CCEA GCSE DOUBLE AWARD SCIENCE

SCIENCE



EXAM QUESTION PACK

PHYSICS UNIT P1 FOUNDATION TIER GSD31 PAPERS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

[GSD31]

FRIDAY 11 NOVEMBER 2016, AFTERNOON

TIME

1 hour.

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 70.
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**.

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 box contains the names of different forms of energy.

	sound	electrical	strain
light	kinetic	heat	chemical

The pictures below show situations in which energy changes are taking place.
Use words **in the box** to describe each of the **main** energy changes.

(a) An electric kettle boiling water



© TPopova / iStock / Thinkstock

changes *electrical* energy to _____ energy. [1]

(b) A microphone



© Sia_Anastasia / iStock / Thinkstock

changes _____ energy

to _____ energy. [2]

(c) A catapult



© goodapp / iStock / Thinkstock

changes _____ energy

to _____ energy. [2]

Examiner Only	
Marks	Remark

2 In Northern Ireland some electricity is generated using wind farms. Wind is a renewable energy resource.

(a) Tick (✓) the statement which best describes renewable energy resources.

They produce unlimited amounts of energy. ☐

They produce energy which can be used over and over again. ☐

They produce limited amounts of energy. ☐

[1]

(b) Name two **other** renewable energy resources.

1. _____

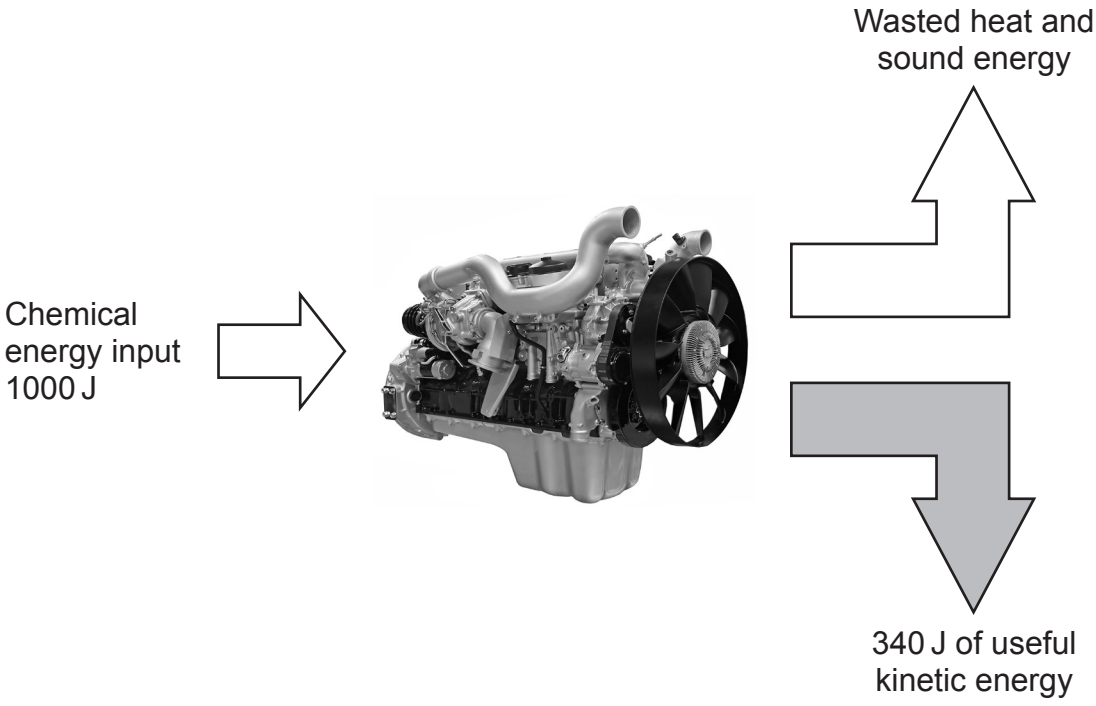
2. _____ [2]

(c) Name a non-renewable energy resource which does **not** produce greenhouse gases.

_____ [1]

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A diesel engine has an energy flow diagram illustrated below.



© sspopov / iStock / Thinkstock

(d) (i) How much energy is converted into wasted heat and sound energy?

Wasted heat and sound energy = _____ J [1]

(ii) Calculate the diesel engine's efficiency.

You are advised to show your working out.

Efficiency = _____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 In the gym, a runner jogs 1500 m on a treadmill. The time taken by the runner to run this distance is 5 minutes.



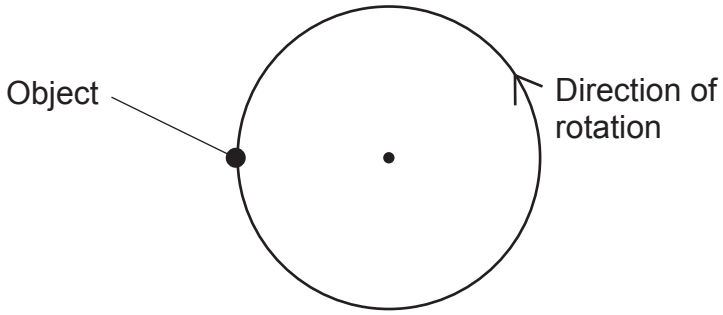
© Antonio_Diaz / iStock / Thinkstock

(a) By first converting the time to seconds, calculate the runner's average speed on the treadmill in m/s.

You are advised to show your working out.

Average speed = _____ m/s [4]

(b) The diagram shows an object moving in a circle.



(i) On the diagram, draw an arrow, beginning at the object, to show the direction of the centripetal force. Label this arrow F. [1]

(ii) What happens to the size of the centripetal force if the mass of the object moving is increased and the speed remains the same? Tick (✓) the correct box.

☐ Increases ☐ Decreases ☐ Remains the same [1]

(iii) What happens to the size of the centripetal force if the speed of the object is increased and the mass remains the same? Tick (✓) the correct box.

☐ Increases ☐ Decreases ☐ Remains the same [1]

(iv) On the diagram draw an arrow, beginning at the object, to show the direction the object would move if the centripetal force was removed.
Label this arrow T. [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** **(i)** A student is given a lump of coal with an irregular shape and asked to find its volume.
Describe how the student could find the volume of the lump of coal.

_____

_____

_____

_____

_____

_____

_____ [3]

(ii) State one precaution the student should take to ensure an accurate result.

_____ [1]

(b) The student finds that the volume of the lump of coal is 175 cm^3 and its mass is 280 g.
Calculate the density of the lump of coal, in g/cm^3.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

5 A crane raises a load, as shown below.



© DrPAS / iStock / Thinkstock

Information about the process is given in the table below.

Load in N	Time in s	Height raised in m
2000	5	2.5

(a) (i) Select information from the table to calculate the work done by the crane.

You are advised to show your working out.

Work done = _____ J [3]

(ii) What is the change in the potential energy of the load when it is raised?

Change in potential energy = _____ J [1]

(b) Calculate the power output of the crane.
Remember to include the unit with your answer.

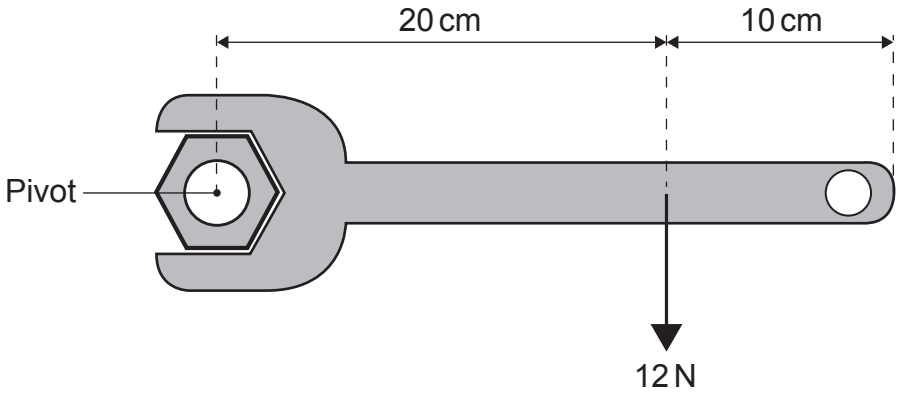
You are advised to show your working out.

Power = _____ [4]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 The diagram shows a spanner being used to tighten a nut.



Source: Chief Examiner

(a) Calculate the moment of the 12 N force about the pivot.

You are advised to show your working out.

Moment = _____ N cm [3]

(b) Tick (✓) the box to show the direction of the moment of the 12 N force.

☐ Anticlockwise

☐ Vertically downwards

☐ Clockwise [1]

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7 Describe an experiment you would carry out to measure the power output of an electric motor.

In your description you should include:

- the apparatus used;
- the measurements you take.

Do not include any formulas.

In this 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

8 **(a)** Explain why atoms are electrically neutral.

_____

_____ [1]

(b) The incomplete table below gives the properties of the three particles which make up an atom.
Complete the table.

Particle	Relative mass	Relative charge
	1	+1
Neutron		
Electron	$\frac{1}{1840}$	

[4]

(c) Explain in terms of nuclear particles the meaning of the word **isotope**.

_____

_____ [2]

(d) The lithium nucleus contains three protons and four neutrons.
Complete the symbol below for the lithium nucleus.

$$\begin{matrix}\square \\ \square\end{matrix} \mathrm{Li}$$

[2]

(e) Another atom has the same number of neutrons but a different number of protons.
Tick (✓) the box to show what this other atom is.

☐ An isotope of lithium

☐ An ion

☐ Another element [1]

Nuclear reactors are used in power stations to release energy through nuclear fission.



© MartinLisner / iStock / Thinkstock

(f) **(i)** What is meant by **nuclear fission**?

_____

_____ [2]

(ii) Name one fission fuel commonly used in nuclear reactors.

_____ [1]

(iii) State one disadvantage, not related to cost, of producing electricity using nuclear power.

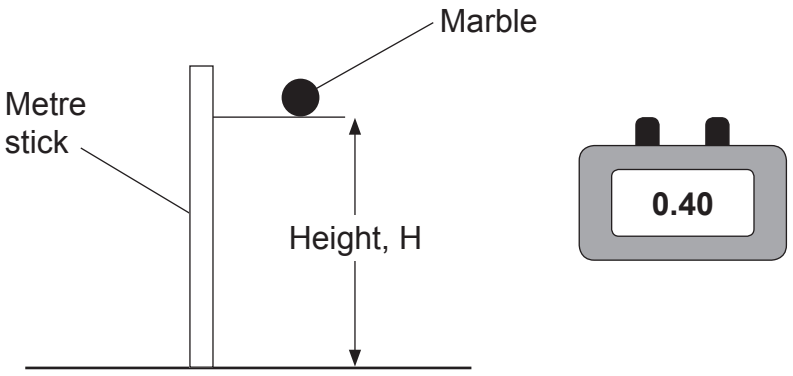
_____ [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

9 The acceleration due to gravity can be measured by finding the times, T, for a marble to fall through various heights, H, above the Earth's surface.



Source: Chief Examiner

According to theory, the relationship between the height, H and the time T, is given by:

$$H = k\,T^2 \qquad \textbf{Equation 9.1}$$

The following data was obtained.

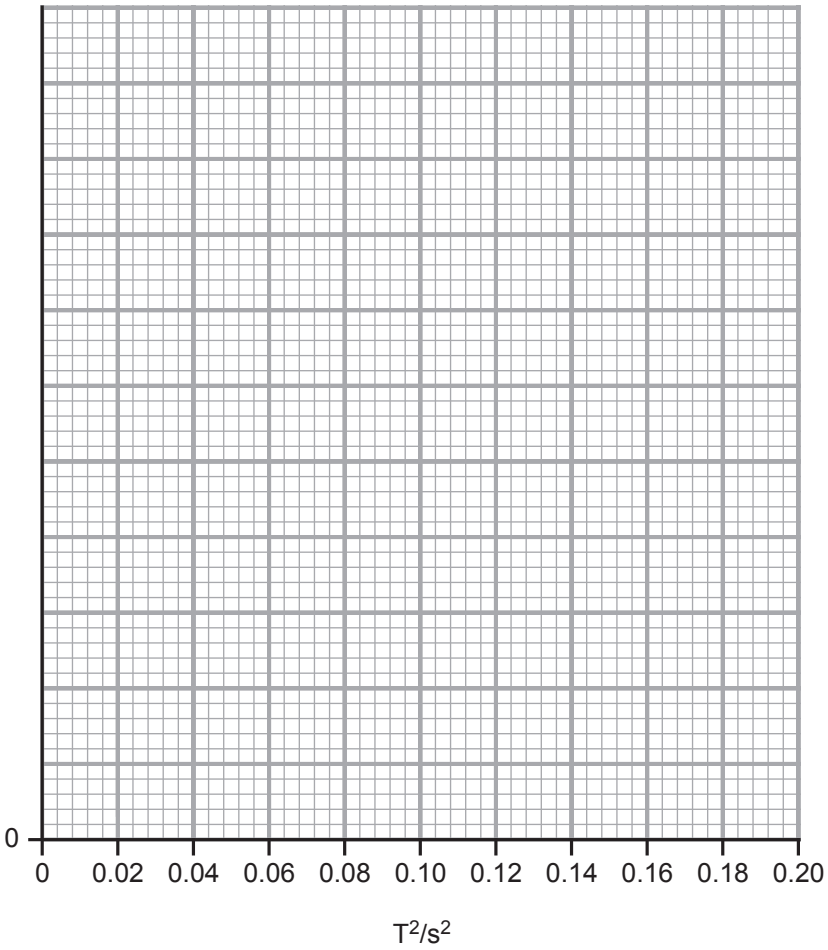
Height/m	0.2	0.4	0.6	0.8	1.0
T^2/s^2	0.04	0.08	0.12	0.16	0.20

(a) On the grid opposite, draw a graph of height H on the vertical axis versus T^2 on the horizontal axis.

(i) Label the vertical axis and insert the appropriate scale. [2]

(ii) Plot the points. [2]

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



(b) (i) Use your graph to find the value of k.
Remember to include the unit for k.

You are advised to show your working out.

k = _____ [2]

Unit of k = _____ [1]

(ii) Does your graph support the relationship between H and T^2 in equation 9.1?

YES NO **Circle the correct answer.**

Explain your answer.

_____

_____ [2]

Examiner Only

Marks	Remark

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THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2016–2017

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

FRIDAY 11 NOVEMBER 2016, AFTERNOON

MARK SCHEME

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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.

				AVAILABLE MARKS
1	**(a)**	heat (Reject: thermal)	[1]	
	(b)	sound to electrical	[2]	
	(c)	strain and kinetic	[2]	5
2	**(a)**	Produces unlimited amounts of energy	[1]	
	(b)	**Two** from: solar, tidal, wave, HEP, wood, geothermal, biomass	[2]	
	(c)	Nuclear	[1]	
	(d) **(i)**	660 (J)	[1]	
	(ii)	Eff = (useful) energy out/energy in [1] = 340 ÷ 1000 [1] = 0.34 (34%) [1]	[3]	8
3	**(a)**	Av sp. = d ÷ t [1] = 1500 ÷ 300 [2] = 5 (m/s) [1]	[4]	
	(b) **(i)**	Correct arrow towards centre [F] Must start at "object"	[1]	
	(ii)	Increases	[1]	
	(iii)	Increases	[1]	
	(iv)	Correct arrow vertically downwards [T] Must start at "object"	[1]	8
4	**(a)** **(i)**	Partly filled **graduated/measuring cylinder** [1] **Dependent marking** must have first mark Add coal [1] Subtract initial and final readings [1] **or** Filled **eureka can**/displacement can [1] **Dependent marking** must have first mark Add coal [1] (Measure volume) overflow using grad. cylinder [1]	[3]	
	(ii)	No splashing/insert coal carefully/read at eye level/fill to spout/ ensure coal fully submerged/very thin thread	[1]	
	(b)	ρ = m ÷ v (or equiv.) [1] = 280 ÷ 175 [1] = 1.6 [1] (g/cm^3)	[3]	7

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	AVAILABLE MARKS

5 **(a)** **(i)** W = F × d [1]
= 2000 × 2.5 [1]
= 5000 (J) [1] [3]

(ii) 5000 (J) (allow ecf from **(a)(i)**) [1]

(b) P = W ÷ t [1]
= 5000 ÷ 5 (allow ecf from **(a)(i)** only) [1]
= 1000 [1]
= (W) [1] or J/s } or 1 kW award [2]
[4] 8

6 **(a)** M = F × d [1]
= 12 × 20 [1]
= 240 [1] [3]

(b) Clockwise [1] 4

7 stopwatch (or equiv.) [1]
metre rule (or equiv.) [1]
scales [1]
measure the mass/weight [1]
measure height [1]
record time [1]

Response	Mark
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]

[6] 6

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			AVAILABLE MARKS
8	**(a)**	No. of positive charges = no. of negative charges **or** no.of protons = no. of electrons [1]	
	(b)		

Particle	Relative mass	Relative charge
Proton		
	1	0
		–1

[4]

(c) Same no. of protons, **(threshold mark)** [1]
different no. of neutrons [1] [2]

(d)

$$\begin{matrix}7\\3\end{matrix}\mathrm{Li}$$

[2]

(e) Another element [1]

(f) **(i)** **Nucleus** [1] is **split** [1] Independent marking [2]

(ii) Uranium or plutonium [1]

(iii) Waste is radioactive [1] 14

9 **(a)** **(i)** Scale halfway or better [1] label and unit [1] [2]

(ii) 3 or 4 pts correct [1] 5 pts correct [1] tolerance ± 1 square [2]

(iii) Best fit line through **their** points [1]

(b) **(i)** k = grad. or k = $\frac{1}{0.2}$ [1] (or equiv.)

k = 5 [1] accept 4.9 to 5.1
Unit = m/s^2 [1] [3]

(ii) Yes (is circled)
straight line [1] through the origin [1] [2] 10

Total **70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 25 MAY 2016, AFTERNOON

TIME

1 hour.

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 eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **10**.

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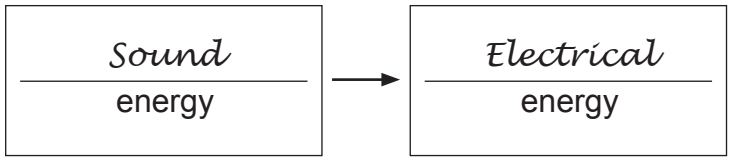
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1 A microphone is **designed** to change sound energy into electrical energy, as shown below.

Microphone



É nmarques74 / iStock / Thinkstock

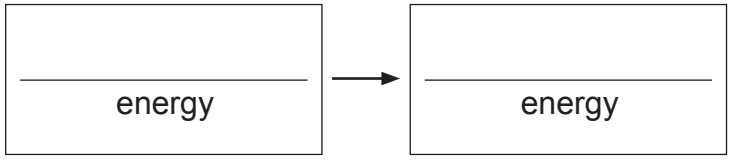


Fill in the spaces below to show the main types of energy change each device is designed to bring about.

(i) Room heater



É Serhiy Stakhnyk / iStock / Thinsktock

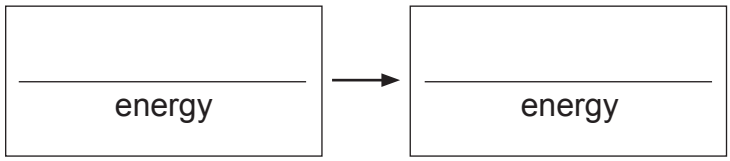


[2]

(ii) Match



É dvarg / iStock / Thinkstock

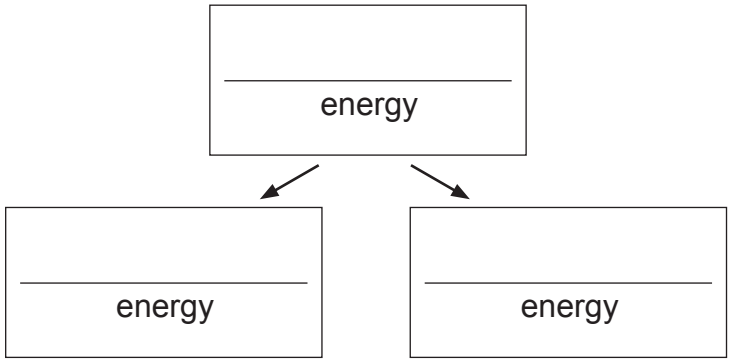


[2]

(iii) Television



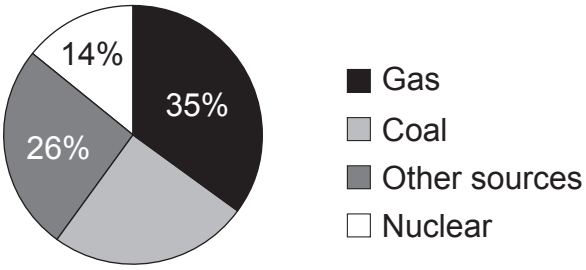
É designymk / iStock / Thinkstock



[3]

2 The chart below shows the sources of energy used to produce electricity in the U.K.

Source of energy used to produce electricity



Source: Chief Examiner

(a) Calculate the percentage of the electricity produced from coal.

_____ % [1]

(b) State one disadvantage, other than cost, of producing electricity from coal.

Disadvantage _____ [1]

Electricity can also be produced from wind energy.

(c) State one advantage and one disadvantage, other than cost, of producing electricity from wind energy.

Advantage: _____ [1]

Disadvantage: _____ [1]

(d) The engine of a crane consumes 5000 J of chemical energy to produce 3000 J of useful output energy. Calculate the efficiency of the engine of the crane.

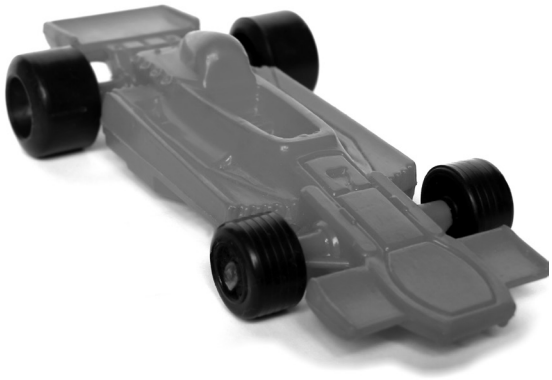
You are advised to show your working out.

Efficiency = _____ [3]

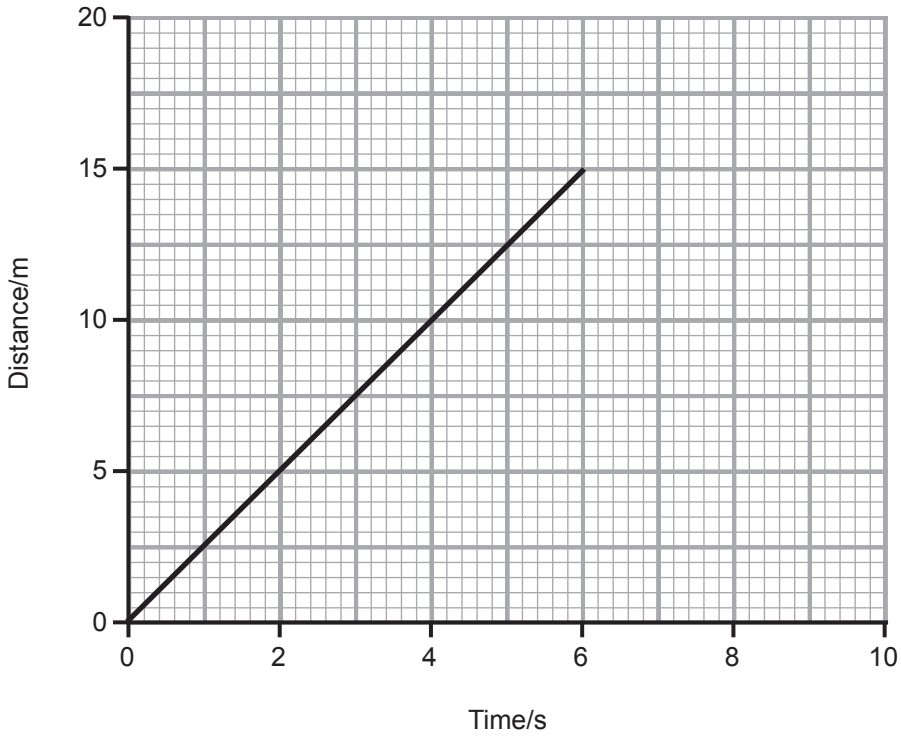
[Turn over

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3 The graph of distance against time for a toy car is shown below.



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(a) Use the graph to calculate the speed of the toy car.

You are advised to show your working out.

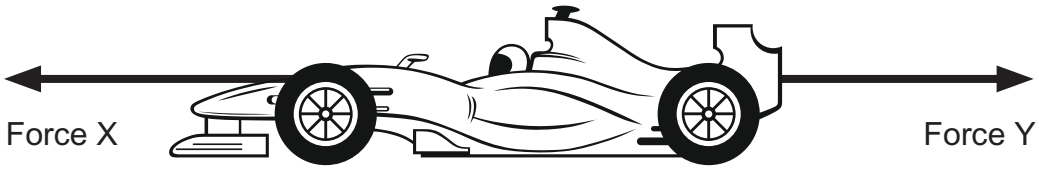
Speed = _____ m/s [3]

(b) The car stops after 6 seconds.
Continue the graph for a further 4 seconds. [1]

[Turn over

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4 A racing car travels along a straight racetrack.



© Kreatiw / iStock / Thinkstock

gravity	weight	reaction force
driving force	mass	friction

(a) Select from the box the names of the forces X and Y.

Force X _____ Force Y _____ [2]

(b) If force X is equal to force Y, what can you say about the speed of the racing car?
Remember the racing car is moving.

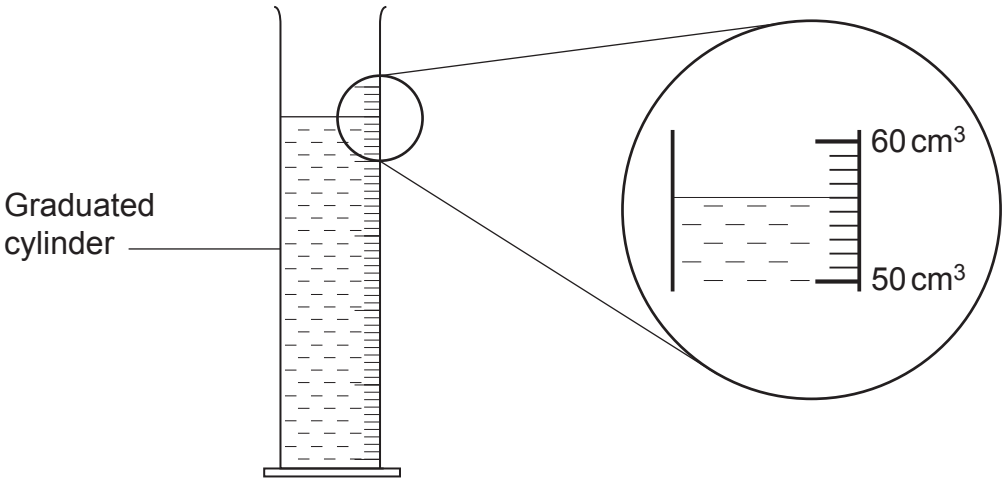
_____ [1]

(c) The driver takes his foot off the accelerator pedal and the racing car begins to slow down.
How do the forces X and Y now compare?

_____ [1]

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5 A student pours 42 g of a liquid into a graduated cylinder and measures its volume.



Source: Principal Examiner

Use the information given above to calculate the density of the liquid.
Give your answer to 2 decimal places.

Remember to include the unit.

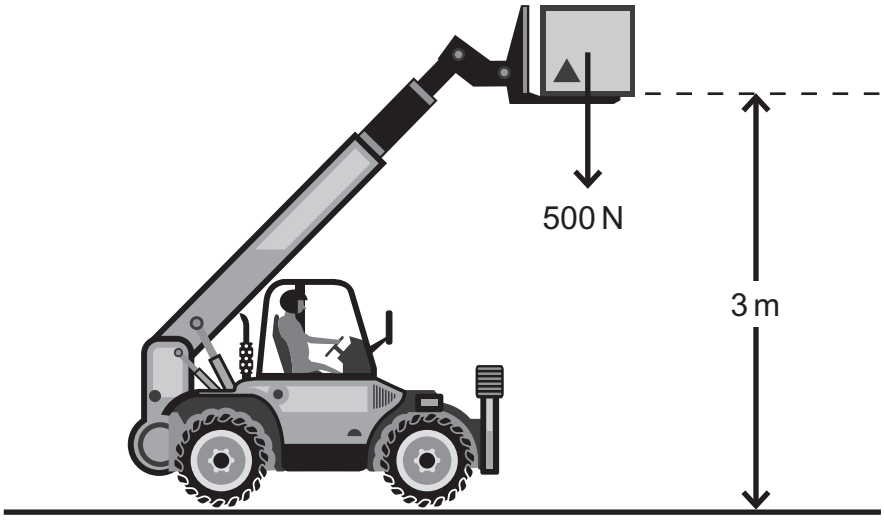
You are advised to show your working out.

Density of liquid = _____ [5]

[Turn over

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20GSD3107

6 A forklift truck raises a load of 500 N to a height of 3 m above the ground.



© anton_novik / iStock / Thinkstock

(a) Calculate the work done lifting the load.

You are advised to show your working out.

Work = _____ J [3]

(b) On another occasion, the engine of the forklift truck uses 5000 J of energy in a time of 20 s.
Calculate the power of the engine of the forklift truck.
Give your answer in kilowatts.

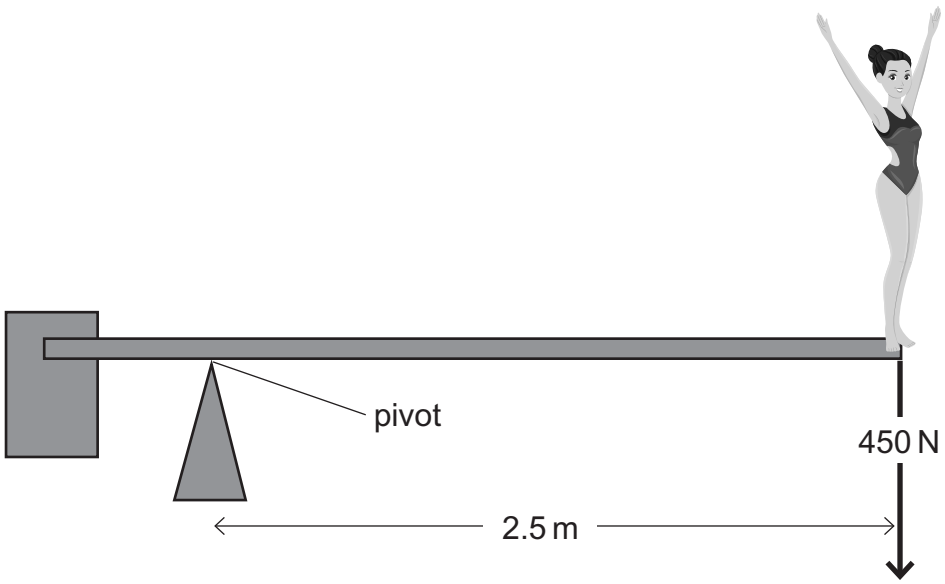
You are advised to show your working out.

Power = _____ kW [4]

[Turn over

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7 Deirdre, who has a weight of 450 N, stands at the end of a diving board.



Source: Principal Examiner

(a) Calculate the moment of Deirdre's weight about the pivot when she stands at the end of the diving board.

You are advised to show your working out.

Moment = _____ Nm [3]

(b) What is Deirdre's mass?

You are advised to show your working out.

Mass = _____ kg [2]

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20GSD3110

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(Questions continue overleaf)

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8 **(a)** This part of the question is about how mass, speed and radius affect the centripetal force acting on a stone whirled in a horizontal circular plane.

(i) How does the centripetal force depend on the mass of the stone?
Tick (✓) the correct box.

Increases with mass ☐

Remains constant with mass ☐

Decreases with mass ☐ [1]

(ii) How does the centripetal force depend on the speed of the stone?
Tick (✓) the correct box.

Increases with speed ☐

Remains constant with speed ☐

Decreases with speed ☐ [1]

(iii) How does the centripetal force depend on the radius of the circular path?
Tick (✓) the correct box.

Increases with radius ☐

Remains constant with radius ☐

Decreases with radius ☐ [1]

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(b) Calculate the kinetic energy of a snowboarder who has a mass of 50 kg and a speed of 3 m/s.

You are advised to show your working out.

Kinetic energy = _____ J [3]

[Turn over

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9 **(a)** The symbol for Thorium-234 is

$$^{234}_{90}\text{Th}$$

(i) State the total number of protons and neutrons in a nucleus of Thorium-234.

_____ [1]

(ii) How many protons does a nucleus of Thorium-234 contain?

_____ [1]

(iii) What name is given to the total number of protons and neutrons in the nucleus of Thorium-234?

_____ [1]

(iv) How many neutrons does a nucleus of Thorium-234 contain?

_____ [1]

(b) A radioactive isotope has a half-life of 30 days. Initially there are 64 000 undecayed nuclei. How many undecayed nuclei will remain after 90 days?

You are advised to show your working out.

Number of undecayed nuclei = _____ [3]

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20GSD3114

10 The modern theory for the structure of the atom is quite different from the earlier theory which it replaced.

Write a brief account of both theories.

Your account should include:

- the name of each theory;
- a description of the structure of the atom in each theory.

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

[6]

[Turn over

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20GSD3115

11 Theory shows that the gravitational potential energy (G.P.E.) of a body depends on its height (h) above the Earth's surface, according to the formula:

G.P.E. = k h **Equation 11.1**

where k is a constant.

The following table shows the results for the gravitational potential energy (G.P.E.) of an object at different heights above the Earth's surface.

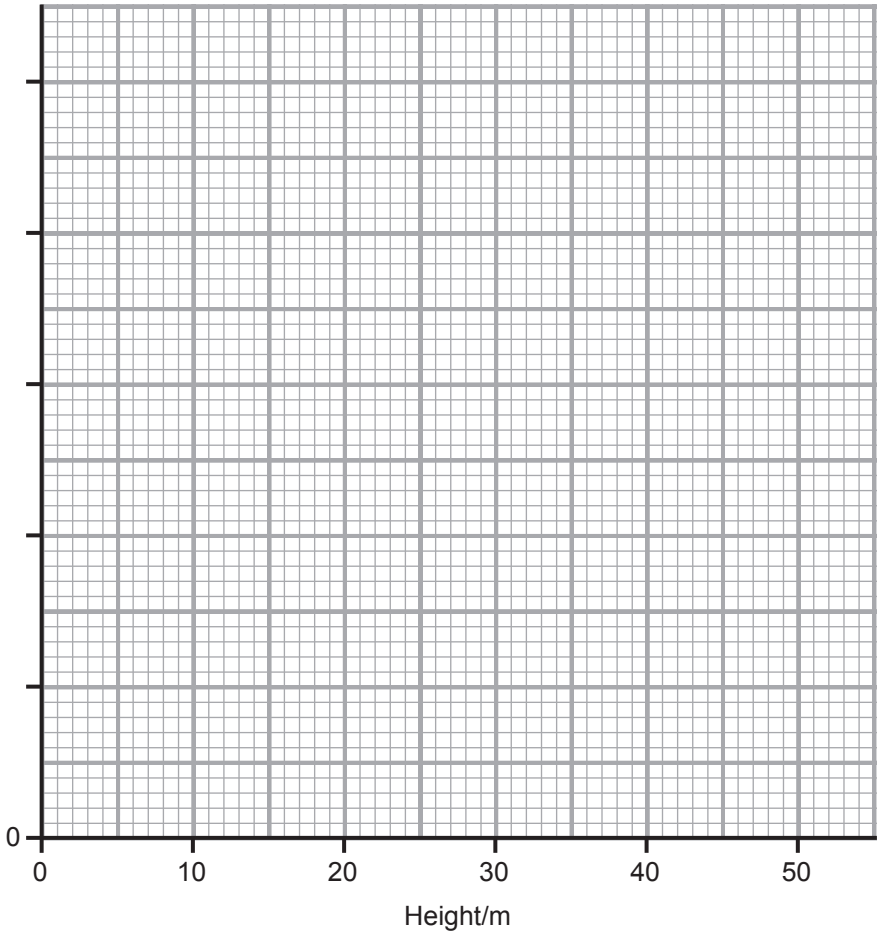
Height/m	0	10	20	30	40	50
G.P.E./J	0	50	100	150	200	250

You are asked to plot a graph of gravitational potential energy against height.

(a) Choose a suitable vertical scale and label its axis. [2]

(b) Plot the points on the grid of G.P.E. against height above the Earth's surface. [2]

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



10179

(d) **(i)** From your graph state the relationship between G.P.E. and height above the Earth's surface.

_____

_____ [1]

(ii) Explain fully how the graph shows this.

_____

_____

_____ [1]

(e) From your graph find the gravitational potential energy when the height is 45 m.

_____ [1]

(f) Use your graph to determine the constant k, in **Equation 11.1**.
Remember to include the units for k.

You are advised to show your working out.

k = _____ Units = _____ [4]

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Question Number	**Marks**
1	
2	
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7	
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9	
10	
11	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 25 MAY 2016, AFTERNOON

MARK SCHEME

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General Marking Instructions

Introduction

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				AVAILABLE MARKS
1	**(i)**	Electric(al) [1] heat [1] Thermal = heat	[2]	
	(ii)	Chemical [1] heat [1]	[2]	
	(iii)	Electrical [1] sound [1] light [1] Reject: heat	[3]	7
2	**(a)**	25(%)	[1]	
	(b)	Air pollution/global warming/CO_2	[1]	
	(c)	Advantage: no air pollution/no global warming Disadvantage: not reliable/visual pollution	[2]	
	(d)	E = (useful) energy out/energy in (or equivalent) [1] = 3000/5000 [1] = 0.6 (or 60%) [1]	[3]	7
3	**(a)**	speed = d/t or gradient [1] = 15/6 (or alternative coordinates) [1] = 2.5 (m/s) [1]	[3]	
	(b)	horizontal line up to 10 s	[1]	4
4	**(a)**	X = driving (force) [1] Y = friction [1]	[2]	
	(b)	constant/uniform (speed) **or** steady	[1]	
	(c)	X < Y **or** Y > X	[1]	4
5		Density = mass/volume [1] = 42 [1] / 56 [1] = 0.75 [1] g/cm^3 [1]	[5]	
6	**(a)**	W = F × d [1] = 500 × 3 [1] = 1500 [1] (J)	[3]	
	(b)	Power = work done/time [1] = 5000/20 [1] = 250 [1] (W or J/s) = 0.25 (kW) [1]	[4]	12
7	**(a)**	Moment = force × distance (to pivot) [1] = 450 × 2.5 [1] = 1125 [1] (Nm)	[3]	
	(b)	1 kg = 10 N or W = mg [1] or W = 10 × M 45 [1] (kg)	[2]	5

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				AVAILABLE MARKS
8	**(a)**	**(i)** Increase	[1]	
		(ii) Increase	[1]	
		(iii) Decrease	[1]	
	(b)	K.E. = $\frac{1}{2}$m v^2 [1] = $\frac{1}{2}$ × 50 × $(3)^2$ [1] = 225 [1] (J)	[3]	6
9	**(a)**	**(i)** 234	[1]	
		(ii) 90	[1]	
		(iii) Mass Number	[1]	
		(iv) 144	[1]	
	(b)	(30 days) – 32 000 [1] (60 days) – 16 000 [1] (90 days) – 8000 [1]	[3]	7
10	Plum-pudding [1] Positive (charge) spread (throughout) [1] **Electrons** scattered/electrons like plums [1] Rutherford-Bohr [1] Reject: Bohr-Rutherford Positive protons in nucleus [1] in core/in centre **Electrons** orbit or electrons in shells [1]		[6]	6

Response	**Mark**
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
11	**(a)**	50J = 2 cm is the only acceptable scale [1] axis labelled with unit [1]	[2]	
	(b)	At least 5 correct points [2] 4 points correct [1] } Tolerance ± 1 square	[2]	
	(c)	Best fit line	[1]	
	(d)	**(i)** (Direct) **proportion**	[1]	
		(ii) Straight line Through origin **dependent** on **(d)(i)**	[1]	
	(e)	225 ± 5 (J)	[1]	
	(f)	grad = rise/run (or equiv.) [1] **or** k = gradient = 250/50 [1] **or** $\frac{250}{50}$ = 5 [1] J/m [1] **or** N	[4]	12
			Total	**70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

[GSD31]

FRIDAY 26 FEBRUARY 2016, MORNING

TIME

1 hour.

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 eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **10**.

For Examiner's use only	
Question Number	Marks
1	
2	
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Total Marks	

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Examiner Only	
Marks	Remark

1 Many devices change energy from one form to another. Complete the boxes below to show the main energy change which each device is **designed** to bring about. One box has been completed for you.

