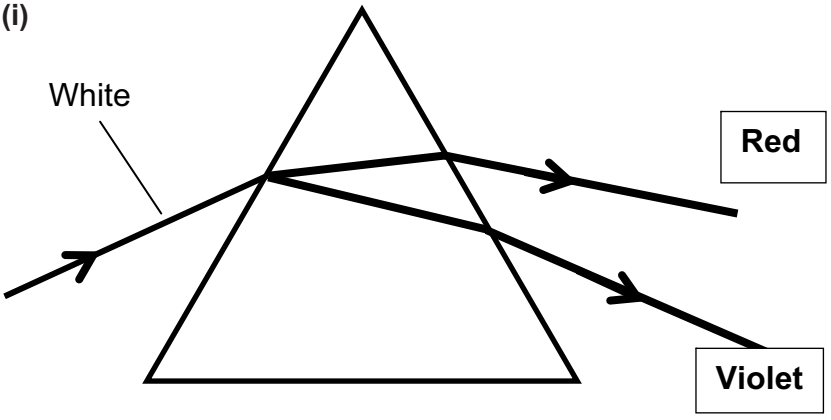
(c) { Speed = frequency × wavelength (**or** symbols) / Wavelength = Speed/frequency } [1]
$= 3.0 \times 10^{8} / 1.5 \times 10^{10}$ [1]
$= 2 \times 10^{-2}$ (m) [1]
or 0.02 (m) [3]

AVAILABLE MARKS: 10

2 **(a)** **(i)** Position of vertical line [1] laterally inverted [1] same size [1]
Independent marking [3]

(ii) New distance of F from mirror = **0.5** (m) [1]
Distance of F to image = 0.5 × 2 = 1.0 (m) [1] [2]

(b) **(i)**



Both correct refractions **inside** prism [1]
Both correct refractions **outside** prism [1] } D.M. Hierarchical Marking
Both correct labels inside or outside [1] [3]

(ii) Travel at different speeds or red travels faster than violet [1]

AVAILABLE MARKS: 9

STEMUP.CO.UK

					AVAILABLE MARKS
3	(a)	(i)	Mars and Jupiter [mark independently]	[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	[2]	
		(iv)	Gravity	[1]	
	(b)	(i)	geocentric	[1]	
		(ii)	Earth	[1]	
		(iii)	Heliocentric	[1]	12
4	(i)		Scale at least half [1] correct label with unit [1]	[2]	
	(ii)		plot points, 6 or 7 correct [2], 4 or 5 correct [1] [± 1 square]	[2]	
	(iii)		points joined in a curve "Point to Point" gets [0]/[1]	[1]	
	(iv)		(reached) room temperature	[1]	
	(v)		Temp. or it decreases [1] to a constant value [1] Dependent marking	[2]	
	(vi)		36(°C)–40(°C)	[1]	9

5 **Five** points from:
Big Bang [1]
Explosion [1] or "singularity"
12–15 billion years ago [1]
Light from other galaxies [1]
Shifted to the red end of the spectrum [1]
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

STEMUP.CO.UK

						AVAILABLE MARKS
6	(a)	(i)	(Clouds) rub together/friction	[1]		
		(ii)	Lightning	[1]		
		(iii)	Put a lightning **conductor** on the tower/use a conducting path	[1]		
	(b)		Q = It or equivalent [1] = 0.02 [1] × 5 × 60 [1] or 0.02 [1] × 300 [1] = 6 (C) [1]	[4]		
	(c)	(i)	Length is constant	[1]		
		(ii)	All products = 12	[1]		
		(iii)	(Area (of cross section) is) INVERSELY PROPORTIONAL (to resistance) **or** R × A = constant	[1]		
		(iv)	8(Ω)	[1]		11

7	(a)	(i)				

SWITCH		Resistance between X and Y (in Ω)
A	B	
Open	Open	**9**
Closed	Open	**7**
Open	Closed	**5.4**

			[1] for each correct answer	[3]		
		(ii)	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	[1]		
			$= \frac{1}{12} + \frac{1}{6} + \frac{1}{4}$ or $\frac{6}{12}$ or $\frac{1}{2}$	[1]		
			R = 2	[1]		
			R_{Total} = 5 (Ω)	[1]	[4]	
			or			
			$R = \frac{\text{Product}}{\text{sum}}$	[1]		
			R = 4(Ω)	[1]		
			R = 2(Ω)	[1]		
			R = 5(Ω)	[1]		
	(b)	(i)	3 Ω – 0.2A [1] 6 Ω – 0.1A [1]	[2]		
		(ii)	V = IR [1] V = 0.3 × 4 [1] V = 1.2 V [1]	[3]		
		(iii)	Power = V × I or $P = I^2R$ or $P = \frac{V^2}{R}$	[1]		
			Power = 1.2 × 0.3 **ecf** for V from **(ii)**	[1]		
			Power = 0.36 W	[1]	[3]	15

STEMUP.CO.UK

			AVAILABLE MARKS
8	**(a)**		

PROCEDURE	OBSERVATION
S pole of magnet enters the coil	Momentary deflection to the left
S pole of magnet leaves the coil	(Momentary) deflection to the **right**
N pole of magnet enters the coil	(Momentary) deflection to the **right**
N pole of magnet leaves the coil	(Momentary) deflection to the **left**

[1] for each correct answer [3]

(b) **(i)** Decreases/step-down/less/weakens (the current) [1]
Ignore reference to voltage

(ii) Reduces the voltage/makes the voltage safer [1]

(iii) **Electrons** collide with **atoms** or ions in the wire [1]

(c) $\frac{N_S}{N_P} = \frac{V_S}{V_P}$ [1] $\frac{N_S}{1800} = \frac{36}{240}$ [1] $N_S = 270$ turns [1] [3] 9

9 **(a)** **A** Crust **B** Mantle **C** Inner Core [1] each [3]

(b) Plates move [1]
Plates stick [1]
Plates lurch/jerk/any sudden movement [1]

plates move [1]
plates/rocks melt [1] molten rock
magma (released) [1]
magma = lava

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] 9

Total **90**

STEMUP.CO.UK

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2014

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

GSD62

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 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(c)(iii)**.

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

STEMUP.CO.UK

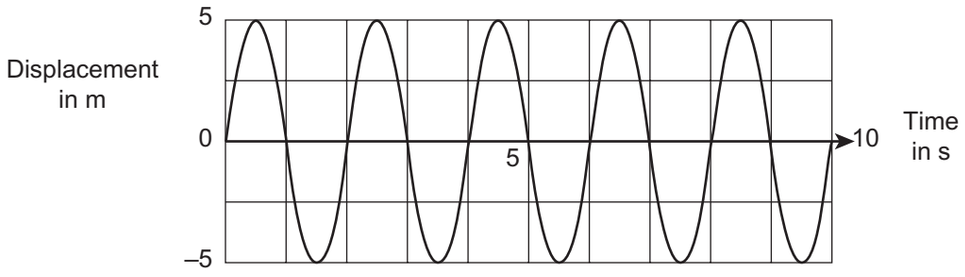
Examiner Only	
Marks	Remark

1 Waves can be divided into two types.

(a) Name the two types of wave.

1. _____ 2. _____ [2]

(b) The graph of a water wave is illustrated below.



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

_____ [1]

(ii) Describe the motion of the particles in the water wave.

_____

_____

_____ [2]

(iii) Use the graph to find the values of amplitude and frequency.

