CCEA GCSE SCIENCE: SINGLE AWARD

SCIENCE



EXAM QUESTION PACK

UNIT 3 (PHYSICS) FOUNDATION TIER GSS31 PAPERS

STEMUP

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 3 (Physics)
Foundation Tier

GSS31

[GSS31]

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

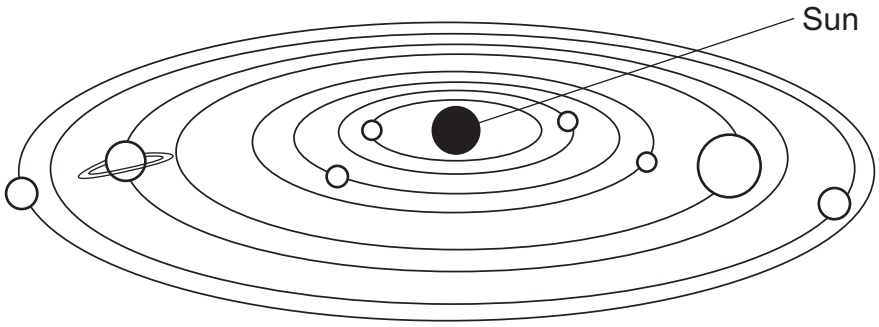
The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9(a)**.

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

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Examiner Only	
Marks	Remark

1 The diagram below shows the Sun and its eight planets.



Source: Principal Examiner

(a) What name is given to this model of the Solar System?

Circle the correct answer.

geocentric **heliocentric** **concentric**

[1]

(b) Complete the following sentences.

Choose from:

moon **galaxy** **star**

A huge collection of stars is called a _____.

An object that orbits a planet is called a _____.

[2]

(c) Place a tick (✓) beside the statement that best describes the movement of most galaxies.

They are moving closer to each other ☐

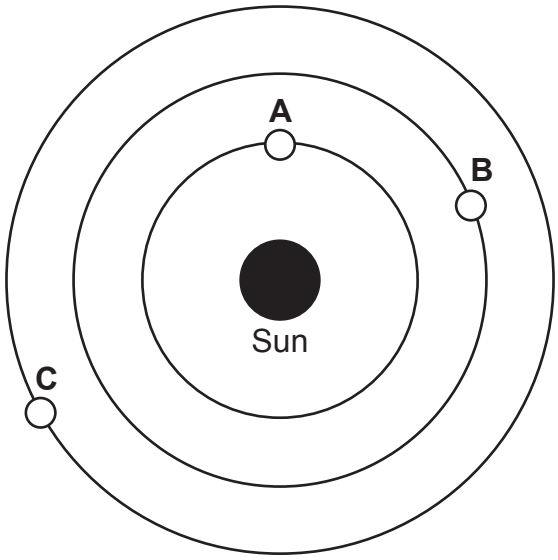
They are moving but staying the same distance apart ☐

They are moving away from each other ☐

[1]

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(d) The diagram below shows the first three planets in our Solar System.



Source: Principal Examiner

(i) Name the planet labelled **B**.

Answer _____ [1]

(ii) Which planet (**A**, **B** or **C**) will take the shortest time to orbit the Sun?

Answer _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** The information below gives some of the stages in the production of fossil fuels but they are not in the correct order.

A	buried by sediments
B	high pressure and heat
C	the remains of dead plants and animals

(i) Using the letters **A**, **B**, and **C** put the stages in the correct order.

_____ → _____ → _____ [1]

(ii) Complete the following sentence.

Choose from:

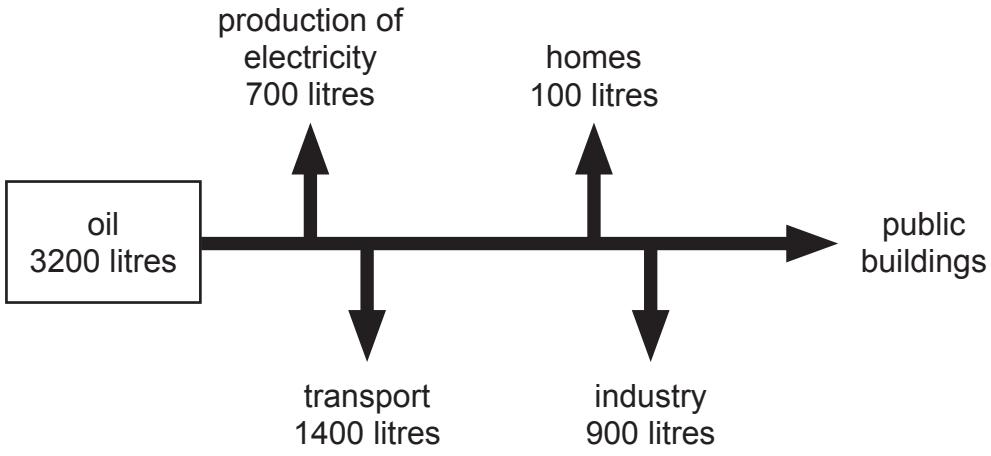
tens **hundreds** **millions**

It takes _____ of years to produce fossil fuels. [1]

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Examiner Only	
Marks	Remark

(b) The diagram below shows how a small town used 3200 litres of oil.

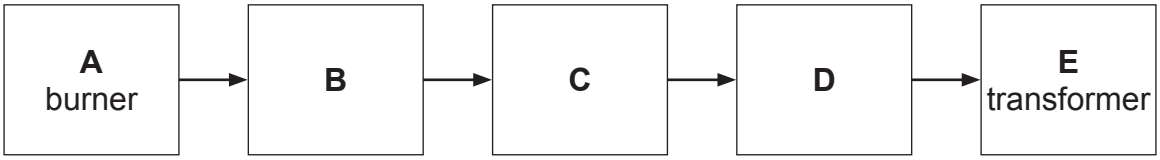


Calculate the number of litres of oil that were used in **public buildings**.

(Show your working out.)

Answer _____ litres [2]

(c) The flow chart below represents the parts found within an oil-burning power station.



Name parts **B**, **C** and **D** shown in the diagram.

Choose from:

generator **boiler** **turbine**

B _____

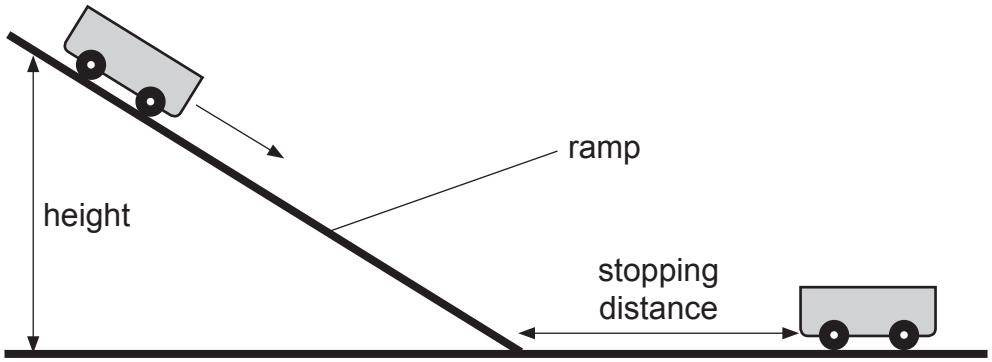
C _____

D _____ [2]

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Examiner Only	
Marks	Remark

3 **(a)** Adam investigated how height affects the stopping distance of a trolley using the apparatus shown below.



Source: Principal Examiner

He changed the height of the ramp and measured how far the trolley travelled from the end of the ramp.

(i) Give **one** thing Adam might have done to make the results more reliable.

Circle the correct answer.

used the same trolley

repeated and averaged the results

used the same ramp

[1]

(ii) Name the force which opposes the movement of the trolley.