(i) Electric bulb



Electrical energy	→	_____ energy

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[1]

(ii) Match



_____ energy	→	_____ energy

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[2]

(iii) Loudspeaker



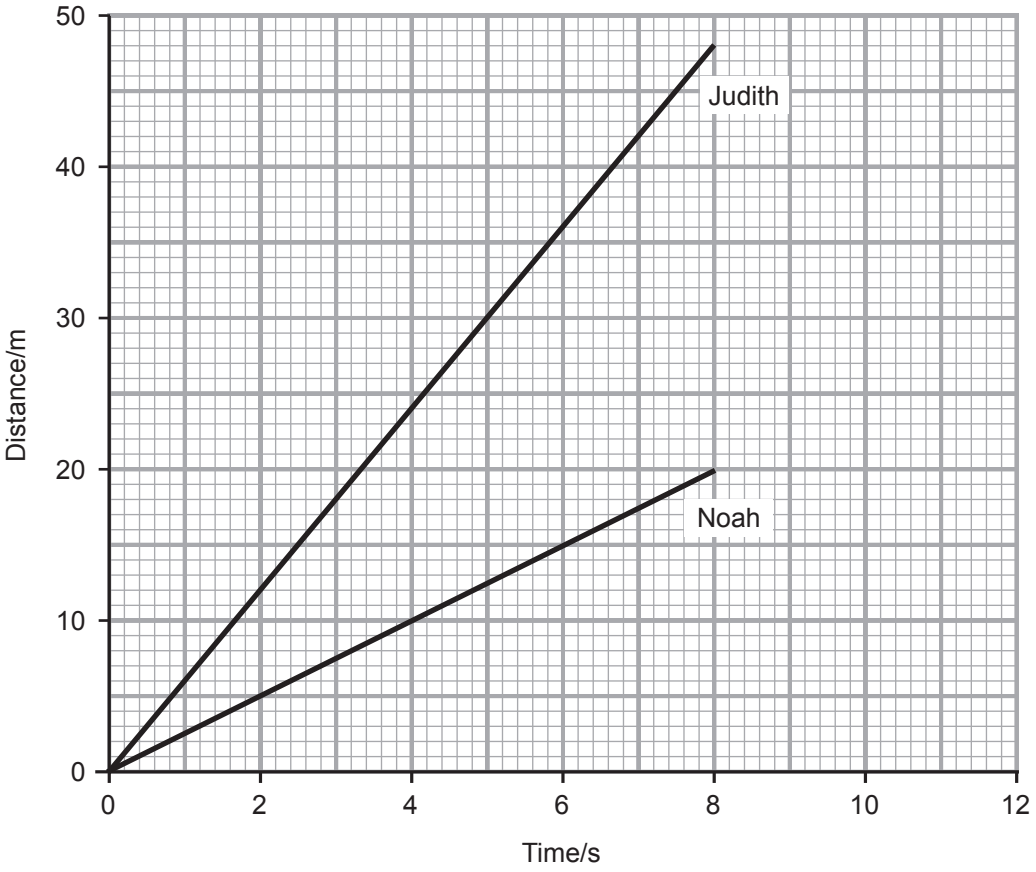
_____ energy	→	_____ energy

[2]

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Examiner Only	
Marks	Remark

2 The graph below is the distance–time graph for two cyclists, Judith and Noah.



(i) How far has Judith cycled in 8 seconds?

Distance = _____ m [1]

(ii) How far apart are Judith and Noah after 8 seconds?

You are advised to show your working out.

Distance apart = _____ m [2]

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(iii) Use the graph to find Judith's speed.

You are advised to show your working out.

Speed = _____ m/s [3]

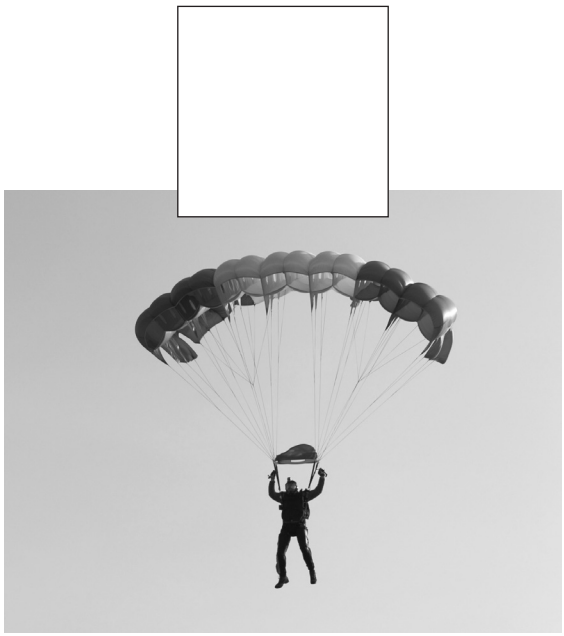
(iv) Noah stops cycling after eight seconds. Complete the distance–time graph for Noah up to twelve seconds. [1]

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Marks	Remark

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Examiner Only	
Marks	Remark

3 Stephen parachutes from a plane. Air resistance causes a friction force on his parachute.



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(a) Mark with an arrow in the box on the diagram, the direction of this friction force. [1]

(b) A force of 850 N acts downwards on Stephen.
Put a tick (✓) in the correct box.

This force is caused by:

friction ☐

the weight of the atmosphere ☐

the attractive force between Stephen and the Earth ☐ [1]

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(c) Stephen falls at a steady speed.
Put a tick (✓) in the correct box.

The size of the friction force acting on the parachute is

equal to 850 N ☐

less than 850 N ☐

more than 850 N ☐ [1]

(d) The friction force decreases. Describe Stephen's motion when this happens.

_____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 Energy resources may be described as renewable or non-renewable.

(i) Describe what is meant by a renewable energy resource.

_____

_____ [1]

(ii) In the table below put an R beside the energy resources which are renewable and N beside those which are non-renewable. One entry has been completed for you.

Energy resource	R or N
Oil	N
Wind	
Nuclear	
Solar	
Hydroelectric	

[4]

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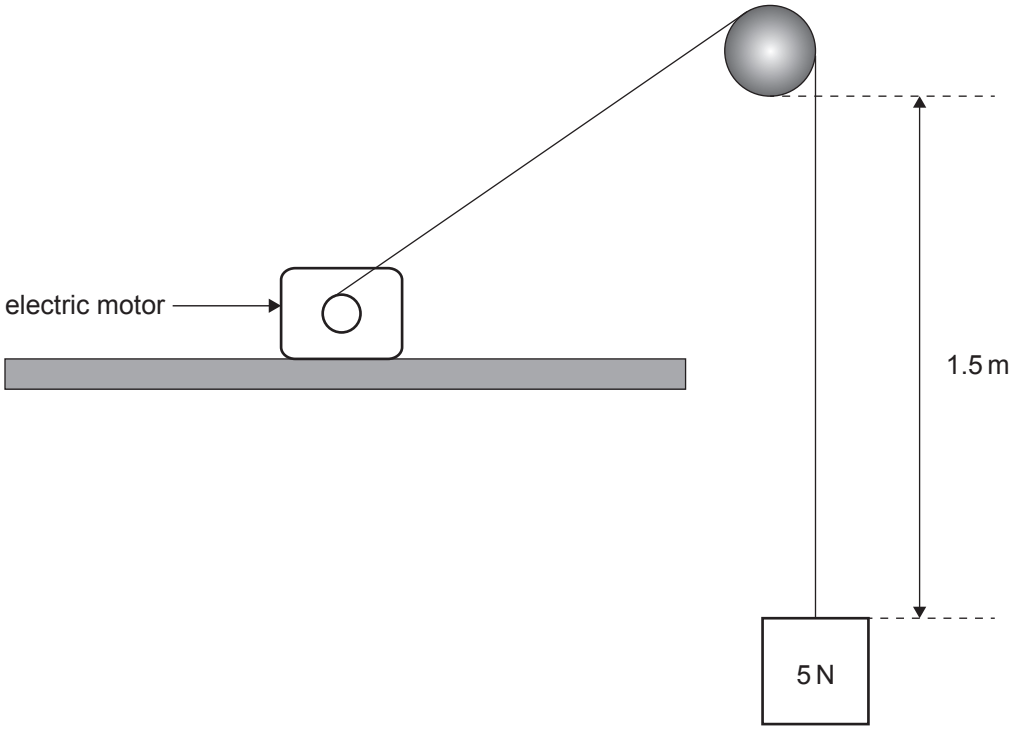
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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

5 An electric motor is used to raise a weight of 5 N through a vertical height of 1.5 m.



Source: CCEA

(a) Calculate the work done by the electric motor.

You are advised to show your working out.

Work done = _____ J [3]

(b) A different motor raises a load and does 20 J of useful work.
The electrical input energy is 25 J.

Examiner Only	
Marks	Remark

(i) Calculate the efficiency of the motor.

You are advised to show your working out.

Efficiency = _____ [3]

The load is raised in a time of 4 seconds.

(ii) Calculate the useful power output of the motor.
Remember to give the unit for power.

You are advised to show your working out.

Power = _____ [4]

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Examiner Only	
Marks	Remark

6 Two identical glasses, A and B, one containing liquid sit on a table.

A



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B



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(a) (i) How does the stability of glass B compare with the stability of glass A? Tick (✓) the correct box.

A is more stable ☐

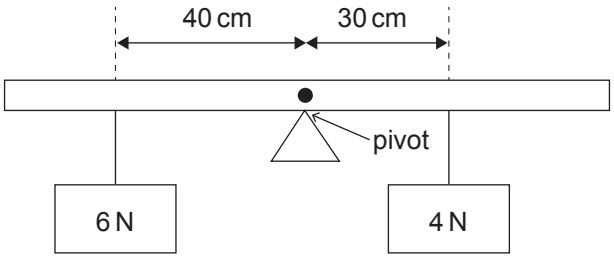
B is more stable ☐

both are equally stable ☐ [1]

(ii) Give a reason for your answer.

_____ [1]

The uniform lever shown below is pivoted at its midpoint. The lever is **unbalanced** and will rotate.



(b) (i) Give the reason why the lever will rotate.

_____ [1]

(ii) How far from the pivot should the 4 N weight be placed to balance the lever?

You are advised to show your working out.

Distance from pivot = _____ cm [4]

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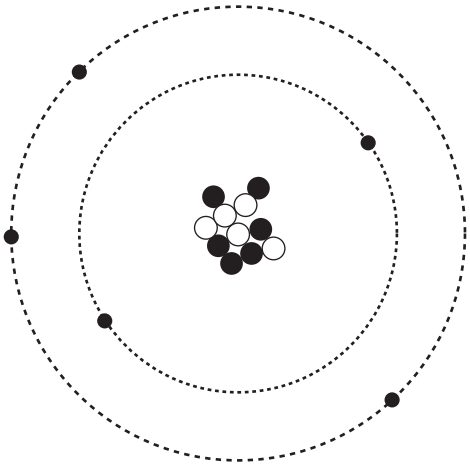
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** Historically, different models for the structure of the atom have been proposed. What is the name of the current model?

_____ [1]

The diagram shows a neutral atom.



(b) Complete the table for this atom.

Mass number	
Number of neutrons	
Number of protons	
Atomic number	

[4]

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8 The picture shows a satellite at a distance from the Earth.



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A force, called the centripetal force, acts on the satellite.

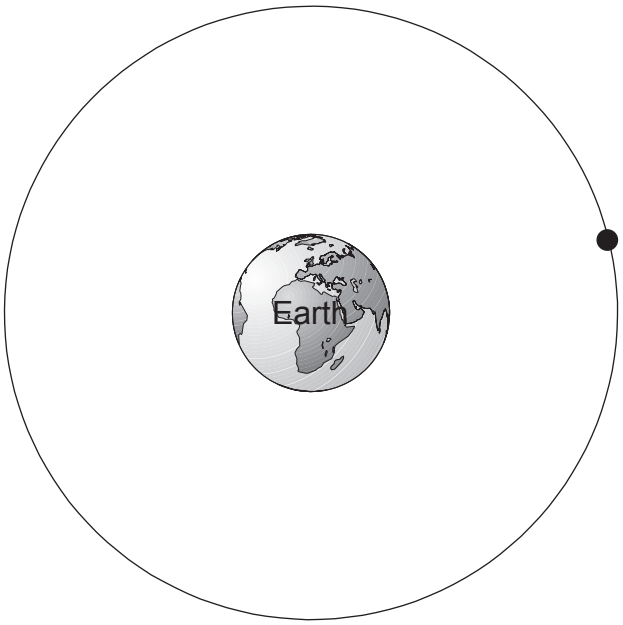
(i) What supplies the centripetal force in this case?

_____ [1]

(ii) What effect does this force have on the direction of the satellite's motion?

_____ [1]

(iii) Starting at the satellite, draw an arrow on the diagram below to show the direction of the centripetal force.



[1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

9 **(a)** Three types of radiation, alpha, beta and gamma, may be emitted from radioactive sources.

Complete the table below by writing alpha, beta or gamma in the second column.

Can penetrate several cm of lead	
Consists of four particles	
Is a wave	
Comes from the nucleus and has a negative charge	

[4]

(b) **(i)** Explain, in detail, what is meant by half-life.

_____

_____

_____ [3]

(ii) When a radioactive substance is delivered to a laboratory its activity is 6000 counts per minute.

Complete the table below.

Activity/counts per minute	Number of half-lives
6000 (arrives)	0
	1
1500	
	4

[3]

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10 Describe, in detail, the process of nuclear fission.

Examiner Only

Marks	Remark

Your answer must include:

- the name of the fuel used;
- the name of the particle which starts the process;
- what happens in the fission process.

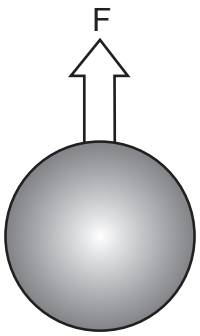
In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

11 When an object falls through the air a drag force, F, acts on the object.

Examiner Only

Marks	Remark



The size of the drag force, F, depends on the speed, v, of the falling object.
A scientist suggests that the drag force is proportional to the speed.

This suggestion may be written:

$$F = kv \qquad \text{Equation 11.1}$$

where k is a constant.

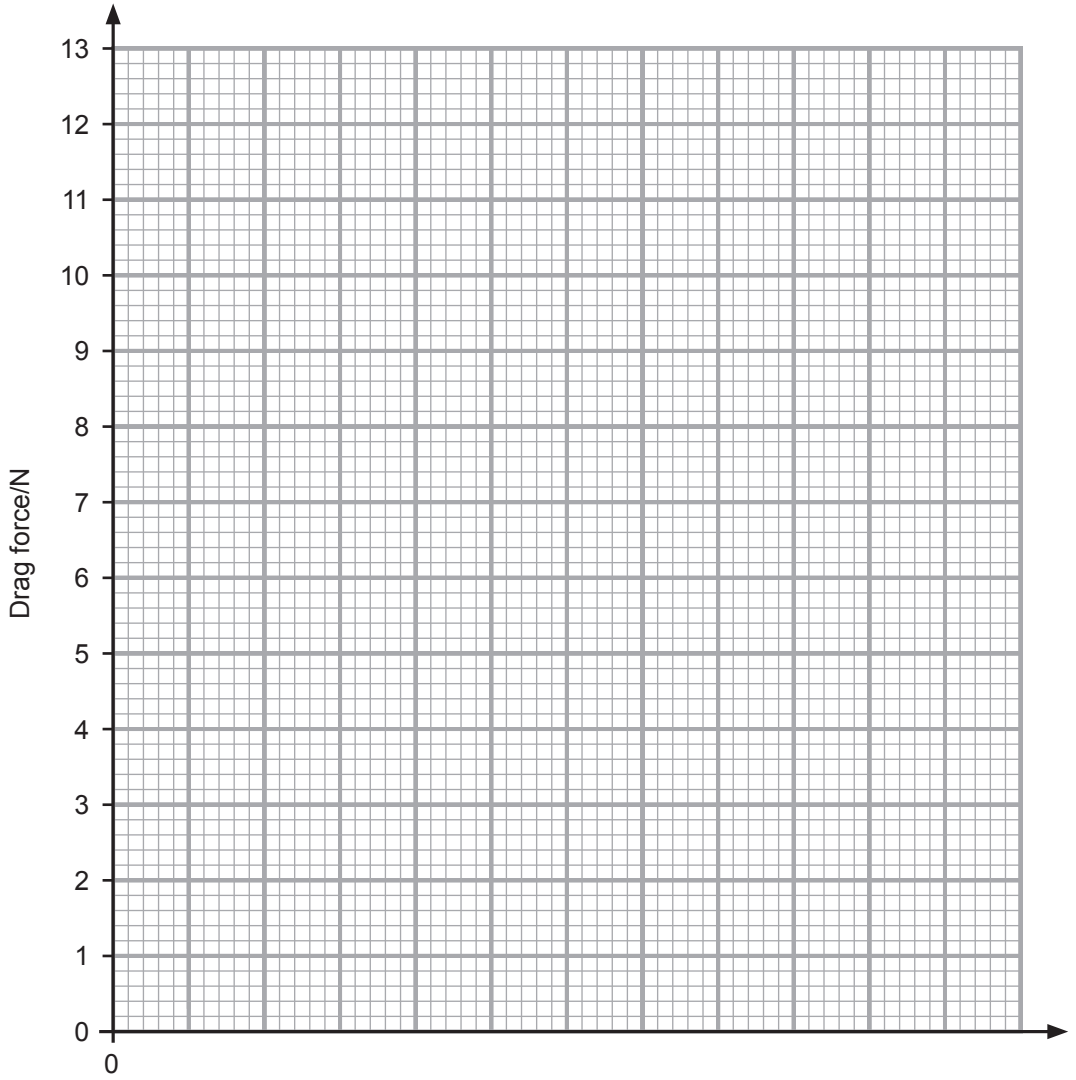
To test her theory she obtains a set of results and these are shown.

F/N	0.0	0.5	2.0	4.5	8.0	12.5
v/ m/s	0	1	2	3	4	5

You are asked to plot a graph of drag force F against speed, v.

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

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(ii) Plot a graph of force against speed. [3]

(iii) From your graph, estimate the drag force when the speed is 4.5 m/s.

Drag force = _____ N [2]

(iv) Is the scientist correct to say that the force and speed are directly proportional? Circle the correct answer.

YES NO

Give a reason for your answer.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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Rewarding Learning

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Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

FRIDAY 26 FEBRUARY 2016, MORNING

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				AVAILABLE MARKS
1	**(i)**	light	[1]	
	(ii)	chemical → heat or thermal	[2]	
	(iii)	electric(al) → sound	[2]	5
2	**(i)**	48 (m)	[1]	
	(ii)	Noah – 20 (m) [1] 28 (m) [1] **e.c.f.** from **(i)**	[2]	
	(iii)	speed = d/t or gradient [1] = 48/8 [1] e.c.f. from **(i)** = 6.0 (m/s) [1]	[3]	
	(iv)	horizontal line up to 12 s	[1]	7
3	**(a)**	vertical arrow upwards	[1]	
	(b)	attractive force	[1]	
	(c)	equal to 850 N	[1]	
	(d)	accelerates/velocity (or speed) increases/he gets **faster**	[1]	4
4	**(i)**	Infinite resource/never runs out	[1]	
	(ii)	Wind R [1] Nuclear N [1] Solar R [1] HEP R [1]	[4]	5
5	**(a)**	W = F × d [1] = 5 × 1.5 [1] = 7.5 (J) [1]	[3]	
	(b)	**(i)** E = (useful) energy out/energy in (or equiv) [1] $= \frac{20}{25}$ [1] = 0.8 (or 80%) [1]	[3]	
		(ii) $P = \frac{W.D.}{t}$ [1] $= \frac{20}{4}$ [1] = 5 [1] W [1] or J/s = W	[4]	10

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					AVAILABLE MARKS
6	**(a)**	**(i)**	A is more stable	[1]	
		(ii)	A has a lower c of g/B has a higher c of g. [**Dep. Marking**]	[1]	
	(b)	**(i)**	**Moments** are not balanced/not equal	[1]	
		(ii)	CM = ACM (or equiv) [1] or $F_1 \times d_1 = F_2 \times d_2$ [1] $4 \times d = 6 \times 40$ [1] d = 60 (cm) [1]	[4]	7
7	**(a)**		Rutherford–Bohr	[1]	
	(b)		Mass number – 11 Number of neutrons – 6 Number of protons – 5 Atomic number – 5 [1] each	[4]	5
8	**(i)**		Gravity/weight	[1]	
	(ii)		Causes it to go in **a circle**/constantly changing	[1]	
	(iii)		Arrow towards centre	[1]	3
9	**(a)**		Gamma or γ Alpha or α Gamma or γ Beta or β [1] each	[4]	
	(b)	**(i)**	Time [1] [**threshold** mark] for radiation/(radio)activity/count rate [1] to halve [1] the scheme is **hierarchical**	[3]	
		(ii)		[3]	10

Activity/counts per minute	Number of half-lives
6000 (arrives)	0
3000	1
1500	**2**
375	4

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10 neutron(s)
absorbed or taken in
(by) U/Pu
(fission) fragments produced or U/Pu **split**
neutron(s) produced
energy or power released
[1] each

Free-standing marks

[6]

Response	Mark
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]

11 **(i)** Scale over halfway [1]
axis labelled with unit [1] speed m/s = speed (m/s) = V (m/s) = V m/s [2]

(ii) At least 5 correct points [2] or 4 points for [1]
curve [1] Reject: Point to point lines [3]

(iii) Evidence from graph [1]
Drag force = 10.1 (N) [± 0.2] [1] [2]

(iv) Not a straight line [1]

Total

AVAILABLE MARKS
6
8
70

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

FRIDAY 13 NOVEMBER 2015, MORNING

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

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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.

				AVAILABLE MARKS
1	**(i)**	sound → electrical	[2]	
	(ii)	electrical → light	[2]	
	(iii)	chemical → electrical	[2]	6
2	**(i)**	coal/oil/nuclear Any two for [1] each	[2]	
	(ii)	solar/wind [1]	[1]	
	(iii)	solar/wind [1]	[1]	4
3	**(a)**	**(i)** Eff = (useful) energy out/energy in [1] = 240/1200 [1] = 0.2 [1]	[3]	
		(ii) 960 (J)	[1]	
	(b)	W = F × d [1] = 50 × 120 [1] = 6000 (J) [1] = 6 (kJ) [1] [allow e.c.f.]	[4]	8
4	**(a)**	Av speed = dist/time [1] = 4800/1200 [1] = 4 (m/s) [1]	[3]	
	(b)	**(i)** C	[1]	
		(ii) B	[1]	
		(iii) C	[1]	6
5	**(a)**	**(i)** v = l × b × h [1] **or** v = 10 × 6 × 4 [1] = 240 (cm^3) [1]	[2]	
		(ii) ρ = mass/vol [1] = 120/240 [1] [e.c.f. from (i) for V] = 0.5 (g/cm^3) [1]	[3]	
	(b)	Unchanged [1]	[1]	6
6	**(i)**	Moment = F × d [1] = 20 × 0.3 [1] and [1] = 6 (Nm) [1]	[4]	
	(ii)	(Force at) greater distance (from pivot) [1] gives bigger moment (or leverage) [1] Reject: easier to turn	[2]	6

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	AVAILABLE MARKS

7 P = W/t [1]
= 15 000/25 [1]
= 600 W [1] and [1] [4] — 4

8 **(a)** **(i)** 92 [1] [1]

(ii) 146 [1] [1]

(b) Same number of protons [1] and different number of neutrons [1]
or
same atomic number [1] but different mass number [1] [4]

(c) After one half life – 50% remains [1]
after two half lives – 25% remains **or** 30/2 [1]
15 (h) [1] [3] — 9

9 **(a)** Centripetal force towards centre [1]
Force depends on: mass, speed, radius [3]
increases with mass [1] and speed [1]
decreases with radius [1] (maximum 6 points) [6]

Response	Mark
Candidates explain **at least 5** 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) Mom = mass × velocity [1]
Mom = 0.2 × 3 [2]
Mom = 0.6 (kg m/s) [1] [4] — 10

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10 **(i)**

L/m	0.0	0.2	0.4	0.6	0.8	1.0
T/s	0.0	0.90	1.27	1.55	1.79	2.00
T^2/s^2	**0.0**	**0.8**	1.6	**2.4**	**3.2**	**4.0**

[$\frac{1}{2}$] each round down [2]

(ii) Scale more than $\frac{1}{2}$ way [1] label [1] [2]

(iii) At least 5 correct [2] minimum of 3 correct [1] [2]

(iv) Best fit line [1]

(v) Yes – straight line [1] through origin [1] [e.c.f. from **(iv)**] [2]

(vi) k = grad (or alternative, e.g. rise/run)
or = 4(.0)/1 (or alternative)
= 4(.0) [1] } [1] either line [2]

Total

AVAILABLE MARKS

11

70

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 20 MAY 2015, AFTERNOON

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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(a)**.

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1 **(a)** **(i)** Explain what is meant by a renewable energy resource.

_____

_____ [1]

(ii) Give **two** examples of renewable energy resources.

1. _____

2. _____ [2]

(b) Give **one** environmental advantage in using a renewable energy resource rather than a non-renewable resource.

_____ [1]

[Turn over

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2 A light bulb is **designed** to change electrical energy to light energy.



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Indicate in the spaces provided the energy change each of the following is **designed** to bring about.



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(i) An electric kettle changes *electrical* energy

to _____ energy. [1]



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(ii) A microphone changes _____ energy

to _____ energy. [2]

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(iii) A battery changes _____ energy

to _____ energy. [2]

[Turn over

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3 Patricia stands on a set of laboratory scales and the reading is 680 N. She is then handed a suitcase and the reading rises to 820 N.



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(a) (i) Calculate the weight of the suitcase.

Weight = _____ N [1]

(ii) Calculate the mass of the suitcase.
Include the unit with your answer.

Mass = _____ [2]

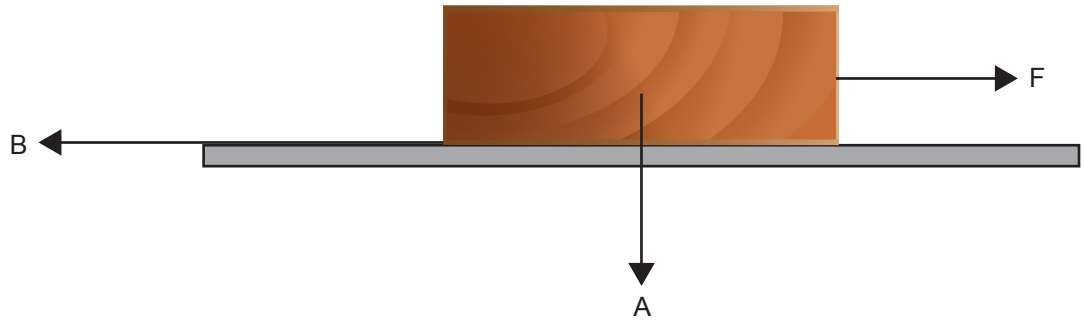
(b) Patricia carries a sponge ball in her suitcase. The ball has a mass of 300 g and a volume of 150 cm^3. Calculate the density of the ball.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

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4 A block of wood is pulled over a rough surface with a force F.



The diagram shows two other forces acting on the wood, labelled A and B.

(a) (i) Name these forces.

Force A: _____

Force B: _____ [2]

(ii) Another force acts on the wooden block. Draw an arrow on the diagram above to show the position and direction of this force. [2]

(b) The block moves to the right at constant speed. Is force F greater than, equal to or less than force B? Circle the correct answer below.

greater than **equal to** **less than**

[1]

(c) (i) Which one of the forces (A, B or F) acting above will cause energy loss? Circle the correct answer below.

A **B** **F**

[1]

(ii) In what form will the energy be lost?

Energy wasted as _____ [1]

[Turn over

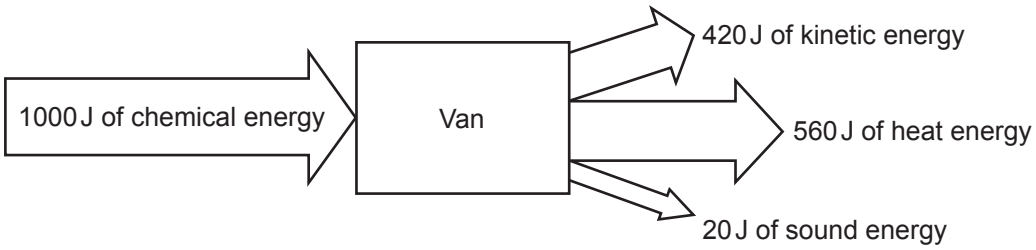
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24GSD3107

5 The engine in a van changes chemical energy to kinetic, heat and sound energy.



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The diagram below illustrates the energy values in a particular situation.



280 J of the heat energy produced may usefully be used to heat the cabin to keep the driver warm.

(i) Calculate the **total** useful output energy.

You are advised to show your working out.

Total useful output energy = _____ J [2]

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(ii) Calculate the efficiency of the engine.

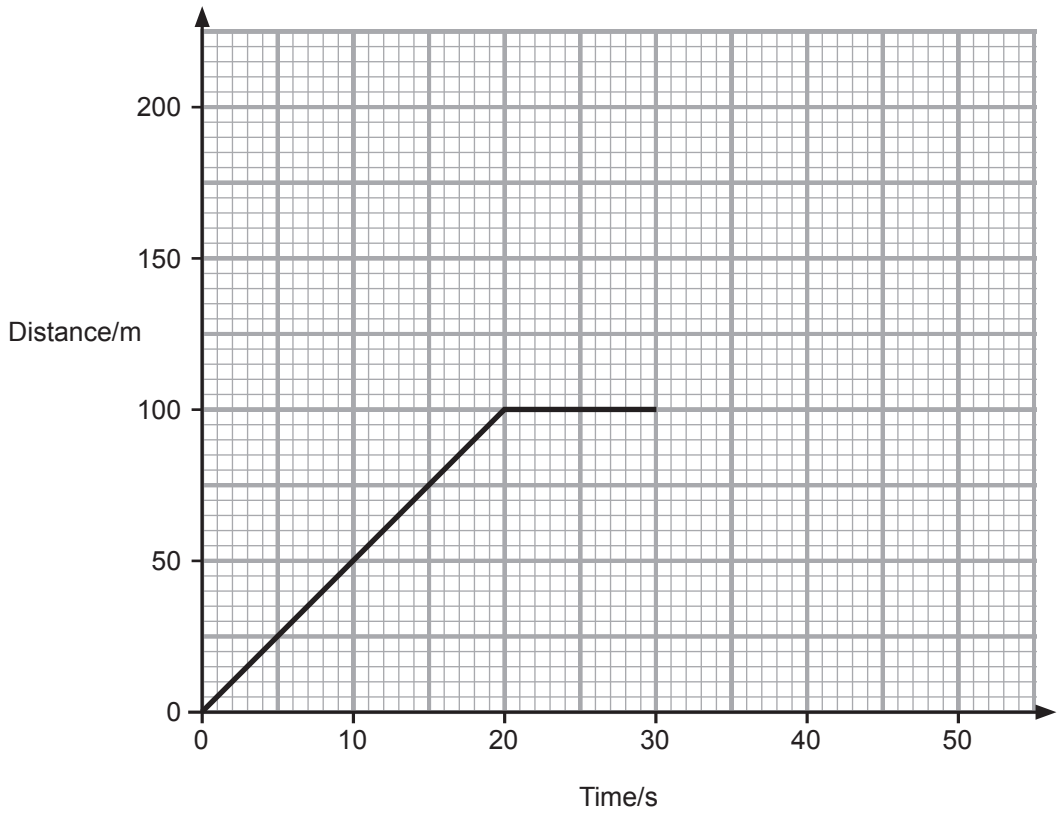
You are advised to show your working out.

Efficiency = _____ [3]

[Turn over

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6 The graph below shows an incomplete plot of a distance-time graph for a student walking to school.



The school is 200 m away. The student walks at a steady speed for 20 seconds and then stops for 10 seconds. He completes the journey walking at a constant speed for a further 20 seconds.

(a) (i) How can you tell from the graph that the student is walking at a steady speed for the first 20 seconds?

_____ [1]

(ii) Complete the graph to show the final 20 seconds of the journey. [2]

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(b) Calculate the average speed of the student for the complete journey.

Remember the total time of the complete journey is 50 seconds.

You are advised to show your working out.

Average speed = _____ m/s [3]

[Turn over

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7 An atom consists of electrons, protons and neutrons.

(i) Complete the table below to show the properties and location of these particles. Some information has already been provided.

Particle	Relative mass	Relative charge	Location
Proton		+1	
Neutron	1		In the nucleus
Electron	1/1840		

[5]

(ii) Historically, different models have been proposed which attempted to describe the arrangement of particles in an atom.

Give the name of the first model.

_____ [1]

(iii) This model was replaced when two scientists proposed a much better model.

Give the name of these two scientists.

_____ and _____ [2]

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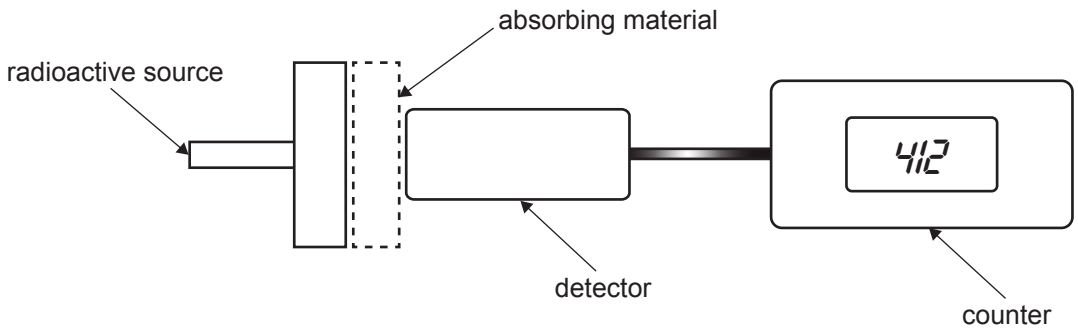
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(Questions continue overleaf)

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24GSD3113

8 **(a)** The apparatus shown is used to investigate how different materials absorb gamma radiation.



The absorbing material is either aluminium, lead or air.

Examine the table below and insert the names of the material in the last column.

Count rate/ Counts per minute	Absorbing material (aluminium, lead or air)
802	
45	
412	

[3]

Technetium is an isotope widely used in medical imaging and has the symbol $^{99}_{43}Tc$.

(b) **(i)** How many particles are in the nucleus of technetium?

_____ [1]

(ii) How many of these particles are neutrons?

_____ [1]

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This isotope has a half-life of 211 000 years.

(iii) Beginning with 8 grams of technetium, calculate how long it would take before only 1 gram remains.

You are advised to show your working out.

_____ years [3]

[Turn over

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9 **(a)** Describe an experiment to measure your personal power.

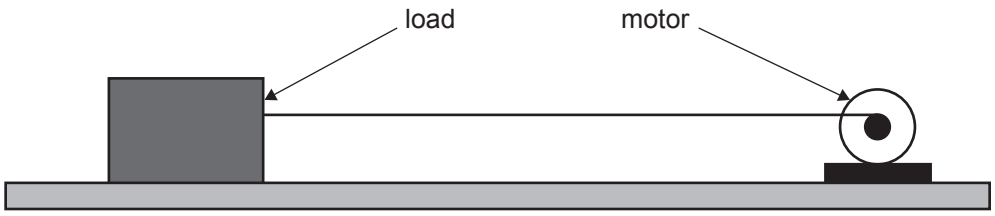
Your account should include:

- the apparatus you use;
- the measurements you make.

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

[6]

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An electric motor pulls a load across a rough surface at a constant speed. The motor exerts a resultant force of 30 N and moves the load a distance of 1.5 m in a time interval of 5 seconds.

(b) Calculate the power developed by the motor.

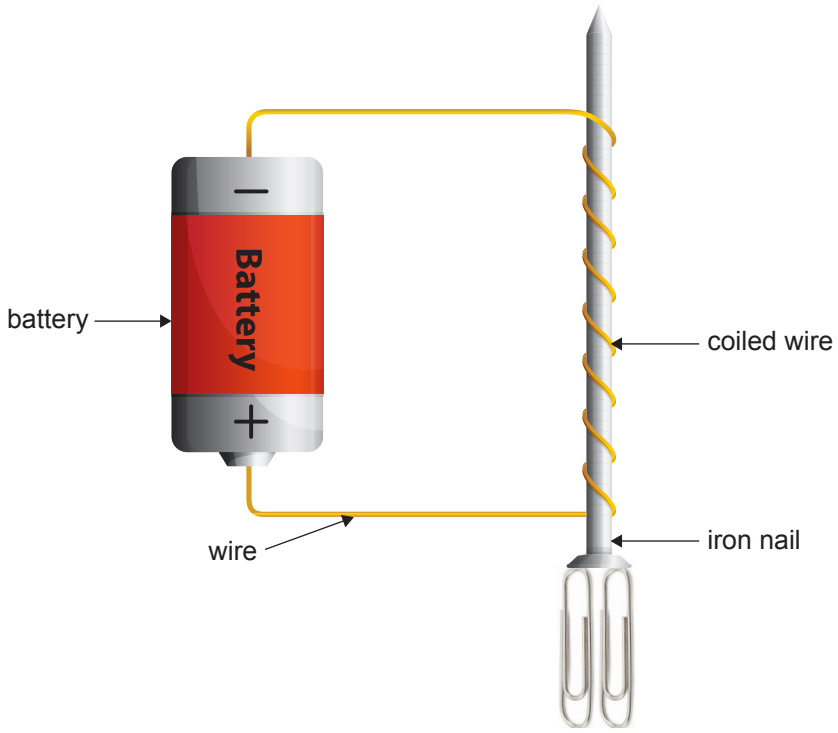
You are advised to show your working out.

Power developed = _____ W [3]

[Turn over

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24GSD3117

10 A large iron nail can be made into a magnet by wrapping a coil around it, as shown, and passing a current through the wire.

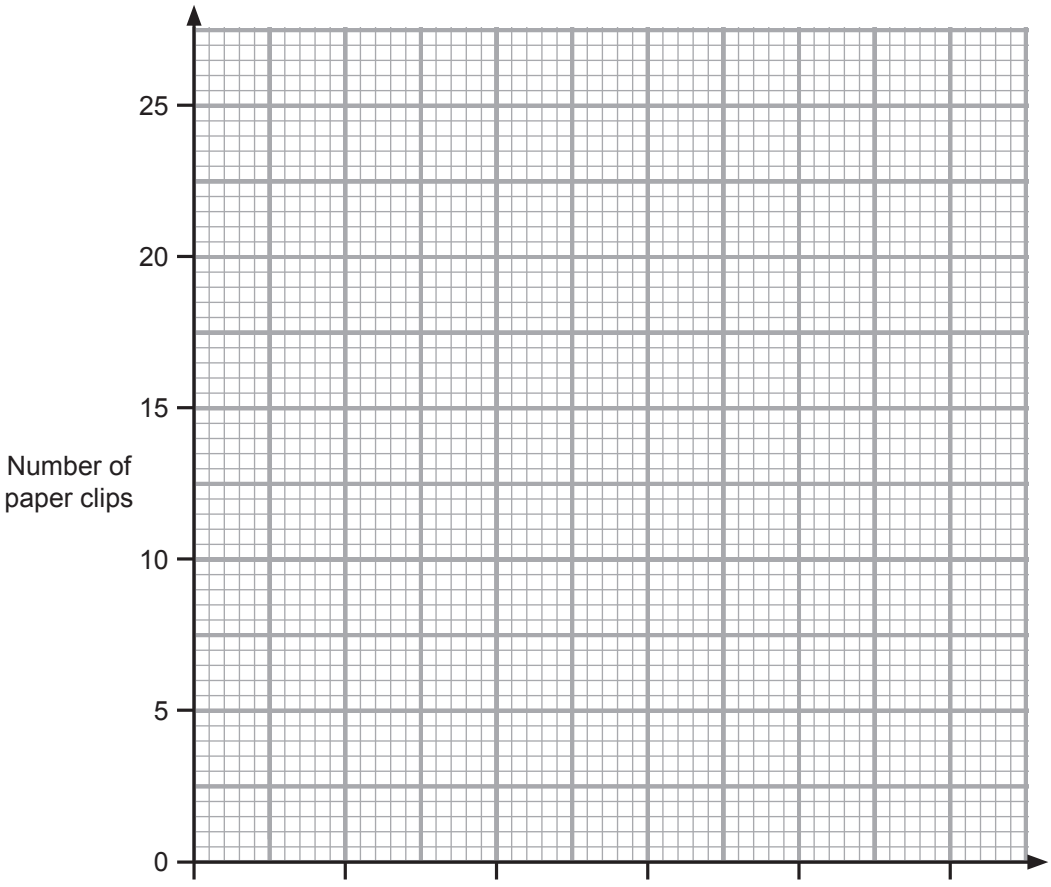


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A student wanted to see how the number of paper clips the magnet was able to pick up depended on the size of the current passing through the wire. The current was changed to different values and the number of paper clips counted each time.

A table of results is shown below.

Current/mA	Number of paper clips
0	0
200	5
400	10
600	15
800	20
1000	25



You are asked to plot a graph of 'number of paper clips' against current.