Amplitude = _____ m

Frequency = _____ Hz

[2]

STEMUP.CO.UK

(c) A radio station broadcasts on 100 MHz. Calculate the wavelength if radio waves travel at 3.0 x10^8 m/s.
You are advised to show your working out.

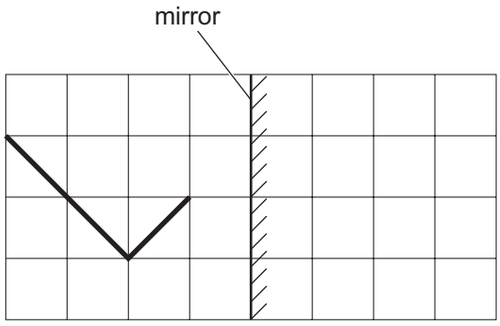
Examiner Only	
Marks	Remark

Wavelength = _____ m [4]

STEMUP.CO.UK

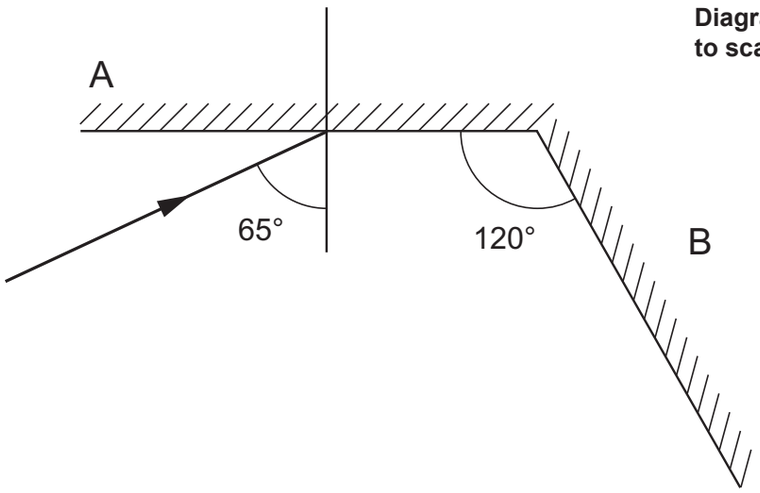
Examiner Only	
Marks	Remark

2 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 A and B are arranged at 120° as shown below. A ray of light is incident on mirror A.



(b) (i) Continue the ray showing reflection in both mirrors. [2]

The angle of incidence of the above ray is 65°.

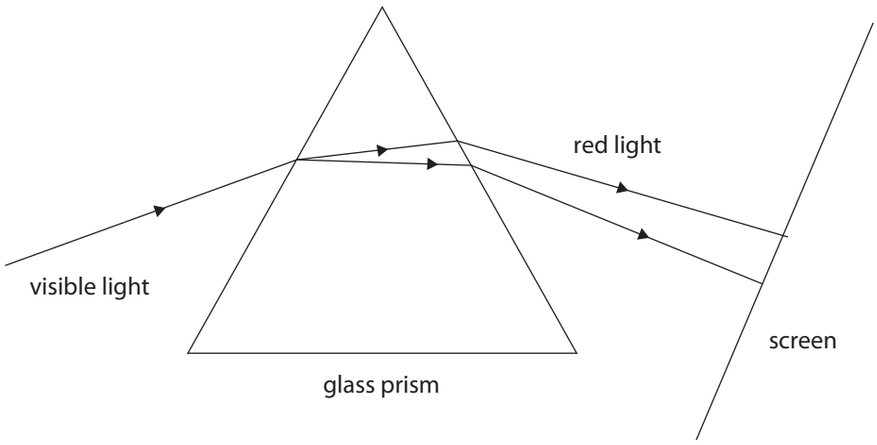
(ii) What is the angle of reflection of the ray reflected by mirror B?

You are advised to show your working out.

Angle of reflection = _____ [2]

STEMUP.CO.UK

(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 _____

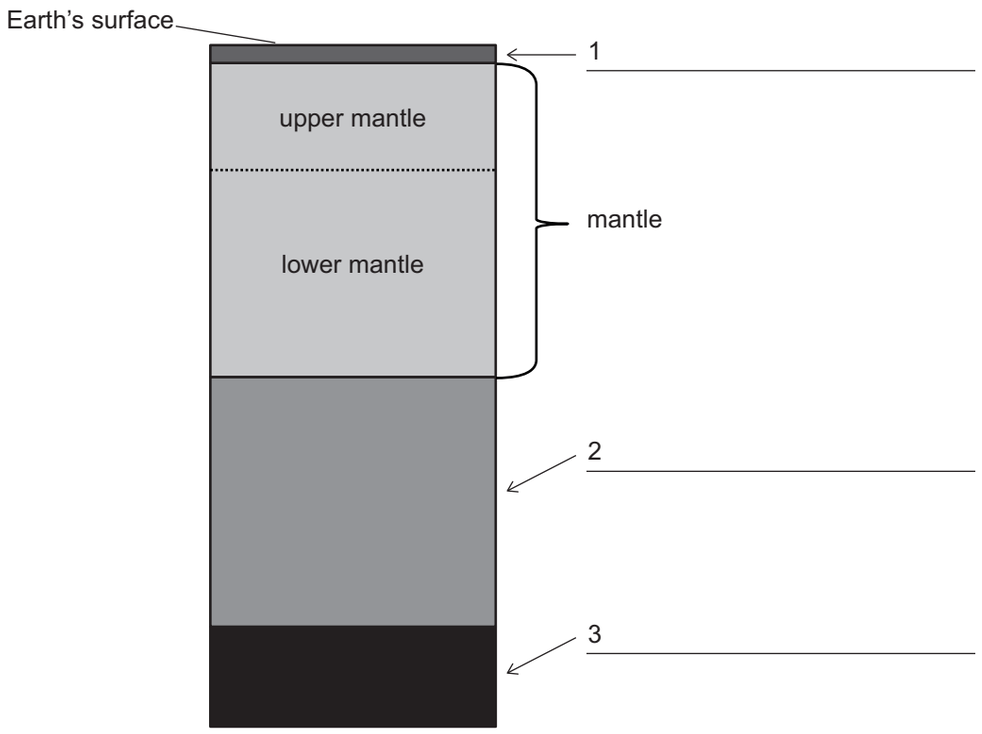
2. Longer wavelength than visible light _____ [2]

Examiner Only	
Marks	Remark

STEMUP.CO.UK

Examiner Only	
Marks	Remark

3 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]

STEMUP.CO.UK

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]

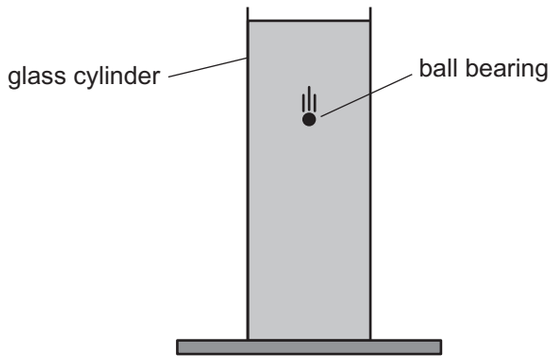
(iii) Name two large-scale processes which occur because of the movement of the plates that make up the lithosphere.