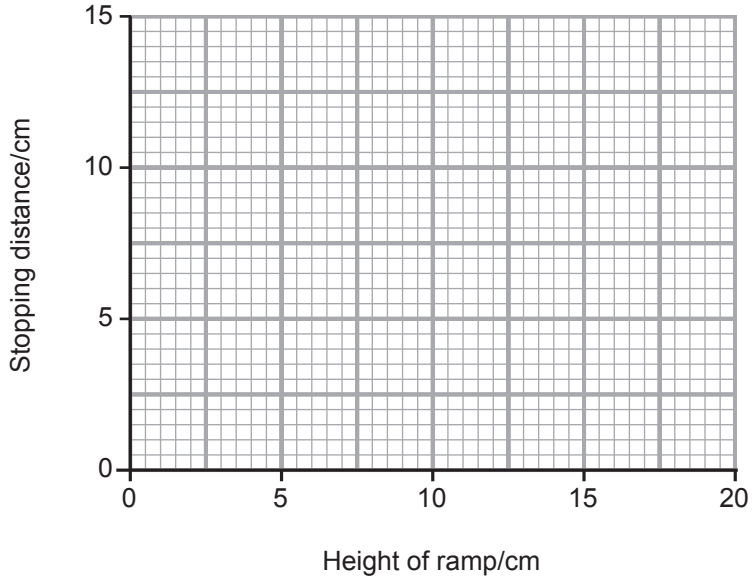
_____ [1]

(iii) Adam's results are shown in the table below.

Height of ramp/cm	Stopping distance/cm
5	0
10	5
15	10
20	15

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On the grid below draw a **line graph** of Adam's results.



[3]

(b) Adam set the height of the ramp at 20 cm to investigate if adding mass affects the stopping distance of the trolley.

His results are shown below.

Mass added to trolley/g	Stopping distance/cm
0	15
100	18
200	21
300	25
400	30

Complete the sentence below to give the trend shown by these results.

As the mass added to the trolley _____

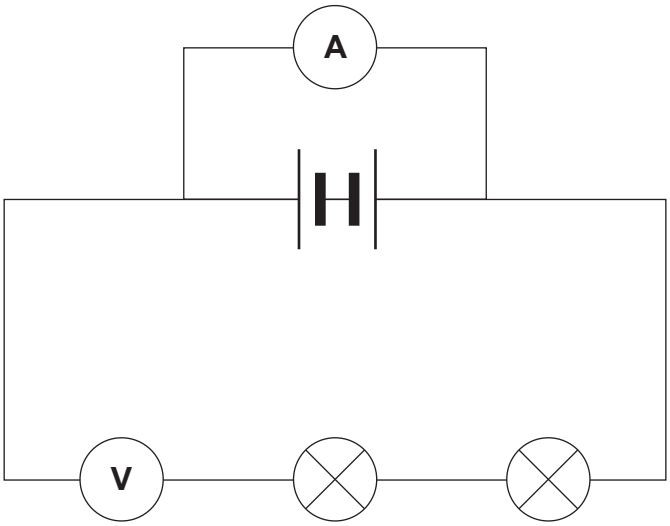
_____ [1]

Examiner Only

Marks	Remark

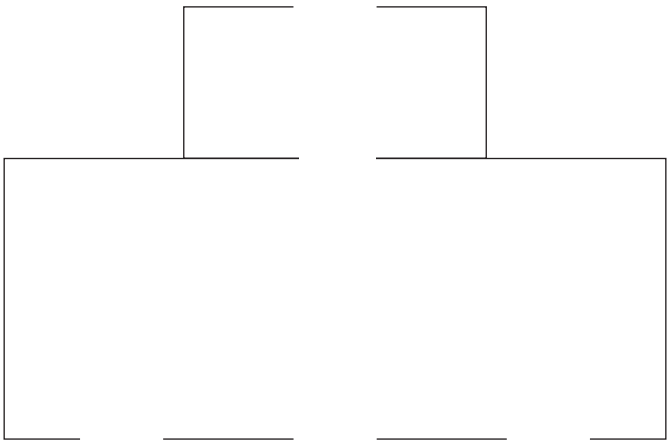
Examiner Only	
Marks	Remark

4 James set up the circuit below to measure the voltage produced by two cells (batteries) and the current through two bulbs. However it contains some mistakes.



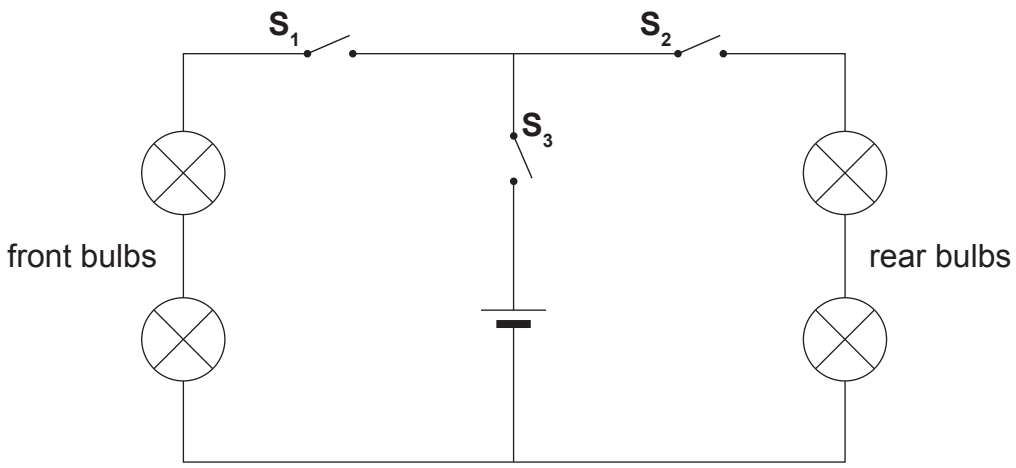
Source: Principal Examiner

(a) Using the same electrical symbols, complete the diagram below to show the correct circuit.



[2]

The circuit diagram below shows how the lights of a model car are controlled.



(b) Which switches (S_1, S_2 or S_3) should be closed:

1. to **only** turn on the front bulbs?

Answer _____ [1]

2. to turn on **all** the bulbs?

Answer _____ [1]

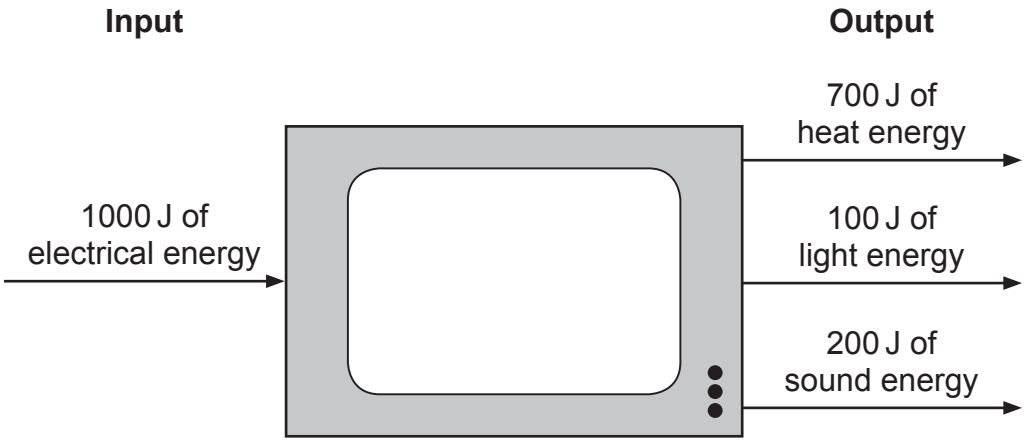
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 **(a)** The diagram below shows how 1000 J of energy is changed by a television.



Source: Principal Examiner

(i) Only some output energy coming from the television is wanted.
This is useful output energy.
Calculate the useful output energy.

Answer _____ J [1]

(ii) The efficiency of this television is low.
Suggest **one** reason why someone would want a more efficient television.

_____

_____ [1]

(b) Complete the following sentences.

The law of conservation of energy states that energy can

not be _____ or _____.