(i) Choose a suitable scale for the horizontal axis, label it and include the correct unit. [3]

(ii) Plot the points of 'number of paper clips' against current. [2]

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

[Turn over

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(iv) Is it true to say that the number of paper clips that can be lifted is directly proportional to the current? Circle your answer.

Yes No

Give **two** reasons for your answer.

1. _____

2. _____ [2]

(v) Use your graph to find the maximum number of paper clips that the magnet would lift when a current of 0.7 A is flowing.
(Hint: 1.0 A = 1000 mA)

You are advised to show your working out.

Number of paper clips = _____ [4]

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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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Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 20 MAY 2015, AFTERNOON

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Never runs out/replaced **in a lifetime**/renewed **in a lifetime**/ limitless supply	[1]	
		(ii)	Any **two** from: solar, wind, HEP, tidal, geothermal, biomass/wood/trees/turf, wave	[2]	
	(b)		Does not pollute/no CO_2/conserves fossil fuels/reduces global warming/ does not affect climate **Reject**: environmentally friendly	[1]	4
2	**(i)**		heat/thermal	[1]	
	(ii)		sound [1] electrical [1]	[2]	
	(iii)		chemical [1] electrical [1]	[2]	5
3	**(a)**	**(i)**	Weight of suitcase = 140 (N)	[1]	
		(ii)	m = 14 [1] kg [1] **e.c.f.** from (a)(i)	[2]	
	(b)		density = m/v [1] = 300/150 [1] = 2 (g/cm^3) [1]	[3]	6
4	**(a)**	**(i)**	A – Weight/gravity or gravitational B – friction [1] each **Reject**: drag or resistance	[2]	
		(ii)	Vertical upwards above block [1] and co linear by eye [1] (dep. on correct direction and position)	[2]	
	(b)		Equal to	[1]	
	(c)	**(i)**	B	[1]	
		(ii)	Heat or thermal or sound **Reject**: noise	[1]	7
5	**(i)**		280 + 420 [1] **Look for** 1000 – 280 = 720 → 0/2 700 (J) [1]	[2]	
	(ii)		E = EO/EI [1] E = 700/1000 [1] e.c.f from (i) **EO < 1000 for 2nd mark** E = 0.7 [1] (or 70%)	[3]	5

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		AVAILABLE MARKS
6	**(a)** **(i)** Constant/uniform/steady gradient/slope/steady speed is 5 m/s/straight line [1]	
	(ii) Straight line (and going to right) from (30, 100) [1] finishing at (50, 200) ± 1 square [1] [2]	
	(b) (Av) speed = dist/time [1] or s = d/t or v = d/t etc. = 200/50 [1] = 4 (m/s) [1] [3]	6

7 **(i)**

Particle	Relative mass	Relative charge	Location
Proton	**1**		**nucleus**
Neutron		**0**	
Electron		**–1**	**In orbit/ in shells or orbiting nucleus**

[5]

(ii) Plum pudding
Reject: currant bun etc. [1]

(iii) Rutherford, Bohr [1] each [2] 8

8 **(a)** Air, Lead, Aluminium [3]

(b) **(i)** 99 [1]

(ii) 56 [1]

(iii) 8 → 4 [1]
8 → 4 → 2 → 1 [1]
or 3 half-lives identified
633 000 y [1] [3] 8

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9 **(a)** Measure weight [1] with scales [1]
Measure height [1] with metre rule [1] (or equiv)
Measure time (to run upstairs) [1] with stopwatch [1] } mark independently

Response	Mark
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]

[6]

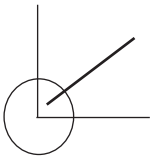
(b) P = work/time [1] or P = Fd/t
= (30 x 1.5)/5 [1]
= 9 (W) [1]

Not: $P = \frac{mgh}{t} \rightarrow 0/3$ [3] 9

10 **(i)** Suitable scale, i.e. half or more of graph paper used [1]
Axis labelled [1]
correct unit [1] [3]

(ii) 5 or 6 points correct [2] 4 points [1] tolerance ± 1 square [2]

(iii) Line of best fit

Accept:  [1]

(iv) Yes (no marks) Straight line [1] through origin [1]
If "NO" → 0/2
Accept: Straight line = Constant ratio
Reject: If one doubles, the other doubles [2]

(v) 700 (mA) [1]
17.1 <–> 18 [1]
Value = 17.5 ± 0.2 [1]
Number of clips = 17 [1] [4] 12

Total **70**

AVAILABLE MARKS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

[GSD31]

THURSDAY 26 FEBRUARY 2015, MORNING

TIME

1 hour.

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 70.
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(a)**.

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

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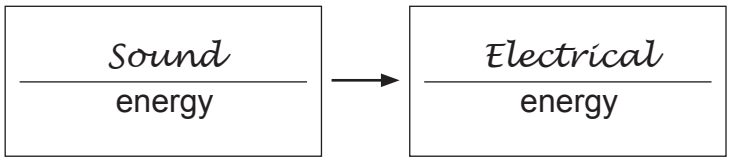
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Examiner Only	
Marks	Remark

1 A microphone changes **sound** energy into **electrical** energy, as shown in the energy flow diagram below.



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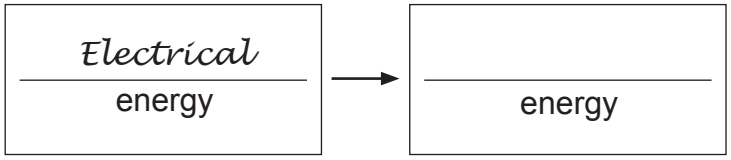


Fill in the spaces below to show the **main** types of energy changes which the device is designed to bring about.

(a) Electrical oven



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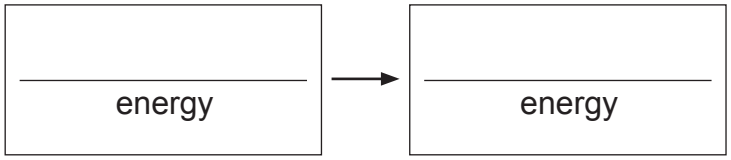


[1]

(b) Loudspeaker



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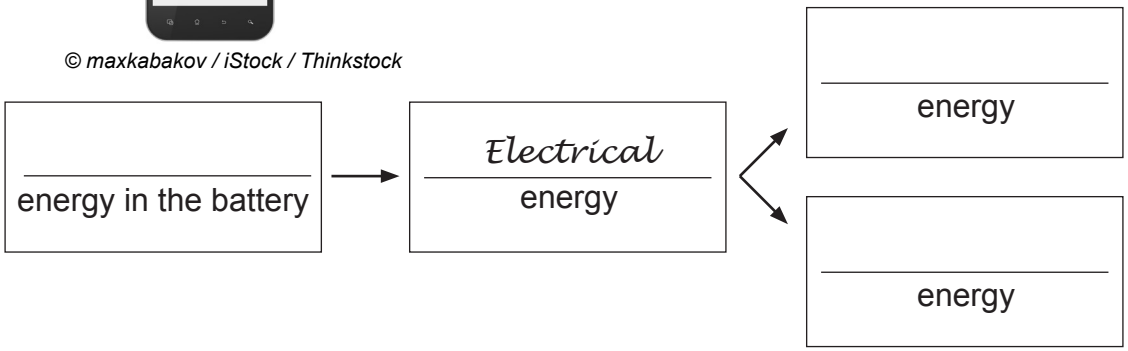


[2]

(c) Mobile phone



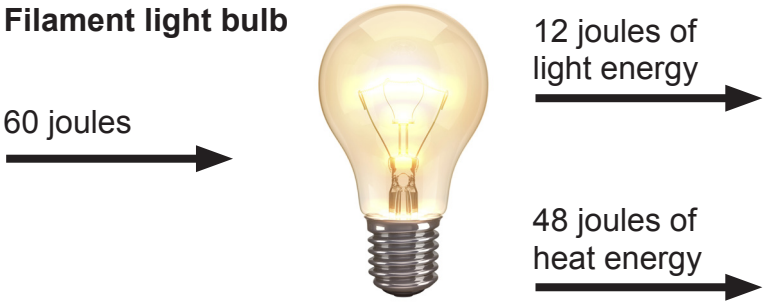
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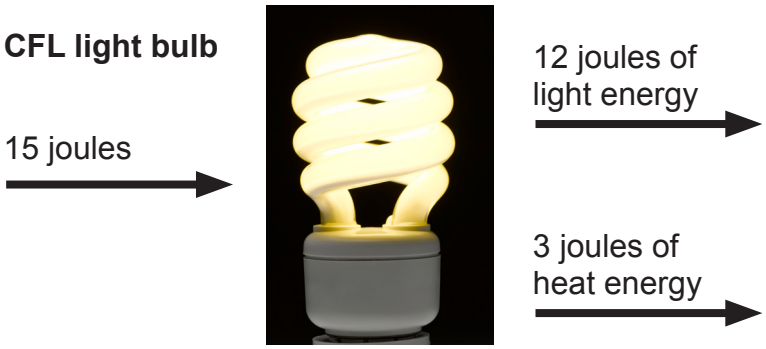
[3]

Examiner Only	
Marks	Remark

2 Filament light bulbs and CFL light bulbs are designed to convert electrical energy into light energy.



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(a) Use the information above to explain fully why the government is encouraging the use of the more modern CFL light bulbs.

_____

_____ [1]

(b) Calculate the efficiency of the CFL light bulb.

You are advised to show your working out.

Efficiency = _____ [3]

Read the passage below.

Examiner Only	
Marks	Remark

Some islands off the west coast of Ireland have no **coal** or **oil**. The islanders depend on **wind** energy to generate electricity. When there is little demand for electricity, the islanders charge their batteries. They can use the batteries if there is no wind.

(c) (i) Name one renewable and one non-renewable energy resource mentioned in the passage above.

Renewable energy resource _____

Non-renewable energy resource _____ [2]

(ii) Name one renewable and one non-renewable energy resource **not** mentioned in the passage above.

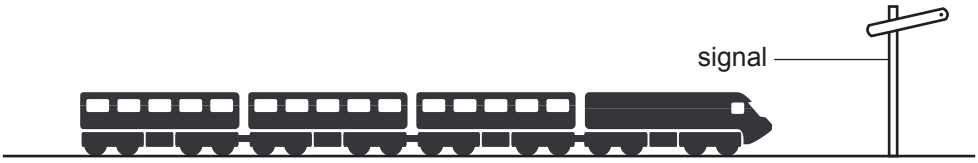
Renewable energy resource _____

Non-renewable energy resource _____ [2]

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Examiner Only	
Marks	Remark

3 **(a)** A train is 75 m long. The whole train takes 5 seconds to pass a signal.

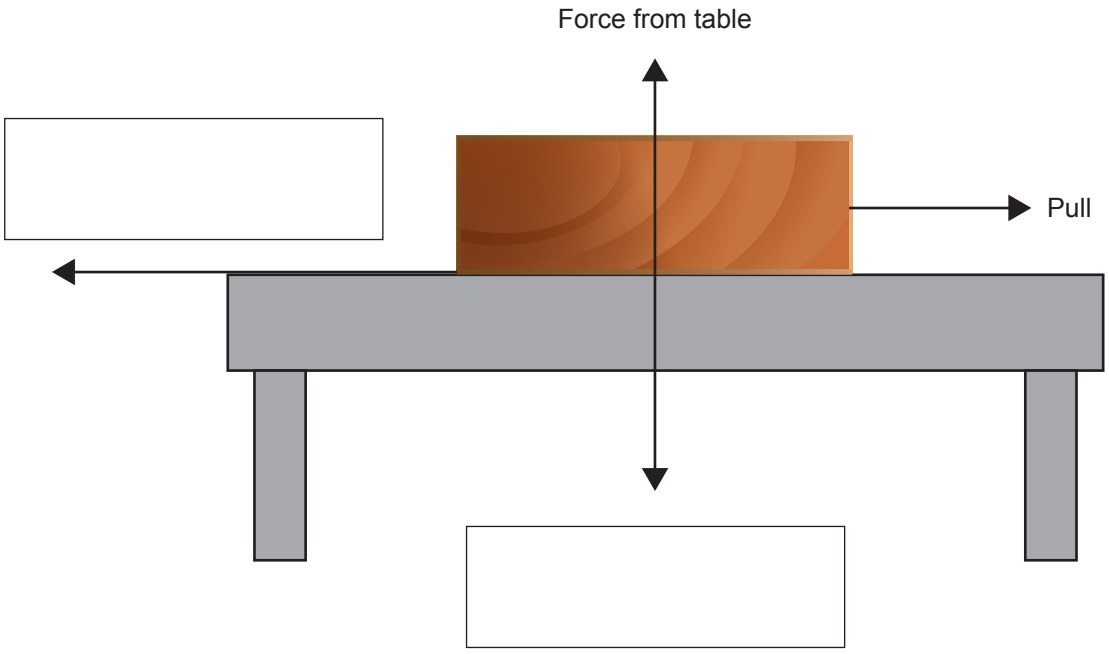


Calculate the speed of the train.

You are advised to show your working out.

Speed of train = _____ m/s [3]

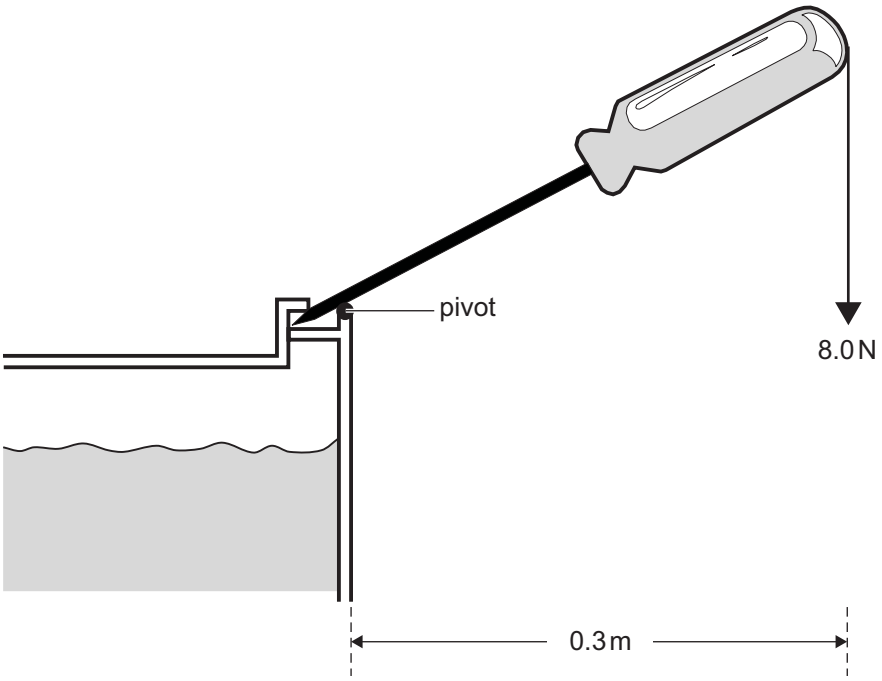
(b) The diagram shows a block of wood being pulled across a table.



Complete the boxes by inserting the names of the two other forces acting on the block of wood. [2]

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The diagram shows a screwdriver being used to open a tin of paint.
The force exerted by the painter is 8.0 N.



(c) (i) Calculate the moment of the 8.0 N force about the pivot.
Remember to include the unit.

You are advised to show your working out.

Moment = _____ [4]

(ii) Tick (✓) the correct box to indicate the direction of the moment of the 8.0 N force.

Clockwise ☐

Vertically downwards ☐

Anticlockwise ☐ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** Complete the following sentence.

An object has kinetic energy if it is _____ [1]

(b) A bus, car and athlete are travelling at 10 m/s.



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© Jupiterimages / Digital Vision / Thinkstock

Which has the greatest kinetic energy?

_____

Explain your answer.

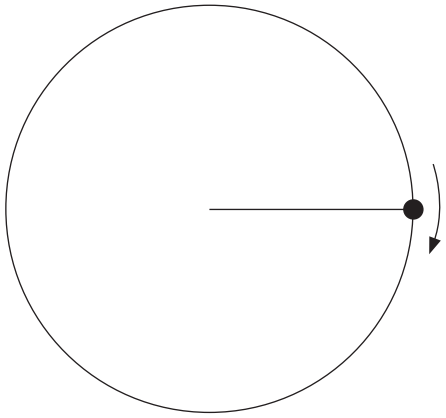
_____ [2]

(c) Calculate the kinetic energy of a 60 kg cheetah moving at 5 m/s.

You are advised to show your working out.

Kinetic energy of cheetah = _____ J [3]

5 A steel ball is whirled on a string in a horizontal circle. A bird's eye view of the situation is shown in the diagram below.



(a) Tick (✓) the correct box to show which force provides the centripetal force acting on the steel ball.

Friction	☐
Electric force	☐
Weight	☐
Tension	☐

[1]

(b) (i) Complete the formula below, **in words**, to find the momentum of an object.

Momentum = _____ [1]

(ii) The steel ball has a mass of 0.5 kg and velocity of 4.0 m/s. Calculate the momentum of the steel ball.

You are advised to show your working out.

Momentum = _____ kg m/s [2]

Examiner Only

Marks	Remark

6 Robert, whose mass is 70 kg, runs up a flight of stairs.



(a) Calculate Robert's weight in newtons.

Weight = _____ N [2]

(b) The vertical height of the stairs is 3.5 m.
Calculate the work done by Robert.

You are advised to show your working out.

Work done = _____ J [3]

(c) The time taken by Robert to run up the stairs is 5.0 s.
Use your answer to part **(b)** to calculate the power developed by Robert.

You are advised to show your working out.

Power = _____ W [3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

7 **(a)** Describe an experiment you would carry out to measure the density of milk.

In your description you should include:

- the apparatus you would use;
- the measurements you would take;
- the formula you would use to find the density.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(b) Metal rivets have a mass of 54 g and a volume of 20 cm^3.
Calculate the density of the metal.

You are advised to show your working out.

Density = _____ g/cm^3 [2]

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Examiner Only

Marks	Remark

8 **(a)** An atom is made up of protons, neutrons and electrons.
Complete the table below to show the relative electrical charge and the location of each particle.
Two of the boxes have already been done for you.

Particle	Relative electrical charge	Location in the atom
Proton	+1	In the nucleus
Neutron		
Electron		

[4]

(b) The symbol for the nucleus of carbon-14 is shown below.

$$^{14}_{6}C$$

(i) How many protons does the nucleus of carbon-14 contain?

Number of protons = _____ [1]

(ii) How many electrons does a neutral atom of carbon-14 contain?

Number of electrons = _____ [1]

(iii) How many neutrons does a neutral atom of carbon-14 contain?

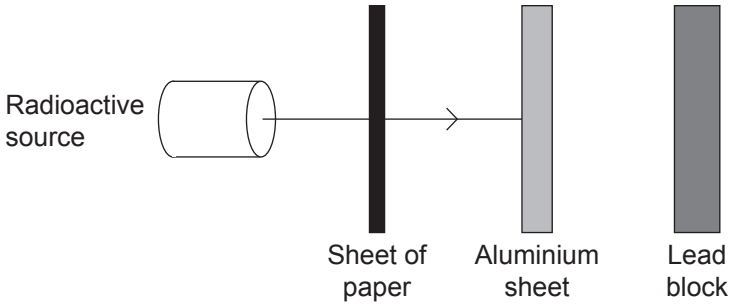
Number of neutrons = _____ [1]

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Examiner Only	
Marks	Remark

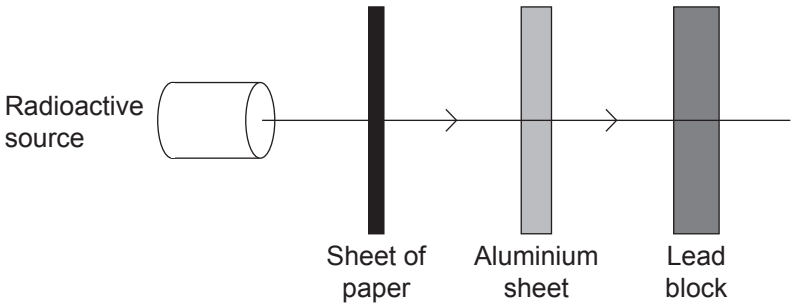
(c) The diagrams show two radiations being emitted by a radioactive substance and being absorbed by different materials.
State the name of the radiation being emitted in each case, in the appropriate space.

(i)



Radiation = _____ [1]

(ii)



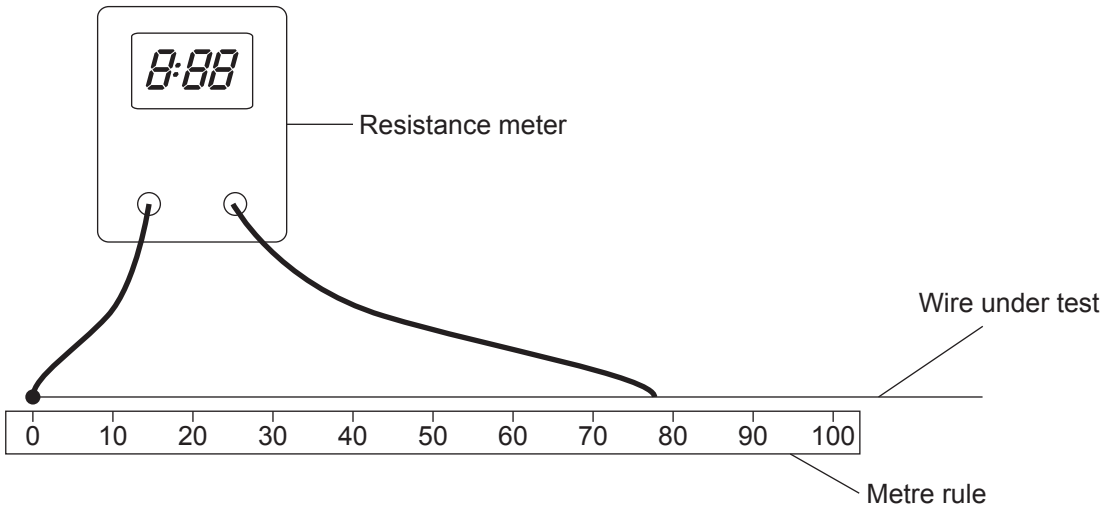
Radiation = _____ [1]

(iii) What name is given to the electromagnetic radiation which comes from the nucleus of a radioactive atom?

Radiation = _____ [1]

Examiner Only	
Marks	Remark

9 The apparatus required to investigate the factors affecting the resistance of copper wire is shown below.



According to theory, the resistance R of a copper wire is proportional to its length L and the relationship is given by the equation

$$R = k \times L \qquad \textbf{Equation 9.1}$$

where k is a constant.

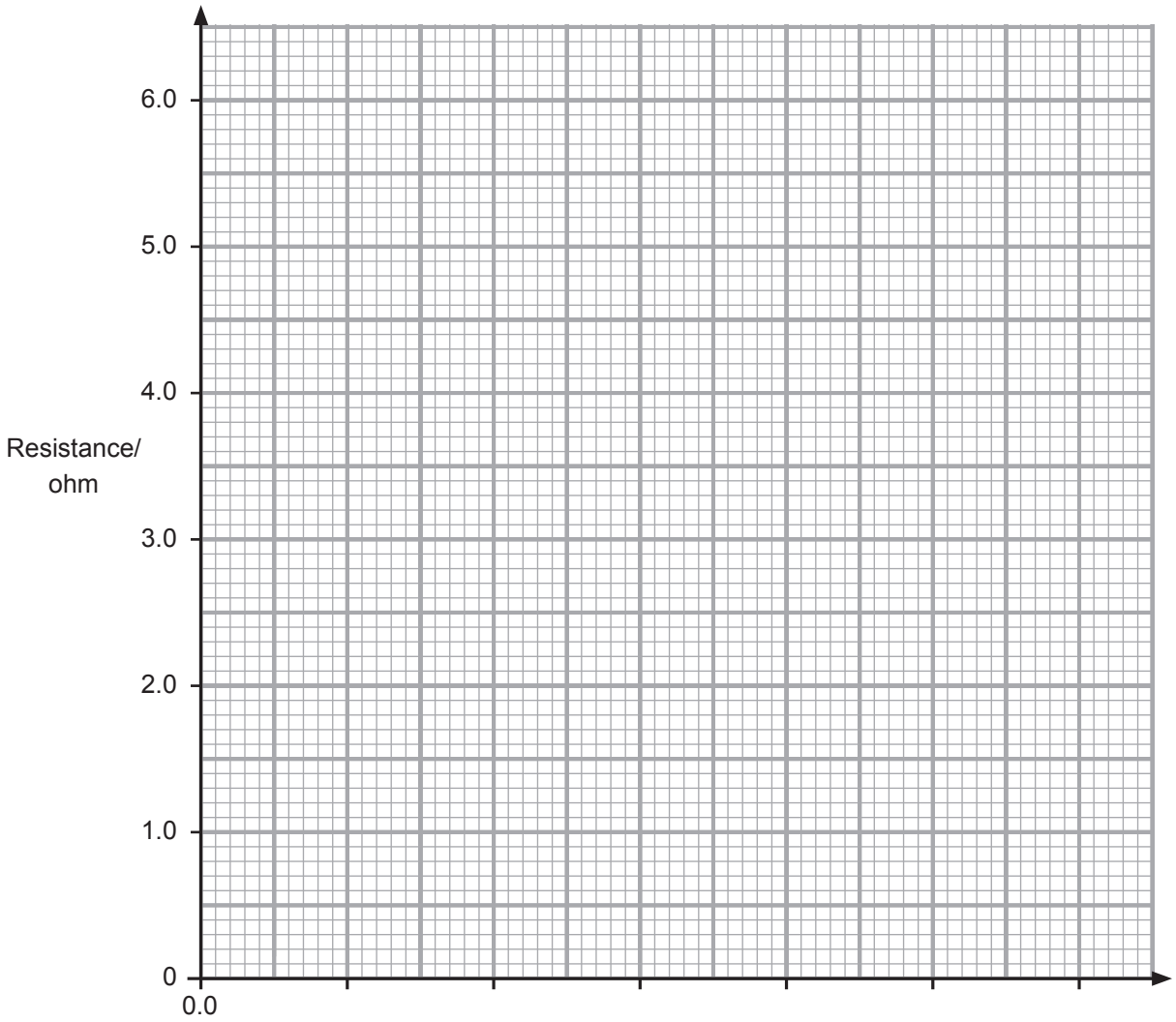
The results recorded in an experiment to verify the above relationship are in the table below.

Length/m	0.0	0.2	0.4	0.6	0.8	1.0
Resistance/ohm	0.0	1.2	2.4	3.6	4.5	6.0

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

(b) Plot the points on the grid of resistance against length. [2]

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Examiner Only	
Marks	Remark

(c) Draw the line of best fit. [1]

(d) Draw a circle around the point which does **not** show the trend in the graph. [1]

(e) Use your graph to determine the constant k, in **Equation 9.1**. Remember to include the units for k.

You are advised to show your working out.

k = _____: Units = _____ [4]

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112901

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

THURSDAY 26 FEBRUARY 2015, MORNING

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.

				AVAILABLE MARKS
1	**(a)**	Heat/thermal	[1]	
	(b)	Electric(al) [1] sound [1]	[2]	
	(c)	Chemical [1] sound [1] light [1]	[3]	6
2	**(a)**	More efficient	[1]	
	(b)	Eff = (Useful) output energy/Input energy [1] = 12/15 [1] = 0.8 or 80% [1]	[3]	
	(c) **(i)**	Wind [1] Coal or oil [1] Reject: Petrol	[2]	
	(ii)	Solar, geothermal, wave, tidal, biomass, wood or HEP (any one of) [1] Lignite, peat, gas, uranium, nuclear (any one of) [1]	[2]	8
3	**(a)**	Speed = distance/time [1] = 75/5 [1] = 15 [1] (m/s)	[3]	
	(b)	Friction [1] Weight [1] Reject: Drag Accept: Gravity/gravitational	[2]	
	(c) **(i)**	Moment = F × d [1] = 8 × 0.3 [1] = 2.4 [1] Nm [1]	[4]	
	(ii)	Clockwise	[1]	10
4	**(a)**	Moving	[1]	
	(b)	Bus [1] biggest mass [1] [depen. marking] Reject: Heaviest Accept: Larger mass	[2]	
	(c)	K.E. = ½ mv^2 [1] = ½ × 60 × 25 [1] = 750 [1] (J)	[3]	6
5	**(a)**	Tension	[1]	
	(b) **(i)**	Momentum = mass × velocity Reject: Speed	[1]	
	(ii)	Momentum = 0.5 × 4 [1] = 2 [1] (kg m/s)	[2]	4

	AVAILABLE MARKS

6 **(a)** W = mg or W = 70 × 10 [1]
700 [1] (N) [2]

(b) Work done = Weight × height or equivalent [1]
= 700 × 3.5 [1] allow e.c.f. from (a)
= 2450 (J) [3]

(c) Power = Work done/time [1]
= 2450/5 [1]
= 490 [1] allow e.c.f. from (b) [3] — 8

7 **(a)** Measure volume of milk with graduated cylinder or measuring jug [1]
Measure mass of grad. cylinder [1]
Measure mass of grad. cylinder plus milk [1]
With top-pan balance or scales [1]
Subtract to find mass of milk [1]
Use Density = mass/volume [1] [6]

Response	Mark
Candidates mention at least **5** 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 at least **3** 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** 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) Density = 54/20 [1]
= 2.7 [1] (g/cm^3) [2] — 8

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				AVAILABLE MARKS
8	**(a)**			

Relative electrical charge	Location in the atom
0	(In the) nucleus
–1	Outside the nucleus/in shells/orbiting

[1] each [4]

(b) **(i)** 6 [1]

(ii) 6 [1]

(iii) 8 [1]

(c) **(i)** Beta or β [1]

(ii) Gamma or γ [1]

(iii) Gamma or γ [1] 10

9 **(a)** Suitable scale > half of axis [1] labelled “Length/m” [1] [2]

(b) 5 or 6 points correctly plotted [2], 4 points correct [1]
Tolerance = ± ½ square [2]

(c) Line of best fit [1]

(d) (0.8, 4.5) [1]

(e) k = gradient or equivalent [1]
= 6/1 or similar [1]
= 6 [1] ohm/m [1] [4] 10

Total **70**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

FRIDAY 14 NOVEMBER 2014, MORNING

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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(a)**.

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

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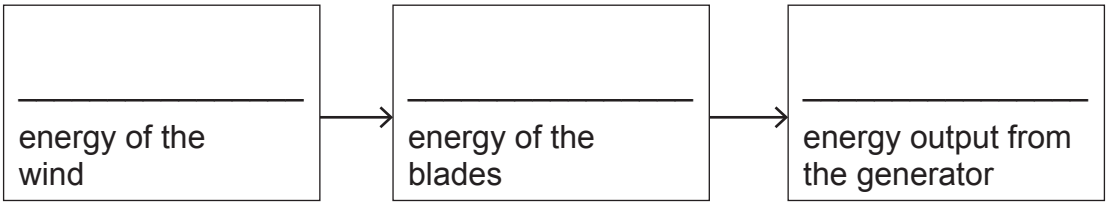
Examiner Only	
Marks	Remark

1 A wind turbine consists of a set of blades connected to a generator.



© Image Source Pink/Image Source/Thinkstock

(a) (i) Complete the energy flow diagram below.



[3]

(ii) Name two unwanted forms of energy output from the wind turbine.

1. _____

2. _____ [2]

Wind energy is regarded as a renewable energy resource.

(b) (i) What do you understand by the term renewable?

_____ [1]

(ii) Give an environmental advantage of using wind energy.

_____ [1]

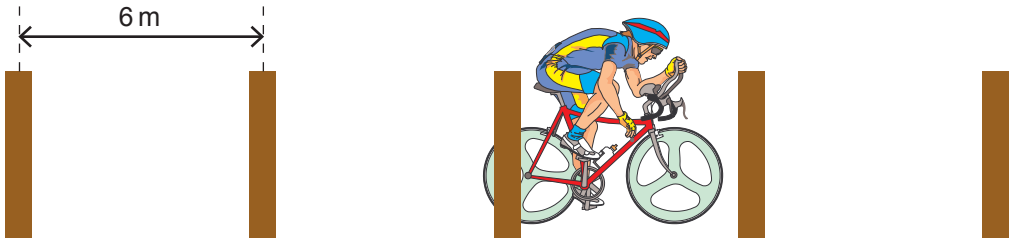
(iii) Give a disadvantage of using wind turbines, other than cost.

_____ [1]

Examiner Only	
Marks	Remark

2 A student wants to measure the speed of a cyclist who cycles past a fence at constant speed.

She measures the distance between the posts and times how long the cyclist takes from the 1st post to the 5th post.



Source: Chief Examiner

(a) Name the two pieces of apparatus that the student would use for her measurements.

1. _____

2. _____ [2]

(b) The fence posts are 6 m apart and the time taken to travel the distance from the 1st post to the 5th post is 3 seconds.

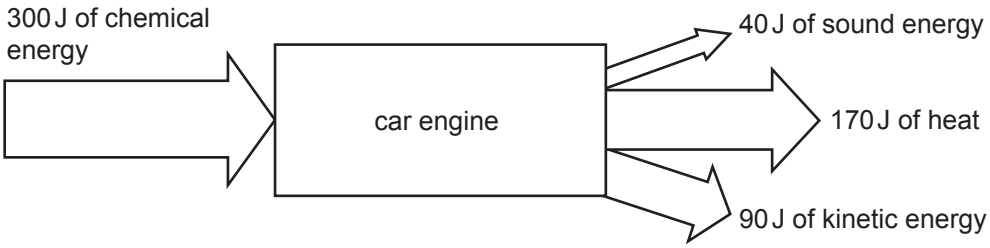
Calculate the cyclist's speed.

You are advised to show your working out.

Speed = _____ m/s [4]

Examiner Only	
Marks	Remark

3 A car engine is designed to change **chemical** energy to **kinetic** energy. The input and output figures are given below.



Source: Chief Examiner

Calculate the efficiency of the engine.

You are advised to show your working out.

Efficiency = _____ [3]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

4 A ball falls vertically through the air. The mass of the ball is 1.25 kg.



(i) Calculate the force of gravity pulling the ball downwards.

You are advised to show your working out.

Force of gravity = _____ N [2]

(ii) Give the name of a force which opposes the motion of the ball.

Name of force = _____ [1]

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Examiner Only	
Marks	Remark

(iii) The ball has a mass of 1.25 kg.
The resultant force acting downwards on the ball is 10 N.
Calculate its acceleration using the equation

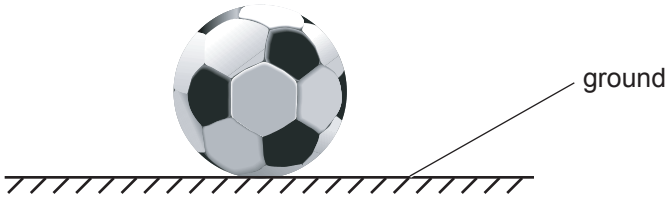
$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

Remember to include the units with your answer.

You are advised to show your working out.

Acceleration = _____ [3]

Later the ball comes to rest on the ground as shown.



(iv) The ground exerts a force on the ball. Give the size of this force and state its direction.

Size of force = _____ N

Direction _____ [2]

Examiner Only	
Marks	Remark

5 **(a)** **(i)** What do you understand by the centre of gravity of a body?

_____

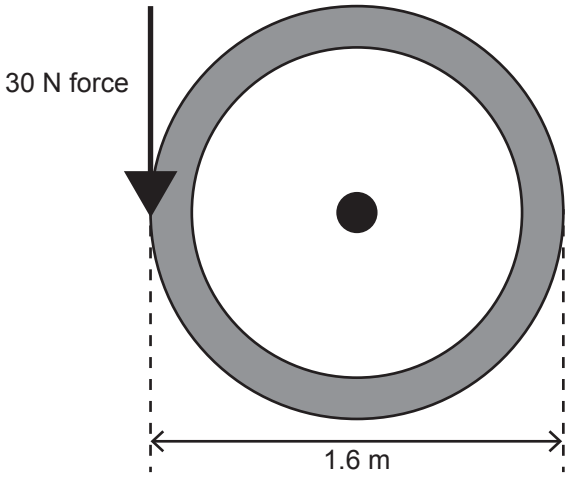
_____ [2]

(ii) In what way does raising the centre of gravity affect the stability of a body?

_____

_____ [1]

An engineer turns a wheel by exerting a downward force of 30 N at the outside edge of the wheel as shown. The diameter of the wheel is 1.6 m.



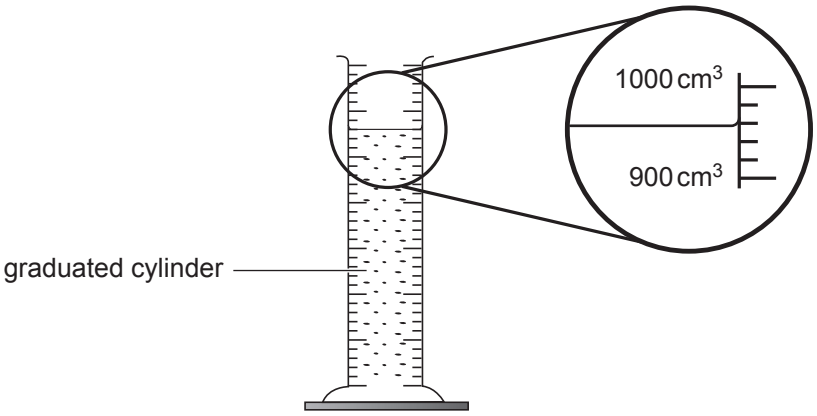
(b) Calculate the moment exerted, in Nm, about the **centre** of the wheel.

You are advised to show your working out.

Moment = _____ Nm [3]

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6 A student pours 768 g of a liquid into a graduated cylinder and measures its volume.



Use the information given above to calculate the density of the liquid in g/cm^3.

You are advised to show your working out.

Density of liquid = _____ g/cm^3 [4]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

7 **(i)** Name two **charged** particles which make up the atom. Give the relative charge in each case.

Particle _____ Charge _____

Particle _____ Charge _____ [4]

The letters A, B, C and D represent atomic nuclei.

$^{30}_{15}A$ $^{30}_{16}B$ $^{32}_{17}C$ $^{33}_{16}D$

(ii) Which of the atomic nuclei (A, B, C and D) are isotopes of each other?

_____ [1]

(iii) Explain your answer.

_____

_____ [2]

Examiner Only	
Marks	Remark

8 When radiation travels through air it causes ionisation.

(a) What is ionisation?

_____

_____ [1]

(b) People who work with radioactive materials must take steps to protect themselves.

State two ways that workers can protect themselves.

1. _____

2. _____ [2]

Cobalt-60 is the name of a radioactive substance. The number 60 refers to the number of particles in the nucleus of the cobalt.

(c) **(i)** What do we call this number?

_____ [1]

(ii) Cobalt-60 has a half-life of 5 years. After how many years will its count-rate fall from 240 counts per minute to 30 counts per minute?

You are advised to show your working out.

Time = _____ years [3]

Examiner Only	
Marks	Remark

9 **(a)** Describe an experiment you would carry out to measure personal power. Your description should include:

- the apparatus you would use;
- the measurements you would take.

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

[6]

An electric motor lifts a load of 400 N through a distance of 6.0 m in 3 seconds.

Examiner Only	
Marks	Remark

(b) (i) Calculate the power of the motor in watts.

You are advised to show your working out.

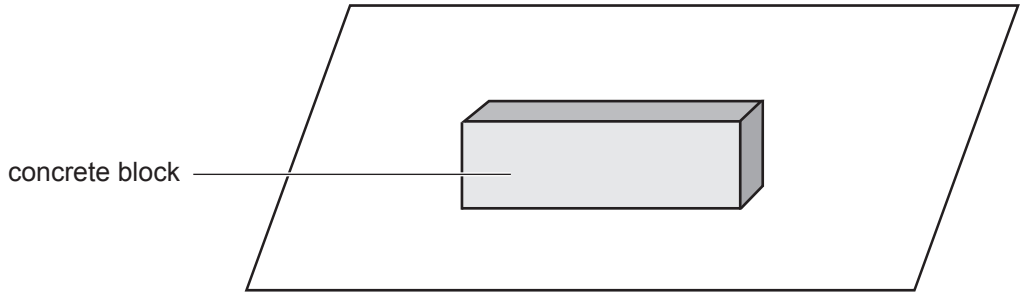
Power = _____ W [3]

(ii) Give your answer to **(b)(i)** in kilowatts.

Power = _____ kW [1]

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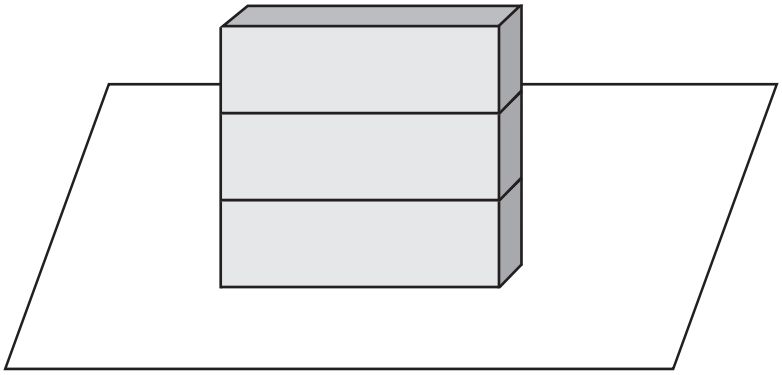
10 When a block of concrete sits on a surface it exerts a pressure.