_____ and _____ [2]

STEMUP.CO.UK

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

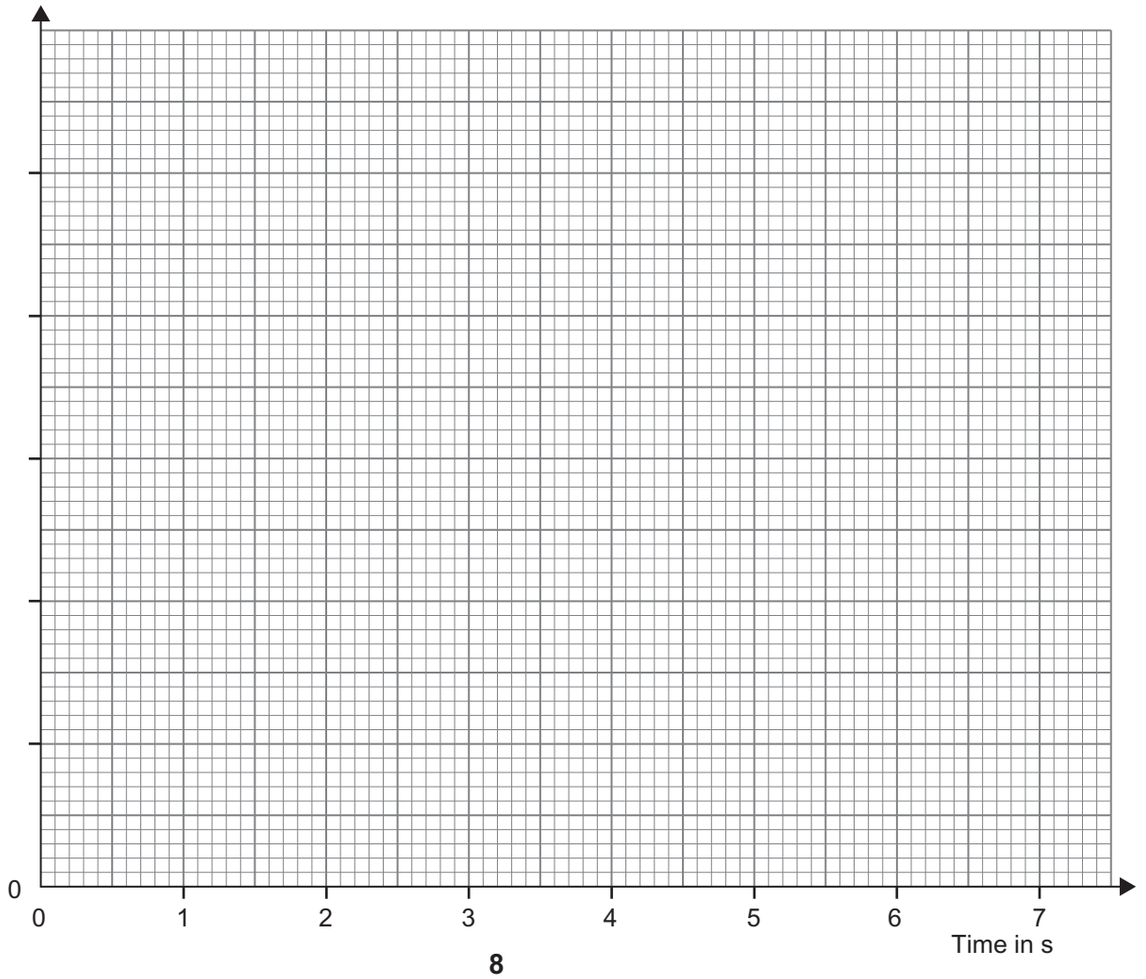
Examiner Only	
Marks	Remark



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]



STEMUP.CO.UK

(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 = _____

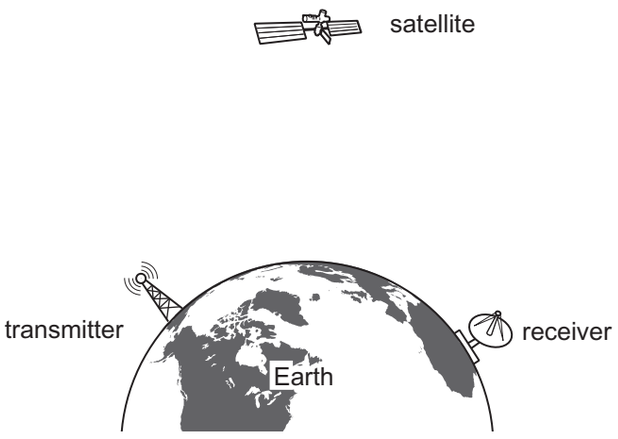
Unit = _____ [3]

Examiner Only	
Marks	Remark

STEMUP.CO.UK

Examiner Only	
Marks	Remark

5 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]

STEMUP.CO.UK

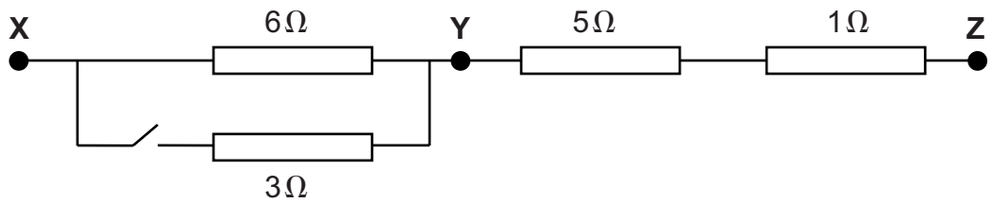
BLANK PAGE

(Questions continue overleaf)

STEMUP.CO.UK

Examiner Only	
Marks	Remark

6 Resistors are arranged in the following formation.



(a) (i) Calculate the resistance between points **X** and **Y** when the switch is **closed**.

You are advised to show your working out.

Resistance between **X** and **Y** = _____ Ω [3]

(ii) Complete the table to show the total resistance between the different switch settings.

Switch	**Resistance between points in Ω**	
Open	**X** and **Z**	
Closed	**X** and **Z**	

[2]

(b) When the switch is **closed** a current of 600 mA flows through the 1 Ω resistor. State the currents flowing through the other resistors.

Resistor	**Current in mA**
5 Ω	
6 Ω	
3 Ω	

[3]

STEMUP.CO.UK

(c) (i) What is the voltage across an 8 Ω resistor when a current of 600 mA is flowing through it?

You are advised to show your working out.

Voltage = _____ V [4]

(ii) What is the power developed in the 8 Ω resistor when 600 mA flows through it?
Remember to include the unit.

You are advised to show your working out.

Power = _____ [4]

Examiner Only	
Marks	Remark

STEMUP.CO.UK

Examiner Only	
Marks	Remark

7 A girl's hair is brushed with a plastic brush.
A few strands of hair are left sticking out.



© Andrew Lambert Photography / Science Photo Library

(a) Explain fully why the strands of hair are sticking out.

_____

_____

_____ [2]

(b) A current of 0.2A flows through a resistor for 3 minutes. Calculate the charge which flows in this time interval.
You are advised to show your working out.

Charge = _____ C [4]

(c) Amy is asked to find how the resistance of a metallic conductor depends on the area of cross section.