It can only be changed from one form to another. [1]

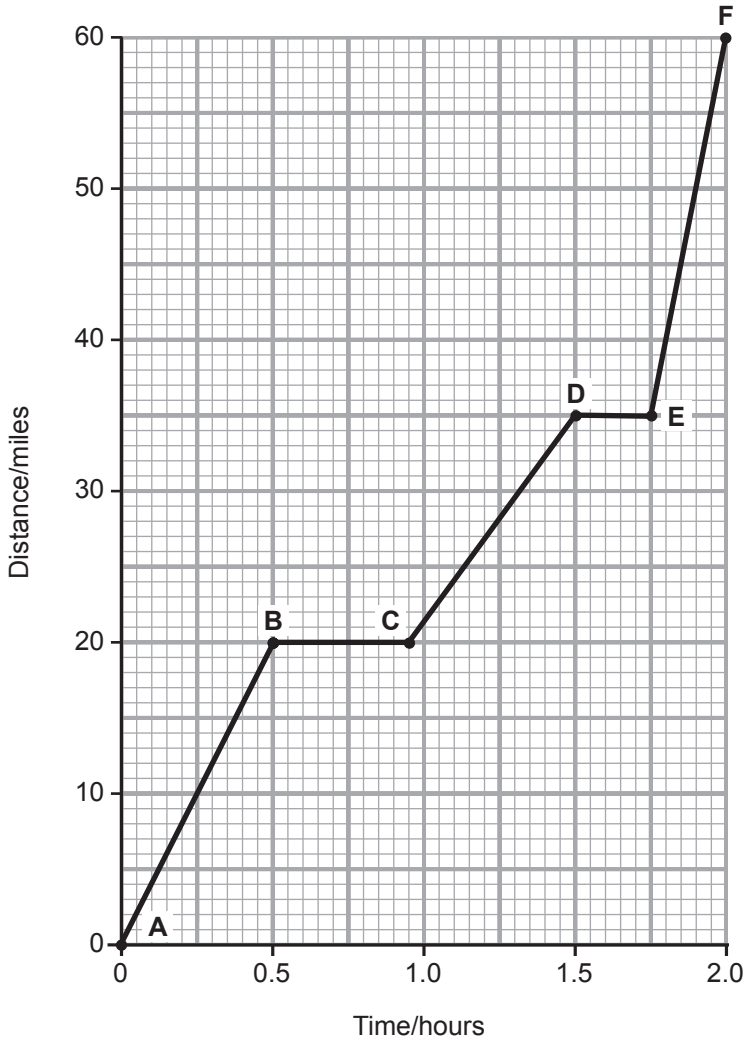
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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

6 **(a)** Shown below is a distance–time graph for a van.



(i) Describe the motion of the van from **D** to **E**.

Circle the correct answer.

stopped : **steady speed** : **slowing down**

[1]

(ii) Between which two points is this van travelling the fastest?

Choose from:

A–B **C–D** **E–F**

Answer _____ [1]

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(iii) Use the equation:

$$\textbf{average speed} = \frac{\textbf{distance}}{\textbf{time}}$$

to calculate the average speed of the van between **A** and **F**.

(Show your working out.)

Answer _____ mph [2]

The table below shows the results for a different journey by the van.

Time/hours	Distance/miles
0	0
0.5	15
1.0	30
1.5	45
2.0	60

(b) Over the two hours of this journey, is the average speed more than, less than, or the same as the previous journey from **A** to **F** on the graph opposite?

_____ [1]

Examiner Only

Marks	Remark

(c) The table below shows the thinking and braking distances at 20 mph and 50 mph for a car on different road conditions.

Speed/ mph	Road conditions	Thinking distance/ m	Braking distance/ m
20	dry	6	6
	snow	6	24
	ice	6	60
50	dry	15	38
	snow	15	152
	ice	15	395

(i) What effect, if any, does speed have on the thinking distance?

_____ [1]

(ii) What effect, if any, do road conditions have on the thinking distance?

_____ [1]

(iii) Calculate the stopping distance for a car travelling at 20 mph on a road covered with ice.

Answer _____ m [1]

Examiner Only

Marks	Remark

(d) The photograph below shows a crash test dummy after a collision.



© Jim West / Science Photo Library

State **two** features shown in the photograph which will reduce the risk to drivers in an accident.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The table below shows the lowest and highest frequencies that some sea animals can hear.

Sea animal	Lowest frequency/ Hz	Highest frequency/ Hz
Porpoise	75	150 000
Beluga whale	1000	123 000
Dolphin	40 000	100 000
Seal	300	56 000

(i) Many sea animals can hear ultrasound. What is meant by the term 'ultrasound'?

_____

_____

_____ [2]

(ii) Name the sea animal which can **only** hear ultrasound.

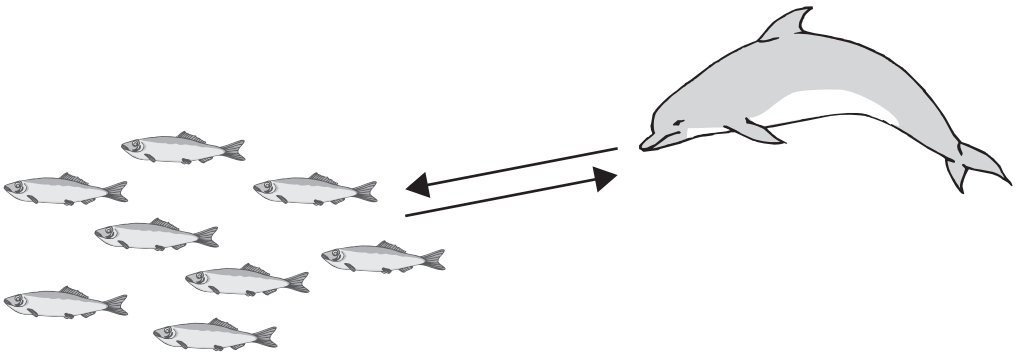
Answer _____ [1]

(iii) Name the sea animal which can hear the greatest range of frequencies.

Answer _____ [1]

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(b) The diagram below shows a dolphin using ultrasound to hunt fish.



Source: Principal Examiner

The dolphin sends out an ultrasound pulse and the echo returns 0.04 seconds later. Ultrasound travels at 1500 m/s in water.

Use the equation:

distance = speed × time

to calculate the distance between the dolphin and the fish.

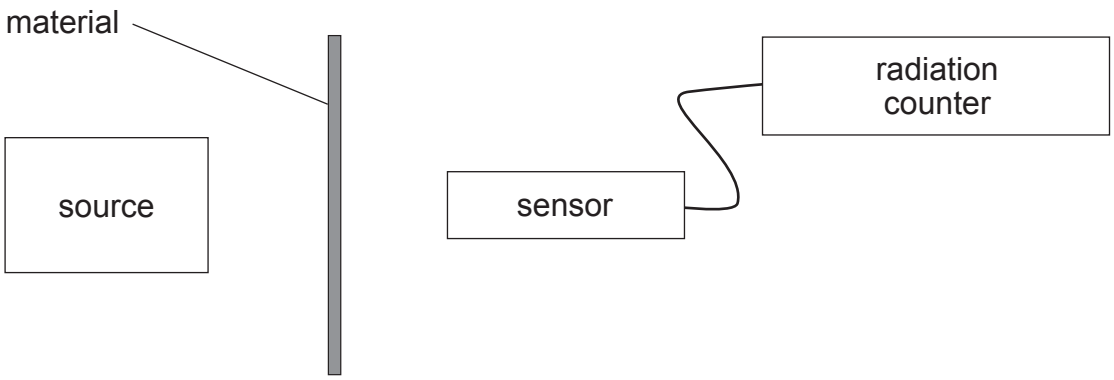
(Show your working out.)

Answer _____ m [3]

Examiner Only

Marks	Remark

8 The apparatus below was used to investigate the type(s) of radiation emitted from a source.



The table below shows the results obtained when different materials were used.