The pressure exerted is given by the equation:

$$\text{pressure} = \frac{\text{weight}}{\text{area}}$$

The weight is changed by adding similar blocks on top as shown below.



The weight of each block is 20 N and the area in contact with the surface is 1.5 m^2.

Examiner Only

Marks	Remark

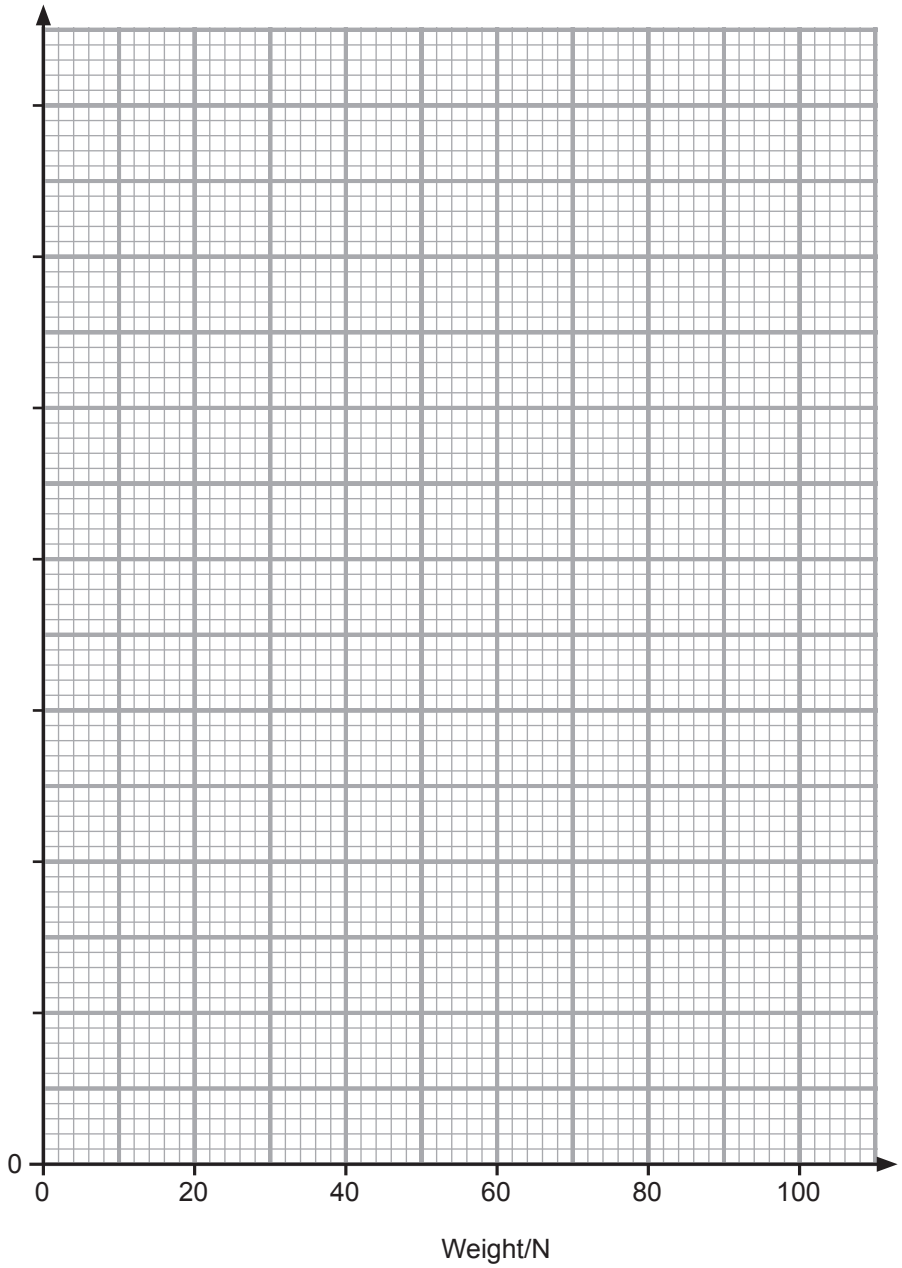
Examiner Only	
Marks	Remark

(i) Use the equation $\text{pressure} = \frac{\text{weight}}{\text{area}}$

to complete the table below.
Your values of pressure should be correct to the nearest whole number.

No. of blocks	1	2	3	4	5
Weight/N	20	40	60	80	100
Area/m^2	1.5	1.5	1.5	1.5	1.5
Pressure/ N/m^2	13				

[2]



(ii) Choose a suitable scale for the pressure on the vertical axis of the graph (page 16) and label it. [2]

(iii) Plot a graph of pressure against weight. [2]

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

The surface that the blocks are resting on will be damaged if the pressure is greater than 45 N/m^2.

(v) Use your graph to find the smallest number of blocks that will damage the surface.

Number of blocks = _____ [2]

(vi) Find the gradient of your graph.

You are advised to show your working out.

Gradient = _____ $/m^2$ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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112901

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

FRIDAY 14 NOVEMBER 2014, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

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						AVAILABLE MARKS
1	**(a)**	**(i)**	K.E. **or** kinetic →	K.E. **or** kinetic →	electric **or** electrical [1] each [3]	
		(ii)	heat and sound [1] each **not** noise [2]			
	(b)	**(i)**	Limitless energy source/replaced in a lifetime/never runs out [1]			
		(ii)	non-polluting or no greenhouse gas produced smaller carbon footprint/no CO_2/no air pollution/conserves fossil fuels **not** no harm to environment [1]			
		(iii)	erratic production **or** non-reliable **or** not dependable/ visual **or** unsightly pollution **not** kills birds **not** noise pollution [1]			8
2	**(a)**		measuring tape/(metre) rule [1] **or** trundle wheel **or** metre stick **not** stick (unqualified) stopwatch/stopclock [1] [2]			
	(b)		speed = dist/time [1] = 24/3 [1] each = 8 (m/s) [1] [4]			6
3			Eff = (Useful) energy out/ energy in [1] = 90/300 [1] = 0.3 [1] [3]			3
4	**(i)**		W = mg **or** W = 1.25 × 10 [1] W = 12.5(N) [1] [2]			
	(ii)		Friction/drag/air resistance [1]			
	(iii)		= 10/ 1.25 [1] = 8 [1] m/s^2 [1] [3]			
	(iv)		12.5(N) e.c.f. from (i) [1] up(wards) [1] [2]			8
5	**(a)**	**(i)**	The point [1] where gravity/weight (appears) to act [1] [2]			
		(ii)	The stability is lowered/decreased [1]			
	(b)		M = F × d [1] = 30 × 0.8 [1] = 24 (Nm) [1] [3]			6

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	AVAILABLE MARKS

6 density = mass/volume [1]
= 768/960 [2]
= 0.8 (g/cm^3) [1] [4] — 4

7 **(i)** electron –1
proton +1 [1] mark each [4]

(ii) B and D [1]

(iii) Same atomic number (threshold) **or** same number of protons, [1]
different mass number/different number of neutrons/nucleons [1] [2] — 7

8 **(a)** loss or gain electron(s) [1]

(b) Any **two** from:
- shielding (e.g. use gloves/goggles/glass shield)
- keep at a distance (e.g. use tongs/robotic arms)
- keep exposure time small/work quickly

Reject radiation badge **or** store in lead boxes
[1] × 2 [2]

(c) **(i)** Mass number **or** Atomic Mass number **or** Nucleon number [1]

(ii) 240 → 120 → 60 → 30
One halving [1] mark,
3 half-lives identified/halving to 30 but **no** further [1]
15 (y) [1] [3] — 7

9 **(a)** Weight of person measured (or mass × 10)
with scale(s)/balance/newtonmeter
Height of one step measured and multiplied by no. of steps/total height
with metre rule **or** ruler **or** metre stick
Time to run up steps **or** go up steps
with stopwatch/stopclock timer [6]

Response	Mark
Candidates describe **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 describe **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 describe **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
(b) **(i)** P = w/t [1] = (400 × 6)/3 [1] = 800 (W) [1] [3]		
(ii) 0.8(kW) e.c.f. from (b)(i) [1]		10
10 **(i)**		

No. of blocks	1	2	3	4	5
Weight/N	20	40	60	80	100
Area/m^2	1.5	1.5	1.5	1.5	1.5
Pressure/N/m^2	13	**27**	**40**	**53**	**67**

1/2 mark each – round up [2]

(ii) Scale at least half [1] , axis labelled with units [1] N/m^2 = Pa [2]

(iii) At least 4 points [2] Three points [1] [2]

(iv) Best fit line [1]

(v) Evidence from graph [1] 4 blocks [1] [4 blocks get 2/2 immediately]
Min. evidence = 1 horizontal or vertical line or point on graph [2]

(vi) gradient = Δy/Δx or similar [1]
= any value between 0.6–0.7 [1] [2] 11

Total **70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

MONDAY 19 MAY 2014, AFTERNOON

TIME

1 hour.

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 70.
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 **8(a)**.

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 **(a)** Complete the statements below to describe the energy change each device is **designed** to bring about.

The first one has been done for you as an example.



Loudspeaker

© Dorling Kindersley/ Thinkstock

Changes *electrical* energy to *sound* energy.



Match

© iStock/ Thinkstock

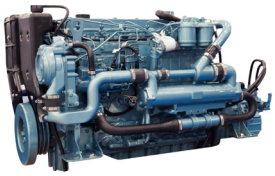
Changes _____ energy to _____ energy.



Microphone

© iStock/ Thinkstock

Changes _____ energy to _____ energy.



Diesel engine

© iStock/ Thinkstock

Changes _____ energy to _____ energy.

[6]

(b) State the principle of Conservation of Energy.

Examiner Only

Marks	Remark

_____

_____ [1]

(c) The table below shows the energy input and useful output values for 3 electric toasters. However, one value has been recorded incorrectly.

Toaster	Energy Input /J	Useful Output Energy/J
A	450	200
B	350	500
C	550	450

Which set of figures A, B or C is **incorrect**?

Answer _____

Explain your answer.

_____

_____ [2]

Examiner Only	
Marks	Remark

2 **(a)** Some nuclei are said to be radioactive.

What does radioactive mean?

_____

_____ [2]

(b) When measuring radioactivity, background activity is taken into account.

(i) Name a **major** source of background activity.

_____

_____ [1]

(ii) How is it taken into account when measuring radioactivity?

_____

_____ [1]

(c) Radioactive emissions can cause dangerous ionisations.

Name two precautions which are taken to minimise the risk to those using ionising radiations.

1. _____

2. _____ [2]

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Examiner Only	
Marks	Remark

3 **(a)** Where are the protons, neutrons and electrons to be found in an atom?

Protons: _____

Neutrons: _____

Electrons: _____ [3]

(b) The symbol for an isotope of carbon is

$$^{14}_{6}C$$

(i) How many protons are there in this isotope of carbon-14?

_____ [1]

(ii) How many neutrons are there in this isotope of carbon-14?

_____ [1]

(iii) How many electrons are there in a neutral atom of carbon-14?

_____ [1]

(c) In terms of **nuclear particles**, explain the meaning of the word isotope.

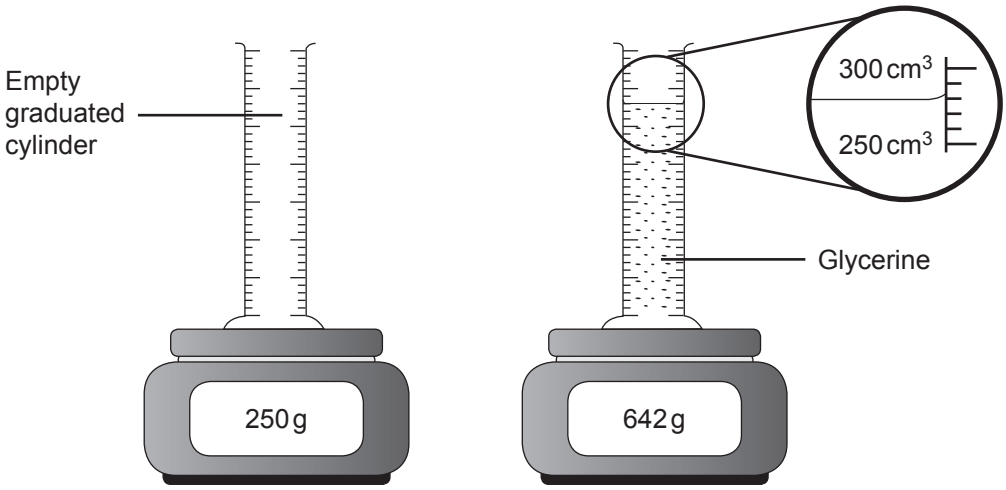
_____

_____ [2]

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4 To find the density of glycerine the following readings were recorded.

Examiner Only	
Marks	Remark



(i) State the mass of the empty graduated cylinder.

Mass of cylinder = _____ g [1]

(ii) Calculate the mass of the glycerine in the graduated cylinder.

Mass of glycerine = _____ g [1]

(iii) State the volume of the glycerine in the graduated cylinder.

Volume of glycerine = _____ cm^3 [1]

(iv) Calculate the density of glycerine.

You are advised to show your working out.

Density of glycerine = _____ g/cm^3 [3]

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Examiner Only	
Marks	Remark

5 A remote-controlled model helicopter, of mass 2.0 kg, accelerates upwards at 1.5 m/s^2.

(i) Calculate the resultant force acting on the helicopter.

You are advised to show your working out.

Resultant force = _____ N [3]

The diagram shows the forces acting on the helicopter.



© *iStock/ Thinkstock*

(ii) State the weight of the helicopter. Remember its mass is 2.0 kg.

Weight = _____ N [1]

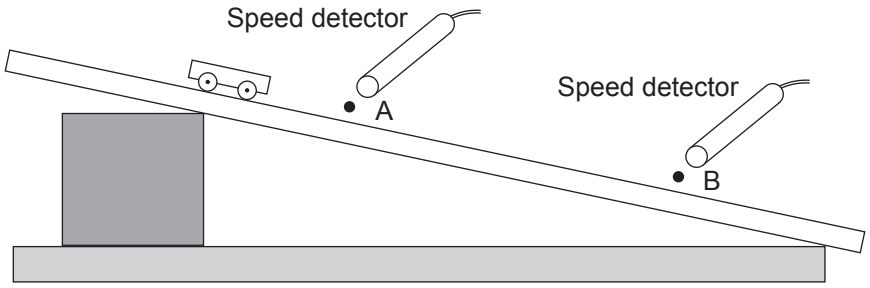
(iii) Calculate the upward force on the helicopter by using

Upward force = Resultant force + Weight

Upward force = _____ N [1]

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6 A trolley accelerates down a ramp.



In a particular experiment the results are shown below.

Speed at A = 0.5 m/s

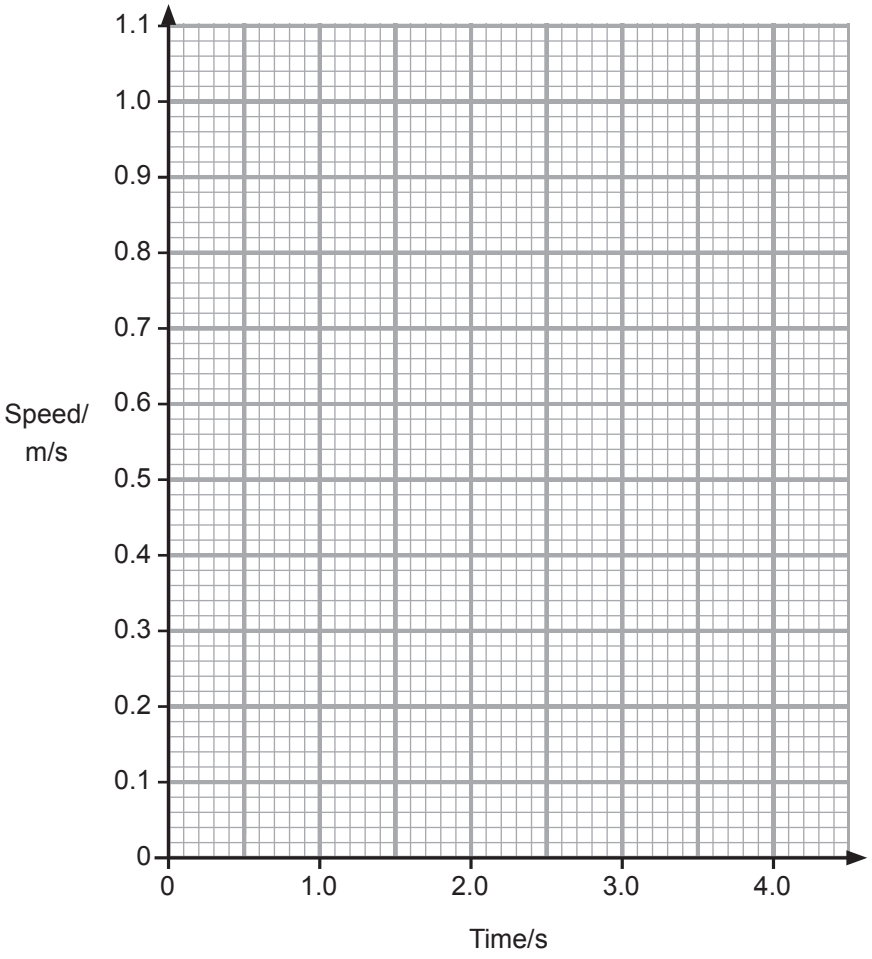
Speed at B = 1.1 m/s

Time interval from A to B = 3.0 s

(i) State the increase in speed of the trolley.

Increase in speed = _____ m/s [1]

(ii) Remember at time t = 0 s, the speed of the trolley is 0.5 m/s.
Draw a graph of the trolley's motion.



[3]

Examiner Only

Marks	Remark

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(iii) Calculate the acceleration of the trolley using the formula:

$$\text{Acceleration} = \frac{\text{Increase in speed}}{\text{Time}}$$

You are advised to show your working out.

Acceleration = _____ m/s^2 [2]

(iv) The average speed of the trolley as it rolls down the ramp is the average of its speeds at A and B.

Use the formula below to find the distance between points A and B.

$$\text{Distance} = \text{average speed} \times \text{time}$$

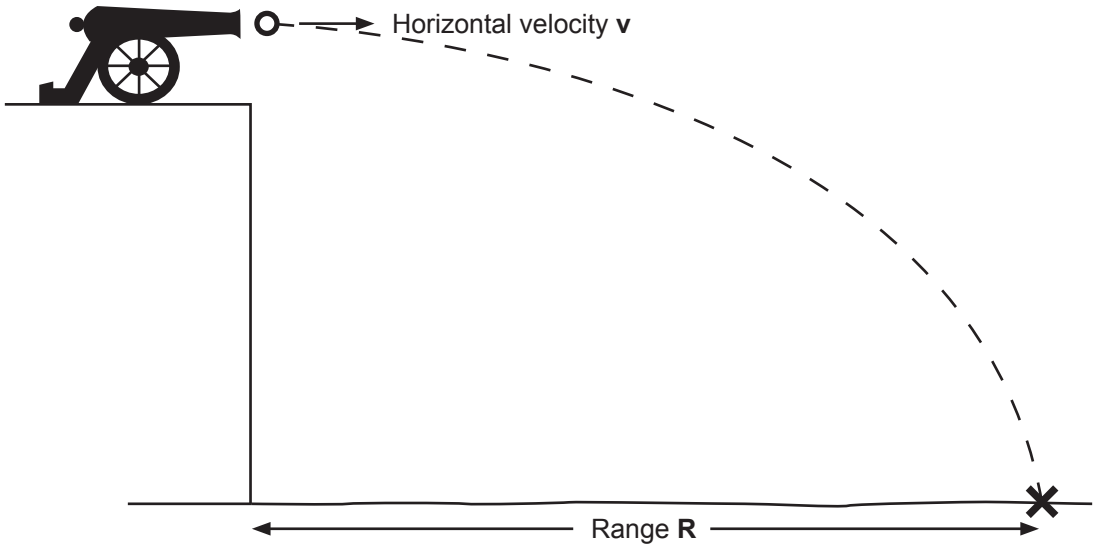
You are advised to show your working out.

Distance = _____ m [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 According to theory, the range **R** of a cannonball depends on the horizontal velocity **v** when fired from the top of a cliff.



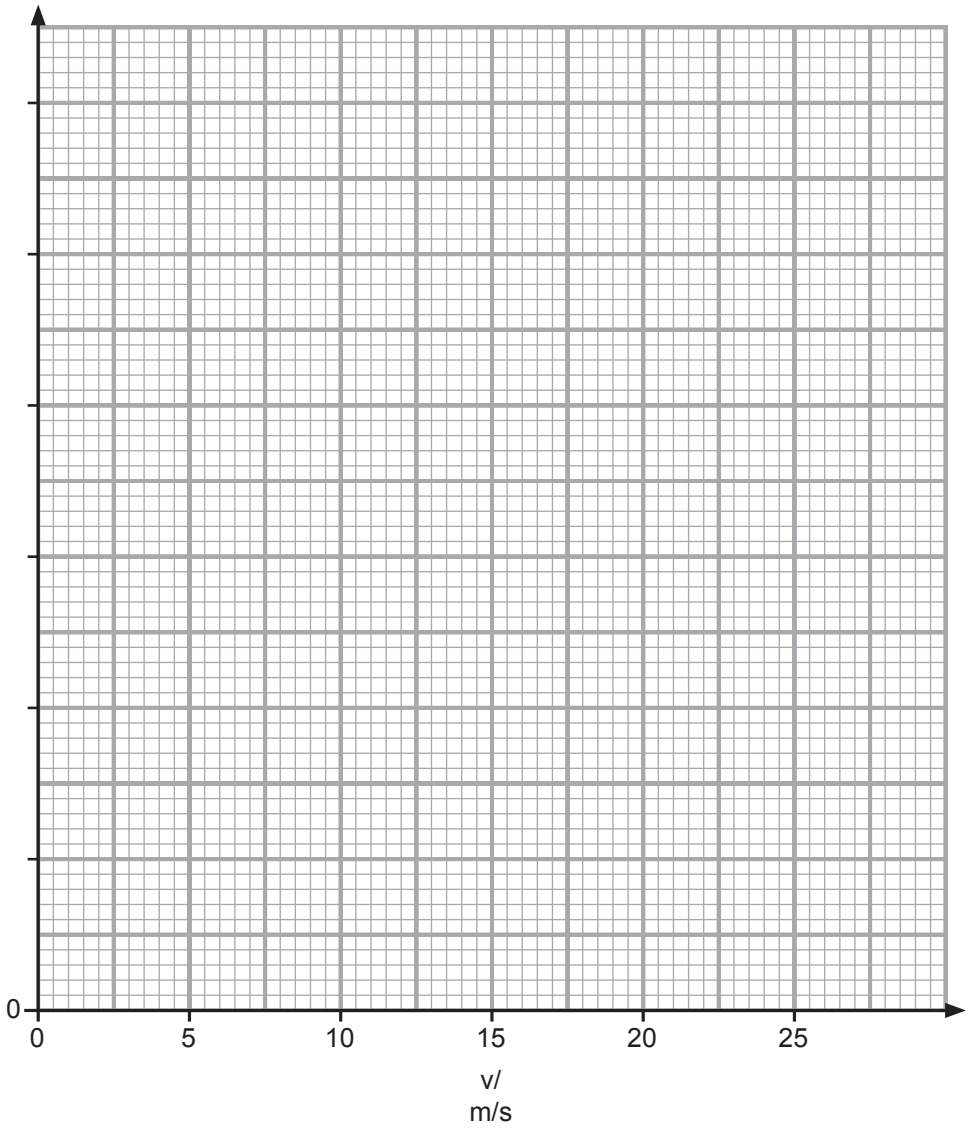
A series of readings is shown in the table.

v/ m/s	0	5	10	15	20
R/m	0	30	60	90	120

(a) (i) Label and choose a suitable scale for the vertical axis. [2]

(ii) Plot the points on the grid and draw the straight line of best fit. [3]

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(b) Find the gradient of the graph.

Remember to include the unit for the gradient.

You are advised to show your working out.

Gradient = _____

Unit = _____ [4]

(c) Use the graph to find the range, **R**, of the cannonball when its horizontal velocity is 12 m/s.

Range = _____ m [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

8 **(a)** Describe the process of nuclear **fusion**.

Your description should include:

- the particles involved
- what happens when nuclear fusion takes place
- where nuclear fusion occurs naturally

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(b) A great deal of money is being invested on research into nuclear **fusion**.

(i) Suggest a reason why.

_____ [1]

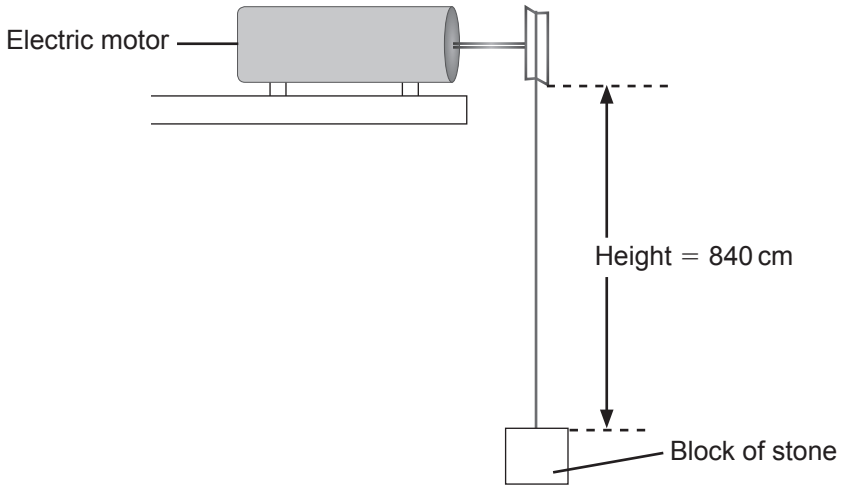
(ii) Give two practical difficulties which must be overcome before fusion reactors become viable.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

9 An electric motor lifts a block of stone, of weight 150 N, through a vertical distance of 840 cm.



(i) Calculate the work done.

You are advised to show your working out.

Work done = _____ J [4]

(ii) Into what energy form has this work been changed?

Work has become _____ [1]

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(iii) If the motor uses 2100 J of electrical energy, calculate the efficiency of the motor.

You are advised to show your working out.

Efficiency = _____ [3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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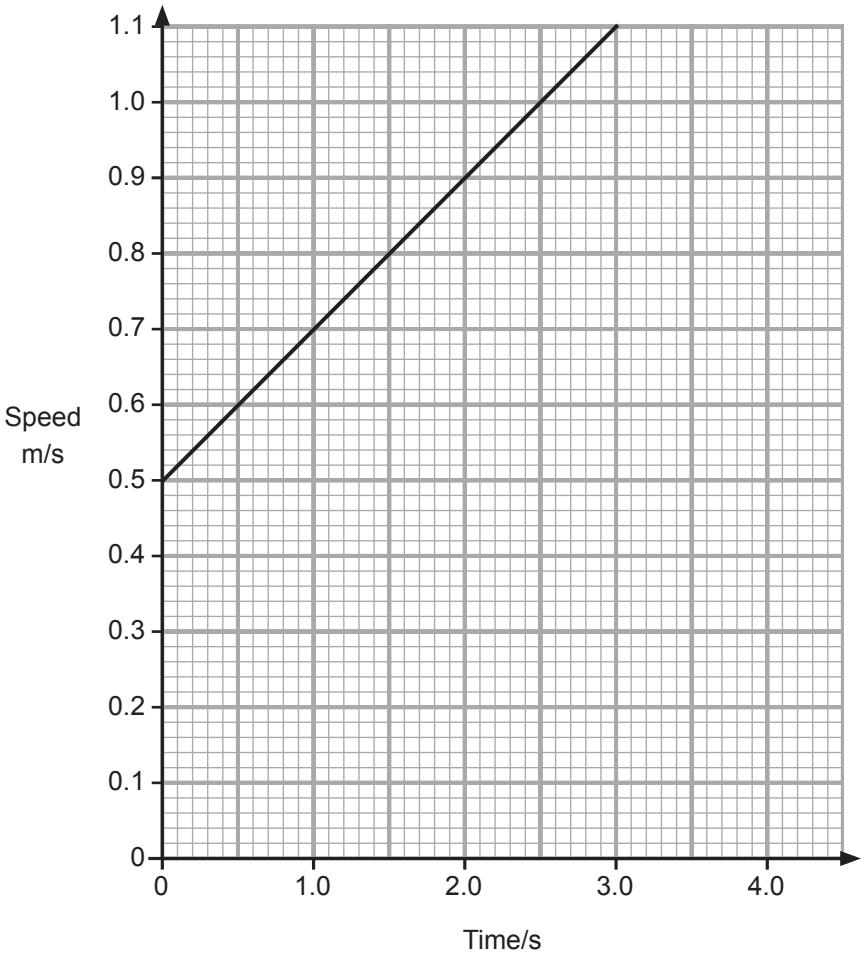
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				AVAILABLE MARKS
1	**(a)**	Chemical [1] Light/Heat or Thermal [1] Sound [1] Electrical [1] Chemical [1] Kinetic [1]	[2] [2] [2]	
	(b)	Energy cannot be created or destroyed	[1]	
	(c)	B (dep. marking) (Energy) power o/p > (Energy) power i/p or converse	[1] [1]	9
2	**(a)**	Unstable [1] and emit radiation [1]	[2]	
	(b)	**(i)** cosmic (rays)/rocks	[1]	
		(ii) Subtracted (from measured count-rate)	[1]	
	(c)	Minimise contact time or Stay large distance from source or Protective clothing Any 2 [1] each	[2]	6
3	**(a)**	nucleus [1] nucleus [1] outside nucleus [1] or in shells or orbiting (nucleus)	[3]	
	(b)	**(i)** 6	[1]	
		(ii) 8	[1]	
		(iii) 6	[1]	
	(c)	Same number of protons [1] (threshold mark) different number of neutrons [1]	[2]	8
4	**(i)**	250	[1]	
	(ii)	392 (e.c.f. from **(i)**)	[1]	
	(iii)	280	[1]	
	(iv)	density = mass/volume [1] = 392 / 280 [1] e.c.f. from **(ii)** and **(iii)** = 1.4 (g/cm^3) [1]	[3]	6
5	**(i)**	RF = m × a [1] = 2.0 × 1.5 [1] = 3.0 (N) [1]	[3]	
	(ii)	20 (N)	[1]	
	(iii)	Upward force = 23 (N) [1] allow e.c.f. from **(i)** and **(ii)**	[1]	5

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6 **(i)** 0.6 (m/s) [1]

(ii)



[1] for each correct pair of co-ordinates
And [1] for straight line joining the points [3]

(iii) accel. = 0.6/3.0 [1] e.c.f. from **(i)**
= 0.2 (m/s^2) [1] [2]

(iv) distance = (1.1 + 0.5)/2 × 3.0 [1]
= 0.8 × 3.0 [1]
= 2.4 (m) [1] [3]

or

av. speed = (1.1 + 0.5)/2 or av. speed = 0.8 [1]
distance = 0.8 × 3 [1]
= 2.4(m) [1] [3]

AVAILABLE MARKS

9

AVAILABLE MARKS

7 **(a)** **(i)** Correct scale for y axis [1]
Correct label for y axis [1] [2]

(ii) 4 points correctly plotted [2] 3 points [1]
line of best fit through all plotted points [1] [3]

(b) grad $= \frac{\text{rise}}{\text{run}}$ or $\frac{R}{v}$ [1] or equivalent

$= \frac{120}{20}$ [1] or equivalent, use candidate's line

$= 6$ [1]

s [1] [4]

(c) $R = 72(m) \pm 4m$ [1]

10

8 **(a)** Two small or two hydrogen or two light [1] nuclei [1]
Combine/join/fuse (together) [1]
To form a (more stable) helium nucleus [1]
Producing energy [1]
In the stars/in the sun [1] [6]

Response	Mark
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)** solve world's energy needs/saves fossil fuels/less air pollution [1]

(ii) difficulty of containment [1]
(sufficiently) high temperature (particle) density/pressure/time [1] [2]

9

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			AVAILABLE MARKS
9	**(i)**	W.D. = Force × distance [1] = 150 [1] × 8.4 [1] = 1260 (J) [1] [4]	
	(ii)	G.P.E. or P.E. or potential [1]	
	(iii)	Eff. = O/p energy / i/p energy [1] or equivalent f'la = 1260/2100 [1] Allow e.c.f. from part **(i)** = 0.6 [1] [3]	8
		Total	**70**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 26 FEBRUARY 2014, MORNING

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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(a)**.

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

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Examiner Only	
Marks	Remark

1 A light bulb is designed to change electrical energy to light energy.



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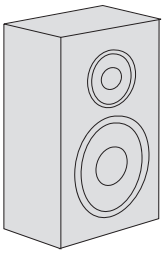
Complete the sentences below for the other devices.



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(i) A petrol engine is designed to change _____ energy

to _____ energy. [2]



(ii) A loudspeaker is designed to change _____ energy

to _____ energy. [2]

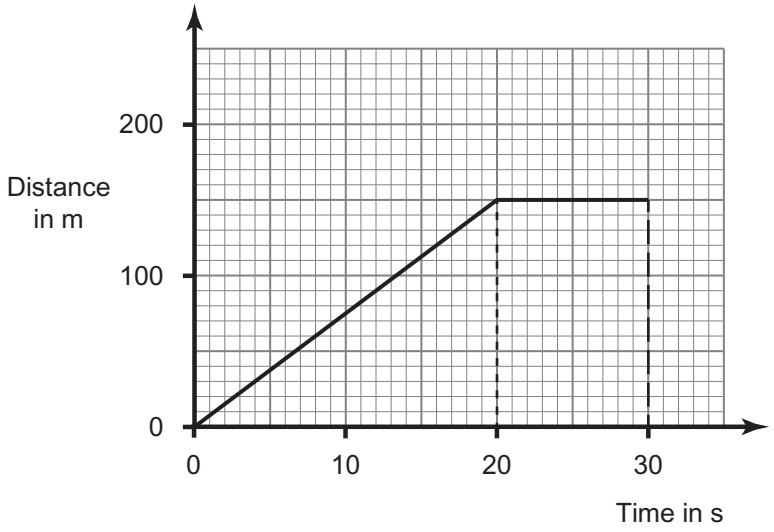


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(iii) A catapult which fires an object upwards changes _____

energy into gravitational potential energy and _____ energy. [2]

2 The distance–time graph below represents the motion of a car.



(a) How can you tell, from the graph, that the car is travelling at constant speed for the first 20 seconds of the journey?

_____ [1]

(b) Describe the motion of the car from 20 seconds to 30 seconds.

_____ [1]

(c) Calculate the average speed for the 30 seconds shown.

You are advised to show your working out.

Average speed _____ m/s [3]

(d) What is the difference between the velocity and the speed of a car?

_____ [1]

Examiner Only

Marks	Remark

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3 A cyclist of mass 65 kg is riding a cycle of mass 10 kg.



© Ljupco/iStock/Thinkstock

(a) (i) What resultant force must the cyclist exert so that he accelerates at 2.0 m/s^2?

You are advised to show your working out.

Resultant force = _____ N [4]

(ii) If a strong wind blows in the **same direction** of the cyclist's movement, what could the cyclist do if he **still** wanted to accelerate at 2.0 m/s^2?

_____ [1]

(b) Air resistance is a type of friction.

What do you understand by the word friction?

_____

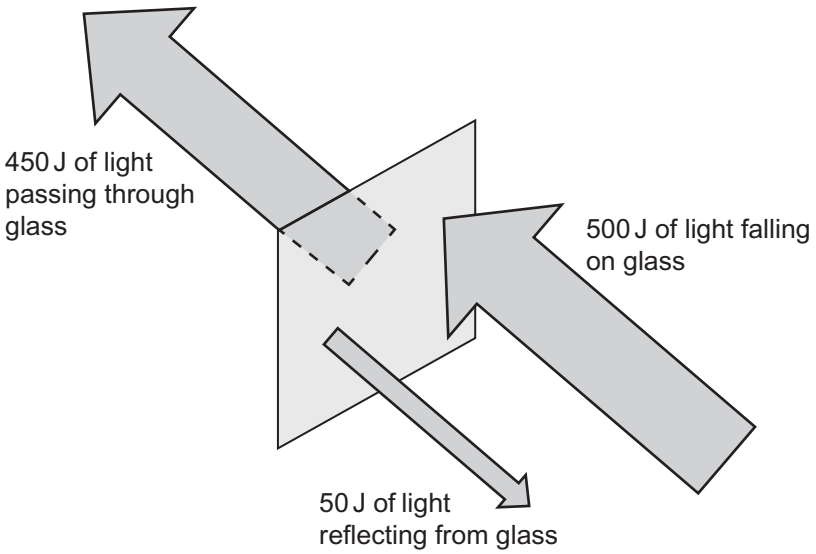
_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 Window glass can reflect light and allow light to pass through. The diagram shows what happens with one particular type of glass that is designed to let light through.

Over a period of time 500 J of light energy falls on the glass as shown.



(i) Calculate the efficiency of the glass.

You are advised to show your working out.

Efficiency = _____ [3]

(ii) What unit, if any, is used for efficiency? Choose from the list below.

Circle your answer.

joule newton no unit

[1]

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5 An athlete is practising the hammer throw for the Olympics.

Examiner Only	
Marks	Remark



© Ria Novosti/Science Photo Library

(a) (i) What is the name of the force which keeps the hammer moving in a circle?

_____ [1]

(ii) In what direction does this force act?

_____ [1]

(iii) At the beginning of the swing the hammer travels faster and faster. How does this affect the force mentioned in part **(a)(i)**? Put a tick (✓) in the correct box.

Gets bigger	☐
Stays the same	☐
Gets smaller	☐

[1]

(b) The hammer has a mass of 7 kg. At one instant its speed is 5 m/s.

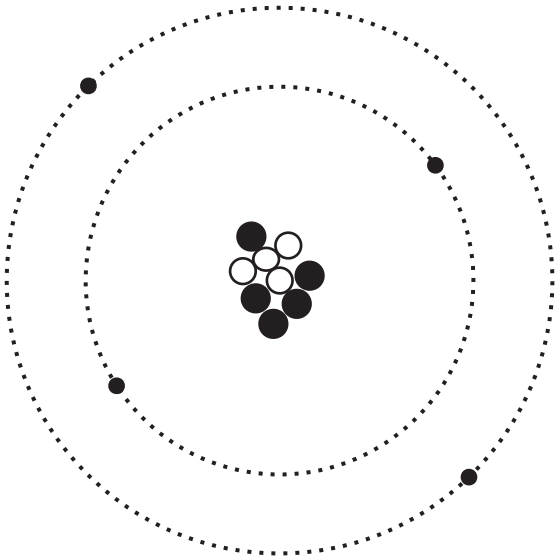
Calculate its momentum.

You are advised to show your working out.

Momentum = _____ kg m/s [3]

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6 The diagram shows a neutral atom, X.



(a) (i) Complete the table for the atom X.

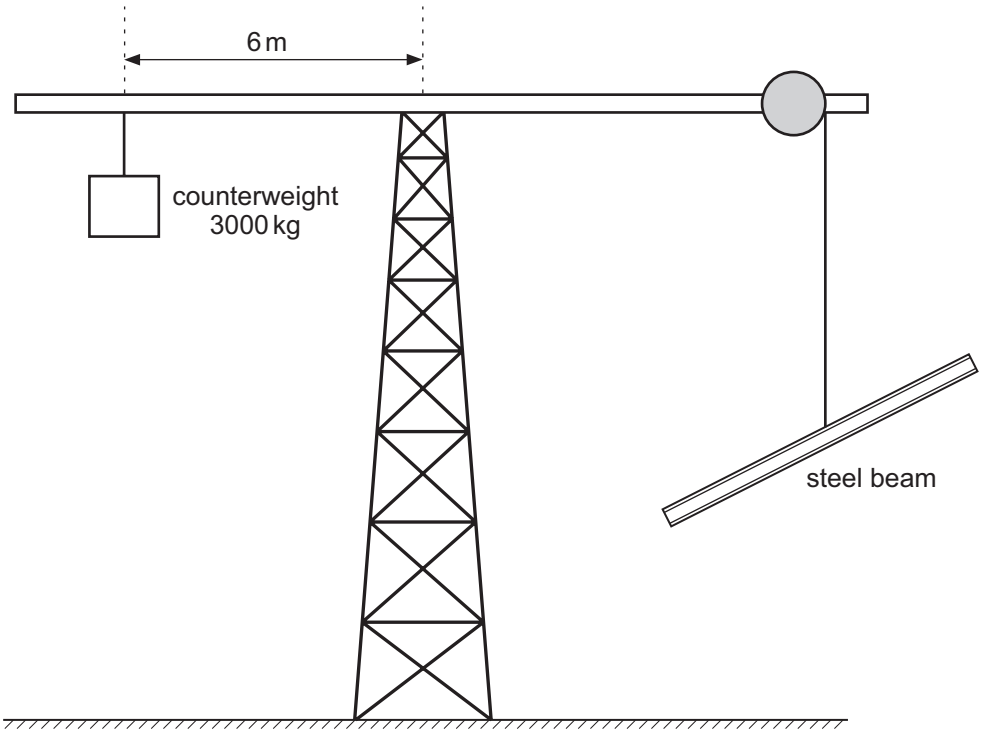
Number of neutrons	
Number of electrons	
Number of protons	
Mass number of atom X	

[4]

(ii) A nucleus of the atom X may be represented as below. Fill in the missing numbers.

$$\square\atop\square\!\!\!