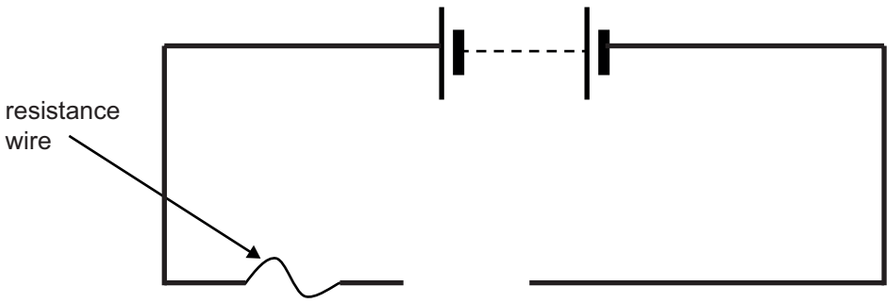
(i) State two precautions she must take to ensure the experiment is a fair test.

_____

_____ [2]

STEMUP.CO.UK

(ii) Complete the circuit diagram to show how she would find the resistance of the metal wire.



[3]

(iii) Describe the experiment Amy would carry out to investigate how the resistance of a wire would depend on its area of cross section. Your method 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.

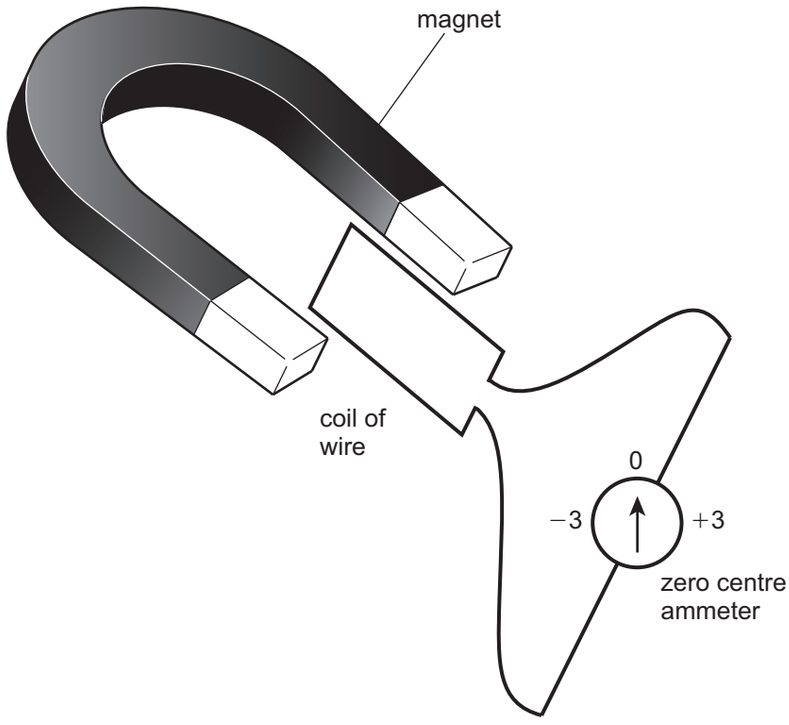
[6]

Examiner Only

Marks	Remark

STEMUP.CO.UK

8 Luke holds a coil of wire between the poles of a large magnet.



When Luke moves the coil into the gap between the poles of the magnet, the needle on the ammeter moves to −3 and returns to zero.

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

_____

_____ [2]

Examiner Only	
Marks	Remark

STEMUP.CO.UK

(ii) Draw a graph to show the output you would expect to obtain from an a.c. generator.



[2]

(b) A transformer for an electric shaver reduces the mains voltage of 240 V to 12 V.

(i) What is the turns ratio?

$$\frac{\text{Turns on secondary coil}}{\text{Turns on primary coil}} =$$

[1]

(ii) If there are 600 turns on the secondary coil, how many are there on the primary coil?

You are advised to show your working out.

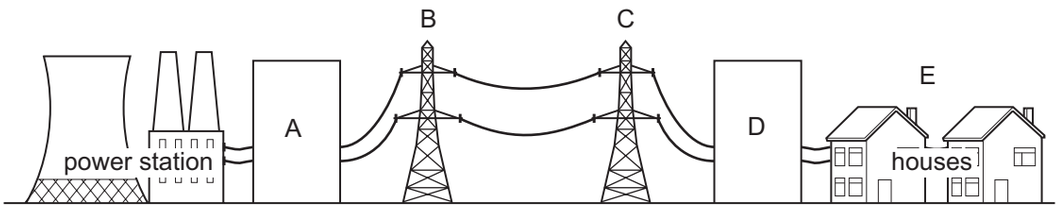
Number of turns = _____ [2]

Examiner Only

Marks	Remark

STEMUP.CO.UK

(c) The following diagram shows the National Grid transmission system.



(i) Between which two points (A to E) is the energy loss greatest in the transmission system?

_____ [1]

(ii) Explain fully how this energy loss is reduced, using a transformer.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

STEMUP.CO.UK

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

178129

Rewarding Learning

General Certificate of Secondary Education
2014

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

THURSDAY 12 JUNE 2014, MORNING

MARK SCHEME

STEMUP.CO.UK

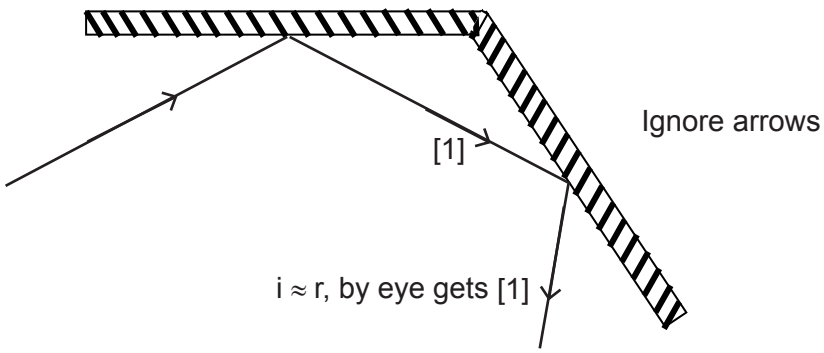
Subject-specific Instructions

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)**	Transverse [1] Longitudinal [1]	[2]	
	(b)	**(i)** Transverse	[1]	
		(ii) Particles move Up and Down [1] at right angles to wave direction [1] – Mark independently	[2]	
		(iii) Amplitude = 5 (m) [1] Frequency = 0.5 [1] (Hz)	[2]	
	(c)	$v = f \times \lambda$ [1] **or** $\lambda = \frac{v}{f}$ [1]		
		[1] $3 \times 10^8 = 100 \times 10^6 \times \lambda$ [1] $= \frac{3 \times 10^8}{100 \times 10^6}$ [1]		
		$\lambda = 3$ (m) [1] $= 3$ (m) [1]	[4]	11
		N.B. **Power of 10 error** 3×10^n in answer plus $v = f \lambda$ gets [3]/[4]		
2	**(a)**	Each part of letter [1] each	[2]	
	(b)	**(i)** 	[2]	
		(ii) Angle of reflection = 35° [1] 55° [1]	[2]	
	(c)	**(i)** Dispersion Reject: Refraction	[1]	
		(ii) Orange, Yellow, Green, Blue, Indigo and Violet	[1]	
		(iii) X-rays or UV or gamma/γ [1] IR or micro or radio [1]	[2]	10
3	**(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]	[2]	10