Material	Radiation/cpm
None	1000
1 mm paper	800
5 mm aluminium	800
30 mm lead	15

(a) Name the **two** types of radiation produced by this source.
Explain your answer.

_____

_____

_____

_____

_____

_____ [3]

Examiner Only

Marks	Remark

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(b) Radioactive tracers are used to examine organs inside the body. The tracer is put into the patient's body and followed by sensors outside the body.

The table below gives information about three isotopes of iodine that could be used as tracers.

Isotope	Radiation emitted	Half-life
Iodine-128	beta	25 minutes
Iodine-129	beta and gamma	25 000 000 years
Iodine-131	beta and gamma	8 days

(i) Explain fully what is meant by the term 'half-life'.

_____

_____

_____ [2]

(ii) Which isotope of iodine would be the best to use as a radioactive tracer? Explain your answer fully.

Isotope _____ [1]

Explanation _____

_____

_____

_____ [2]

(iii) Explain fully why some nuclei are radioactive.

_____

_____

_____

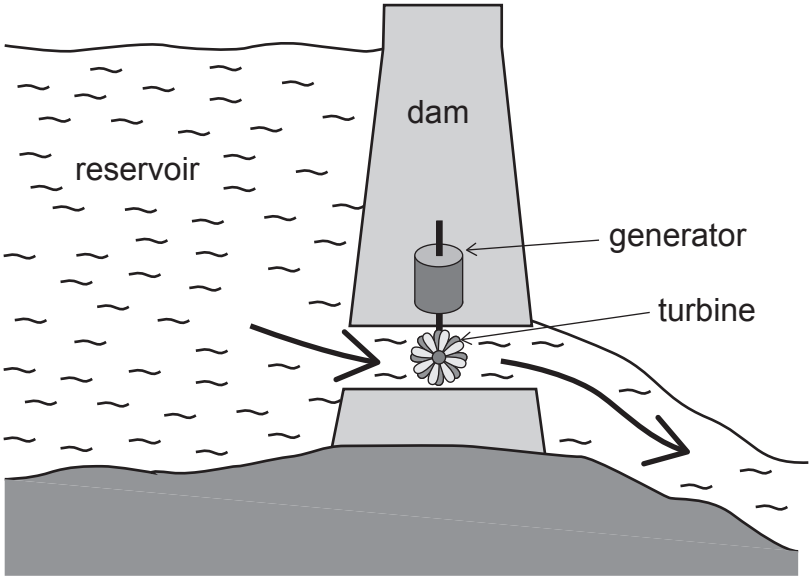
_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** The diagram below shows a hydroelectric power station.



Source: Principal Examiner

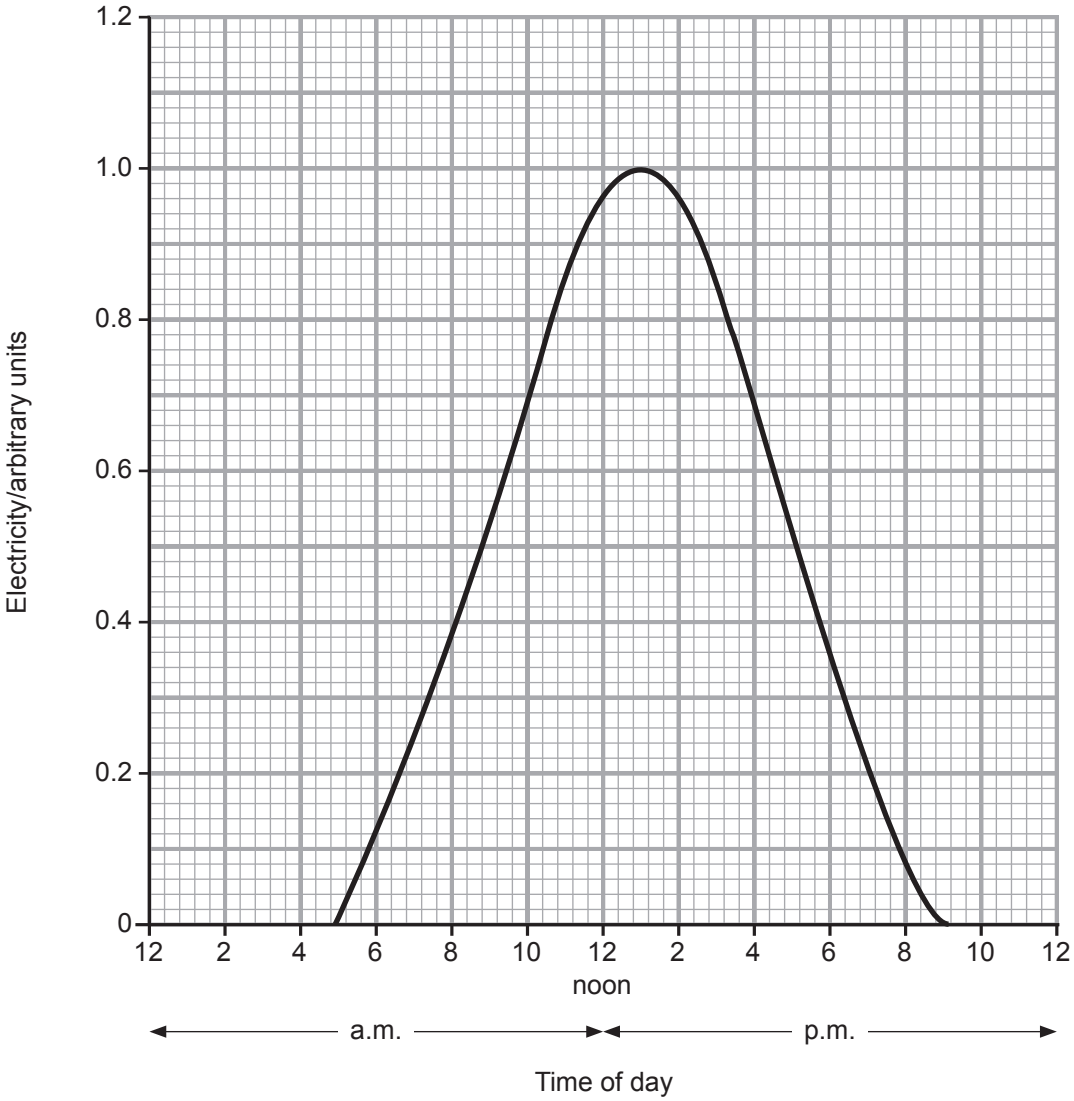
Explain how this power station produces electricity.

Your answer should include the **advantages** and **disadvantages** of using hydroelectric power compared to fossil fuels.

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

[6]

Solar cells can also be used to produce electricity. The graph below shows the amount of electricity produced by a solar cell over a 24 hour period in summer.



(b) On the same axes draw the curve you would expect for a 24 hour period in winter. [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only

Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

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)**	Heliocentric	[1]	
	(b)	Galaxy [1] moon [1]	[2]	
	(c)	They are moving away from each other	[1]	
	(d)	**(i)** Venus	[1]	
		(ii) A	[1]	6
2	**(a)**	**(i)** C A B	[1]	
		(ii) Millions	[1]	
	(b)	3200 – (700 + 100 + 900 + 1400) [1] 100 [1]	[2]	
	(c)	B = boiler C = turbine D = generator all 3 correct [2], any 1 correct [1]	[2]	6
3	**(a)**	**(i)** Repeated and averaged the results	[1]	
		(ii) Friction	[1]	
		(iii) 4 points correct [2] 3 points correct [1] correct line [1]	[3]	
	(b)	As the mass increases, the stopping distance increases	[1]	6
4	**(a)**	Voltmeter and ammeter correct [1] correct battery symbol [1]	[2]	
	(b)	1. S_1 and S_3 2. S_1, S_2 and S_3/all	[2]	4
5	**(a)**	**(i)** 300 J	[1]	
		(ii) Save electricity/cheaper to run	[1]	
	(b)	created : destroyed (any order)	[1]	3