7 A crane raises a steel beam to the top of a tall building.



(a) How is the stability of the structure affected as the beam is raised? Explain your answer.

Effect on stability _____

Explanation _____ [2]

The counterweight, which has a mass of 3000 kg, exerts a moment about the top of the crane.

(b) Calculate the moment and give its unit.

You are advised to show your working out.

Moment = _____ [5]

Examiner Only

Marks	Remark

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8 An isotope of iron has a half-life of 46 days.

(a) (i) Explain what is meant by a half-life of 46 days.

_____

_____ [2]

A sample of this isotope has an activity of 512 disintegrations per second.

(ii) What length of time must pass before its activity falls to 32 disintegrations per second?

You are advised to show your working out.

Time = _____ days [3]

A source of radioactivity emits all three types of radiation: alpha, beta and gamma.

(b) (i) Which radiation(s) will pass through 3 cm of lead?

_____ [1]

(ii) Which radiation(s) will pass through a thick piece of cardboard?

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** You are given a number of steel objects. Describe an experiment you would carry out to find the density of steel.



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Your answer should include,

- the apparatus used,
- the readings you take,
- how the readings are used.

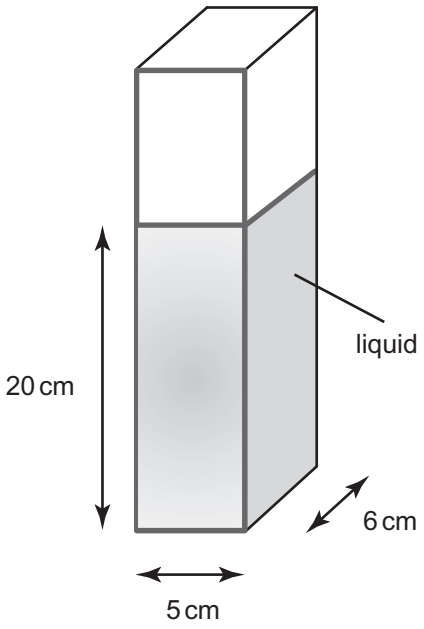
In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

(b) A student wants to find the density of a liquid. Use the information below to find the density of the liquid in g/cm^3.

Examiner Only	
Marks	Remark

Mass of container + liquid	= 1540 g
Mass of container	= 1000 g

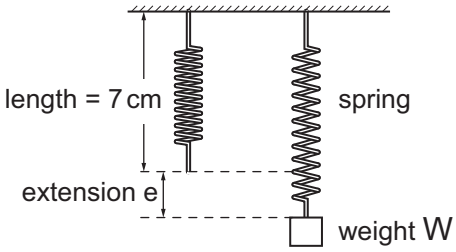


You are advised to show your working out.

Density = _____ g/cm^3 [3]

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10 A student investigates how the extension of a spiral spring depends on the weight hung on it.



The equation connecting the extension, e and weight, W is given by:

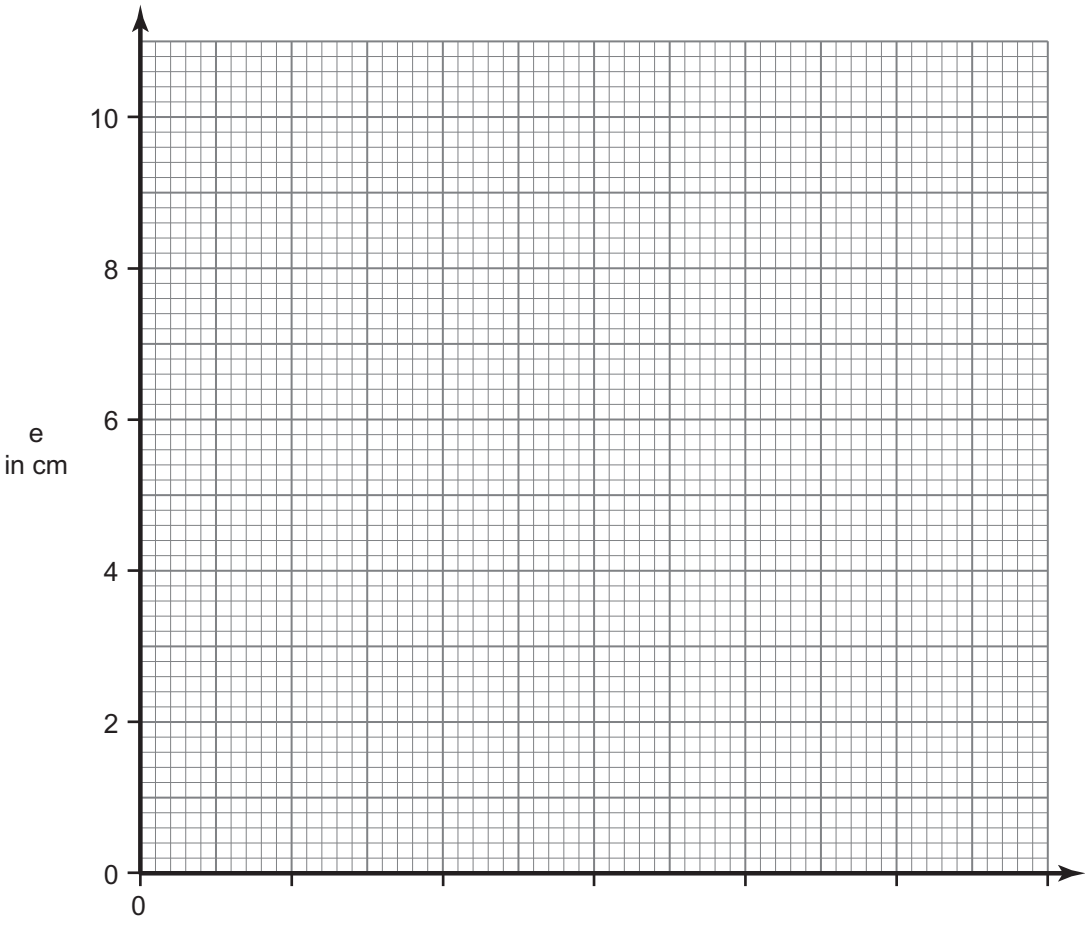
$$\mathbf{e = kW}$$

The table shows some of the results of the investigation.

W in N	0.5	1.0	1.5	2.0	2.5
e in cm	2	4	6	8	10

You are asked to plot a graph of e against W.

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



Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(ii) Plot the points on the graph and draw the best fit line. [3]

(iii) Find the gradient of your graph and give its unit.

You are advised to show your working out.

Gradient = _____ [3]

Unit = _____ [1]

The original length of the spring shown opposite is 7 cm.

(iv) Use your graph to find the load needed to stretch the spring to a total length of 12 cm.

You are advised to show your working out.

Load = _____ N [2]

THIS IS THE END OF THE QUESTION PAPER

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114845

Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 26 FEBRUARY 2014, MORNING

MARK SCHEME

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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.

				AVAILABLE MARKS
1	**(i)**	chemical to kinetic	[2]	
	(ii)	electrical to sound	[2]	
	(iii)	elastic/strain to kinetic	[2]	6
2	**(a)**	(straight line of) const grad/constant gradient	[1]	
	(b)	at rest/stopped	[1]	
	(c)	(av) sp = dist/time [1] or s = d/t **or equivalent** = 150/30 [1] = 5 (m/s) [1]	[3]	
	(d)	velocity has direction **or** speed does not have direction	[1]	6
3	**(a)** **(i)**	(R)F = m a [1] = 75 × 2 [2] [1] for each substitution = 150 (N) [1]	[4]	
	(ii)	Pedal with less force (or similar) **or** 'crouch down' **or** braking	[1]	
	(b)	A force [1] **which opposes motion** [1] dependent marking	[2]	7
4	**(i)**	E = useful energy/input energy [1] = 450/500 [1] = 0.9 or 90% [1]	[3]	
	(ii)	no unit	[1]	4
5	**(a)** **(i)**	centripetal/tension	[1]	
	(ii)	towards centre/centre-seeking	[1]	
	(iii)	gets bigger [✓ in top box]	[1]	
	(b)	p = mv [1] or momentum = mass × speed = 7 × 5 [1] = 35 (kg m/s) [1]	[3]	6

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					AVAILABLE MARKS
6	**(a)**	**(i)**	<table><tr><td>5</td></tr><tr><td>4</td></tr><tr><td>4</td></tr><tr><td>9</td></tr></table>	[4]	
		(ii)	A = 9, Z = 4 i.e. $^{9}_{4}\times$	[2]	
	(b)		Another element (✓) [✓ in bottom box]	[1]	7
7	**(a)**		Less stable [1] c of g higher [1] dependent marking	[2]	
	(b)		moment = F × d [1] = (3000 × 10) × 6 [1] and [1] = 180 000 [1] N m [1]	[5]	7
8	**(a)**	**(i)**	After 46 days/after this time [1] or it is the time taken the activity/count rate **or** radioactivity **or** radiation halves [1] – dependent marking	[2]	
		(ii)	Evidence of halving. 512 → 256 (→ 128) [1] 4 half-lives [1] 184 (days) [1]	[3]	
	(b)	**(i)**	gamma	[1]	
		(ii)	beta and gamma [both required]	[1]	7

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9 **(a)** Find mass [1] using scale(s) [1]
Measuring cylinder/eureka vessel [1]
Reading of volume [1], immerse [1]
density = mass/volume [1]

Response	Mark
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]

[6]

(b) Mass = 540 (g) [1] Volume = 600 (cm^3) [1]
Density = 0.9 [1] [3]

AVAILABLE MARKS: 9

10 **(i)** Suitable scale [1] Correct label with units [1] [2]

(ii) 5 points correct [2] (only 4 points [1]) within ± $\frac{1}{2}$ square
Best fit line [1] [3]

(iii) gradient = $\frac{e}{W}$ [1]

$= \frac{10}{2.5}$ [1]

$= 4$ [1]

cm/N [1] [4]

(iv) (12 − 7) = 5 [1] (cm) or sight of 5
W = 1.25 ± 0.05 [1] (N) [2]

AVAILABLE MARKS: 11

Total **70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

FRIDAY 15 NOVEMBER 2013, AFTERNOON

TIME

1 hour.

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 70.
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**.

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 **(a)** A microphone is designed to change sound energy into electrical energy, as shown below.



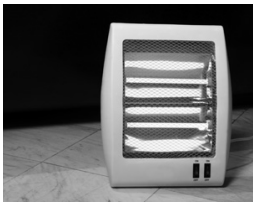
Microphone

© iStock / Thinkstock

Sound energy	→	Electrical energy

Fill in the spaces below to show the type of energy change the device is designed to bring about.

(i)



Electric fire

© iStock / Thinkstock

Electrical energy	→	_____ energy

[1]

(ii)



Trampoline

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_____ energy	→	Kinetic energy

[1]

(iii)



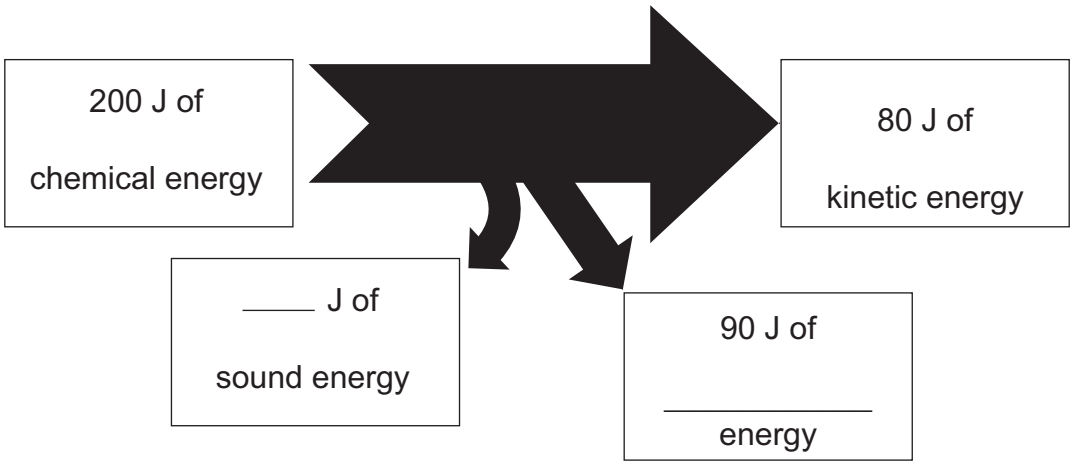
Study lamp

© iStock / Thinkstock

_____ energy	→	Light energy

[1]

(b) An energy flow diagram for a diesel engine is shown below.



(i) Complete the energy flow diagram by filling in the boxes above. [2]

(ii) Calculate the efficiency of this diesel engine.

You are advised to show your working out.

Efficiency = _____ [3]

Examiner Only

Marks	Remark

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2 Recently, the Chinese government decided to invest heavily in building nuclear power stations to generate electricity.

State two advantages and two disadvantages in building nuclear power stations.

Advantages

1. _____

2. _____ [2]

Disadvantages

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

3 An athlete can run 200 m in a time of 25.0 s.



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(a) Calculate the average speed of the athlete.

You are advised to show your working out.

Average speed = _____ m/s [3]

(b) During the race, the athlete increases his velocity from 5.0 m/s to 8.0 m/s in a time of 2.0 s.

Calculate the acceleration of the athlete.

You are advised to show your working out.

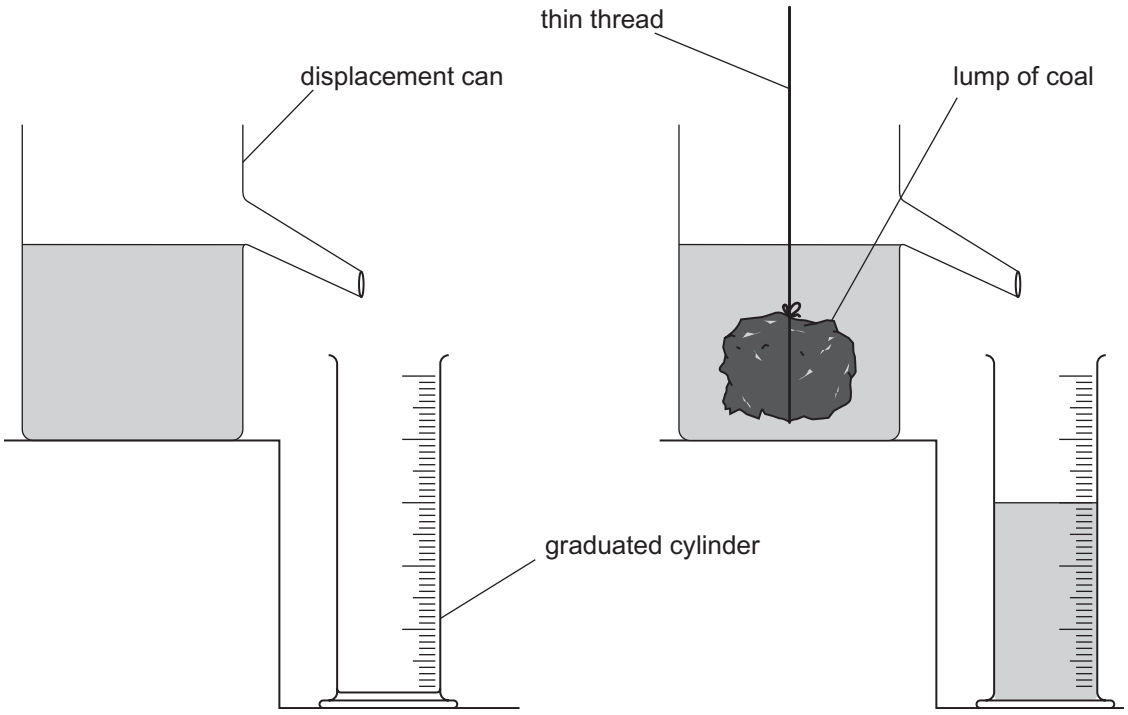
Acceleration = _____ m/s^2 [4]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** A student used the displacement method to find the density of coal.



The student records the results below.

Mass of coal = 900 g
Volume of water displaced = 125 cm^3

(i) Use the results to find the density of coal.

Remember to include the correct units.

You are advised to show your working out.

Density of coal = _____

Units = _____ [4]

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(ii) If a thick thread was used to lower the stone into the water, how would this affect the volume of water displaced?

_____

_____ [1]

(b) Give a reason why the density of solid materials, like coal, is greater than the density of liquids, like water.

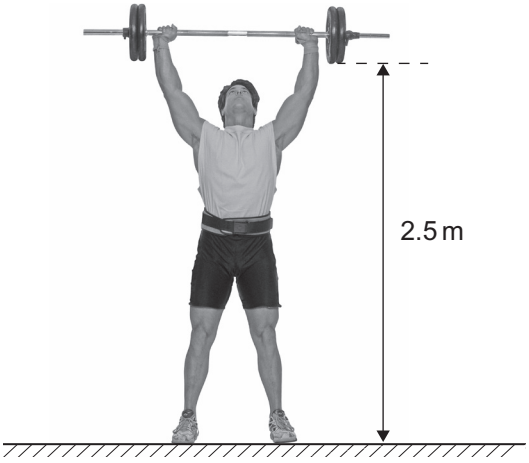
_____

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 During the Olympics, a weightlifter lifted a 140 kg bar from the floor to a height of 2.5 m.



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(i) Calculate the weight of the bar.

Weight = _____ N [1]

The weightlifter uses a constant force to lift the bar 2.5 m above the floor.

(ii) Calculate the work done by the weightlifter.

You are advised to show your working out.

Work done = _____ J [3]

To achieve maximum points, the weightlifter must hold the bar stationary above his head for 2 seconds.

(iii) How much work is done on the bar during these two seconds?

Circle the correct answer.

0 280 900 1800 3500

Give a reason for your answer.

_____

_____ [2]

(iv) The weightlifter drops the bar of mass 140 kg to the ground. It hits the ground with a velocity of 7 m/s. Calculate the kinetic energy of the bar as it hits the ground.

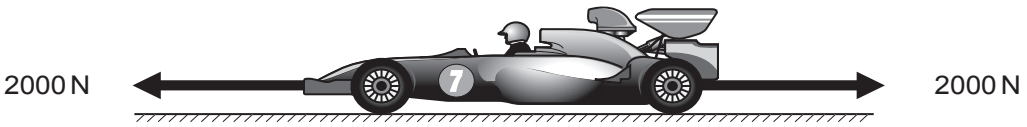
You are advised to show your working out.

Kinetic energy = _____ J [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 The diagram below shows some of the forces acting on a racing car which is moving forwards.



(i) Describe the movement of this racing car.

_____ [1]

The forwards force is increased to 3600 N, the backwards force remains constant at 2000 N.

(ii) Describe fully the movement of the racing car.

_____

_____ [2]

(iii) Calculate the size of the resultant force acting on the racing car.

Resultant force = _____ N [1]

The mass of the racing car is 800 kg.

(iv) Use the formula:

$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

to calculate the acceleration of the racing car.

You are advised to show your working out.

Acceleration = _____ m/s^2 [2]

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7 The modern theory for the structure of the atom is quite different from the earlier theory which it replaced.

Write a brief account of both theories.

Your discussion should include:

- the name of each theory; and
- a description of how the particles are arranged in each theory.

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

[6]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** The symbol for Uranium-235 is

$$^{235}_{92}U$$

(i) How many protons does a nucleus of Uranium-235 contain?

_____ [1]

(ii) What name is given to this number of protons?

_____ [1]

(iii) How many neutrons does a nucleus of Uranium-235 contain?

_____ [1]

(iv) What name is given to the total number of protons and neutrons in the nucleus of Uranium-235?

_____ [1]

(b) Radioactive materials emit radiations which have particular natures and properties.

Complete the table below, linking the radiations to their natures and properties. One arrow has been inserted for you.

Use only **five** straight arrows.

Nature of radiation	Name of radiation	Property of radiation
Helium nuclei	• alpha •	Is absorbed by a few cm of air
High frequency electromagnetic radiation	• beta •	Can penetrate 3 cm of lead
High speed electrons	• gamma •	Can penetrate a thick piece of card, but not 3 cm of lead

[5]

(c) Nuclear reactors rely on the fission of Uranium-235.

Examiner Only	
Marks	Remark

(i) What is the first stage of the nuclear fission process?

_____

_____

_____ [2]

(ii) What happens during the nuclear fission process?

_____

_____

_____ [2]

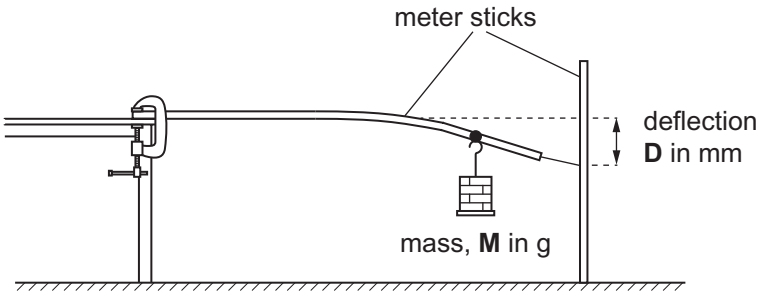
(iii) What is the name of the particle which sustains the chain reaction?

_____ [1]

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Examiner Only	
Marks	Remark

9 Gillian is investigating “bending beams”. She uses the apparatus shown below.



According to theory, the mathematical relationship between the deflection (**D**) of the beam and the mass (**M**) hung from the beam is given by

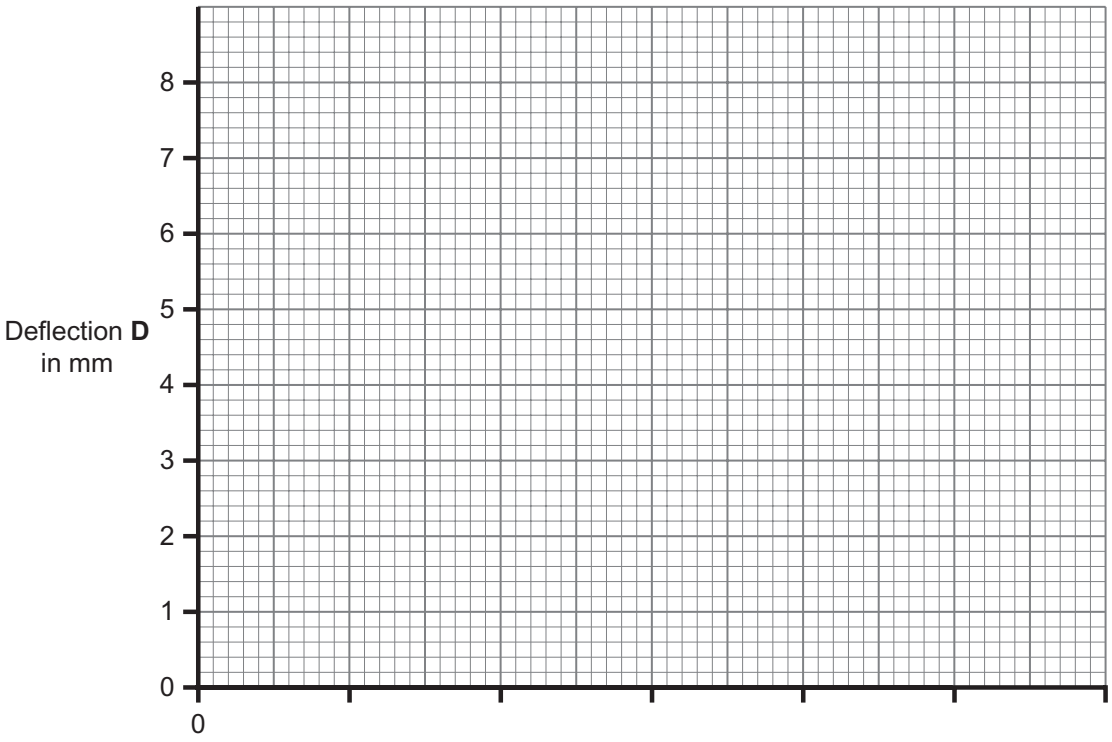
$$\mathbf{D = k\,M} \qquad \textbf{Equation 9.1}$$

The results Gillian collected are as follows.

Mass M in g	Deflection D in mm
50	1.5
100	3.0
150	4.5
200	6.0
250	7.5

Examiner Only	
Marks	Remark

(a) Choose a suitable horizontal scale and label the horizontal axis. Plot a graph of **D** on the vertical axis versus **M** on the horizontal axis on the grid below.



[4]

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

(c) **(i)** Use your graph to determine the constant k, in **Equation 9.1**.

Remember to include the unit for k.

k = _____: Unit = _____ [4]

(ii) Use your graph to find the deflection for a mass of 125 g.

Deflection = _____ mm [1]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

FRIDAY 15 NOVEMBER 2013, 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 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.

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				AVAILABLE MARKS
1	**(a)** **(i)**	Heat/thermal [1]	[1]	
	(ii)	Strain/elastic [1]	[1]	
	(iii)	Electrical [1] or electric	[1]	
	(b) **(i)**	30 (J) [1] Heat/thermal [1]	[2]	
	(ii)	E = (useful) energy out/(total) energy in [1] = 80/200 [1] = 0.4 [1] or 40%	[3]	8
2		Advantages: Conserves fossil fuels [1] No greenhouse gases [1] Disadvantages: Radioactive waste [1] Decommissioning issue [1]	[4]	4
3	**(a)**	(Av) speed = (total) distance/(total) time [1] = 200/25 [1] = 8 (m/s) [1]	[3]	
	(b)	$a = (v - u)/t$ [1] or $a = \frac{\Delta v}{t}$ = 3/2 [2] = 1.5 (m/s^2) [1]	[4]	7
4	**(a)** **(i)**	$\rho = m/v$ [1] = 900/125 [1] = 7.2 [1] g/cm^3 [1]	[4]	
	(ii)	Increase the volume reading [1]	[1]	
	(b)	Atoms/molecules (in a solid) are closer [1]	[1]	6
5	**(i)**	1400 (N) [1]	[1]	
	(ii)	W = F × d [1] = 1400 × 2.5 [1] e.c.f. from **(i)** = 3500 (J) [1]	[3]	
	(iii)	0 (J) [1] Has not moved thro' any distance [1] } dep. marking	[2]	
	(iv)	ke = $\frac{1}{2}$ mv^2 [1] = $\frac{1}{2}$ 140 $(7)^2$ [1] = 3430 (J) [1]	[3]	9

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		AVAILABLE MARKS
6	**(i)** Constant velocity [1] [1]	
	(ii) Car ACCELERATES [1] to the left [1] – Depend. marking [2]	
	(iii) 1600 (N) [1] [1]	
	(iv) a = 1600/800 [1] e.c.f. from **(iii)** = 2 (m/s^2) [1] [2]	6

7 "Plum-pudding" [1] and Rutherford-Bohr [1]
Positive charge spread throughout atom [1] and electrons are plums scattered or dotted [1]
Positive charge in nucleus [1] and electrons orbit nucleus [1]

Response	**Mark**
Candidates explain **5 or 6** 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 is of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

6

8	**(a)**	**(i)** 92 [1]	[1]
		(ii) Atomic number [1]	[1]
		(iii) 143 [1]	[1]
		(iv) Mass number [1]	[1]
	(b)	5 correct arrows, award [1] each	[5]
	(c)	**(i)** (slow) neutron [1] is absorbed [1]	[2]
		(ii) • Fragments are formed or U235 splits or nucleus splits • (2/3) (fast) neutrons are emitted (per fission) • Energy is released/produced/given out Any two points for [1] each	[2]
		(iii) Neutron [1]	[1]

14

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			AVAILABLE MARKS
9	**(a)** Horizontal axis labelled – with unit [1], scale more than half [1] **Plotting points:** 3 or 4 correct answers [1] All correct [2]	[4]	
	(b) Best fit line [1]	[1]	
	(c) **(i)** $k = \text{grad or } k = \frac{\Delta y}{\Delta x}$ [1] = 6/200 e.g. [1] or any other values from graph = 0.03 [1] mm/g [1]	[4]	
	(ii) 3.7 ± 0.2 [1]	[1]	10
		Total	**70**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

THURSDAY 23 MAY 2013, MORNING

TIME

1 hour.

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 70.
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(a)**.

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

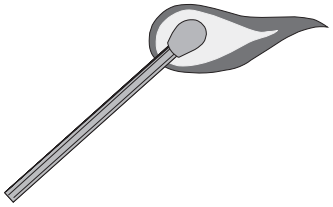
1 An electric heater changes energy from one form to another. This is shown below.



Electrical energy to *heat* energy.

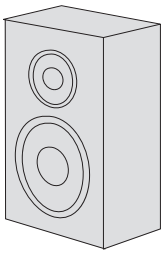
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(a) Complete the following to describe the energy change each device is **designed** to bring about.
Part of one has been done for you.



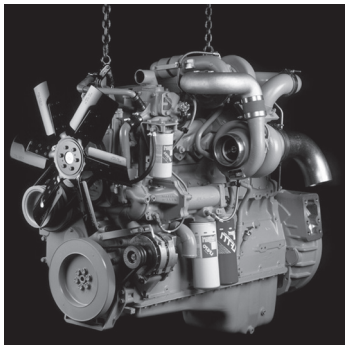
Match

_____ energy to *heat* energy.



Loudspeaker

_____ energy to _____ energy.



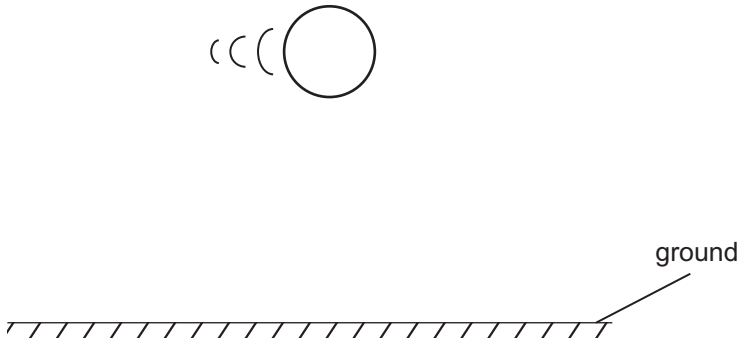
Diesel engine

_____ energy to _____ energy.

[5]

© David Leah / Science Photo Library

A ball travels through the air.



(b) What two types of energy does the ball have?

_____ energy and _____ energy. [2]

Examiner Only

Marks	Remark

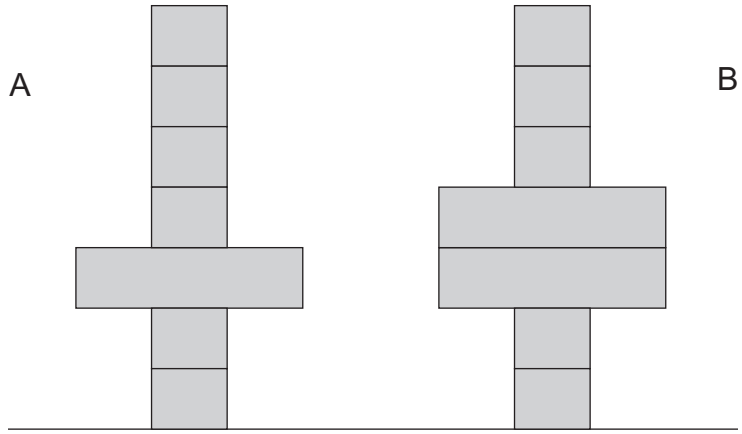
Examiner Only	
Marks	Remark

2 **(a)** What do you understand by the centre of gravity of an object?

_____

_____ [2]

Benjamin builds two towers with toy building blocks. These are shown below.



(b) **(i)** Which tower, if any, is more stable?

Give your answer by placing a tick (✓) in the correct box below.

A is more stable than B. ☐

B is more stable than A. ☐

A and B are equally stable. ☐ [1]

(ii) Give a reason for your choice.

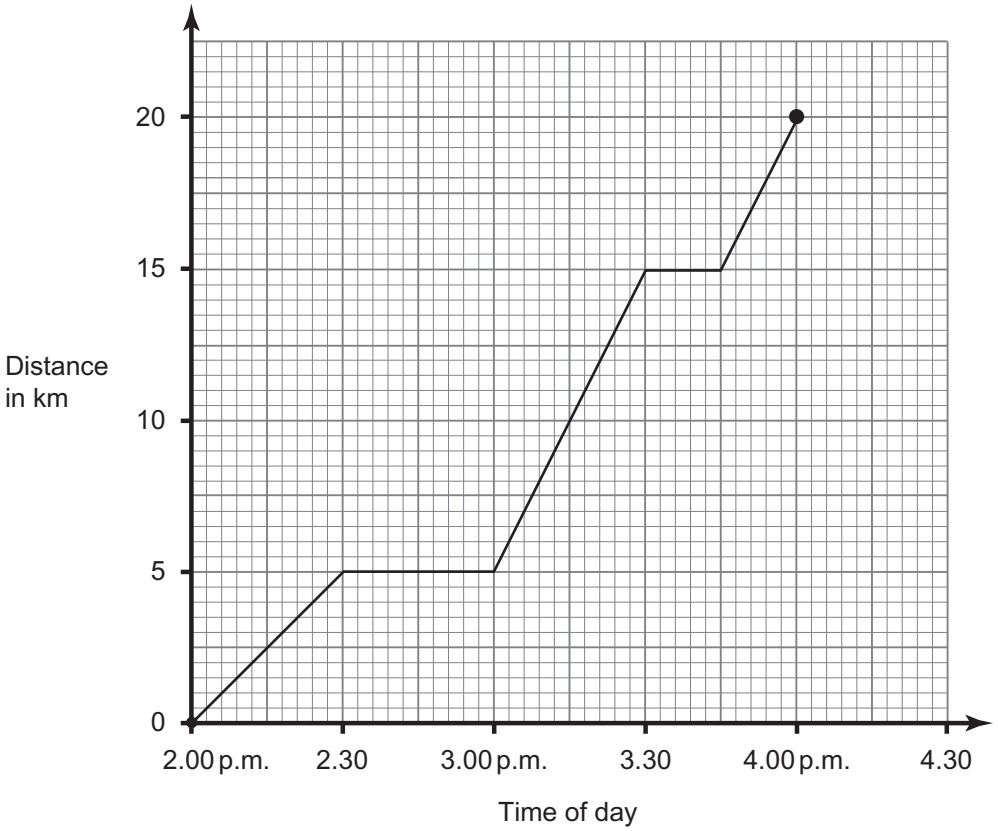
_____

_____ [1]

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Examiner Only	
Marks	Remark

3 An athlete runs a 20 km race from 2 p.m. until 4 p.m. The distance–time graph of the run is shown below.



Use the graph to find:

(a) (i) how many times the athlete stopped **during** the race,

_____ times [1]

(ii) how long the athlete was actually running.

_____ hours [1]

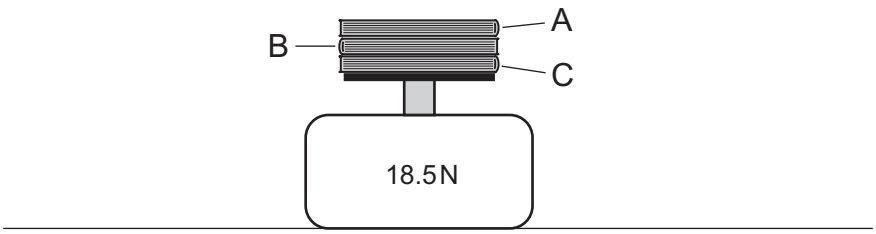
(b) Find the athlete's average speed in **km/h**.

You are advised to show your working out.

Average speed = _____ km/h [3]

Examiner Only	
Marks	Remark

4 Tabitha finds the weight of three books, A, B and C, by placing them on a top pan balance. The reading on the balance is 18.5 N.



Book A has a mass of 0.75 kg, book B a mass of 0.5 kg.

(a) What is the mass of book C?

You are advised to show your working out.

Mass of book C = _____ kg [3]

(b) **(i)** What force do the books exert downwards on the balance?

Downward force = _____ N [1]

(ii) What force does the balance exert on the books?

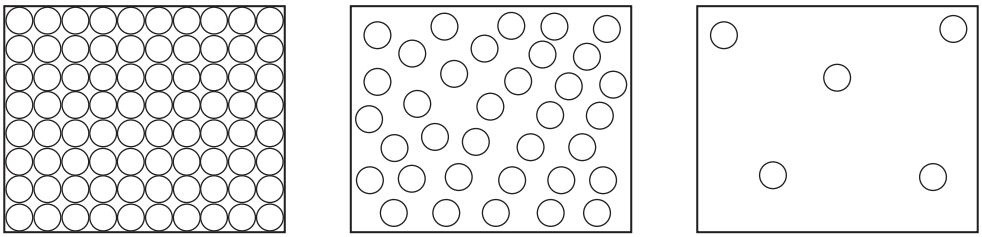
Force = _____ N [1]

(iii) Give the direction of the force exerted by the top pan balance.

_____ [1]

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5 The diagrams below illustrate the three states of matter.



A B C

(a) (i) Which diagram, A, B or C, represents the liquid state?

Diagram _____ [1]

(ii) To change from one state to another, heat energy has to be added or removed. Tick (✓) the box to show if heat is added or removed in the following changes of state.
Tick one box only, in each line.

A to C	Heat added	☐	Heat removed	☐
C to B	Heat added	☐	Heat removed	☐

[2]

(b) The densities of the three states of water are (in kg/m^3) 0.6, 1000 and 931.
Ice is **less** dense than water.

Write the densities in the correct places in the table below.

State	Density in kg/m^3
Liquid water	
Steam	
Ice	

[3]

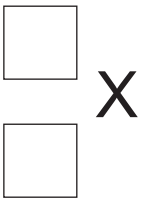
Examiner Only
Marks | Remark

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Examiner Only	
Marks	Remark

6 An atom, X, is electrically neutral. It contains 17 electrons and 18 neutrons.

(a) (i) Insert the mass number and the atomic number for the nucleus of atom X.



[2]

A number of unknown nuclei, P, Q, R and S are listed below.

P	Q	R	S
$^{30}_{16}$	$^{30}_{15}$	$^{32}_{17}$	$^{33}_{16}$

(ii) Which, if any, of P, Q, R and S are isotopes?

_____ [1]

(iii) Explain your answer.

_____

_____ [2]

The nuclei of some atoms are radioactive and emit radiation.

(b) (i) Why do these nuclei emit radiation?

_____ [1]

(ii) Complete the table below, giving the names of the three types of radiation emitted by radioactive substances and state whether it is an electromagnetic wave or a particle.

Name of radiation	Nature (electromagnetic wave or particle)

[6]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

7 **(a)** Describe an experiment you would carry out to measure the power output of an electric motor.

In your description you should include:

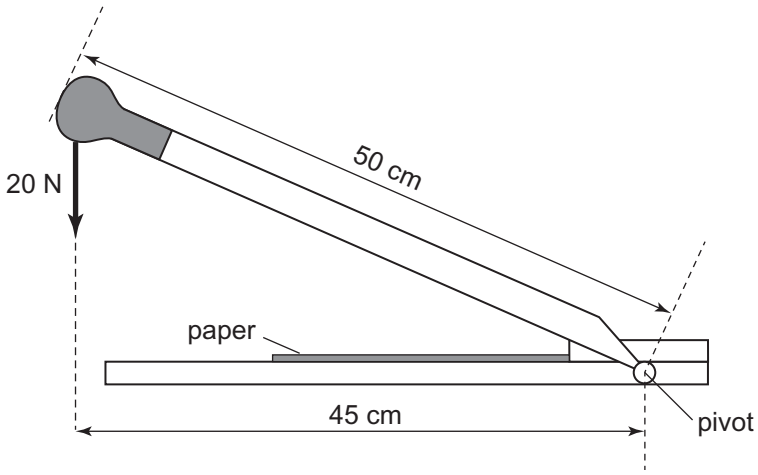
- the apparatus used,
- the measurements you take,
- the formula you would use to find the power.

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

[6]

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(b) A guillotine is used to cut sheets of paper. A constant downward force of 20 N is exerted on the handle.



Calculate the moment of the 20 N force about the pivot.

Remember to include the unit in your answer.