			AVAILABLE MARKS
4	**(a)**	Suitable scale [1] labelled correctly [1] 6 or more points correctly plotted [2] 5 points [1] [4]	
	(b)	Best fit line by eye – 2 aspects for [1] each [2]	
	(c)	**(i)** Up to 5 (seconds) **or** 0 to 5 (seconds) [1]	
		(ii) Straight line [1], through origin [1] – Independent marking [2]	
		(iii) grad = rise/run or equivalent [1] Grad = Accel/grad $\frac{v}{t}$ /grad = $\frac{y_2 - y_1}{x_2 - x_1}$ = 0.20 [1] or $\frac{1}{5}$ cm/s^2 [1] or $cm\ s^{-2}$ [3]	12
		Mark **(i)** and **(ii)** independently	
5	**(a)**	Travel through vacuum/space Travel in straight lines Can pass through the atmosphere Any **two** [1] each [2]	
	(b)	Espionage = Spying = Observation = Military use Weather (Sat.) Navigation = Google maps/mapping/Google Earth/G.P.S Astronomy Agriculture Any **two** [1] each [2]	4

			AVAILABLE MARKS
6	**(a)** **(i)** $\frac{1}{R_{(T)}} = \frac{1}{R_1} + \frac{1}{R_2}$ [1] **or** $R_T = \frac{\text{Product}}{\text{Sum}}$ [1] $\frac{1}{R_{(T)}} = \frac{1}{6} + \frac{1}{3}$ [1] $= \frac{6 \times 3}{6 + 3}$ [1] $R_T = 2$ [1] (Ω) $= 2$ (Ω) [1] [3]		
	(ii) 12 [1] 8 [1] **allow ecf from (a)(i)** i.e. 6 Ω + **their** answer to **6(a)(i)** [2]		
	(b) 600 (mA) [1] 200 (mA) [1] 400 (mA) [1] [3]		
	(c) **(i)** V = IR [1] = 8 [1] × 0.6 [1] = 4.8 (V) [1] [4]		
	(ii) Power = IV [1] = 0.6 × 4.8 [1] **allow e.c.f. for V from (c)(i)** = 2.88 [1] W [1] or J/s = 2.9 [4]		16

or $P = I^2R$ $= 0.6^2 \times 8$ $= 2.88 = 2.9$ } [3]/[3]

or $P = \frac{V^2}{R}$ $= \frac{4.8^2}{8}$ $= 2.88 = 2.9$ } [3]/[3]

STEMUP.CO.UK

AVAILABLE MARKS

7 **(a)** Unlike charges attract = [2] [2]
Electrons move ... [1]

(b) $I = \frac{Q}{t}$ [1] **or** $Q = It$

$Q = 0.2$ [1] × 180 [1]
$Q = 36$ [1] (C) [4]

(c) **(i)** Same material/same temperature/same length Any **two** for [2] [2]

(ii) Ammeter in series [1] voltmeter in parallel [1]
2 correct symbols [1] [3]

(iii) Indicative content

- Measure current and voltage [2]
- Use $R = \frac{V}{I}$ [1]
- Repeat [1] for different thicknesses [1]
- Draw a graph of R versus reciprocal C.S.A. [1]
- Conclusion R is inversely proportional to A [1]

(Any **five** points)

Response	**Marks**
Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence **five 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]

17

					AVAILABLE MARKS
8	(a)	(i)	Needle moves to + side **or** to right **or** to (+)3 [1] and back to zero [1] – Dependent marking Momentary deflection to the right [2]	[2]	
		(ii)	AC output – **sine** or **cosine** curve [1] with constant frequency [1]	[2]	
	(b)	(i)	Turns ratio = $\frac{12}{240} = \frac{1}{20}$ or 1:20 or 0.05	[1]	
		(ii)	Number of turns = 600 × 20 [1] = 12000 [1] [1] for correct formula, and if no further	[2]	
	(c)	(i)	B and C **or** B to C	[1]	
		(ii)	Increases voltage [1], reduces current [1] Mark **(c)(i)** and **(ii)** independent marking	[2]	10
				Total	**90**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2013

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

GSD62

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

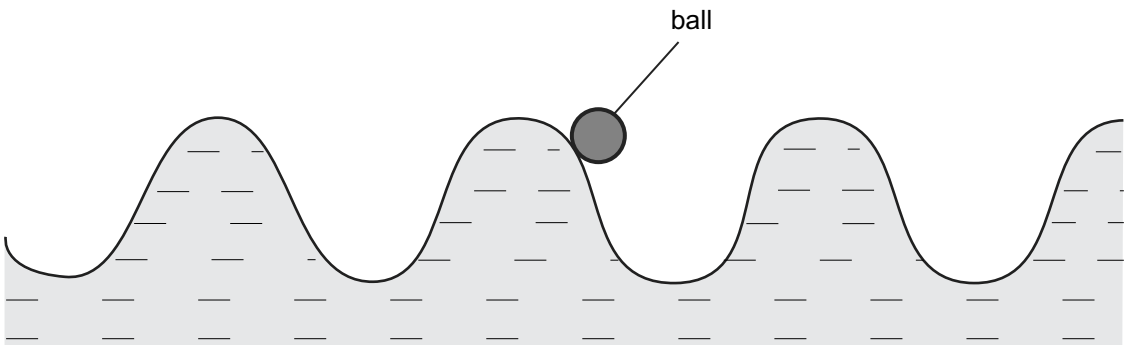
The total mark for this paper is 90.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **3(b)**.

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

STEMUP.CO.UK

Examiner Only	
Marks	Remark

1 Water waves travel on the surface of a pond.



A ball sits on the water as the wave passes.

(i) Describe the motion of the ball as the wave passes.

Choose your answer by placing a tick (✓) in one of the boxes below.

The ball vibrates sideways about the same position. ☐

The ball vibrates up and down. ☐

The ball moves closer to the side of the pond. ☐

[1]

Jamie observes that the ball oscillates 5 times during a 20 second time interval.

(ii) How many waves are produced each second?

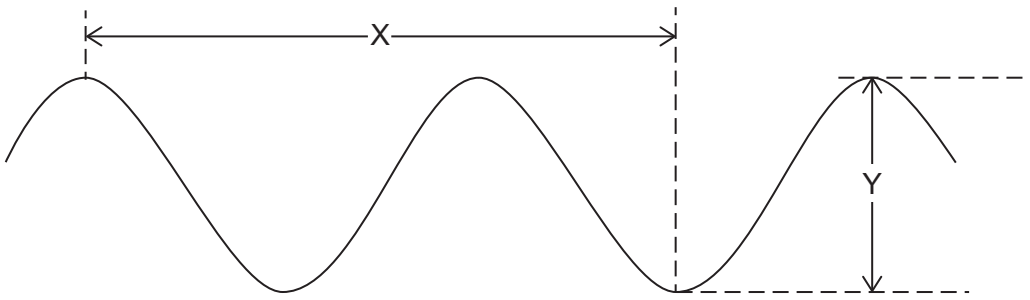
_____ waves each second [1]

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

Frequency = _____ [2]

Examiner Only	
Marks	Remark

(iv) Jamie is told that the amplitude of the wave is 5 cm and its wavelength is 12 cm. Part of the wave is shown below with two dimensions "X" and "Y" marked.



Record the distances "X" and "Y" below.