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					AVAILABLE MARKS
6	**(a)**	**(i)**	Stopped	[1]	
		(ii)	E–F	[1]	
		(iii)	60 ÷ 2 [1] 30 mph [1]	[2]	
	(b)		It is the same speed	[1]	
	(c)	**(i)**	Increasing speed increases thinking distance	[1]	
		(ii)	Road conditions have no effect on thinking distance	[1]	
		(iii)	66	[1]	
	(d)		Air bags [1] seat belts [1]	[2]	10
7	**(a)**	**(i)**	A sound with a frequency [1] above 20 kHz [1]	[2]	
		(ii)	Dolphin	[1]	
		(iii)	Porpoise	[1]	
	(b)		1500 × 0.04 [1] 1500 × 0.02 [2] 30 m [3]	[3]	7
8	**(a)**		Alpha and gamma [1] Any **two** from: • paper reduces the count so alpha radiation is present • aluminium has no effect on the count so beta radiation is absent • lead reduces the count so gamma radiation is present [2]	[3]	
	(b)	**(i)**	The time it takes [1] for the radioactivity to fall by half [1]	[2]	
		(ii)	Iodine-131 [1] It produces gamma rays [1] short half-life less damage to body [1]	[3]	
		(iii)	The (combination of) protons and neutrons [1] is unstable [1]	[2]	10

AVAILABLE MARKS

9 (a) Indicative content

- water flows to turn the turbine
- coil of wire and magnet (in generator)
- relative movement
- water is a renewable resource/coal is non-renewable
- it produces no carbon dioxide/air pollution
- saves fossil fuels/fossil fuels last longer/cheaper to run
- expensive to build
- floods habitats/uses land where people live

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how the hydroelectric power station works (using **at least six** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, how the hydroelectric power station works (using **four or five** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how the hydroelectric power station works (using **one to three** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(b) Graph has a lower maximum [1]
Starts later than 5 am and finishes before 9 pm [1] [2]

8

Total **60**

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General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

WEDNESDAY 25 MAY 2016, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

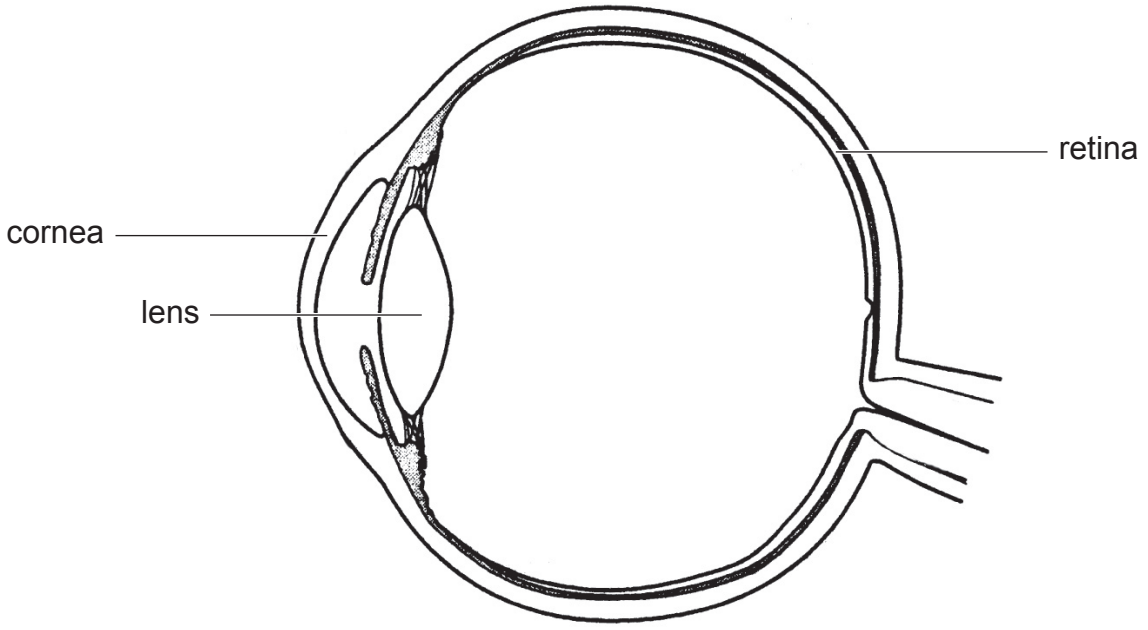
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all nine**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

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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 The diagram below shows the human eye.



Source: Principal Examiner

(a) Using lines, match the following parts of the eye with their main function.

Part	Function
cornea	controls the amount of light entering the eye
retina	image forms here
	bends light

[2]

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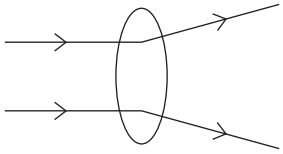
(b) Name the type of lens found in the human eye.

Circle the correct answer.

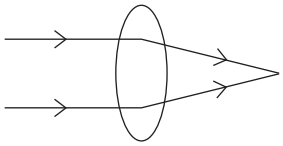
contact **convex** **concave**

[1]

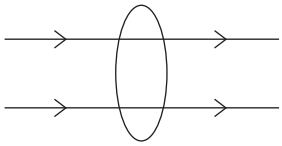
(c) Which diagram (**A**, **B** or **C**) below correctly shows what this lens does to light?



A



B



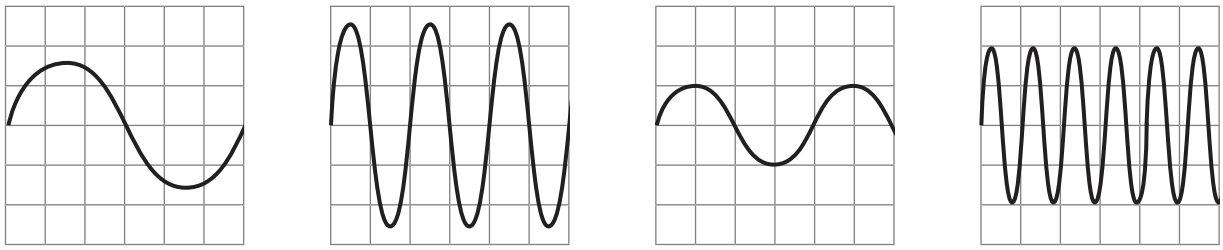
C

Answer _____ [1]

[Turn over

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2 **(a)** The diagrams (**A**, **B**, **C** and **D**) below represent sound waves recorded over the same length of time.



A **B** **C** **D**

Source: Principal Examiner

(i) Which sound wave has the shortest wavelength?

Answer _____ [1]

(ii) Which sound wave has the highest frequency?

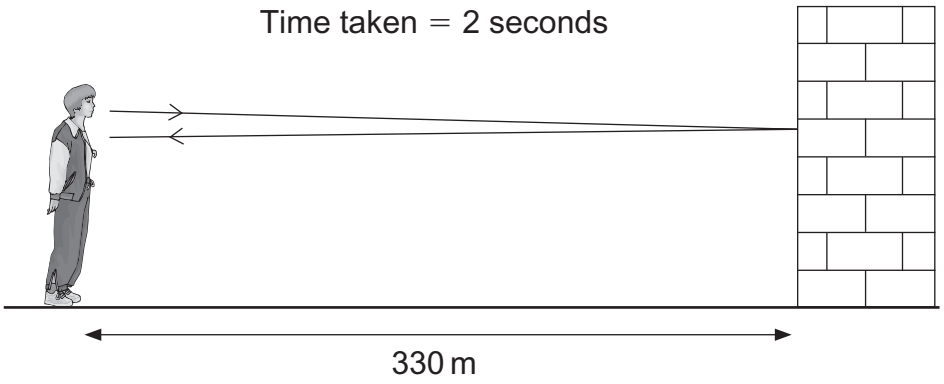
Answer _____ [1]

(iii) Which sound wave is the loudest?