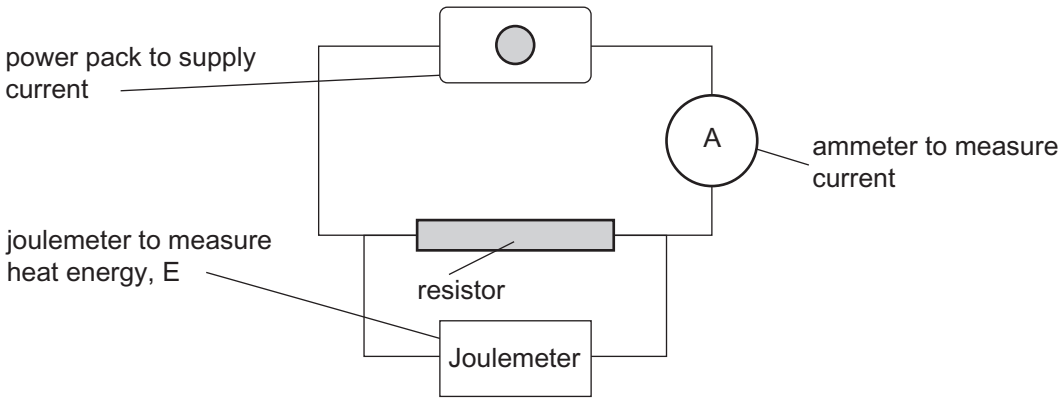
You are advised to show your working out.

Moment = _____ [4]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 When a battery passes a current through a resistor then heat energy is produced in the resistor.



David suspects that the heat energy, E, produced depends on the square of the current, I. This relationship could be written as:

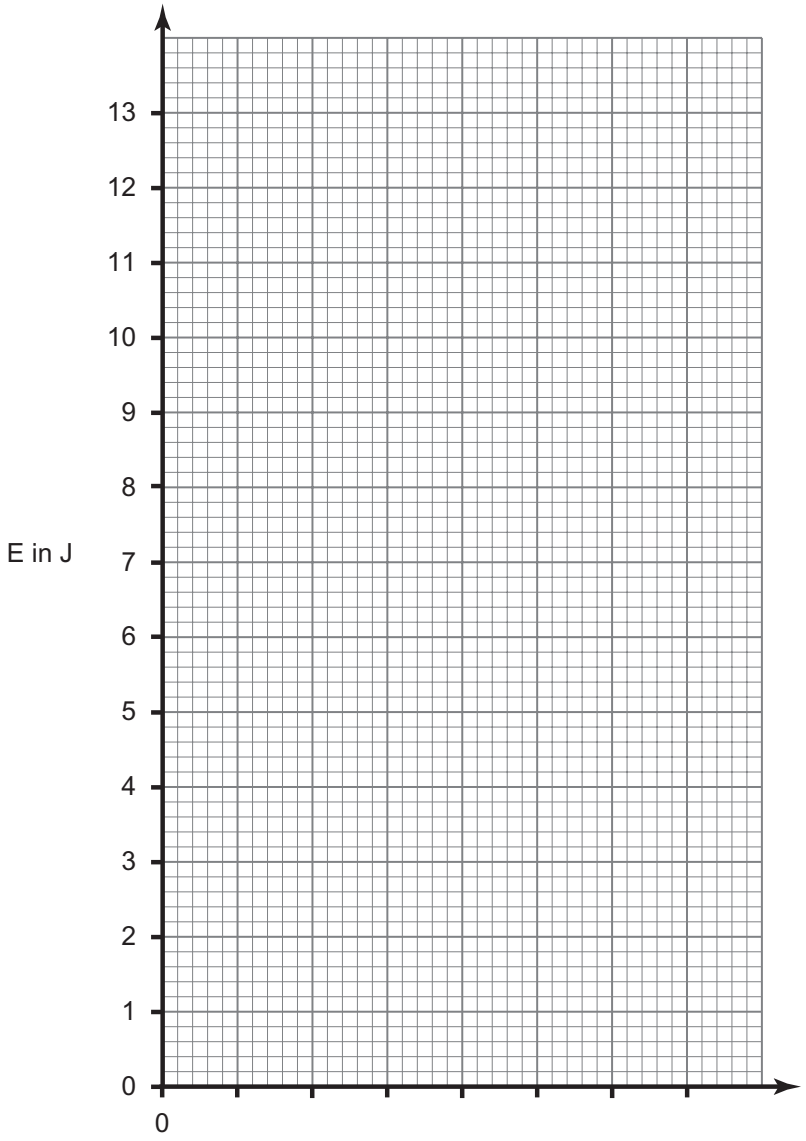
$$E = k\,I^2$$

He obtains a series of readings of current and energy and these are shown in the table.

I in A	0.0	0.5	1.0	1.5	2.0	2.5
I^2 in A^2					4.0	
E in J	0.0	0.5	2.0	4.5	8.0	12.5

(a) Complete the table by entering the values of I^2, correct to 1 decimal place. One entry has been recorded for you. [2]

(b) Choose a suitable scale and label the *x*-axis. Plot a graph of energy, E, on the vertical axis versus I^2 on the horizontal axis. [4]



(c) Draw the line of best fit. [1]

(d) Use your graph to find the constant k.

Remember to include the unit for k.

You are advised to show your working out.

k = _____

Unit = _____ [4]

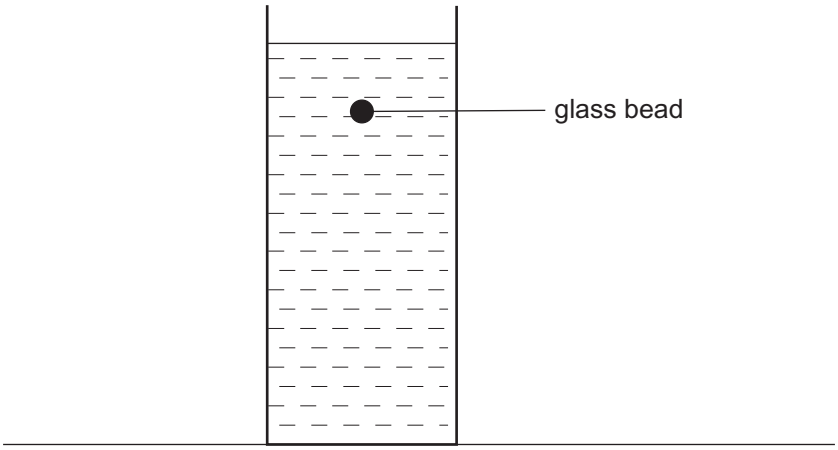
Examiner Only

Marks	Remark

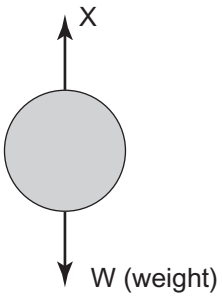
9 Kyle is interested in how quickly a glass bead falls through water.

Examiner Only

Marks	Remark



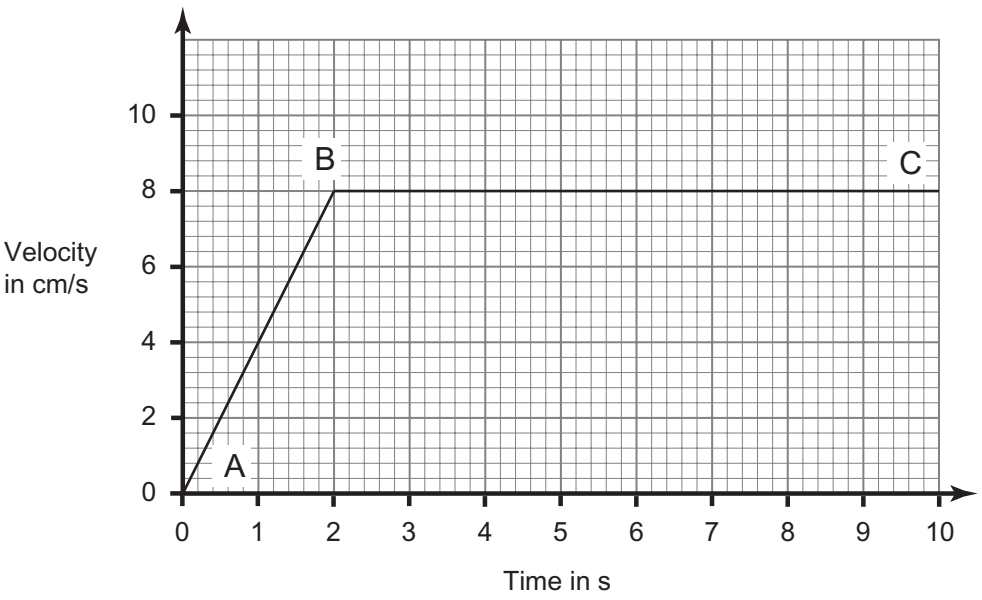
(a) Two forces, W and X, act on the bead as it falls. W is the weight.



(i) What is the name of the other force X?

Force X is called _____ [1]

Kyle plots a velocity–time graph of the bead's motion.



Examiner Only	
Marks	Remark

(ii) How do the sizes of these forces compare during the regions AB and BC? Give your answer by ticking (✓) the correct box in each case.

During AB,

W is less than X. ☐

The two forces are equal. ☐

X is less than W. ☐

During BC,

W is less than X. ☐

The two forces are equal. ☐

X is less than W. ☐ [2]

The bead hits the bottom of the cylinder after 10 s.

(b) (i) Use the graph on page 14 to calculate the depth of water in the container.

You are advised to show your working out.

Depth of water = _____ cm [3]

(ii) The bead has a mass of 0.2 g. Calculate its maximum momentum in g cm/s.

You are advised to show your working out.

Maximum momentum = _____ g cm/s [3]

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

THURSDAY 23 MAY 2013, MORNING

MARK SCHEME

STEMUP.CO.UK

Subject-specific Instructions

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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)**	chemical electrical to sound **reject** 'noise' chemical to kinetic	[1] [2] [2]	
	(b)	kinetic/movement and potential/gravitational **reject** 'gravity'	[2]	7
2	**(a)**	The **point** [1] [threshold mark] where **weight** (appears) to act [1]	[2]	
	(b) **(i)**	A is more stable than B (✓)	[1]	
	(ii)	Lower centre of gravity (dependent marking from **(i)**)	[1]	4
3	**(a)** **(i)**	2 (times)	[1]	
	(ii)	$1\frac{1}{4}$ (hours) or 1.25	[1]	
	(b)	(av) sp = (total) dist/(total) time [1] or s = d/t = 20/2 [1] = 10 (km/h) [1]	[3]	5
4	**(a)**	18.5 N to 1.85 kg [1] Addition of 0.75 and 0.5 to give 1.25 kg [1] Subtraction of 1.25 from 1.85 to get 0.6 [1] **or** 0.75 + 0.5 = 1.25 (kg) [1] 18.5 − 12.5 = 6 (N) [1] mass = 0.6 (kg) [1]	[3]	
	(b) **(i)**	18.5 (N)	[1]	
	(ii)	18.5 (N) ecf from **(i)**	[1]	
	(iii)	upwards or up or ↑ but **not** NORTH	[1]	6
5	**(a)** **(i)**	B	[1]	
	(ii)	Heat added [1] Heat removed [1]	[2]	
	(b)	**density** 1000 0.6 931	[3]	6

AVAILABLE MARKS

6 **(a)** **(i)** (mass number) 35 [1]
(atomic number) 17 [1] [2]

(ii) P and S [1]

(iii) same atomic number/proton number (threshold mark) [1]
different mass number/neutron number [1] [2]

(b) **(i)** They are unstable [1]

(ii) alpha [1] particle [1]
beta [1] particle [1]
gamma [1] (e.m.) wave [1] or e.m. [6] 12

7 **(a)**
- Timer or stop watch or stop clock, measuring tape or metre stick, scales/balance
(any 2) [1] each to max. of [2]
- Measure: height raised, time taken, weight to be lifted
(any 2) to max. of [2]
- Power = $\frac{\text{work}}{\text{time}}$ WRONG CONCEPT? then [2]/[6] max.

Response	**Mark**
Candidates mention at least **5** 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 at least **3** 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** 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]

(b) Moment = force × distance [1]
M = 20 × 45 [1] **or** M = 20 × 0.45 [1]
= 900 [1] = 9 [1]
= N cm [1] = Nm [1] [4] 10
i.e. consistent units of distance – must be correct for unit mark
Unit can be credited on its own

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			AVAILABLE MARKS
8	**(a)**	5 entries – [$\frac{1}{2}$] each round down: 0.0, 0.3, 1.0, 2.3, 6.3 [2]	
	(b)	Choice of scale [1] and label (I^2 in A^2) [1] Points plotted – 5 or 6 correct [2], 4 correct [1] [4]	
	(c)	Best fit line Curve can get e.c.f. [1]	
	(d)	k = grad [1] or equivalent = 8/4 (or other) [1] or picks pair of coordinates from table or graph = 2 [1] Tolerance ±0.1 Unit: J/A^2 [1] [4]	11
9	**(a)**	**(i)** Friction/drag **not** resistance [1]	
		(ii) During AB – X is less than W [1] bottom box ticked During BC – The two forces are equal [1] middle box ticked [2]	
	(b)	**(i)** Depth = area under line [1] **or** $A = \frac{1}{2}(a+b)\,h$ = (2 × 8)/2 + (8 × 8) [1] **or** $\frac{1}{2}(8+10)\,8$ = 72 (cm) [1] [3]	
		(ii) Momentum = m × v [1] = 0.2 × 8 [1] = 1.6 (g cm/s) [1] **no** ecf for v [3]	9
		Total	**70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 27 FEBRUARY 2013, MORNING

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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**.

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

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Examiner Only	
Marks	Remark

1 **(a)** In this question you have to distinguish the quantities **mass** and **weight**, words with precise meanings in Physics.

In each of the following sentences write the word **mass** or **weight**, in the spaces provided.

An example has been done for you.

Example: _____Mass_____ is the amount of matter in a body.

(i) The _____ of a body does not vary. [1]

(ii) The _____ of a body has size and direction. [1]

(iii) _____ is measured using a top-pan balance. [1]

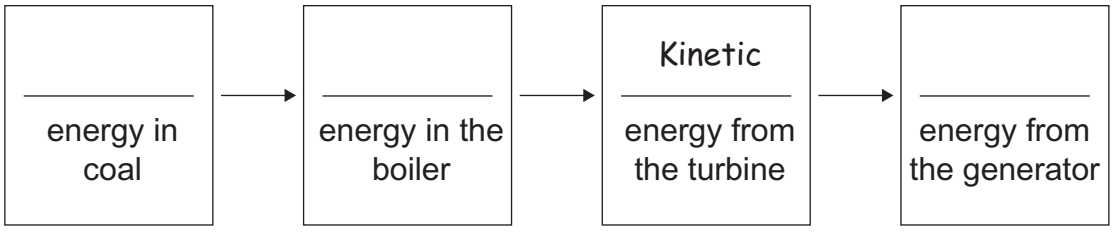
(iv) The _____ of a body is a force. [1]

(b) Boilers, turbines and generators are used in power stations.

Use the words from the box to complete the energy transfer process involved in a coal fired power station.

One has been done for you.

Heat	Potential	Chemical
Kinetic	Magnetic	Electrical

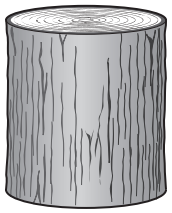


[3]

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Examiner Only	
Marks	Remark

2 The block of wood shown below has a mass of 960 g and a volume of 1200 cm^3.

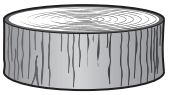


(i) Calculate the density of the wood in g/cm^3.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

(ii) The block of wood is now cut into two sections A and B. Section B is twice the mass of section A.

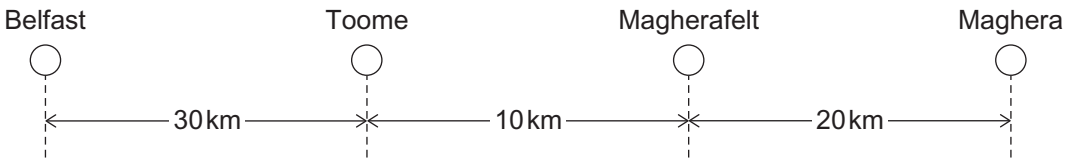
section A 

 section B

What effect, if any, will this have on the density of each section?

_____ [1]

3 The plan below shows the bus journey from Belfast to Maghera.



Plan is not to scale

The bus timetable is shown below.

		Time of day
Belfast	Departing	13.00
Toome	Arriving	13.30
Toome	Departing	13.40
Magherafelt	Arriving	14.00
Magherafelt	Departing	14.20
Maghera	Arriving	14.30

Examiner Only

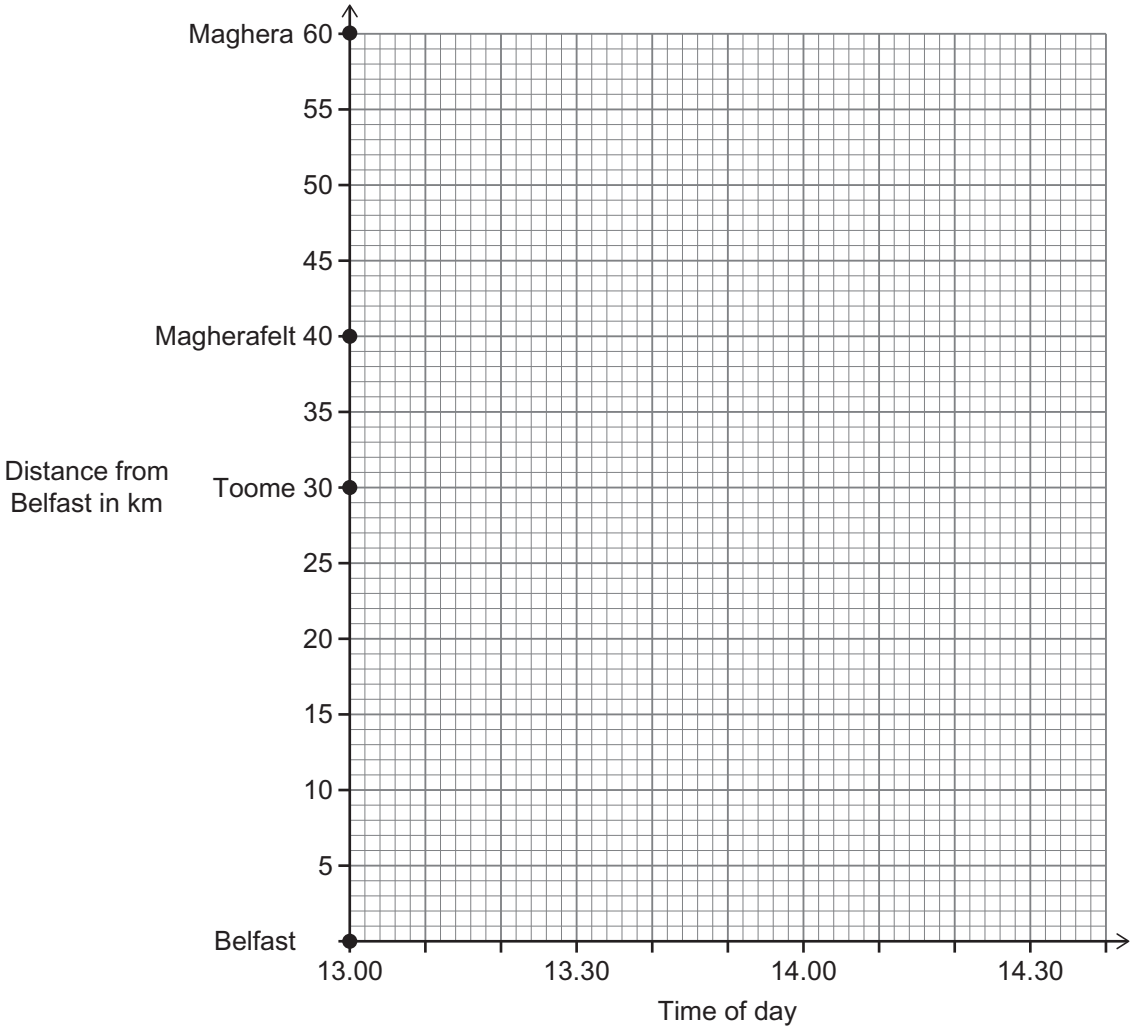
Marks	Remark

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Marks	Remark

(i) Draw a distance–time graph for the 13.00 bus from Belfast to Maghera.

Assume the bus travels at constant speed between stops.



[3]

(ii) Calculate the average speed of the bus from Belfast to Maghera in km/h (kilometres per hour).

You are advised to show your working out.

Average speed = _____ km/h [4]

4 **(i)** Complete the formula for momentum, in words.

Momentum =

[1]

(ii) Calculate the momentum of a car of mass 800 kg travelling at 20 m/s.
Remember to include the units for momentum.

You are advised to show your working out.

Momentum = _____ [3]

Examiner Only	
Marks	Remark

5 **(i)** What is meant by the term centre of gravity of an object?

Examiner Only

Marks	Remark

_____

_____ [2]

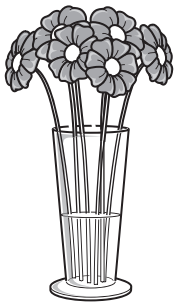
(ii) A vase contains water.

Mark on the diagram, with an X, the approximate position of its centre of gravity.



[1]

(iii) A large bunch of tall flowers is put into the vase.



State and explain how the stability of the vase is affected.

_____

_____ [2]

Examiner Only	
Marks	Remark

6 Wheel-braces are used to remove wheel nuts.

(i) Explain why wheel-braces are designed so that they may be extended.



Unextended wheel-brace



Extended wheel-brace

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_____

_____ [1]

(ii) Calculate the moment of a force, in N m, when a force of 20 N is applied to a wheel-brace of length 40 cm.

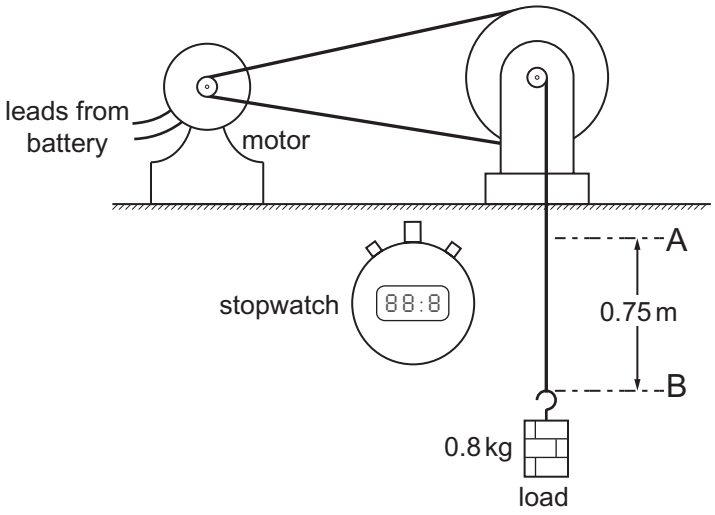
You are advised to show your working out.

Moment = _____ N m [4]

(iii) A motorist applies a force vertically upwards at the handle, in the first diagram above. State the direction of the moment.

Direction: _____ [1]

7 The power output of an electric motor was measured using the apparatus shown below.
The motor lifts a load of 0.8 kg through a height of 0.75 m.



(i) Calculate the work done in raising the load from B to A.
You are advised to show your working out.

Work done = _____ J [4]

(ii) What time interval should be measured to allow you to calculate the power of the motor?

_____ [1]

(iii) The time interval measured was 4.0 seconds.
Calculate the output power of the motor in watts.
You are advised to show your working out.

Power output = _____ W [3]

(iv) The time taken to raise the load is too short to measure accurately.
Using the apparatus shown how could you get a more accurate measurement of the power output of the motor?

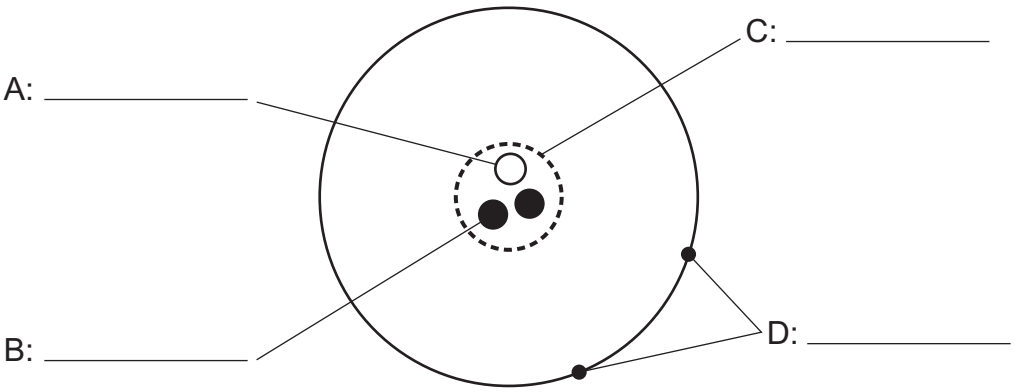
_____ [1]

Examiner Only
Marks | Remark

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Examiner Only	
Marks	Remark

8 **(a)** The diagram illustrates a neutral atom.



(i) Complete the diagram by writing in the spaces above, the four missing labels. [4]

(ii) Explain why atoms are neutral.

_____

_____ [1]

(iii) Give two differences between the atom drawn above and an alpha particle.

1. _____

2. _____ [2]

(b) Nuclear reactors are used in power stations to release energy through nuclear fission.



© Dr Jeremy Burgess / Science Photo Library

(i) What is meant by nuclear fission?

_____

_____

_____ [3]

(ii) Name two fissionable substances commonly used in nuclear reactors.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

9 Describe, in detail, an experiment to verify the Principle of Moments.

In your description you should include:

- the apparatus used;
- how the apparatus is used to test the Principle of Moments; and
- the formula you would use to test the Principle of Moments.

In this 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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(Questions continue overleaf)

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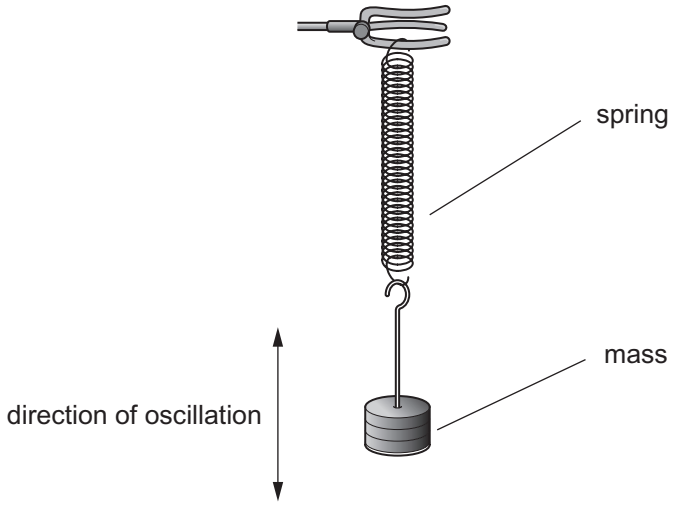
Examiner Only	
Marks	Remark

10 A mass hangs on the end of a spring. When the mass is pulled down and released then it will oscillate up and down.

When the spring carries a mass (m), the time taken (T) for one complete up and down movement is given by the relationship:

$$T^2 = K\,m \qquad \textbf{Equation 10.1}$$

where **K** is a constant.



To test the relationship, the following experimental results were recorded.

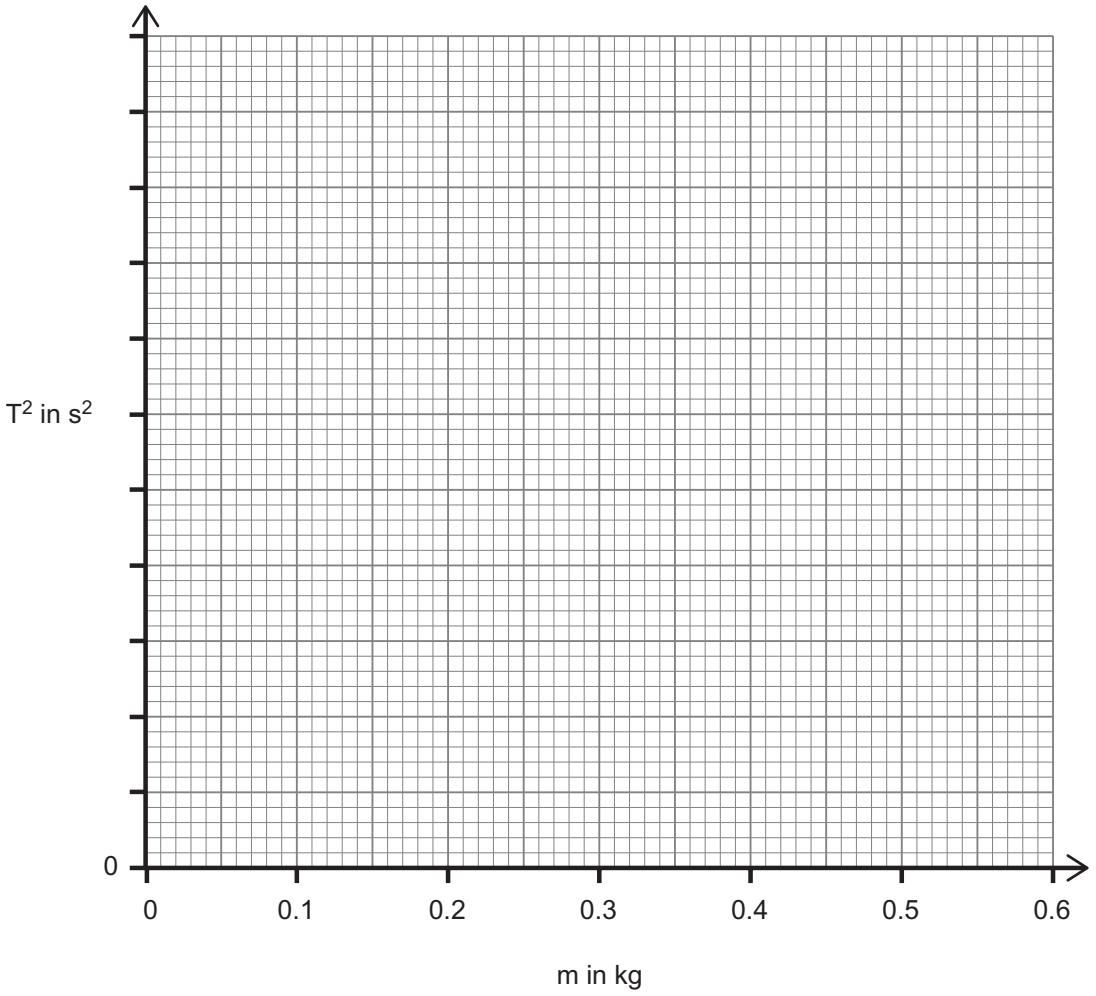
m in kg	0	0.1	0.2	0.3	0.4	0.5
T in s	0	0.63	0.90	1.10	1.26	1.41
T^2 in s^2	0			1.2		

(i) Complete the table by entering the values for T^2, to 1 decimal place.

One has been done for you. [2]

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



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

(iv) Does your graph support the theory described by **Equation 10.1**?

Explain your answer.

_____

_____

_____ [2]

(v) Find the value of K from the graph.

You are advised to show your working out.

K = _____ s^2/kg [2]

Examiner Only

Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 27 FEBRUARY 2013
9.30 am–10.30 am

MARK SCHEME

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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.

				AVAILABLE MARKS
1	**(a)**	(i) Mass	[1]	
		(ii) Weight	[1]	
		(iii) Mass	[1]	
		(iv) Weight	[1]	
		[1] each		
	(b)	Chemical	[1]	
		Heat	[1]	
		Electrical	[1]	7
2	**(i)**	Density = Mass/volume	[1]	
		= 960/1200	[1]	
		= 0.8 (g/cm^3)	[1]	
	(ii)	No effect/Nothing	[1]	4
3	**(i)**	3 slopes of positive gradient [1]	[1]	
		2 stops [1]	[1]	
		ALL Correct points [1]	[1]	
	(ii)	Av speed = (total) distance/(total) time	[1]	
		= 60/1.5	[2]	
		= 40 (km/hr)	[1]	7
4	**(i)**	Mass × velocity OR velocity × mass	[1]	
	(ii)	(Momentum =) 800 × 20 [1]		
		= 16000 [1] kg m/s [1]	[3]	4
5	**(i)**	It is a point [1] through which the (whole) weight (dep. marking) of the body appears to act. [1]	[2]	
	(ii)	Appropriate point (in the middle and under water line)	[1]	
	(iii)	Less stable [1] because C. of G. is higher [1] [dep. marking]	[2]	5
6	**(i)**	Bigger Moment or Bigger Turning Effect or Smaller Force	[1]	
	(ii)	Moment = Force × distance (from pivot) [1]		
		= 20 × 0.4 [2]		
		= 8 (Nm) [1]	[4]	
	(iii)	anticlockwise	[1]	6

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				AVAILABLE MARKS
7	**(i)**	$W = F \times d$	[1]	
		$= 8 \times 0.75$	[2]	
		$= 6$ (J)	[1]	
	(ii)	(Time from) B to A	[1]	
	(iii)	Power = Work done/time	[1]	
		= 6/4 (allow e.c.f. from **(i)**)	[1]	
		= 1.5 (W)	[1]	
	(iv)	Increase height/Increase load	[1]	9
8	**(a)**	**(i)** A = Neutron	[1]	
		B = Protons	[1]	
		C = Nucleus	[1]	
		D = Electrons	[1]	
		(ii) (Total of) positive charge = (total of) negative charge or number of protons = number of electrons	[1]	
		(iii) Alpha has no electrons Alpha is (doubly) positively charged Alpha has two neutrons Alpha has a bigger mass/relative mass of 4 Any two [1] each	[2]	
	(b)	**(i)** (Heavy) <u>nucleus</u> splits or uranium/plutonium splits [1] into two (light) <u>nuclei</u> neutron incident or absorbed (fission) neutrons produced — any 2 from 3 points for 2 marks	[3]	
		(ii) Uranium	[1]	
		Plutonium (insist on words)	[1]	12

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9 **Apparatus:** Metre stick, pivot, (hanging) weights or masses (any 2) [1]

Use:
- Balance ruler on pivot
- Place masses on either side
- Balance again
- Measure distances to pivot from masses
- Table of results

any 4 points for 4 marks [4]

Formula: CM = ACM [1]

Response	Mark
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]

AVAILABLE MARKS: 6

10 **(i)**

m in kg	0	0.1	0.2	0.3	0.4	0.5
T in s	0	0.63	0.90	1.10	1.26	1.41
T^2 in s^2	**(0)**	***0.4***	***0.8***	***(1.2)***	***1.6***	***2.0***

All 4 values of T^2 correct gets 2/2
2 or 3 values only correct [1] [2]

(ii) Scale more than half [1]
5 or 6 points correct [2]
3 or 4 points [1] [3]

(iii) Best fit line through candidate's points [1]

(iv) (Yes), Graph is a straight line [1] through origin [1] [2]

(v) K = 1.6/0.4 (or other) OR K = gradient for 1st mark [1]
= 4 (s^2/kg) [1]

AVAILABLE MARKS: 10

Total **70**

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New Specification

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 14 NOVEMBER 2012, AFTERNOON

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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(a)**.

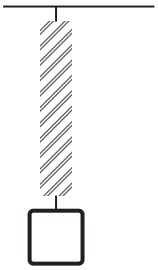
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

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Examiner Only	
Marks	Remark

1 What type of energy is represented by the drawings below?

(i) A stretched spring



_____ energy [1]

(ii) A rolling ball



_____ energy [1]

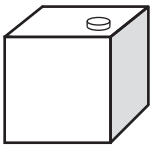
(iii) A raised ball



_____ energy [1]



(iv) A can of diesel



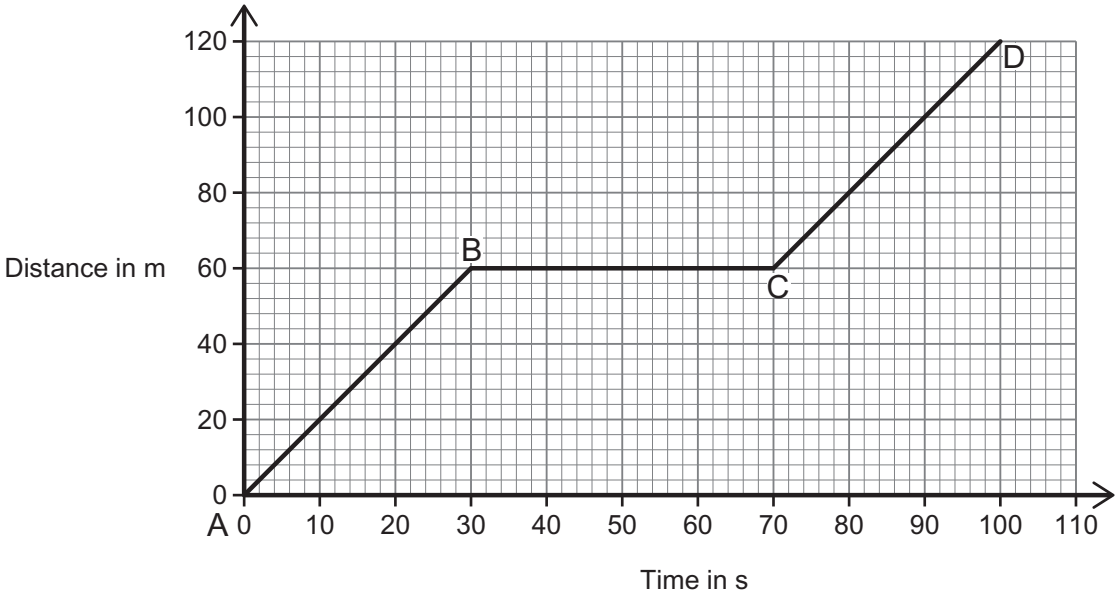
_____ energy [1]

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2 **(a)** What is the difference between distance and displacement?

_____ [1]

(b) Fred walks to the local shop and the distance–time graph for his journey is shown below.



(i) Describe Fred's motion during BC.

_____ [1]

(ii) Calculate Fred's average speed for the whole journey.

You are advised to show your working out.

Average speed = _____ m/s [3]

Examiner Only

Marks	Remark

3 An object of mass 3 kg sits on a rough bench.



(a) (i) The object exerts a force on the bench. What is this force called?

_____ [1]

(ii) What is the size of this force?

_____ N [1]

(iii) The bench exerts a force on the object. Give the name, the size, and the direction of this force.

Name _____

Size _____ N

Direction _____ [3]

(b) The object is now pulled to the right over the surface of the rough bench.

What is the name of the force which acts in the opposite direction?

Force is called _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 Clare pushes a lawnmower across her lawn. She exerts a force of 75 N and moves the lawnmower a distance of 12 m, at a speed of 1.5 m/s.



(i) Calculate the amount of work Clare does.

You are advised to show your working out.

Work = _____ J [3]

Clare needs chemical energy to do this work.

(ii) Where does Clare get her chemical energy from?

Answer _____ [1]

(iii) Clare uses 4500 J of chemical energy to do this work.
Calculate her efficiency.

You are advised to show your working out.

Efficiency = _____ [3]

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5 **(a)** What is meant by the centre of gravity of an object?

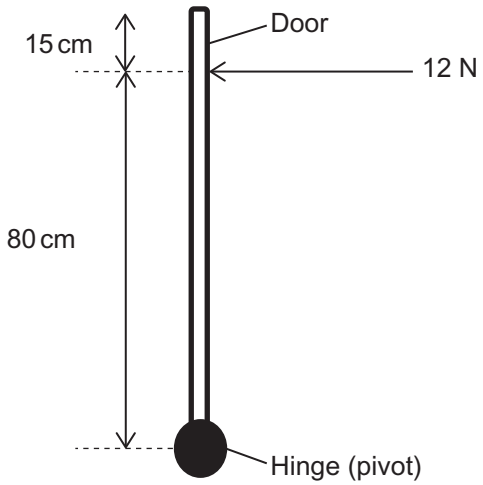
Examiner Only

Marks	Remark

_____

_____ [2]

(b) A plan view of a door is shown. Mary pushes with a force of 12 N as shown.



(i) Calculate the moment exerted by Mary.
Remember to include the unit.

You are advised to show your working out

Moment = _____ [4]

(ii) What is the direction of the moment exerted by Mary?

Direction is _____ [1]

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6 **(a)** **(i)** Jamie is given a stone with an irregular shape and asked to find its volume. Describe how Jamie could find the volume of the stone.

Examiner Only

Marks	Remark

_____

_____

_____

_____

_____

_____

_____ [3]

(ii) State **one** precaution Jamie should take to ensure an accurate result.

_____ [1]

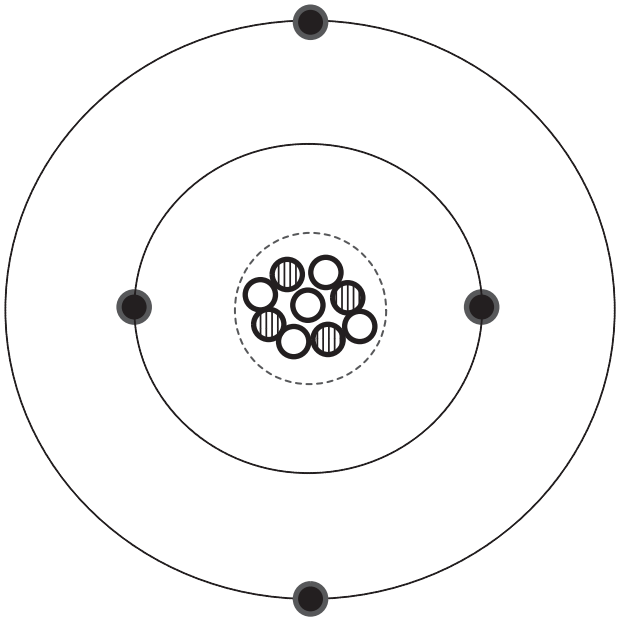
(b) The stone has a mass of 320 g and Jamie finds the volume to be 40 cm^3.