Distance X = _____ cm Distance Y = _____ cm [2]

(v) Use your answer to part **(iii)** to calculate the speed of the water wave in cm/s. Remember the wavelength of the wave is 12 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]

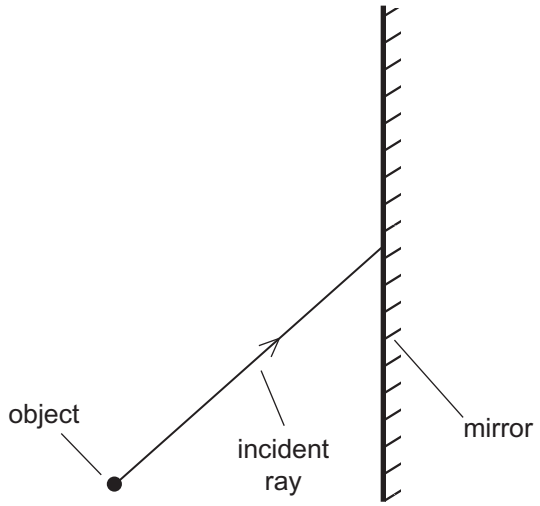
Examiner Only	
Marks	Remark

2 In a plane mirror the image of an object is as far behind the mirror as the object is in front.

(a) (i) Give **one** other property of the image in a plane mirror.

_____ [1]

Claire draws a ray diagram to show how we see the image in a plane mirror. The diagram is incomplete.



(ii) Draw in the normal. Label it N. [1]

(iii) Draw the reflected ray and mark its direction. [1]

(iv) Draw on the diagram the position of the eye if the image is to be seen. [1]

The diagram below shows some members of the electromagnetic spectrum arranged in order of increasing wavelength.

increasing wavelength →

gamma rays	X-rays		visible	infrared		radio

(b) (i) Label the two members which are missing. [2]

(ii) State a property which all electromagnetic waves have in common.

_____ [1]

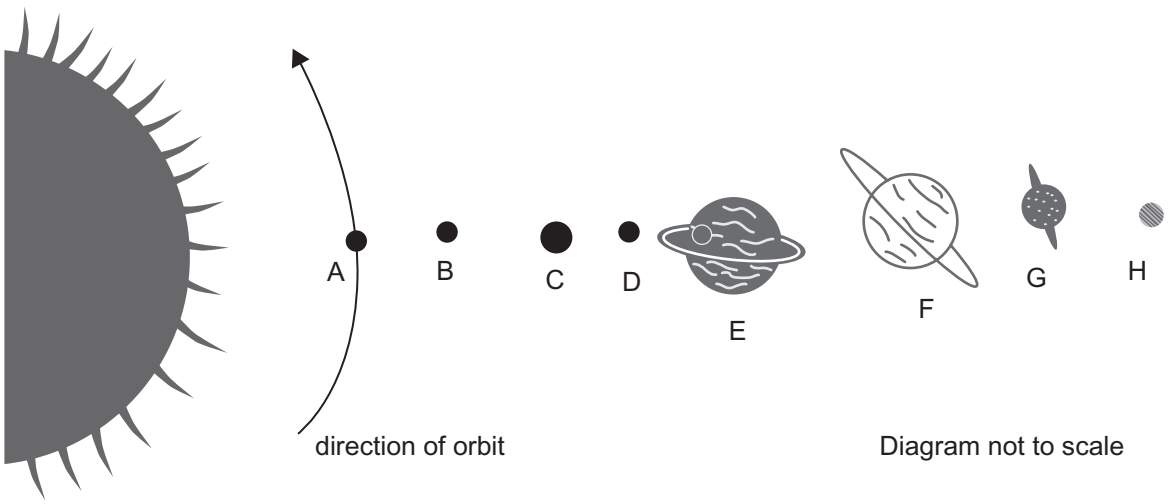
STEMUP.CO.UK

BLANK PAGE

(Questions continue overleaf)

STEMUP.CO.UK

3 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

STEMUP.CO.UK

(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.

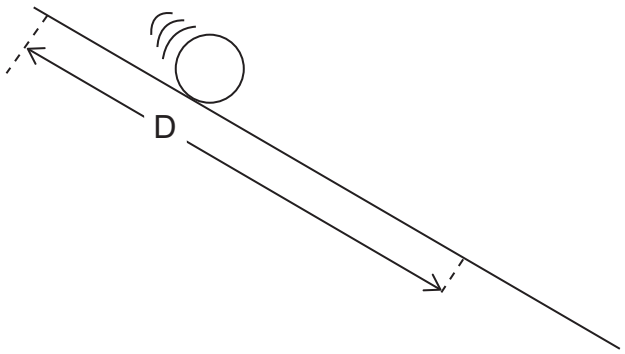
1. _____

2. _____ [2]

Examiner Only

Marks	Remark

4 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.

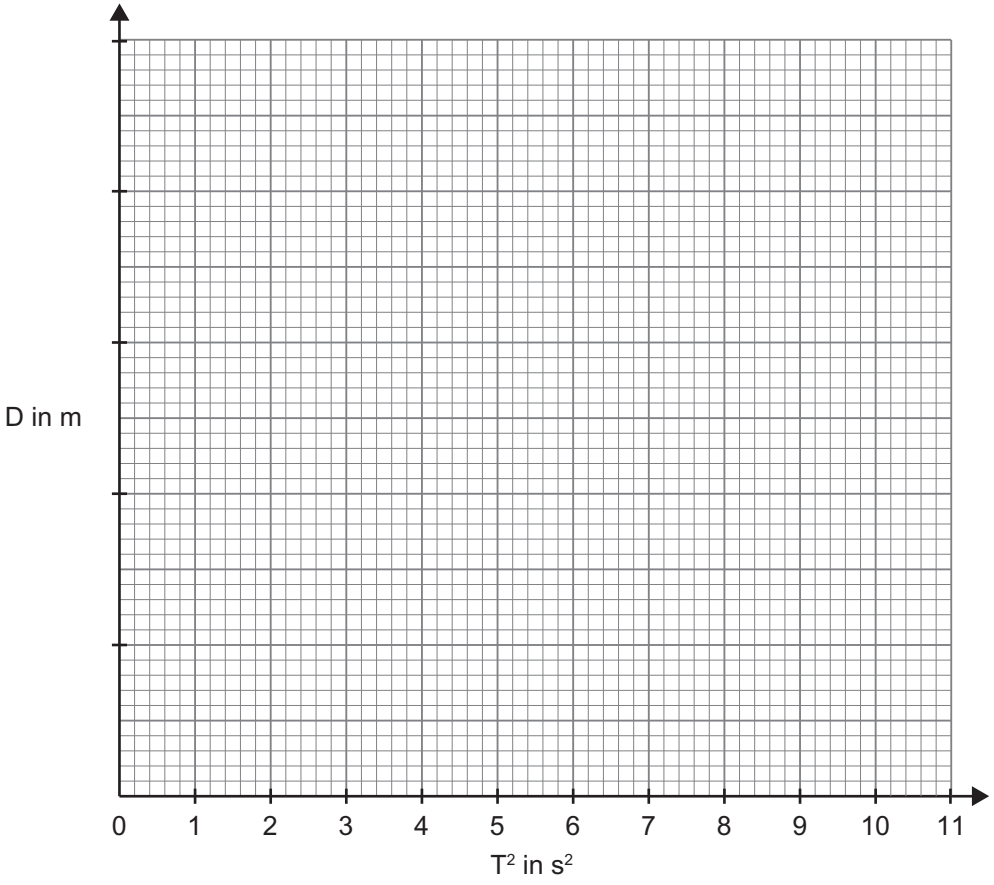
(i) Complete the table by entering the missing values of T^2 to 1 decimal place. [2]

(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



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

Remember to include the units for k.

You are advised to show your working out.