Answer _____ [1]

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(b) Pupils investigated the speed of sound by making a loud noise and waiting for the sound to be reflected off a wall. They measured the time between making the noise and hearing its reflection as 2 seconds.



Source: Principal Examiner

(i) Use the equation:

$$\textbf{speed of sound} = \frac{\textbf{distance sound travels}}{\textbf{time}}$$

to calculate the speed of sound.

(Show your working out.)

Answer _____ m/s [2]

(ii) What name is given to a reflected sound?

_____ [1]

[Turn over

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3 **(a)** The table below shows some results from an investigation to find the most efficient energy source for a car.

		Output energy/J	
Energy source	**Input energy/J**	**Useful**	**Wasted**
petrol	500	150	350
gas	500		270
battery	500	350	150
diesel	500	290	

(i) Complete the table. [2]

(ii) Use information from the table to state **one** thing that was done to ensure a fair test.

_____ [1]

(iii) Which energy source is the most efficient?
Explain your answer.

_____

_____

_____ [2]

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(b) Complete the following sentences.

Choose from:

carried **changed** **destroyed** **transmitted** **created**

The conservation of energy states that energy cannot

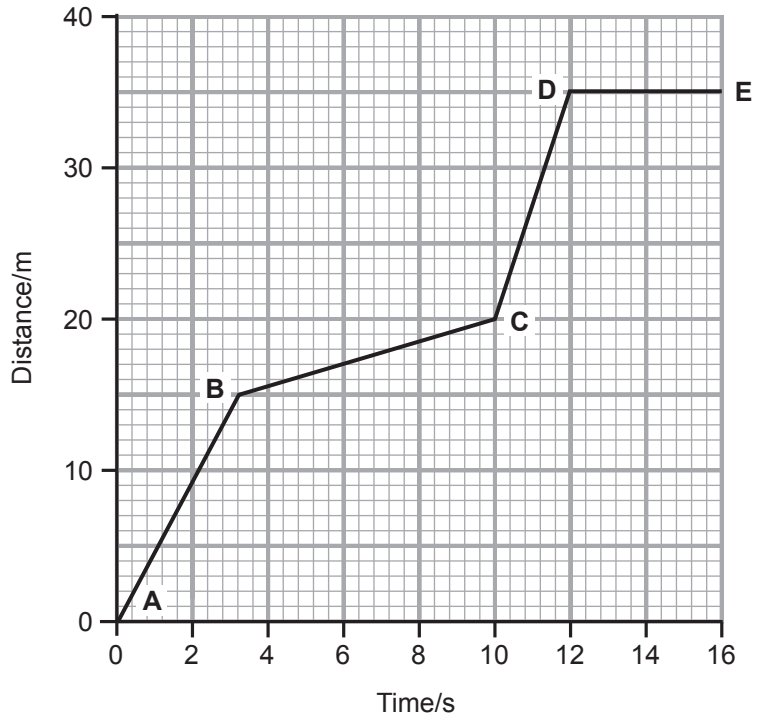
be _____ or _____.

It can only be _____ from one type to another. [2]

[Turn over

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4 **(a)** Shown below is a distance–time graph for a train.



Use the graph to answer the following questions.

(i) How long did the train take to travel the first 15 m?

Answer _____ s [1]

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(ii) Use the equation:

$$\textbf{average speed} = \frac{\textbf{distance}}{\textbf{time}}$$

to calculate the average speed of the train for the first 10 seconds.

(Show your working out.)

Answer _____ m/s [2]

(iii) Between which two positions is the train travelling the fastest?

Choose from:

A – B **B – C** **C – D** **D – E**

Answer _____ [1]

(iv) Describe the movement of the train, if any, between **D** and **E**.
Explain your answer.

_____

_____

_____ [2]

[Turn over

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(b) Police use fixed position and mobile (in police vans) cameras to detect speeding vehicles.

The table below shows the number of drivers caught by each method over a four year period in one region.

Year	Number of drivers caught speeding		
	using fixed position cameras	using mobile cameras	total
2010	78	44	122
2011	67	61	128
2012	50	95	145
2013	25	129	154

(i) State the trend shown in the table for **mobile** cameras.

_____

_____ [1]

(ii) Suggest **one** reason for the trend shown by the **fixed position** speed cameras.

_____

_____ [1]

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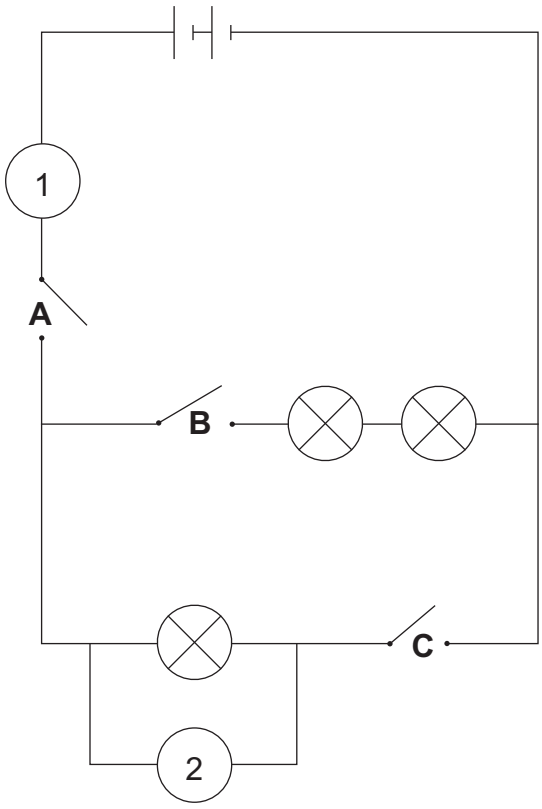
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(Questions continue overleaf)

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5 **(a)** The diagram below shows an electrical circuit diagram.



Use the diagram and your knowledge to answer the following questions.

(i) Which two switches must be closed to light only **one** bulb?

Answer _____ and _____ [1]

(ii) Meters **1** and **2** shown in the circuit can be used to calculate resistance.

Name meters **1** and **2**.

Meter **1** _____

Meter **2** _____ [2]

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(iii) What is the unit of resistance?

Choose from:

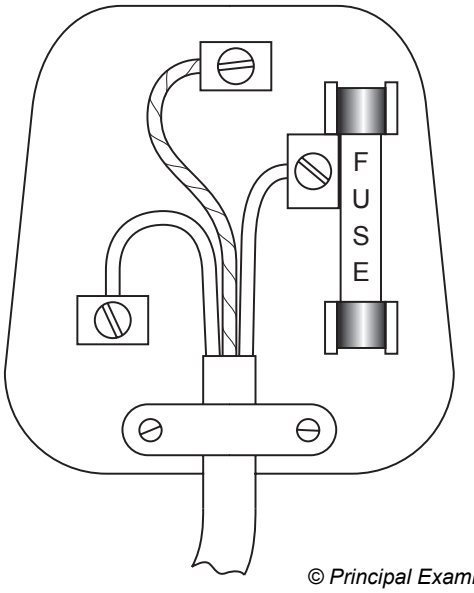
amp **watt** **ohm** **volt**

Answer _____ [1]

[Turn over

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(b) The 3-pin plug shown below contains a fuse of unknown size.



© Principal Examiner

(i) Apart from the fuse, name **one** other safety feature shown in this plug.

_____ [1]

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To find the fuse size, a range of currents were passed through the fuse and the observations made are shown in the table below.

Current/A	Description of fuse wire
2	grey and cold
4	red and warm
6	yellow, glowing and hot
8	grey, cold and melted (broken)

Use the information provided and your knowledge to answer the following questions.

(ii) Explain fully how a fuse works.

_____

_____

_____ [2]

(iii) What size of fuse has been used in this plug?

Circle the correct answer.

3A **5A** **7A** **9A**

[1]

[Turn over

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6 **(a)** The advert below was used to discourage drink driving.