Calculate the density of the stone, in g/cm^3.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

7 A beryllium atom is represented by the diagram below.



Complete the table below giving the name, relative mass and relative charge of all the particles in an atom of beryllium.

Particle	Name	Relative mass	Relative charge
●		negligible	
◍			+1
○	neutron		

[6]

Examiner Only

Marks	Remark

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

8 Radioactive substances emit up to three types of radiations, alpha, beta, and gamma. These radiations can travel different distances in air. A source of radiation is placed at one end of a laboratory bench.

A detector is placed at points A, B and C in turn.



(a) (i) At which point A, B or C, will the detector record only gamma radiation?

Answer = _____ [1]

(ii) At which point A, B or C, will the detector record alpha, beta, and gamma radiation?

Answer = _____ [1]

(iii) At which point A, B or C, will the detector record only beta and gamma radiation?

Answer = _____ [1]

(b) (i) When alpha or beta particles pass through air they collide with the air molecules, causing them to become charged. What is the name of this process?

Name of this process is _____ [1]

(ii) How do the air molecules become charged?

_____ [1]

(c) Workers who use radioactive sources must take steps to protect themselves. Give two ways in which they can do this.

1. _____

2. _____ [2]

(d) The half-life of a radioactive source is a measure of how quickly it decays. What do we mean by "half-life"?

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** Describe, in detail, how you would measure your personal power.

In your account you should include:

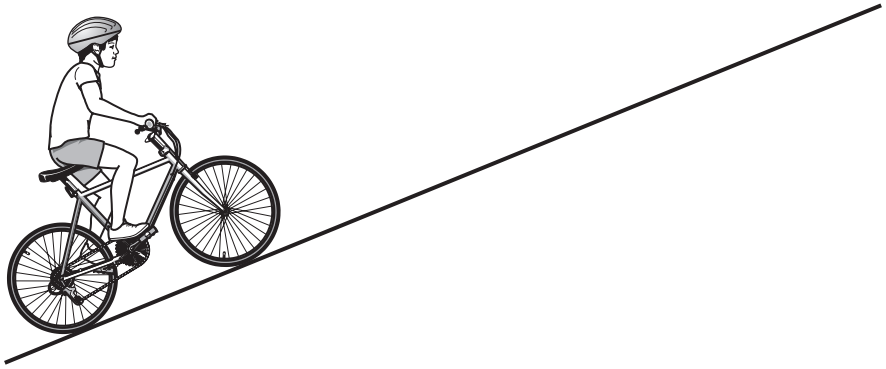
- the measurements you make and the measuring instruments;
- how you use your measurements to measure your personal power.

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

[6]

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(b) Jim does 3800 J of work when riding his bicycle up a hill as shown.



It takes 5 seconds to travel from the bottom of the hill to the top.

Calculate the power developed by Jim.

Give your answer in kW.

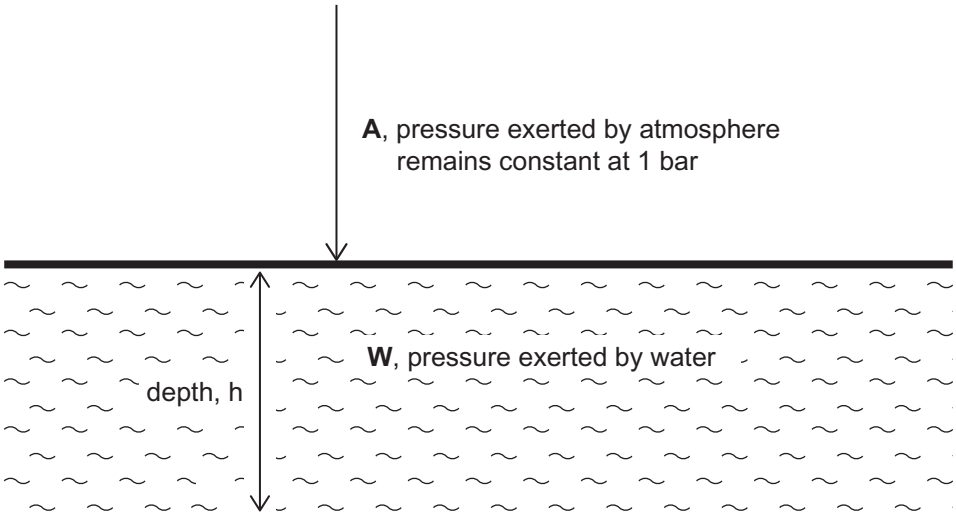
You are advised to show your working out.

Power = _____ kW [3]

Examiner Only

Marks	Remark

10 When divers go underwater the pressure exerted on them changes with depth.



The total pressure exerted at a depth h is equal to the pressure exerted by the water, W, plus the pressure exerted by the atmosphere, A. This means:

Total pressure at a depth h = A + W

The pressure exerted by the atmosphere, A, **remains constant at 1 bar**. The bar is a unit of pressure.

Each 10 m depth of water adds 1 bar of pressure as shown in the second row of the table.

(i) Complete the table below to show the total pressure. One value has been entered for you.

Depth h in m	**0**	**10**	**20**	**30**	**40**	**50**
W in bar	**0**	**1**	**2**	**3**	**4**	**5**
Total pressure in bar				**4**		

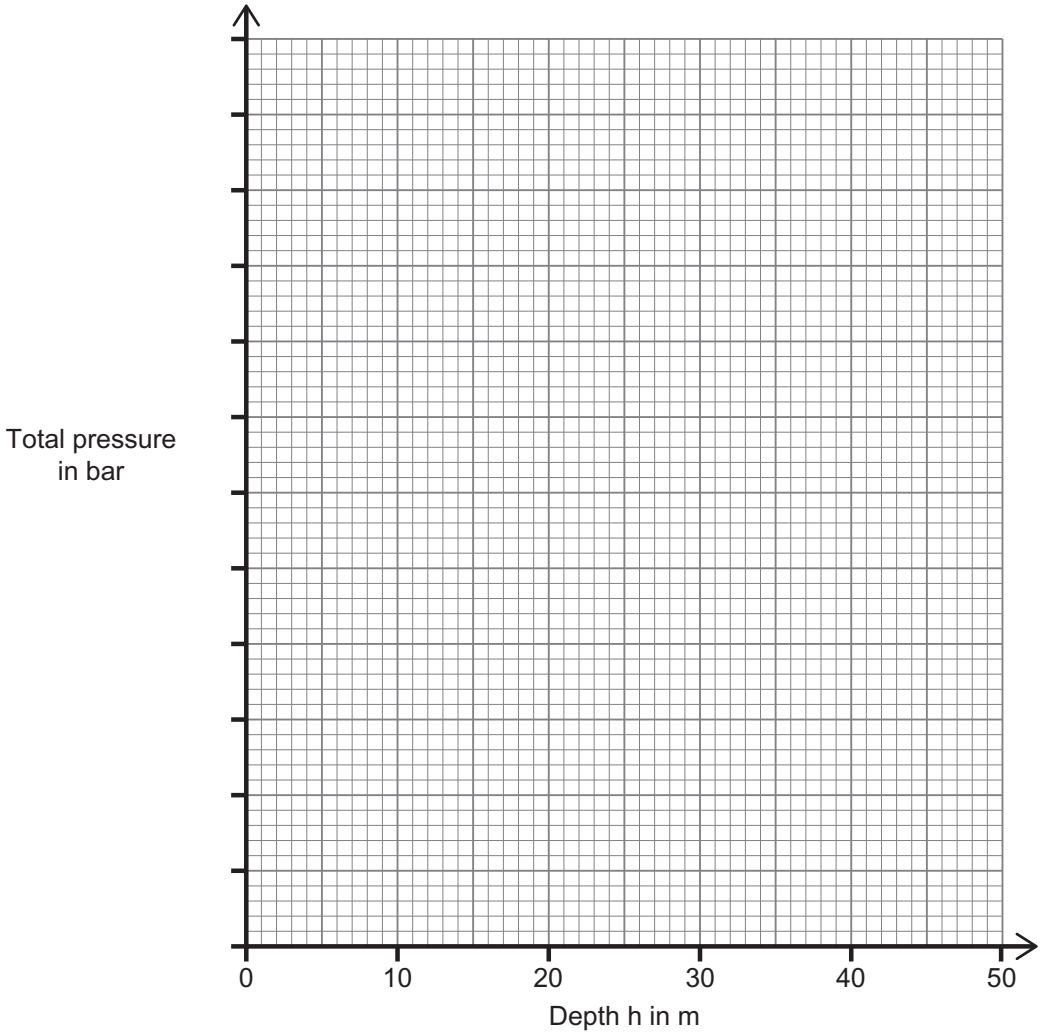
[2]

(ii) Choose a suitable scale on the graph opposite for the vertical axis. Plot a graph of total pressure against the depth h. [4]

Examiner Only

Marks	Remark

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

(iv) What feature **of the graph** indicates that the pressure exerted by the atmosphere alone is 1 bar?

_____ [1]

(v) A diver is at a depth of 35 m. Use the graph to find the total pressure acting on the diver.

_____ [1]

(vi) What feature of the graph tells us that total pressure is **not** directly proportional to depth?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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112998

New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 14 NOVEMBER 2012
1.30 pm–2.30 pm

MARK SCHEME

STEMUP.CO.UK

		AVAILABLE MARKS
1	**(i)** strain/elastic [1]	
	(ii) kinetic [1]	
	(iii) potential/gravitational [1]	
	(iv) chemical [1]	4
2	**(a)** distance is a scalar/displacement is a vector/ displacement involves direction [1]	
	(b) **(i)** Stopped or at rest [1]	
	(ii) (Av) speed = (total) distance/(total) time [1] = 120/100 [1] = 1.2 (m/s) [1]	5
3	**(a)** **(i)** Weight/gravity [1]	
	(ii) 30 (N) [1]	
	(iii) Reaction [1] 30 (N) Allow e.c.f. from **(a) (ii)** [1] Upwards [1]	
	(b) Friction [1] [NB: not drag]	6
4	**(i)** $W = F \times d$ [1] $= 75 \times 12$ [1] = 900 (J) [1]	
	(ii) Food [1]	
	(iii) E = (useful) energy out/(total) energy in [1] = 900/4500 [1] e.c.f. from **(i)** = 0.2 [1] (or 20%)	7
5	**(a)** The point [1] where weight (appears to) act [1]	
	(b) **(i)** Moment $= F \times d$ [1] $= 12 \times 80$ [1] = 960 [1] Ncm [1]	
	(ii) Anticlockwise [1]	7

AVAILABLE MARKS

6 **(a)** **(i)** Immerse stone (in liquid) [1]
in a measuring cylinder [1]
find difference in readings [1]
OR (Eureka vessel method)
Add stone [1] filled eureka vessel [1] or displacement can measure overflow [1]

(ii) Precaution: e.g. stone fully immersed or ensure no splashing [1]

(b) $\rho = m/v$ [1]
$= 320/40$ [1]
$= 8\ (g/cm^3)$ [1] 7

7

	Name	Relative mass	Relative charge
●	electron		−1
●	proton	1	
○		1	0 or neutral

1 mark each [6] 6

8 **(a)** **(i)** C [1] **(ii)** A [1] **(iii)** B [1]

(b) **(i)** Ionisation [1]

(ii) Lose or gain electron/s [1]

(c) e.g. Any two from:
Use tongs/keep distance large [1]
Keep exposure time low [1]
Use shielding/wear protection [1]/safety badge/film badge

(d) Time [1] for activity to halve [1] [dept. marking] 9

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9 **(a)** Find weight (or mass and multiply by 10) [1]
Find total height of stairs [1]
Time to climb stairs [1]
Power = (weight × height)/time; [1]
Any two instruments from scales/metre stick/stop clock [2]
[1 mark each]

Response	Mark
Candidates give **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 is of a limited standard and they have made no use of specialist terms.	[1–2]
Response not worthy of credit.	[0]

[6]

(b) P = Work done/time taken (no marks)
= (3800)/5 [1]
= 760 [1]
= 0.76 (kW) [1] [3]

AVAILABLE MARKS

9

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10 (i)

Depth h in m	0	10	20	30	40	50
W in bar	0	1	2	3	4	5
Total pressure in bar	**1**	***2***	***3***	*4*	***5***	***6***

3 or 4 correct [1]
All correct [2] [2]

(ii) Vertical axis numbered with uniform scale [1], scale more than half [1]
3 or 4 correct [1]
5 or 6 points [2] [4]

(iii) Best fit line [1]

(iv) Intercept (on vertical axis) OR when h = 0 pressure is 1 (bar) [1]

(v) 4.5 bar [1]

(vi) Line does not go through origin [1]

Total

AVAILABLE MARKS

10

70

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

THURSDAY 24 MAY 2012, MORNING

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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)**.

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

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Examiner Only	
Marks	Remark

1 The main fuels used in the UK are given in the box below.

coal	**oil**	**nuclear**	**gas**

(a) Which of the fuels shown is **not** a fossil fuel?

_____ [1]

(b) State **two** uses of fossil fuels.

1. _____

2. _____ [2]

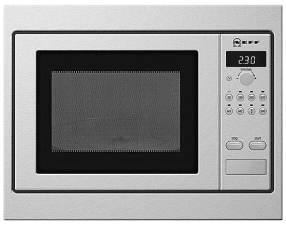
(c) Which fuel does not contribute to the greenhouse effect?

_____ [1]

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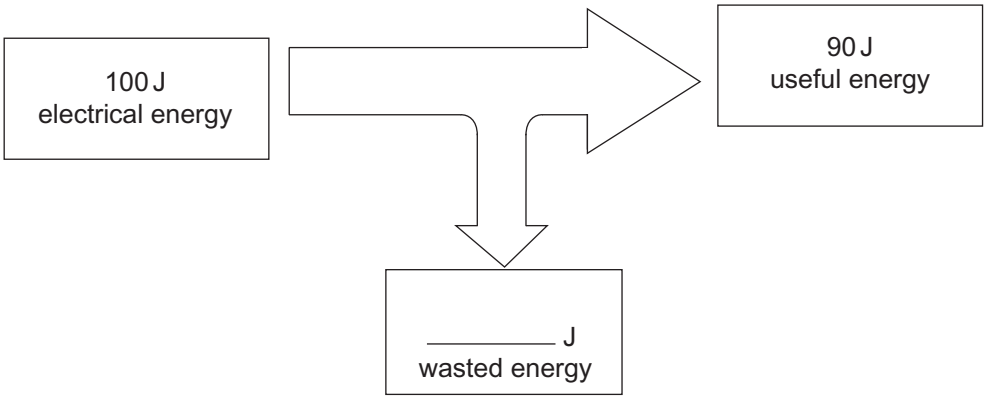
Examiner Only	
Marks	Remark

2 **(a)** A microwave oven converts electrical energy into useful microwave energy and other forms of energy which are wasted.



© BSH Home Appliances Ltd

(i) Complete the box below by adding the appropriate number.



[1]

(ii) Name one other form of energy, other than microwave energy, which the oven produces.

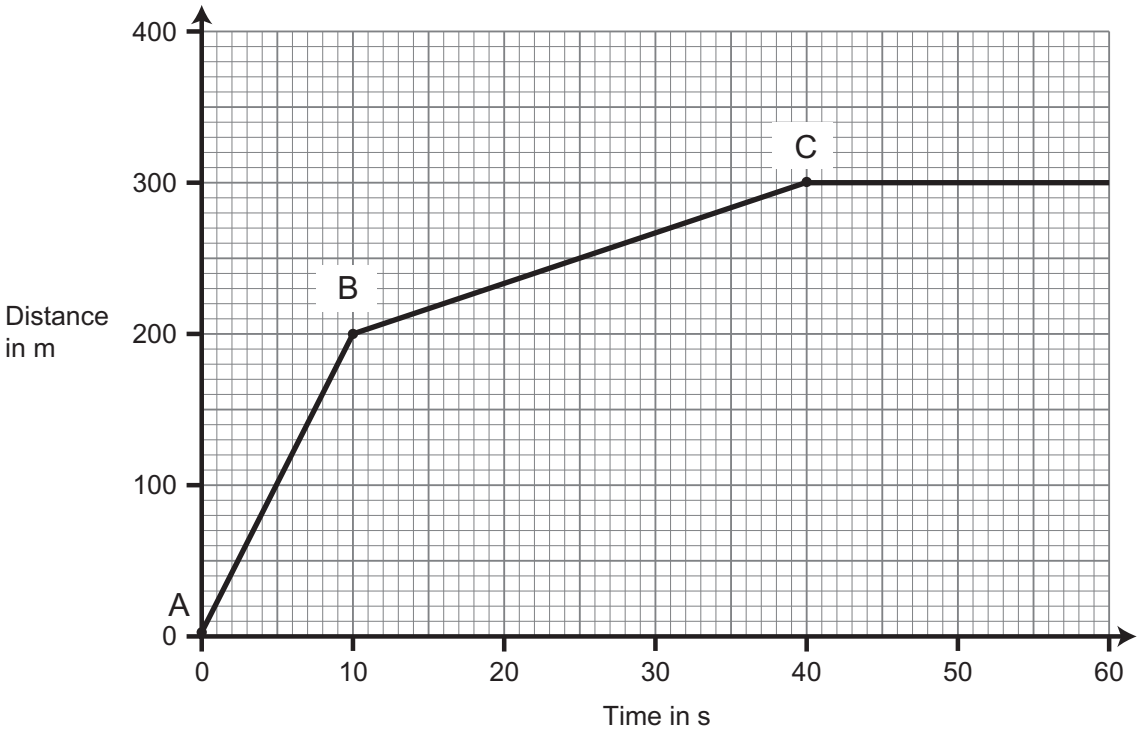
_____ [1]

(b) A different microwave oven takes in 800 J of electrical energy and transfers 640 J to the food.
Calculate its efficiency.

You are advised to show your working out.

Efficiency = _____ [3]

3 The distance–time graph for a car approaching traffic lights is shown below.



At A the driver sees the lights.
At B the driver applies the brakes.
At C the car stops.

(a) At what speed is the car travelling before the driver applies the brakes?

You are advised to show your working out.

Speed = _____ m/s [3]

Examiner Only

Marks	Remark

The distance the car travels while the brakes are being applied is called the braking distance.

(b) Use the graph to find the braking distance for this car.

Braking distance = _____ m [1]

(c) Will the braking distance increase, decrease or remain the same if there is ice on the road?

The braking distance will _____ . [1]

(d) What feature of the graph tells you that the car is stationary after 40 s?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The diagrams show the forces acting on three skydivers falling through the air. At any instant there are two forces acting on the skydiver. The Earth pulls him down and air resistance acts upwards.

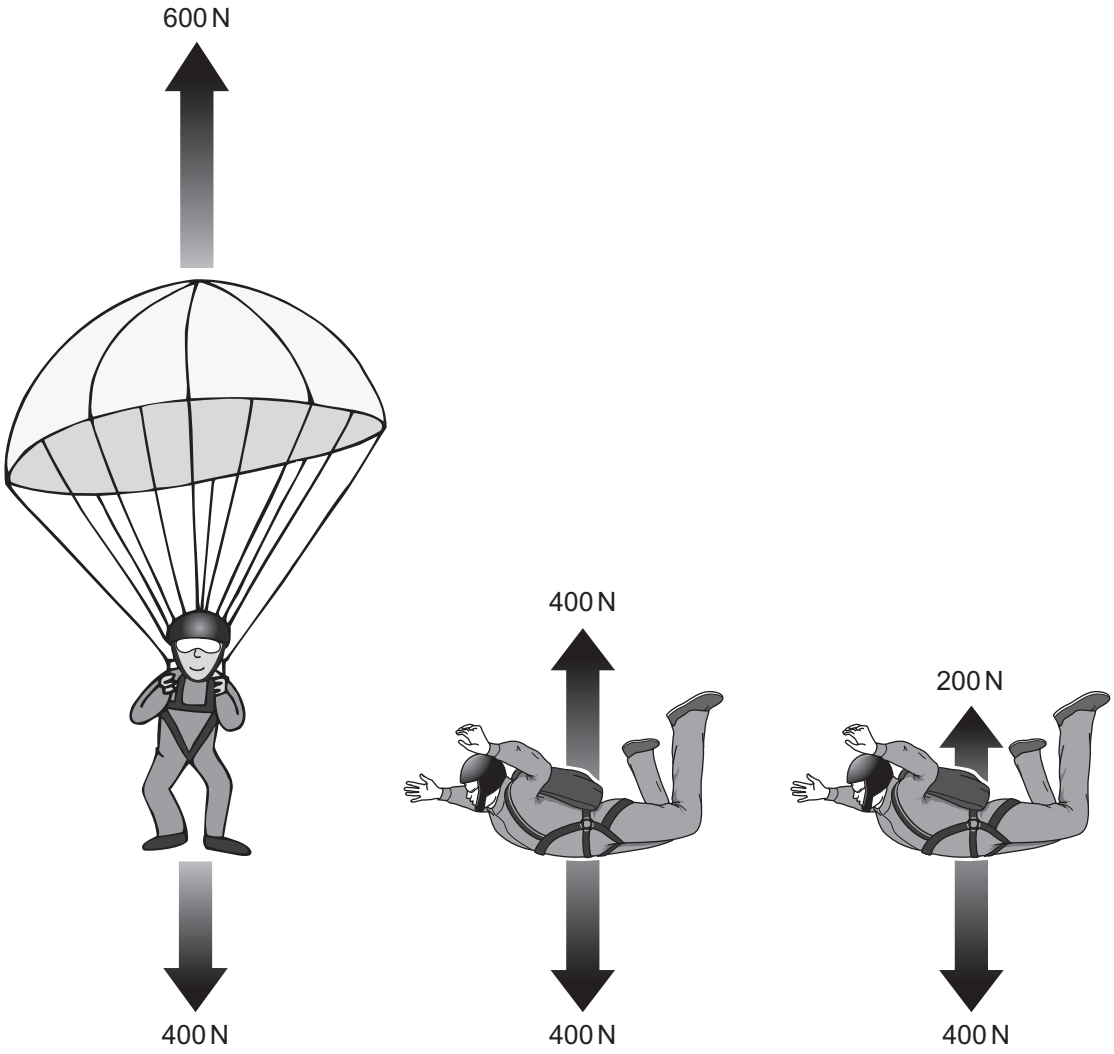


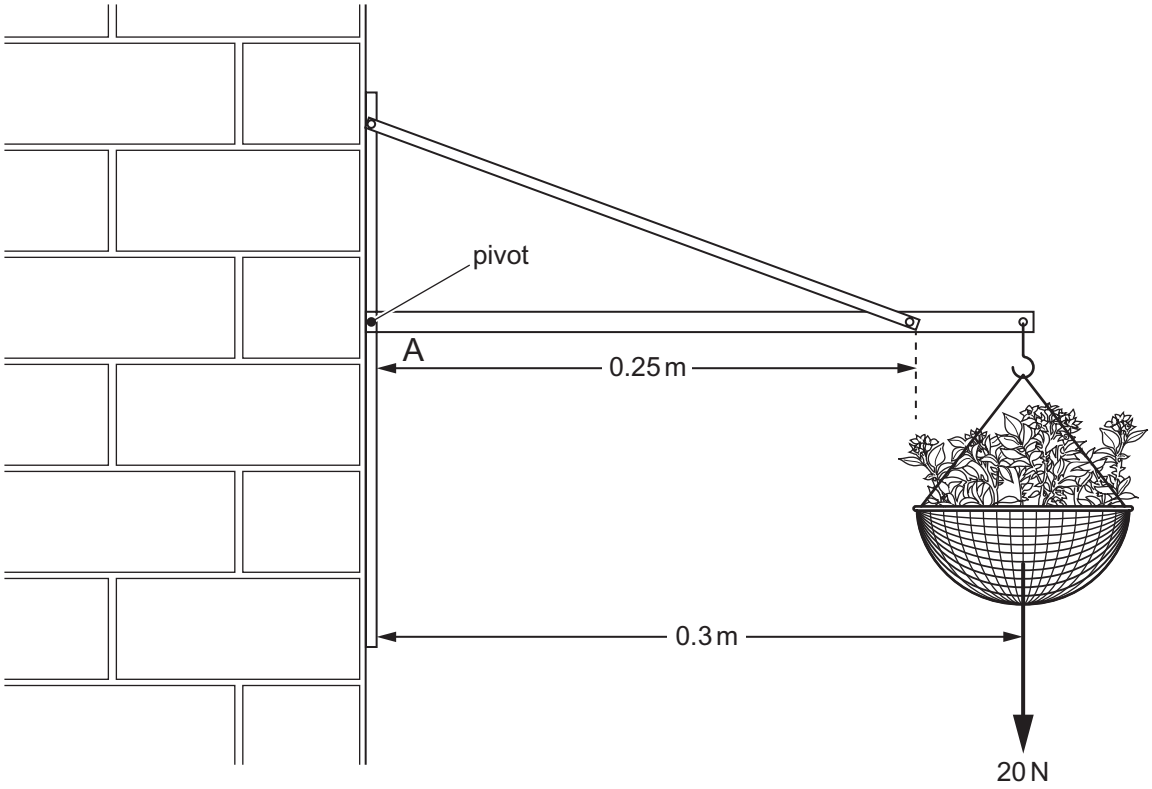
Diagram A **Diagram B** **Diagram C**

Complete the table below by writing the appropriate letter in each of the boxes.

Motion of Skydiver	Diagram A, B or C
The skydiver is speeding up.	
The skydiver is travelling at a constant speed.	
The skydiver is slowing down.	

[3]

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A hanging basket of weight 20 N exerts a moment about the pivot A.

(b) Calculate the moment caused by the weight of the hanging basket about the pivot A.

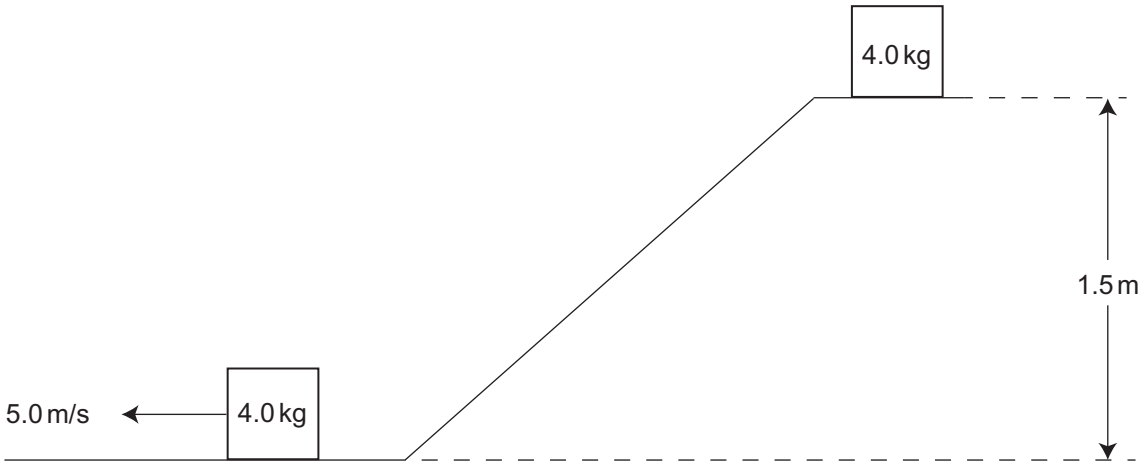
You are advised to show your working out.

Moment = _____ Nm [3]

Examiner Only

Marks	Remark

5 A mass of 4.0 kg is at rest at the top of a slope which is 1.5 m above ground level.



(i) Calculate its potential energy, at the top of the slope.

You are advised to show your working out.

Potential energy = _____ J [3]

(ii) The mass slides down a **rough** slope and its speed at the bottom is 5.0 m/s.
Calculate its kinetic energy at the bottom of the slope.

You are advised to show your working out.

Kinetic energy = _____ J [3]

(iii) Explain, fully, why the answers to parts **(i)** and **(ii)** are different.

_____

_____ [2]

Examiner Only

Marks	Remark

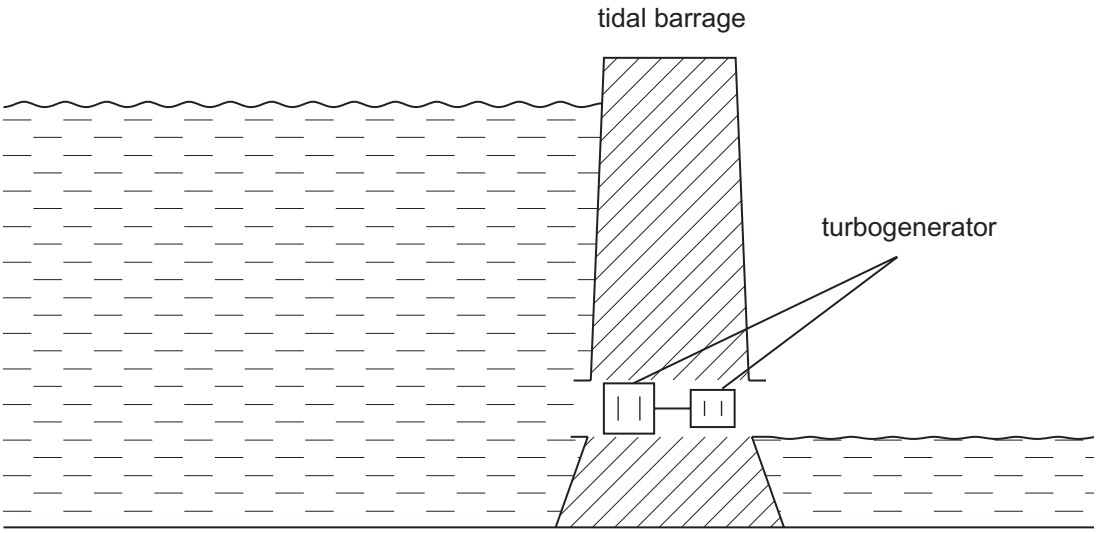
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(Questions continue overleaf)

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6 At La Rance in France, there is a tidal power station.

Examiner Only	
Marks	Remark



(a) (i) When the tide is in, the volume of sea water trapped behind the barrage is 200 m^3. The mass of sea water trapped is 210 000 kg. Calculate the density of the sea water trapped.

You are advised to show your working out.

Density = _____ kg/m^3 [3]

(ii) Tidal barrage is an example of a renewable energy resource. State **two** advantages of using a tidal barrage to generate electricity.

1. _____

2. _____ [2]

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(b) (i) A wind turbine can produce 900 000 J of electrical energy every **minute**.
Calculate its power output.

You are advised to show your working out.

Power output = _____ W [3]

(ii) What is the power output of the wind turbine in kilowatts?

Power output = _____ kW [1]

Examiner Only	
Marks	Remark

Examiner Only

Marks	Remark

7 **(a)** When a radioactive material arrives in a hospital, its activity is 2000 counts per second.

Complete the blanks in the table below.

Activity in counts per second	Time in half-lives
2000 (arrives)	0
	1
250	
	4

[3]

(b) State **two** safety precautions which should be taken when working with radioactive sources in the laboratory.

1. _____

2. _____ [2]

8 This question is about isotopes.

(a) Explain the meaning of the term isotopes.

_____

_____ [2]

(b) Describe the structure of an atom in terms of protons, neutrons and electrons.

_____

_____ [2]

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Examiner Only	
Marks	Remark

9 **(a)** **(i)** What is the symbol for the Mass Number of an atom?

_____ [1]

(ii) What is the symbol for the Atomic Number of an atom?

_____ [1]

(iii) Complete the following table for the nucleus of uranium, $^{238}_{92}U$.

Mass number	
Number of protons	
Number of neutrons	

[3]

(iv) A nucleus of uranium, $^{238}_{92}U$, decays to form a nucleus of thorium, $^{234}_{90}Th$.

1. What type of radiation, alpha, beta or gamma, is emitted by the uranium nucleus?

_____ [1]

2. Why does a nucleus that decays by emitting alpha or beta radiation become a nucleus of a different element?

_____

_____ [1]

(b) Discuss the social, environmental and ethical issues relating to the use of nuclear energy.

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

Social: _____

_____

_____

Environmental: _____

_____

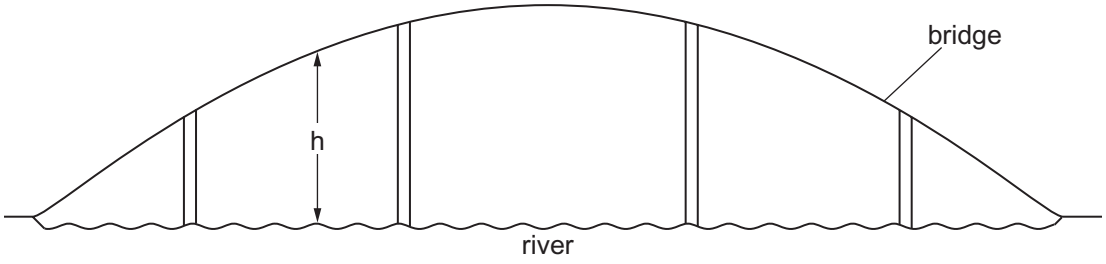
_____

Ethical: _____

_____

_____ [6]

10



Examiner Only

Marks	Remark

Jamie thinks that the height (h) fallen by a stone off a curved bridge depends on the square of the time (t) between releasing the stone and hitting the water, according to the formula:

$$h = kt^2$$

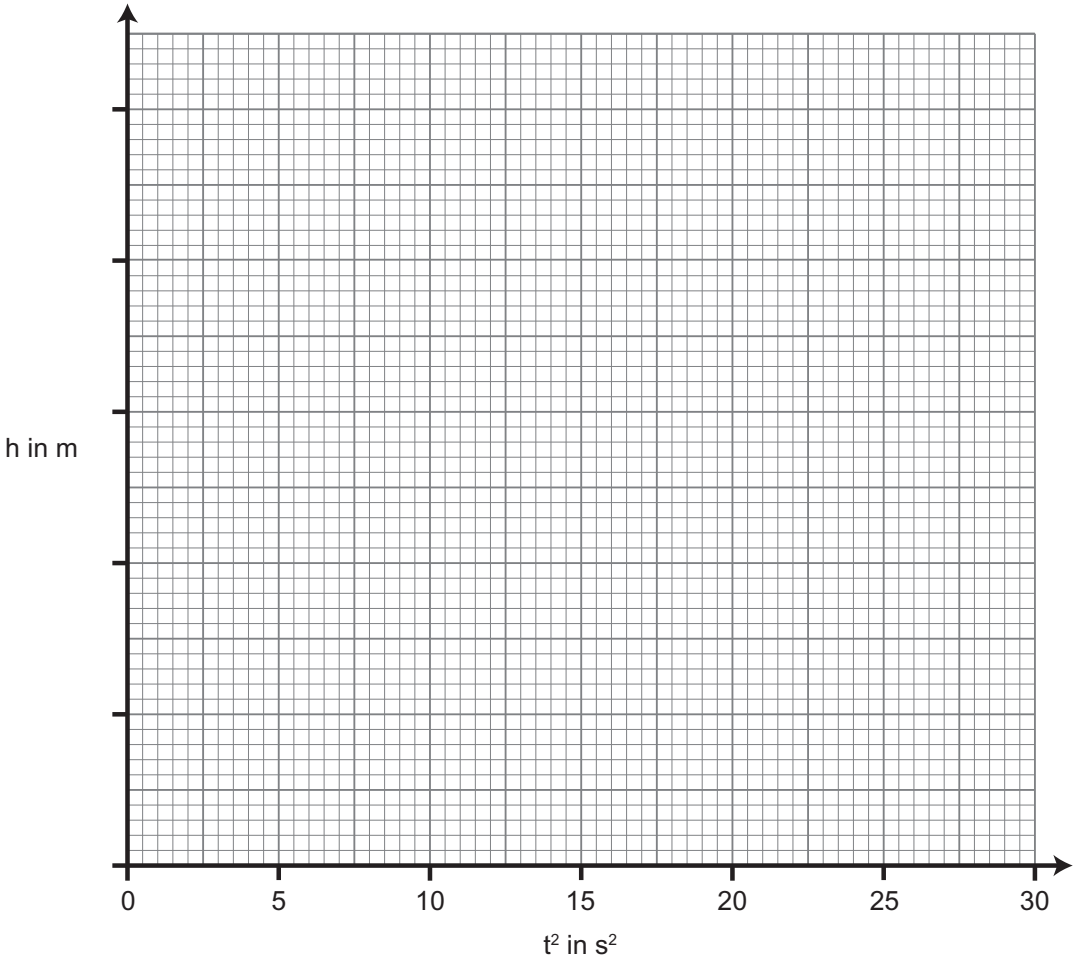
He obtains a set of results and these are shown below.

t in s	0	1	2	3	4
t^2 in s^2	0	1	4		
h in m	0	5	20	45	80

(a) Complete the table by entering the values of t^2. [2]

(b) Choose a suitable scale and plot a graph of h on the vertical axis versus t^2 on the horizontal axis on the grid opposite. [3]

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



(d) Use your graph to determine the constant k.
Remember to include the units for k.

You are advised to show your working out.

k = _____ : Unit = _____ [4]

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Marks	Remark

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112901

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

THURSDAY 24 MAY 2012, MORNING

MARK SCHEME

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				AVAILABLE MARKS
1	**(a)**	Nuclear	[1]	
	(b)	Transport Heating (Homes) Electricity (generation) Any 2, [1] each	[2]	
	(c)	Nuclear	[1]	4
2	**(a)**	**(i)** 10 (J)	[1]	
		(ii) KE/heat/light/sound	[1]	
	(b)	Efficiency $= \frac{\text{Useful Output Energy}}{\text{Input Energy}}$	[1]	
		Eff = 640/800	[1]	
		Eff = 0.8 or 80%	[1]	5
3	**(a)**	Speed = Gradient	[1]	
		= 200/10	[1]	
		= 20 (m/s)	[1]	
	(b)	(300 – 200) = 100 (m)	[1]	
	(c)	Increase	[1]	
	(d)	Zero gradient	[1]	6
4	**(a)**	C	[1]	
		B	[1]	
		A	[1]	
	(b)	Moment = Force × distance (to pivot)	[1]	
		= 20 × 0.3	[1]	
		= 6 (Nm)	[1]	6
5	**(i)**	PE = m g h	[1]	
		= 4 × 10 × 1.5	[1]	
		= 60 (J)	[1]	
	(ii)	KE = $\frac{1}{2}$ mv^2	[1]	
		= $\frac{1}{2}$ × 4 × 25	[1]	
		= 50 (J)	[1]	
	(iii)	(Energy lost) as heat or sound [1] due to friction [1]	[2]	8

					AVAILABLE MARKS
6	**(a)**	**(i)**	Density = Mass/Volume	[1]	
			= 210 000/200	[1]	
			= 1050 (kg/m^3)	[1]	
		(ii)	Limitless or never runs out	[1]	
			Non-Polluting/conserves fossil fuels	[1]	
	(b)	**(i)**	Power = $\frac{\text{Energy}}{\text{Time}}$	[1]	
			= $\frac{900\,000}{60}$	[1]	
			= 15 000(W)	[1]	
		(ii)	15 (kW) allow e.c.f. from (b)(i)	[1]	9
7	**(a)**		1000	[1]	
			3	[1]	
			125	[1]	
	(b)		Shielding/ Handle sources with tongs/ Hold sources at arms length/ Minimise exposure time/put warning sign on door when sources are in use	[1]	5
8	**(a)**		Atoms with same Z no. [1] but different A nos [1]	[2]	
	(b)		Nucleus contain protons + neutrons	[1]	
			Orbiting electrons	[1]	4

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AVAILABLE MARKS

9 **(a)** **(i)** A [1]

(ii) Z [1]

(iii) 238 [1]
92 [1]
146 [1]

(iv) 1. Alpha or α [1]

2. Different atomic number
Or different place on periodic table [1]

(b) N.I.M.B.Y.
Long term necessity of N fuel/conserves fossil fuel
Treatment of cancers

Waste argument e.g. hazardous waste will cause problems for future generations
No polluting gases
Safety/causes cancer

Proliferation of N. weapons [5–6]

Response	**Mark**
Candidates must use appropriate specialist scientific terms throughout to describe fully and in a logical sequence the problems of nuclear power stating **5–6** of the 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 scientific terms throughout to partially describe and in a logical sequence the problems of nuclear power stating **3 or 4** of the points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar throughout and the form and style are of satisfactory standard.	**[3–4]**
Candidates must use limited specialist scientific terms to describe fully and in a logical sequence the problems of nuclear power stating **1 or 2** of the points shown in the indicative content above. Their spelling, punctuation and grammar throughout and the form and style are of a limited standard.	**[1–2]**
Response not worthy of credit.	**0**

13

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			AVAILABLE MARKS
10	**(a)** 9	[1]	
	16	[1]	
	(b) Scale $> \frac{1}{2}$ of h axis	[1]	
	4 or 5 points correct [2] 2 or 3 points correct [1] } tolerance $\pm$ 1 square	[2]	
	(c) line of best fit [1]	[1]	
	(d) Grad $= \frac{Y_2 - Y_1}{x_2 - x_1}$ [1] Appropriate values [1] $= 5 \pm 0.2$ [1] m/s^2 [1]	[4]	10
		Total	**70**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.30 am

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 may be assessed in **questions requiring extended answers**.