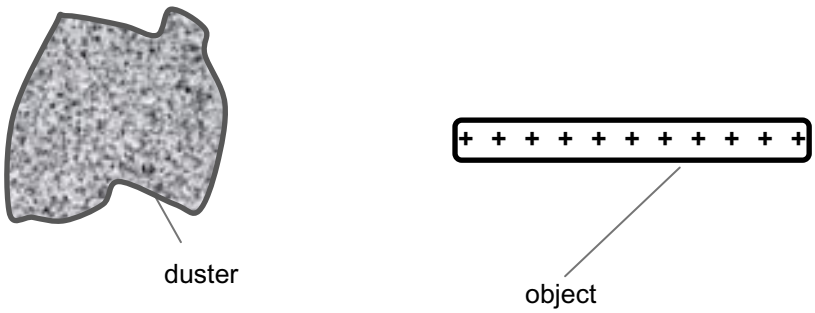
k = _____

Units = _____ [4]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** Julie wants to charge an object by rubbing it with a duster.



(i) Before she starts rubbing it, the object is uncharged. Explain why it is uncharged.

_____

_____ [1]

The object becomes positively charged when Julie rubs it with a duster.

(ii) Complete the sentence below.

The object becomes positively charged because

_____ have moved from the _____.
[2]

STEMUP.CO.UK

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

Examiner Only	
Marks	Remark

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

[5]

(ii) Describe how Julie would carry out the experiment.

_____

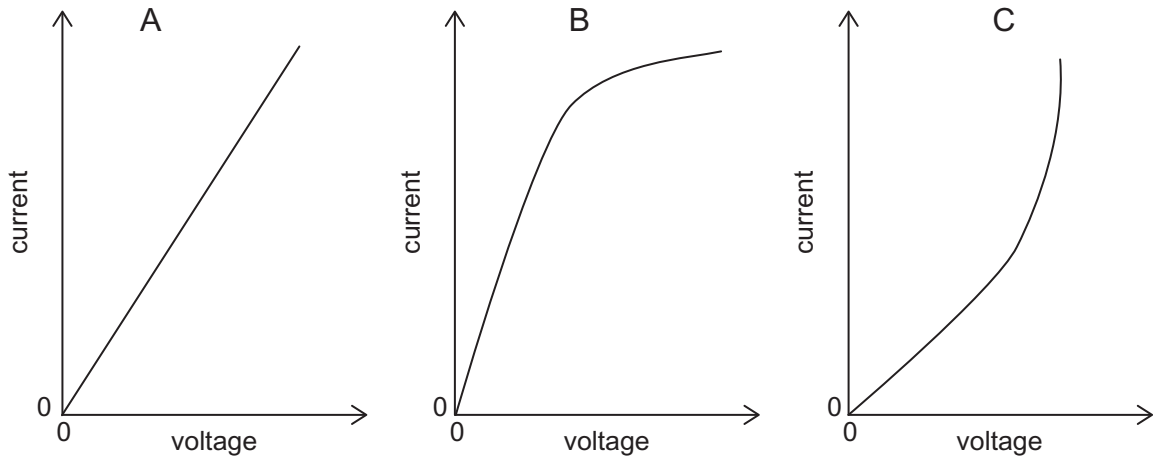
_____

_____

_____ [3]

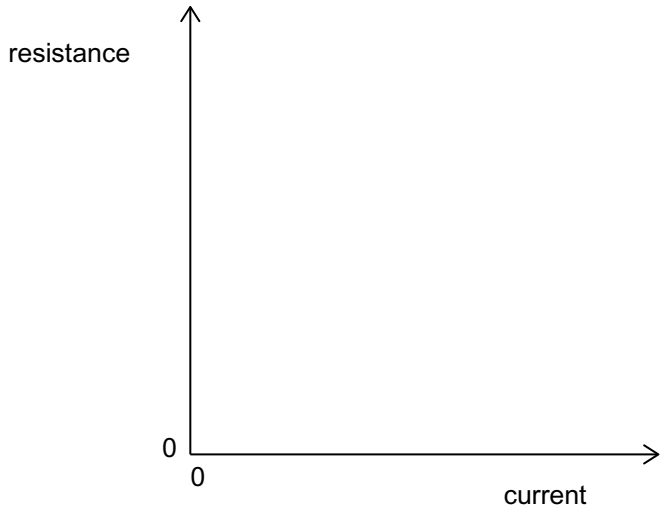
Julie plots a graph of current against voltage for the filament lamp.

(iii) Which of the following graphs will she obtain?



Graph: _____ [1]

(iv) Julie plots a second graph of resistance against current. Sketch the shape of graph that you would expect her to obtain.



[2]

Examiner Only

Marks	Remark

BLANK PAGE

(Questions continue overleaf)

STEMUP.CO.UK

Examiner Only	
Marks	Remark

6 **(a)** **(i)** State Ohm's Law in words.

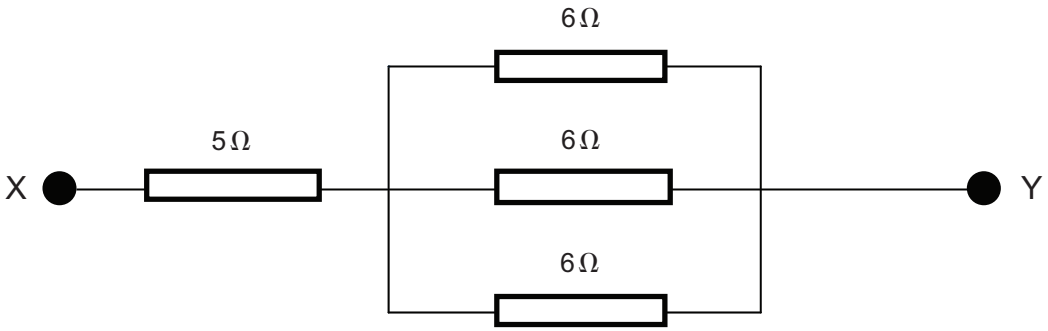
_____

_____

_____ [2]

(ii) Find the resistance between the points X and Y.

You are advised to show your working out.



Resistance = _____ Ω [4]

(b) An 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]

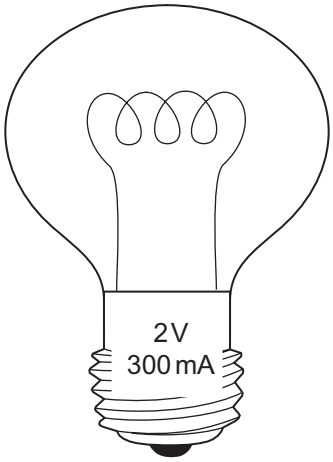
The following fuses are available: 1 A, 3 A, 5 A and 13 A.

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

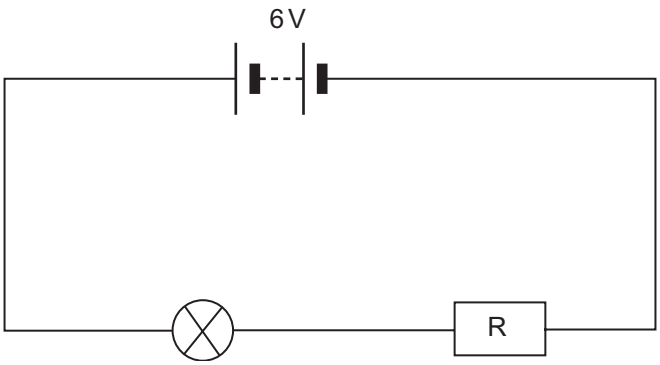
Fuse _____ A [1]

STEMUP.CO.UK

(c) A lamp is rated as 2 V, 300 mA. This means that when a voltage of 2 V is applied then a current of 300 mA flows through the lamp and it glows with normal brightness.