© Crown Copyright. The THINK! Campaign is run by the Department for Transport. Contains public sector information licensed under the Open Government Licence v3.0.

(i) Suggest how drink driving could lead to a person losing his or her job.

_____

_____ [1]

(ii) Describe and explain how alcohol affects a driver's thinking distance.

_____

_____

_____ [2]

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(b) The table below shows how the braking distance and the thinking distance may be affected by the number of people in a car at different speeds.

Speed/ km/h	Braking distance/m		Thinking distance/m	
	car and driver only	car, driver and three passengers	car and driver only	car, driver and three passengers
30	5	7	6	6
45	12	14	8	8
60	21	23	11	11

(i) Explain what is meant by the term 'braking distance'.

_____

_____ [1]

(ii) In what way, if any, is braking distance affected by having passengers?

_____

_____ [1]

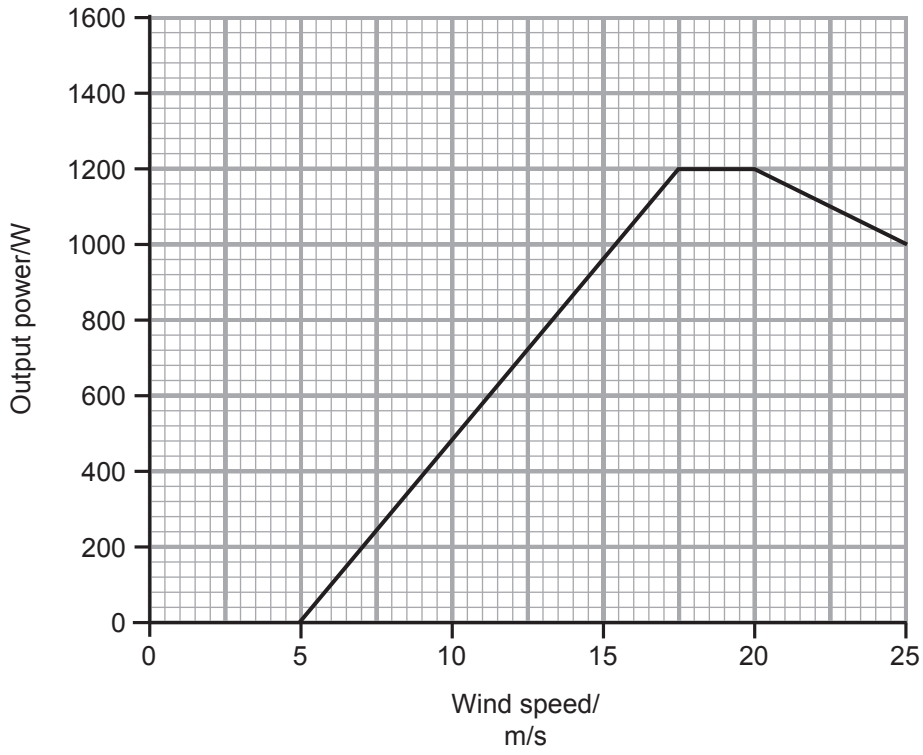
(iii) Calculate the **stopping** distance for a car with a driver and three passengers travelling at 30 km/h.

Answer _____ m [1]

[Turn over

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7 **(a)** The graph below shows the output power produced by a wind turbine at different wind speeds.



(i) Describe fully the trend shown by the graph.

_____

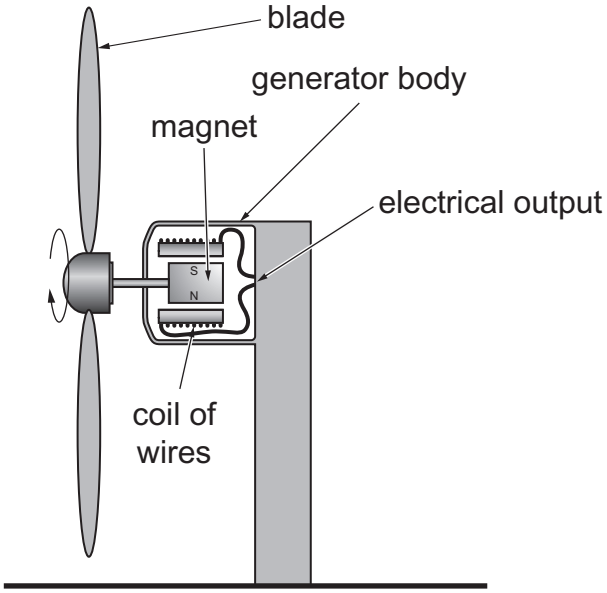
_____

_____

_____ [2]

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The diagram below shows a cross section through a wind turbine.



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(ii) Use the diagram and your knowledge to describe how electricity is produced by this turbine.

_____

_____

_____ [2]

(b) Give **one** environmental advantage and **one** environmental disadvantage of using wind turbines.

Advantage _____

_____

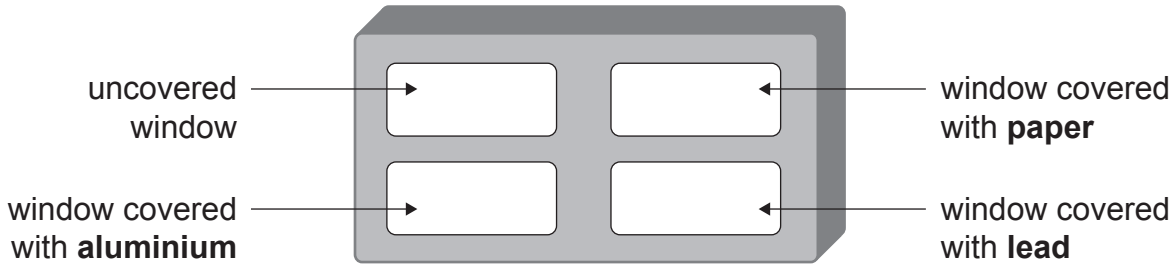
Disadvantage _____

_____ [2]

[Turn over

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8 **(a)** The diagram below shows a badge that is used to detect radiation.
The badge has four windows.



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Behind each window there is a film that is sensitive to radiation. This film changes colour from brown to white when exposed to radiation.

(i) Suggest the function of the uncovered window.

_____ [1]

(ii) How many windows will change from brown to white when exposed to **beta** radiation?

Answer _____ [1]

(b) Surgical equipment can be treated with radiation before it is used in hospital operations.
Suggest why this is necessary, naming the type of radiation used.

_____

_____

_____

_____

_____ [3]

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(c) The table below shows the results of an investigation into the activity of a radioactive isotope.

Day	Activity/cpm
1	100
2	73
3	50
4	37
5	25
6	18
7	15
8	15
9	15
10	15

Describe fully the trend shown by this information.

_____

_____

_____ [2]

[Turn over

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9 **(a)** Describe fully the present day model of the Solar System and explain how it differs from the earlier model.

Your answer should include:

- the name of each model
- **two** differences between these models
- the names and positions of **two** planets

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) Our Universe consists of millions of galaxies.

(i) What is a 'galaxy'?