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

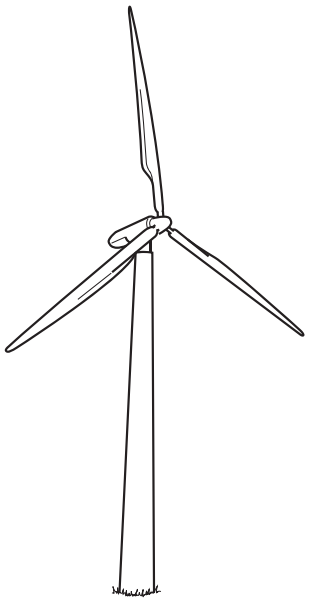
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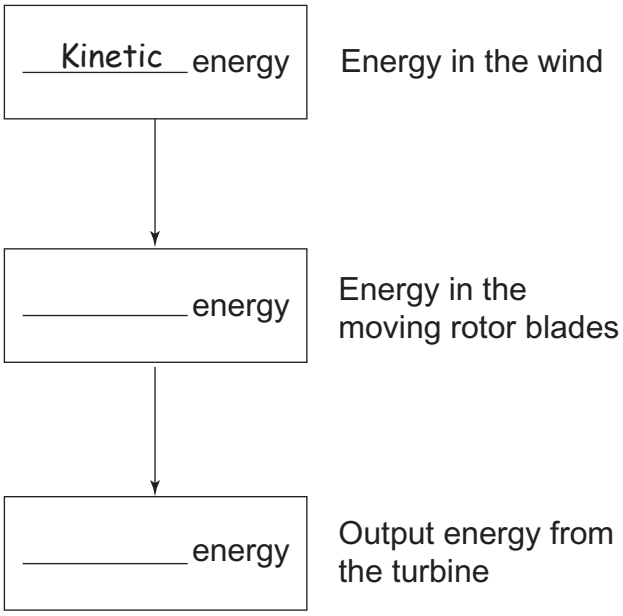
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Examiner Only	
Marks	Remark

1 The largest European wind farm has recently been opened off the coast of Kent.

(i) Complete the energy flow diagram below naming the **main** energy changes taking place in a wind turbine. The first stage has been done for you.





[2]

(ii) Name **two** unwanted forms of energy that result from the use of wind turbines.

1. _____ 2. _____ [2]

(iii) State a disadvantage of wind turbines.

_____ [1]

(iv) State **two** advantages of using wind turbines.

1. _____

2. _____ [2]

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2 Electricity companies are increasing the price of electricity for consumers. Energy-saving lamps will need to be considered.



filament lamp



energy-saving lamp

(i) Complete the table for the filament lamp.

Type of lamp	Electrical input energy in J	Heat energy produced in J	Light energy produced in J
Filament lamp	100	95	
Energy-saving lamp	100	75	25

[1]

(ii) Calculate the efficiency of the energy-saving lamp.

You are advised to show your working out.

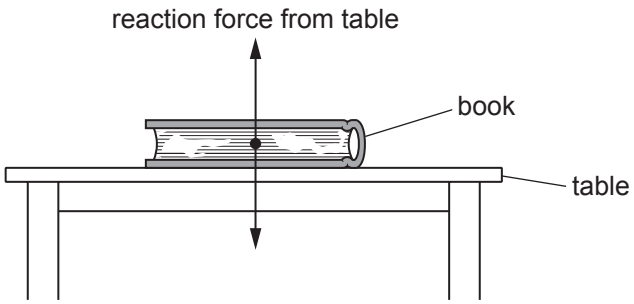
Efficiency = _____ [3]

Examiner Only

Marks	Remark

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3 A book is at rest on a table.



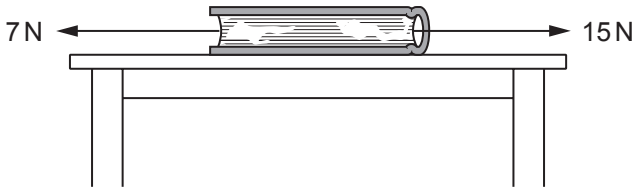
(a) Name the downwards force acting on the book.

_____ [1]

(b) Explain why the book is at rest.

_____ [1]

(c) There are now two horizontal forces acting on the book.



(i) Calculate the resultant of these two forces.

_____ N [1]

(ii) Describe fully the motion of the book.

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** **(i)** Name the three particles that make up an atom.

_____

_____

_____ [3]

A nucleus has an atomic number 3 and mass number 7.

(ii) What does this tell you about the particles that make up the nucleus?

_____

_____ [2]

(b) **(i)** What is a beta (β) particle?

_____ [1]

(ii) What part of the atom emits a beta particle?

_____ [1]

(iii) Name **two** radiations, other than beta particles, that can be emitted by a radioactive substance.

1. _____ 2. _____ [2]

A sheet of paper can stop **one** of the radiations emitted by a radioactive source.

(iv) What is the name of this radiation?

_____ [1]

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5 A car starts off from rest and reaches a speed of 15 m/s in a time of 20 seconds.

(a) Calculate its acceleration in m/s^2.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

(b) Explain the difference between speed and velocity.

_____ [1]

(c) What do speed and velocity have in common?

_____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 Mass and weight are two quantities used in physics.

(a) Mass is measured in kilograms while weight is measured in newtons.

(i) What is mass? _____

_____ [1]

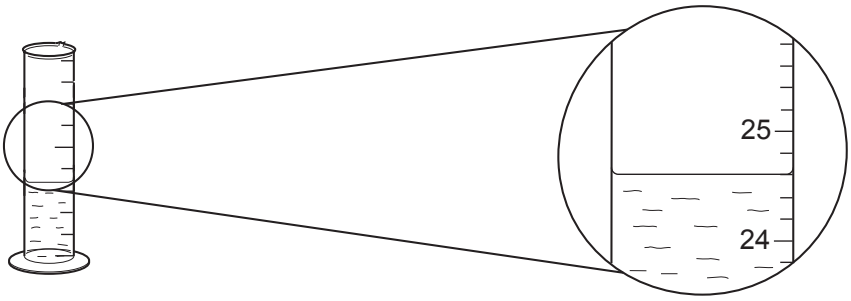
(ii) What is weight? _____

_____ [1]

(b) Jasmin has a bracelet which she believes to be gold. To find out if this is true she carries out an experiment to measure the density of the material used to make the bracelet.



She pours water into a measuring cylinder.

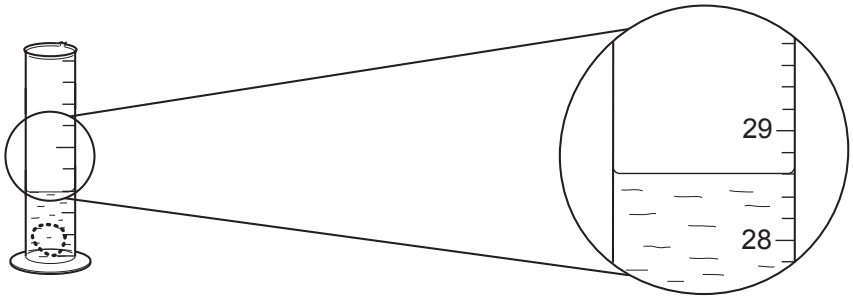


Study the diagram and complete the statement below.

(i) The volume of water in the cylinder is _____ cm^3 [1]

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She carefully places the bracelet in the measuring cylinder so that it is completely covered by the water, as shown in the diagram below.



(ii) Calculate the volume of the bracelet.

You are advised to show your working out.

Volume of bracelet = _____ cm^3 [2]

When she measures the mass of the bracelet, it is found to be 42 g.

(iii) Calculate the density of the material of the bracelet.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

The table below shows the densities of some metals.

Metal	Density in g/cm^3
Aluminium	2.7
Brass	8.8
Silver	10.6
Gold	19.3

(iv) Using your answer to part **(iii)**, decide what her bracelet is made of.

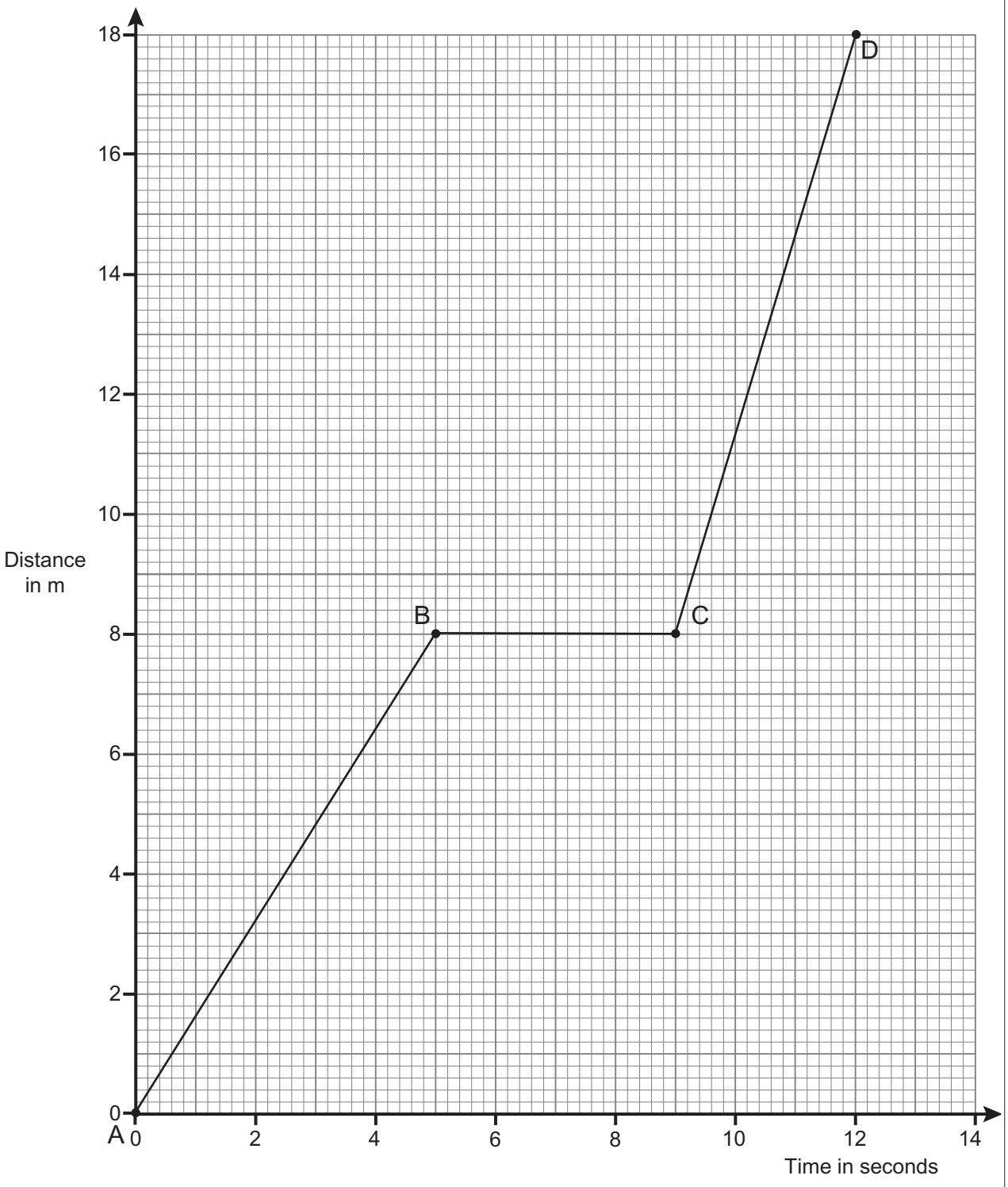
_____ [1]

Examiner Only

Marks	Remark

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7 A distance-time graph for a cyclist is shown below.



Examiner Only	
Marks	Remark

(a) (i) Describe the motion of the cyclist during BC.

_____ [1]

(ii) What feature of the graph tells you that the speed is greatest during CD?

_____ [1]

(b) State the distance travelled during the first seven seconds.

Distance = _____ m [1]

(c) Use the graph to calculate the average speed of the cyclist over the entire journey.

You are advised to show your working out.

Average speed = _____ m/s [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 A lorry of mass 7500 kg travelling at a velocity 20 m/s decelerates to 0 m/s.

(i) Write down the formula for kinetic energy in the box.

[1]

(ii) Calculate the kinetic energy lost by the lorry as it brakes.

You are advised to show your working out.

Kinetic energy lost = _____ J [2]

(iii) State the work done by the brakes of the lorry.

Work done = _____ J [1]

The lorry comes to rest in 20 s.

(iv) Calculate the power of the brakes.

You are advised to show your working out.

Power = _____ W [3]

(v) State the power of the brakes in kilowatts (kW).

Power = _____ kW [1]

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9 A star's energy is generated by the process of nuclear fusion.

Describe, in detail, what happens in nuclear fusion.

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

_____

_____

_____

_____

_____

_____

_____ [6]

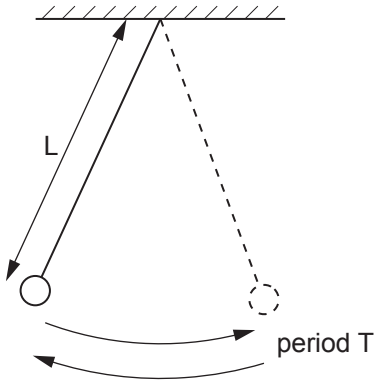
Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

10 The period of a pendulum is the time it takes to swing to the right and back again. Maureen thinks that the period T of a simple pendulum depends on the length L of the string according to the formula:

$$T^2 = k\,L$$



She obtains a set of results and these are shown below.

L in m	0.2	0.3	0.4	0.6	0.7
T in s	0.9	1.1	1.3	1.6	1.7
T^2 in s^2	0.8		1.7		2.9

(a) Complete the table by entering the other values of T^2, rounded to one decimal place. [2]

(b) Choose a suitable scale and plot a graph of T^2 on the vertical axis against L on the horizontal axis. [4]

(c) **(i)** Draw the line of best fit. [2]

(ii) Does the graph support Maureen's theory?

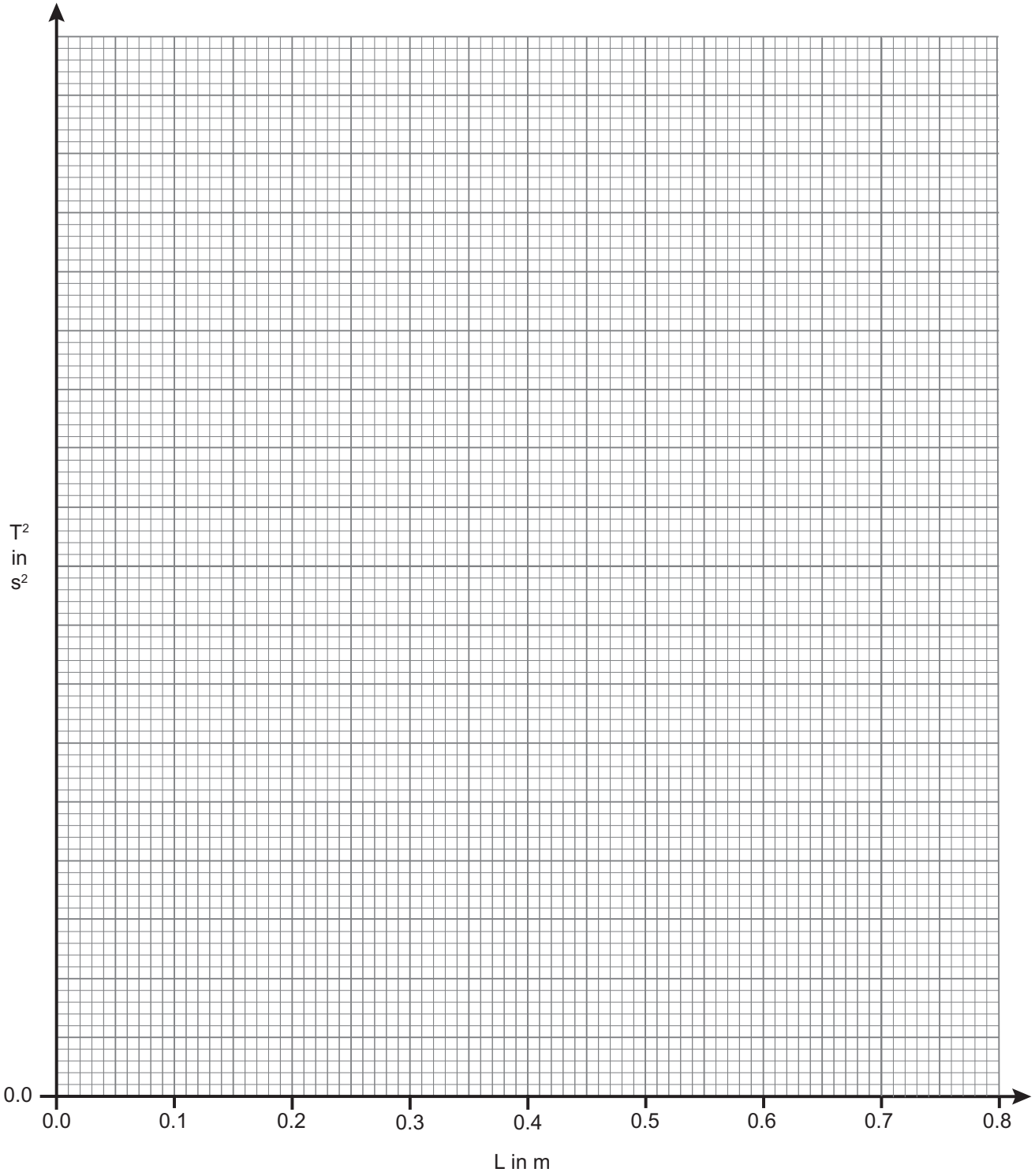
Explain your answer.

_____

_____

_____ [2]

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.30 am

MARK SCHEME

STEMUP.CO.UK

					AVAILABLE MARKS
1	**(i)**	Kinetic [1], Electric(al) [1]		[2]	
	(ii)	Heat [1], Sound [1]		[2]	
	(iii)	Visual pollution/unreliable/noise pollution Dangers to birds/animals or destroys habitats [1]		[1]	
	(iv)	No pollution/saves fossil fuels/energy is free/renewable *any* 2 for 2 marks		[2]	7
2	**(i)**	5 [1]		[1]	
	(ii)	Efficiency $= \frac{\text{(Useful) Energy Output}}{\text{Input Energy}}$ [1] $= \frac{25}{100}$ [1] $=$ 0.25 or 25% [1]		[3]	4
3	**(a)**	Weight/(Force of) gravity [1]		[1]	
	(b)	Balanced forces/No resultant force [1]		[1]	
	(c)	**(i)** 8 (N) [1]		[1]	
		(ii) Accelerates/or moves faster [1] to the right [1]	Independent marking	[2]	5
4	**(a)**	**(i)** Electron, proton, neutron [1] each		[3]	
		(ii) 3 protons [1], 4 neutrons [1]		[2]	
	(b)	**(i)** Fast moving electrons [1]		[1]	
		(ii) Nucleus [1]		[1]	
		(iii) Alpha [1], Gamma [1]		[2]	
		(iv) Alpha [1]		[1]	10

					AVAILABLE MARKS
5	**(a)**	$a = \frac{v - u}{t}$ or $v = u + at$ [1]	[1]		
		$= \frac{15 - 0}{20}$ [1] if $\frac{0-15}{20}$ then loses subs mark & answer mark	[1]		
		$= 0.75\ (m/s^2)$ [1]	[1]		
	(b)	Velocity has direction/vel. is a vector Speed has no direction/speed is a scalar [1]	[1]		
	(c)	Rates of change/same units [1] Both have distance and time.	[1]		5
6	**(a)**	**(i)** Mass is amount of material [1]	[1]		
		(ii) Weight is force (due to gravity) [1]	[1]		
	(b)	**(i)** 24.6 (cm^3) [1]	[1]		
		(ii) 28.6 [1] allow e.c.f. from (i). 4.0 (cm^3) [1]	[2]		
		(iii) Density = Mass/Volume [1] $= \frac{42}{4}$ [1] allow e.c.f. from (b)(ii) $= 10.5\ (g/cm^3)$ [1]	[3]		
		(iv) Silver [1] allow e.c.f. from (b)(iii)	[1]		9
7	**(a)**	**(i)** At rest [1]	[1]		
		(ii) Bigger or steeper gradient [1]	[1]		
	(b)	Distance = 8 (m)	[1]		
	(c)	Average Speed = Gradient [1] $= \frac{18}{12}$ [1] $= 1.5$ (m/s) [1]	[3]		6

	AVAILABLE MARKS

8 **(i)** KE $= \frac{1}{2}mv^2$ [1] Full formula required [1]

(ii) $= \frac{1}{2} \times 7500 \times 20^2$ [1]
$= 1500000$ (J) [1] [2]

(iii) Work = 1500000 (J) [1] allow e.c.f. from (ii) [1]

(iv) Power = Work done/time [1]
= 1500000/20 [1]
= 75000 (W) [1] [3]
Allow e.c.f. from (ii) or (iii)

(v) 75(kW) allow e.c.f. from (iv) [1] [1]

8

9
- Two (light) nuclei [1]
- Join together [1] or combine or fuse
- To form a different nucleus [1] or a heavier nucleus or new nucleus
- Energy is released [1]
- Decrease in mass [1]
- High temperature [1]

Response	**Mark**
Candidates must use appropriate specialist scientific terms throughout to describe fully and in a logical sequence the process of fusion in a nuclear reactor using **5 or 6** the 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 scientific terms to partially describe, in a logical sequence, **3 or 4** points relating to nuclear fusion shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of satisfactory standard.	**[3-4]**
Candidates use limited specialist scientific terms to describe **1 or 2** of the points relating to fusion 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

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			AVAILABLE MARKS
10	**(a)**	1.2, 2.6 2 correct = [2], 1 correct = [1]	[2]	
	(b)	Scale > half of axis [1] Deduct [1] for each incorrect point within ± 1 square } if non linear scale then 0/4	[4]	
	(c)	**(i)** Straight line [1], including origin [1] dependent marking ± 1 square	[2]	
		(ii) Yes [1] Straight line thro' origin [1] allow e.c.f. from (c) (i)	[2]	10
			Total	**70**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

MONDAY 14 NOVEMBER 2011
1.30 pm–2.30 pm

GSD31

TIME

1 hour.

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 requiring extended answers**.

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

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Examiner Only	
Marks	Remark

1 Maureen uses her mobile phone.



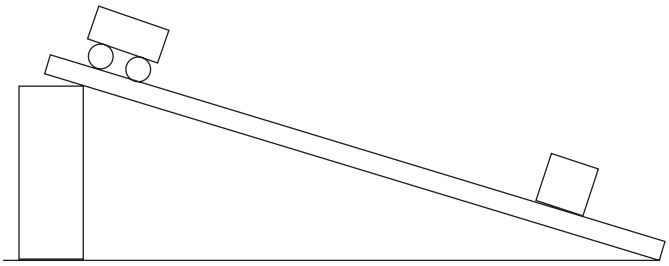
(a) (i) Where is the energy stored in the mobile phone?

Answer _____ [1]

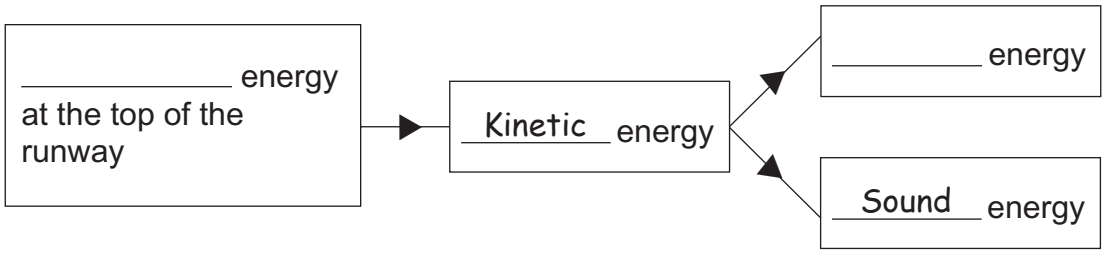
(ii) Name **two** useful forms of energy the mobile phone produces when it is in use.

_____ energy and _____ energy. [2]

A trolley is held at rest and then allowed to run down a runway. It hits a block of wood at the bottom and stops.



(b) Complete the energy transfer diagram below to show the energy changes that take place when the trolley is released.



[2]

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Examiner Only	
Marks	Remark

2 Joan wants to find the average speed of her friend Siobhan as she cycles past.



(i) What two measurements would Joan have to make to allow her to calculate Siobhan's average speed? In each case give the name of the measuring instrument Joan would use.

1. _____ measured with _____

2. _____ measured with _____ [4]

(ii) In the box below, give the equation, **in words**, that Joan would use to carry out the calculation to find the average speed.

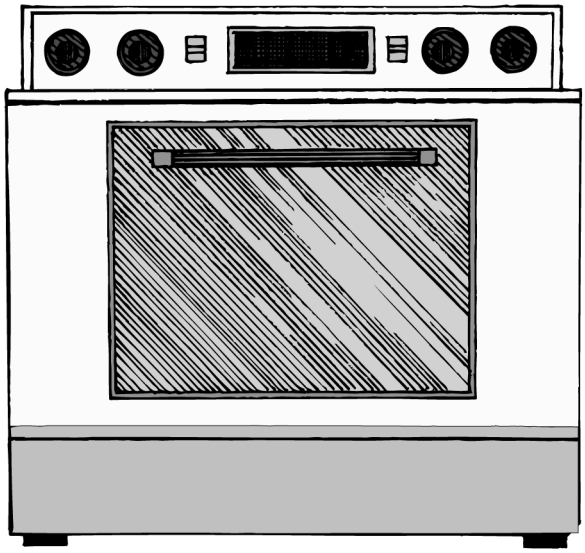
[1]

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Examiner Only	
Marks	Remark

3 An electric oven produces 2000 J of heat energy every second.

However 400 J of heat energy are lost every second.



(a) (i) Calculate the efficiency of the oven.

You are advised to show your working out.

Efficiency = _____ [3]

(ii) What unit, if any, is efficiency measured in? Choose from:

joule, newton, no unit, watt.

Answer _____ [1]

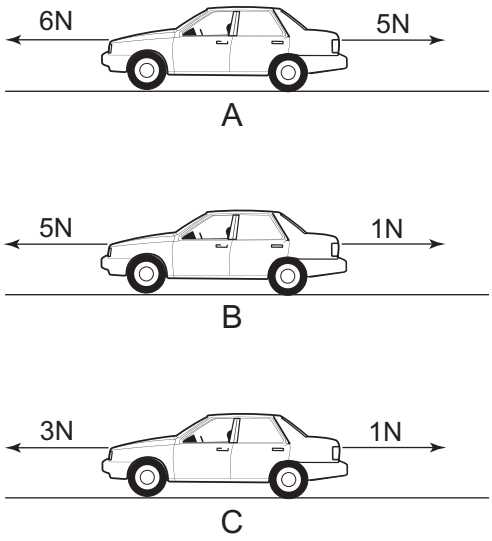
(b) In what practical way could the manufacturer make the oven more efficient?

_____ [1]

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Examiner Only	
Marks	Remark

4 Three toy cars are shown and each one has the same mass.



(a) (i) Which car, A, B or C, will have the greatest acceleration?

Car _____ [1]

(ii) Give a reason for your answer.

_____ [1]

(b) Car C has a mass of 0.5 kg. Use the equation:

$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

to find the acceleration of car C.

Remember to include the correct unit.

You are advised to show your working out.

Acceleration = _____ [3]

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Examiner Only	
Marks	Remark

5 When an object moves in a circle then a force, called a centripetal force, must act towards the centre of the circle. Give the name of the force which provides the centripetal force in the two examples below.

(a) (i) a car moving round a circular track

Force = _____ [1]

(ii) a ball moves in a circle at the end of a string

Force = _____ [1]

A ball of mass 0.5 kg moves in a circle at the end of a string, as shown below.



(b) At a particular instant its velocity is 3 m/s. Calculate the ball's momentum at this instant.

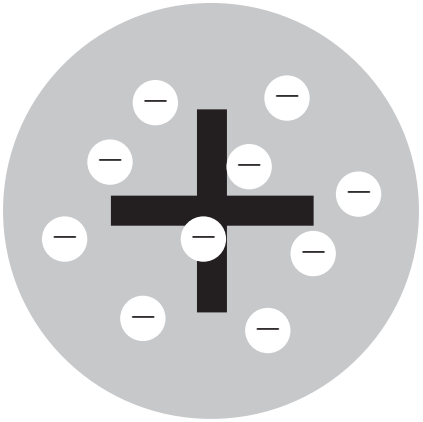
You are advised to show your working out.

Momentum = _____ kgm/s [3]

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Examiner Only	
Marks	Remark

6 In 1904 a scientist called J.J. Thomson put forward a model about the structure of the atom as shown in the diagram below.



(a) (i) What is the name of this model of the atom?

_____ [1]

Later this model was replaced by a better model. This model is named after two of the scientists who proposed it.

(ii) Give the name of **one** of the scientists.

_____ [1]

(b) Information about the model in **(ii)** above can be given in a table. Complete the table below.

Particle	Location	Charge
proton		positive
	nucleus	neutral
electron	in orbit	

[3]

Examiner Only	
Marks	Remark

7 Mass and weight are two different quantities with different units.

(a) What is the weight of 400 g?

You are advised to show your working out.

Weight = _____ N [3]

Jim wants to find the density of steel. He has 100 steel nails and he finds that their volume is 20 cm^3.

(b) **(i)** Describe a method that Jim could have used to find the volume of the nails.

_____

_____

_____

_____

_____ [3]

(ii) The total mass of the nails is 150 g and their volume is 20 cm^3. Calculate the density of steel. Remember to include the units.

You are advised to show your working out.

Density = _____ [4]

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Examiner Only	
Marks	Remark

8 Nuclear fission reactors make use of a fuel called uranium. Uranium may be written in the following way:

$$^{235}_{92}U$$

(a) (i) What is the number 92 called?

_____ [1]

(ii) What information about the uranium nucleus is given by the number 92?

_____ [1]

(iii) What is the number 235 called?

_____ [1]

(iv) What information about the uranium nucleus is given by the number 235?

_____ [1]

(b) Some scientists believe that we should make greater use of nuclear fission.

Describe what happens in the fission of $^{235}_{92}U$ in a nuclear reactor.

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

_____

_____

_____

_____

_____

_____

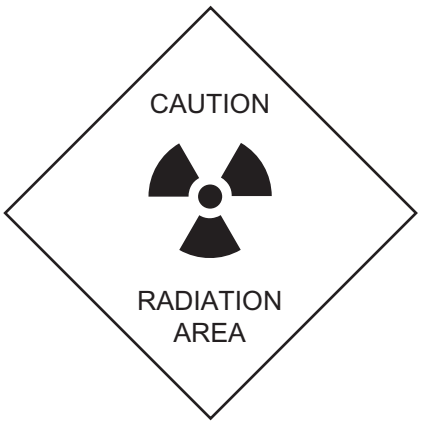
_____

_____ [6]

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Examiner Only	
Marks	Remark

9 Certain substances such as uranium are said to be radioactive.



(a) (i) What does the word "radioactive" mean?

_____

_____ [2]

In the study of radioactivity we learn of three different types of radiation.

(ii) Identify these radiations from the information given below.

This type of radiation is an electromagnetic wave.

Type of radiation _____ [1]

This type of radiation is a particle made up from four smaller particles.

Type of radiation _____ [1]

This type of radiation is a single particle.

Type of radiation _____ [1]

We are all exposed to a certain minimum amount of radiation called "background radiation".

(b) Give two sources of background radiation.

1. _____

2. _____ [2]

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People who work in nuclear power stations must take certain precautions to minimise the amount of radiation they receive.

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Marks	Remark

(c) (i) Why must they keep the radiation they receive to a minimum?

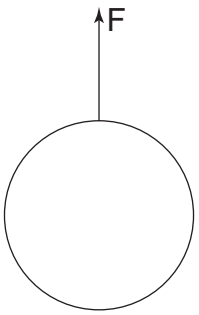
_____ [1]

(ii) Give two methods that they can use to keep the radiation to a minimum.

1. _____

2. _____ [2]

10 When an object falls through the air a drag force, F, acts on the object.



The size of the drag force, F, depends on the speed, v, of the falling object.

A scientist suggests a theory that the drag force is proportional to the square of the velocity. Another way of writing this relationship is:

$$F = kv^2 \qquad \textbf{Equation 10.1}$$

where k is a constant.

He obtains a set of results and these are shown.

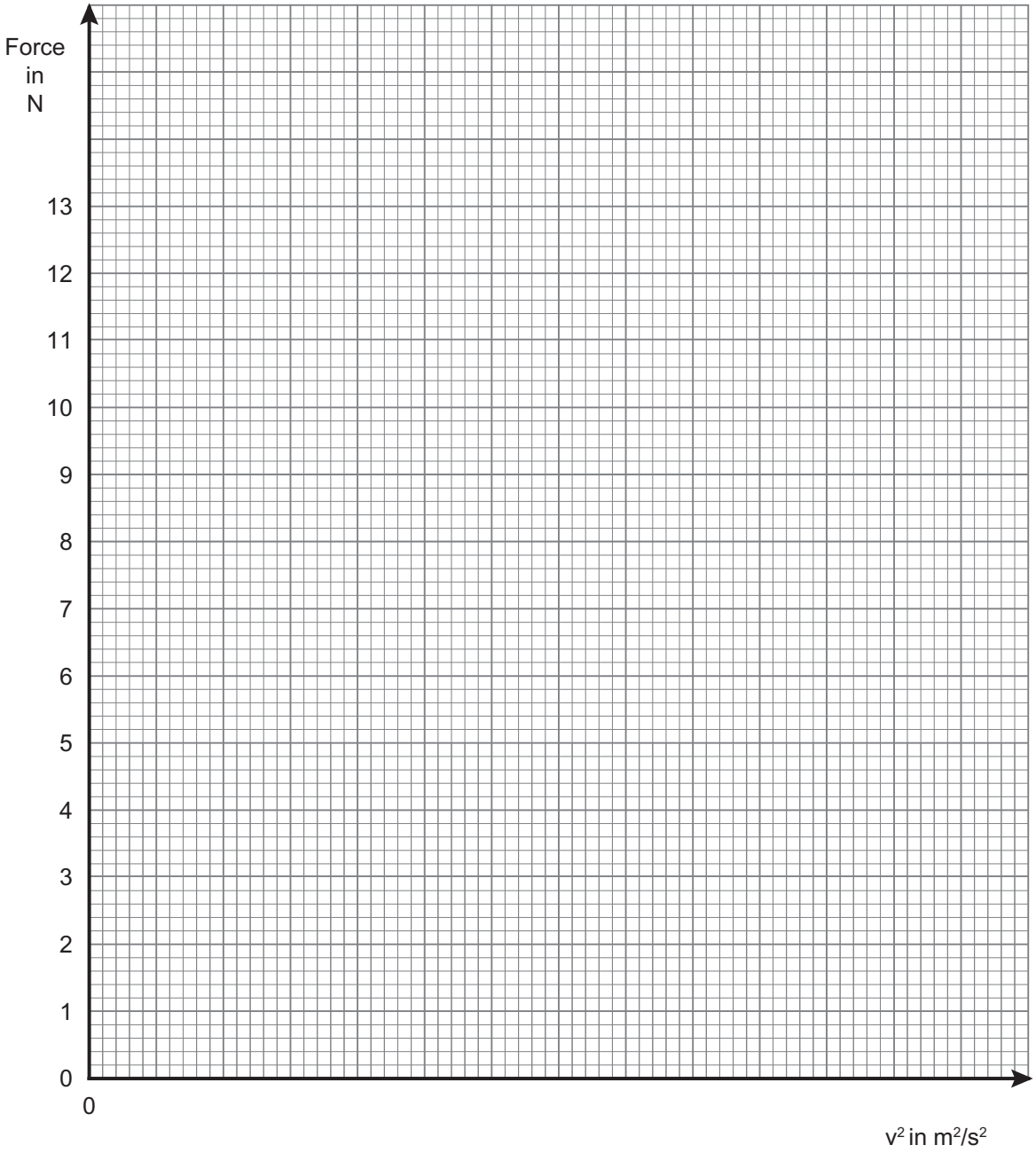
F in N	0.5	2.0	4.5	8.0	12.5
v in m/s	1	2	3	4	5
v^2 in m^2/s^2			9		

(i) Complete the table by entering the values of v^2. One has been done for you. [2]

(ii) Choose a suitable scale for the horizontal axis and plot a graph of F against v^2. [3]

Examiner Only

Marks	Remark



Examiner Only	
Marks	Remark

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

(iv) Does your graph support the theory described by **Equation 10.1**? Explain your answer.

_____

_____ [3]

(v) How would you find the value of k from the graph?

_____ [1]

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

MONDAY 14 NOVEMBER 2011
1.30 pm–2.30 pm

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Battery/cell	[1]	
		(ii)	Any **two** from: Sound, light, microwaves	[2]	
	(b)		Potential [1] – heat [1] or or gravitational thermal	[2]	5
2	**(i)**		distance – e.g. tape measure/trundle wheel time – stopwatch [1 each]	must have measurements to get instrument mark [4]	
	(ii)		av speed = distance/time	[1]	5
3	**(a)**	**(i)**	Efficiency = (useful) energy out/energy in [1] = 1600/2000 [1] = 0.80 [1] or 80%	[3]	
		(ii)	No unit	[1]	
	(b)		Better insulation/smaller door	[1]	5
4	**(a)**	**(i)**	Car B	[1]	
		(ii)	Biggest resultant or unbalanced force *dependent marking*	[1]	
	(b)		(a =) 2/0.5 [1] = 4 [1] m/s^2 [1]	[3]	5
5	**(a)**	**(i)**	Friction	[1]	
		(ii)	Tension	[1]	
	(b)		momentum = mass × vel [1] = 0.5 × 3 [1] = 1.5 (kgm/s) [1]	[3]	5

AVAILABLE MARKS

6 **(a)** **(i)** Plum pudding [1]

(ii) Rutherford/Bohr [1]

(b)

Particle	Where found	Charge
proton	***nucleus***	positive
neutron	nucleus	neutral
electron	in orbit	***negative***

[1] each [3] 5

7 **(a)** W = mg [1] 0.4 × 10 [1]
= 4 [1] (N) [3]

(b) **(i)** Add nails to measuring cylinder containing water [1]
Note initial and final readings [1]
Difference (gives volume) [1] [3]

(ii) density = mass/volume (or symbols) [1]
= 150/20 [1]
= 7.5 [1]
g/cm^3 [1] [4] 10

8 **(a)** **(i)** Atomic number [1] [1]

(ii) No. of protons [1] [1]

(iii) Mass number [1] [1]

(iv) No. of protons + neutrons OR number of particles (in the nucleus) [1] [1]

(b) **Indicative Content**
- Absorbs neutron or neutron strikes (U^{235} nucleus)
- Splits nucleus
- (2 or 3) (fission) neutrons produced
- (Possible) chain reaction
- Energy Released

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Response	Mark
Candidates must use appropriate specialist scientific terms throughout to describe fully and in a logical sequence the process of fission in a nuclear reactor using **all** the 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 scientific terms to partially describe, in a logical sequence, **3 or 4** points relating to nuclear fission shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of satisfactory standard.	**3–4**
Candidates use limited specialist scientific terms to describe **1 or 2** of the points relating to fission shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of limited standard.	**1–2**
Response not worthy of credit.	**0**

AVAILABLE MARKS

10

9 **(a)** **(i)** Unstable nuclei or nuclei disintegrate [1] emit particles or radiation or gamma rays [1] [2]

(ii) gamma, alpha, beta [1] each [3]

(b) Any **two** from:
e.g., radon gas from earth's crust, from space/cosmic rays building materials, food (e.g. bananas) etc. [2]

(c) **(i)** e.g. avoid cancer, radiation sickness/burns [1]

(ii) Any **two** from:
keep exposure time to a minimum
work at a distance/use forceps or tools/robots
use shielding/special clothing [2]

10

10 **(i)** $\frac{1}{2}$ mark each round up [2]

(ii) v^2 scale must be 0.5 or more of axis. [1]
Plot points: 5 correct [2], 4 correct [1] [3]

(iii) Best fit line [1] [1]

(iv) Yes [1]
Graph is a straight line [1] passing thro' origin [1] [3]

(v) k is the grad [1] [1]

10

Total **70**

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