This lamp is connected in the circuit below and it glows with normal brightness.



Calculate the resistance of the resistor R.

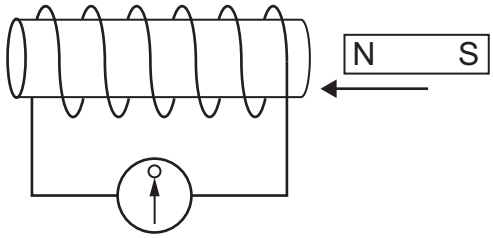
You are advised to show your working out.

Resistance = _____ Ω [4]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 The diagram below shows a wire coil, a sensitive centre-zero ammeter and a bar magnet.



(a) (i) Describe fully what is seen on the centre-zero ammeter when the magnet is moved into the coil, brought to rest and then pulled back out again.

_____

_____

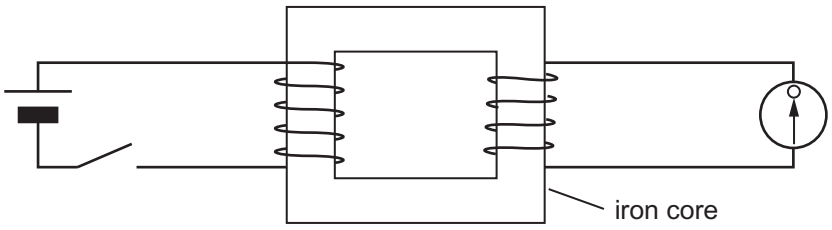
_____

_____ [3]

(ii) What name do we give to this process?

_____ [1]

The diagram below shows two coils wound on an iron core. A battery and switch are connected to one coil and a centre-zero ammeter is connected to the other coil.



(b) (i) The iron core is a conductor. Explain why the current does not flow from the left hand coil to the right hand coil.

_____ [1]

STEMUP.CO.UK

(ii) Describe fully what, if anything, is observed on the ammeter when the switch is closed.

_____

_____ [2]

(iii) Describe fully what, if anything, is observed on the ammeter when the switch is opened.

_____

_____ [2]

(c) Two types of transformer are used in the transmission of electrical power. Describe and explain the role of the transformer at the generating end of an electricity transmission system.

_____

_____

_____

_____ [3]

A transformer steps the voltage up from 25 kV to 132 kV. The primary coil has 2000 turns.

(d) Calculate the number of turns in the secondary coil.

You are advised to show your working out.

Number of turns = _____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 The Earth's crust consists of different layers. The first layer is called the crust and the second is called the mantle.

(a) What does the word "lithosphere" apply to?

_____

_____ [2]

(b) Describe how a volcano is caused.

_____

_____

_____

_____

_____ [4]

THIS IS THE END OF THE QUESTION PAPER

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

113130

Rewarding Learning

General Certificate of Secondary Education
2013

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

THURSDAY 13 JUNE, MORNING

MARK SCHEME

STEMUP.CO.UK

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	**(i)**	Middle box ticked	[1]	
	(ii)	0.25 or $\frac{1}{4}$	[1]	
	(iii)	0.25 [1] Hz/s^{-1} [1] Allow e.c.f. from **(ii)**	[2]	
	(iv)	x = 18 (cm) [1] y = 10 (cm) [1]	[2]	
	(v)	$v = f \times \lambda$ [1] $= 0.25 \times 12$ [1] e.c.f. from **(iii)** = 3 (cm/s) [1]	[3]	
	(vi)	Any **two** named examples of E.M. or S-waves	[2]	11
2	**(a)**	**(i)** One from virtual/laterally inverted/same size (as object)/erect	[1]	
		(ii) Normal	[1]	
		(iii) Reflected ray (i = r)	[1]	
		(iv) Eye drawn to receive reflected ray	[1]	
	(b)	**(i)** ultraviolet [1] microwaves [1] (in correct order)	[2]	
		(ii) Any **one** from: travel in a vacuum, travel at same speed in a vacuum transverse.	[1]	7

STEMUP.CO.UK

AVAILABLE MARKS

3 **(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

Band	Response	Marks
A	Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence **five 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

4 **(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 = 1/4 [1] from coordinates from graph
k = 0.25 [1] m/s^2 [1] [4] 10

STEMUP.CO.UK

						AVAILABLE MARKS
5	**(a)**	**(i)**	**number** of protons (or positive charges) = **number** of electrons (or negative charges)		[1]	
		(ii)	electrons [1] Dependent marking object [1]		[2]	
	(b)	**(i)**	Circuit should include the following: 1. Battery + variable resistor or variable voltage supply 2. bulb, ammeter, voltmeter – correct symbols 3. ammeter in series with the cell and bulb 4. voltmeter in parallel with lamp/ammeter 5. working circuit – which will cause the bulb to light	 [1] [1] [1] [1] [1]	 [5]	
		(ii)	take = record record V and A readings repeat (must have 1st mark for 2nd mark) vary voltage or alter variable resistor or vary current	 [1] [1] [1]	 [3]	
		(iii)	Graph B		[1]	
		(iv)	**increasing** resistance **beginning above zero** } Independent marking	[1] [1]	[2]	14
6	**(a)**	**(i)**	Voltage is proportional to current at constant temperature Dependent marking	[1] [1]	[2]	
		(ii)	$1/R_T = 1/R_1 + 1/R_2 + 1/R_3$ $1/R_T = 1/6 + 1/6 + 1/6$ $R = 2\ \Omega$ Total resistance = 7 (Ω)	[1] [1] [1] [1]	 [4]	
	(b)	**(i)**	$I = \frac{P}{V}$ **or** equivalent formula $= \frac{2800}{250}$ = 11.2 (A)	[1] [1] [1]	 [3]	
		(ii)	Fuse = 13 (A) ecf from **(i)** N.B. If **(b)(i)** > 13A, candidate forfeits mark for **(b)(ii)**		[1]	
	(c)		$R = \frac{V}{I}$ **or** equivalent formula [1] $= \frac{4\ [1]}{0.3\ [1]}$ = 13.3 [1]		[4]	14

STEMUP.CO.UK

					AVAILABLE MARKS
7	**(a)**	**(i)**	Deflection – Threshold mark [1] Returns to zero – Depends on 1st mark [1] Deflects in the opposite direction – Depends on 2nd mark [1]	[3]	
		(ii)	electromagnetic induction or induction or emi	[1]	
	(b)	**(i)**	wires insulated/no electrical connection	[1]	
		(ii)	(momentary) deflected [1] returns to zero [1] Dependent marking	[2]	
		(iii)	deflected to **opposite** side [1] returns to zero [1] Dependent marking	[2]	
	(c)		voltage stepped up [1], current stepped down [1] less energy loss [1]	[3]	
	(d)		Np/Ns = Vp/Vs (**or** equivalent) [1] 2000/Ns = 25/132 (**or** equivalent) [1] Ns = 10 560 [1]	[3]	15
8	**(a)**		Crust [1] and solid (part of) mantle [1]	[2]	
	(b)		Tectonic plates [1] move [1] Lava or molten rock or magma or ashes [1] Rift or rupture occurs [1]	[4]	6
				Total	**90**

STEMUP.CO.UK