_____

_____ [1]

(ii) Name the galaxy that includes planet Earth.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 25 MAY 2016, AFTERNOON

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

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

The Purpose of Mark Schemes

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

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

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

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

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

					AVAILABLE MARKS
1	**(a)**	Cornea ——————— bends light [1] retina ——————— image forms here [1]		[2]	
	(b)	Convex		[1]	
	(c)	B		[1]	4
2	**(a)**	**(i)**	D	[1]	
		(ii)	D	[1]	
		(iii)	B	[1]	
	(b)	**(i)**	660/2 [1] 330 m/s [1]	[2]	
		(ii)	Echo	[1]	6
3	**(a)**	**(i)**	230 [1] 210 [1]	[2]	
		(ii)	**Input** energy the same/500 J	[1]	
		(iii)	Battery [1] **most** useful energy/**least** wasted energy [1]	[2]	
	(b)	Created – destroyed (either order) [1] changed [1]		[2]	7
4	**(a)**	**(i)**	3.2 s	[1]	
		(ii)	20/10 [1] 2 [1]	[2]	
		(iii)	C – D	[1]	
		(iv)	Stopped [1] no change to distance [1]	[2]	
	(b)	**(i)**	More drivers are caught (speeding) over time	[1]	
		(ii)	Drivers more aware of where these cameras are	[1]	8

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					AVAILABLE MARKS
5	**(a)**	**(i)**	A and C	[1]	
		(ii)	Meter 1 – ammeter [1] Meter 2 – voltmeter [1]	[2]	
		(iii)	Ohm	[1]	
	(b)	**(i)**	Earth wire/**cable** grip/insulated wires	[1]	
		(ii)	The more current the hotter the fuse [1] **wire** melts (when too hot) [1]	[2]	
		(iii)	7 A	[1]	8
6	**(a)**	**(i)**	Works as a driver	[1]	
		(ii)	Increases [1] alcohol slows brain/reaction time increases [1]	[2]	
	(b)	**(i)**	The **distance** covered from **when** brakes are first applied until the vehicle **stops**	[1]	
		(ii)	Increases	[1]	
		(iii)	13 m	[1]	6
7	**(a)**	**(i)**	Any **two** from: • no output until **5 m/s** • increased output as wind increases from 5 or up to 17.5 m/s/ 1200 W • levels off at **1200** between wind speeds of **17.5** or **20 m/s** • drops after 20 m/s	[2]	
		(ii)	The blade moves the magnet [1] inside the coil of wires [1]	[2]	
	(b)		Advantage – less fossil fuels used/less global warming [1] Disadvantage – unsightly/noise/uses land [1]	[2]	6
8	**(a)**	**(i)**	For comparison/show (background) radiation	[1]	
		(ii)	Two	[1]	
	(b)		Gamma radiation [1] as could infect patients [1] kill microbes/sterilise [1]	[3]	
	(c)		Activity falls with time [1] and then stays the same after day 7/15 cpm	[2]	7

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9 (a) Indicative content

- current model is heliocentric
- Sun in the centre
- planets orbit the Sun
- name and position of planet – any
- name and position of planet – any other
- geocentric is the previous model/old model
- Earth in centre in geocentric model/old model
- geocentric model had fewer planets/different order

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully the Solar System using **seven or eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe the Solar System using **four to six** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the Solar System using **one to three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(b) (i) A (huge) collection of stars/solar system**s** [1]

(ii) Milky Way [1]

8

Total **60**

AVAILABLE MARKS

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)
Foundation Tier

GSS31

[GSS31]

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 nine** questions.

INFORMATION FOR CANDIDATES

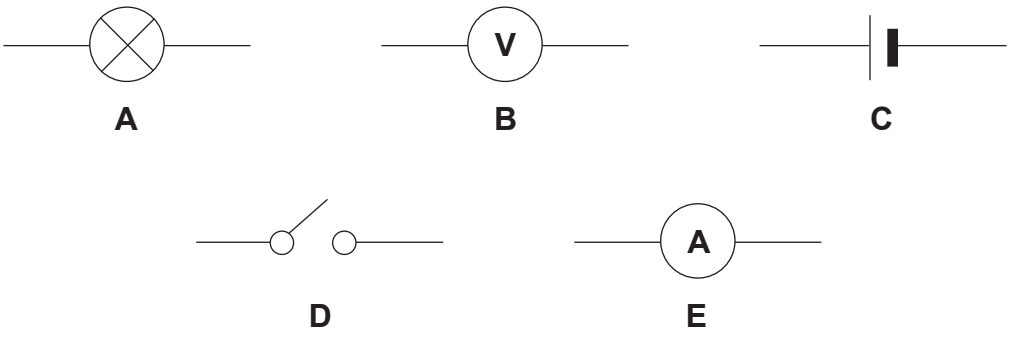
The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **8**.

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

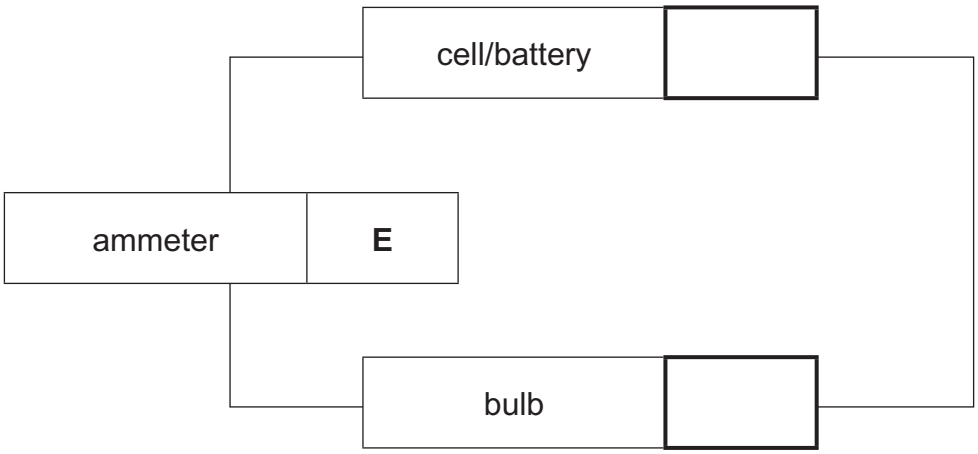
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Examiner Only	
Marks	Remark

1 **(a)** Below are symbols used in electrical circuit diagrams.

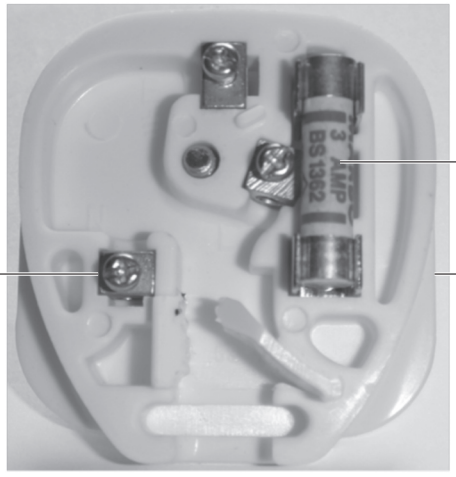


Use the letters (**A**, **B**, **C**, **D** or **E**) to give the symbols which should be used in the following circuit. Write the correct letter in each of the boxes provided.
One has been done for you.



[2]

(b) The photograph below shows the inside of a 3-pin plug.



Source: Principal Examiner

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(i) Name the wire which should be attached to terminal **A**.

Choose from:

earth **live** **neutral**

Answer _____ [1]

(ii) Explain fully why the casing of the 3-pin plug is made of plastic.

_____

_____

_____ [2]

(iii) Which of the following statements (**1**, **2** or **3**) about fuses is true?

1 A fuse melts if the current becomes too low
2 A fuse should be connected to the earth wire
3 A fuse melts if the current becomes too high

Answer _____ [1]

(iv) A refrigerator uses 2 A and is connected to a 230 V mains supply.

Use the equation:

power = voltage × current

to calculate the power used by the refrigerator.

(Show your working out.)

Answer _____ W [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 **(a)** The table below gives information about the four planets nearest the Sun. These planets are **not** in the correct order.

Planet	Average distance from the Sun/million km
A	228
B	108
C	58
D	150

(i) Which planet (**A**, **B**, **C** or **D**) is nearest to the Sun?

Answer _____ [1]

(ii) Name the planet labelled **B**.

Answer _____ [1]

(iii) Which planet (**A**, **B**, **C** or **D**) would you expect to be the coldest?

Answer _____ [1]

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Examiner Only	
Marks	Remark

(b) Our Solar System consists of many different objects. Put the following objects in order of size, starting with the smallest.

Earth **asteroid** **Sun** **Moon**

smallest

largest

[2]

(c) Complete the sentence below.

Choose from:

fission **fusion** **hydrogen** **nitrogen** **helium**

Our Sun is a star which produces energy in a process called

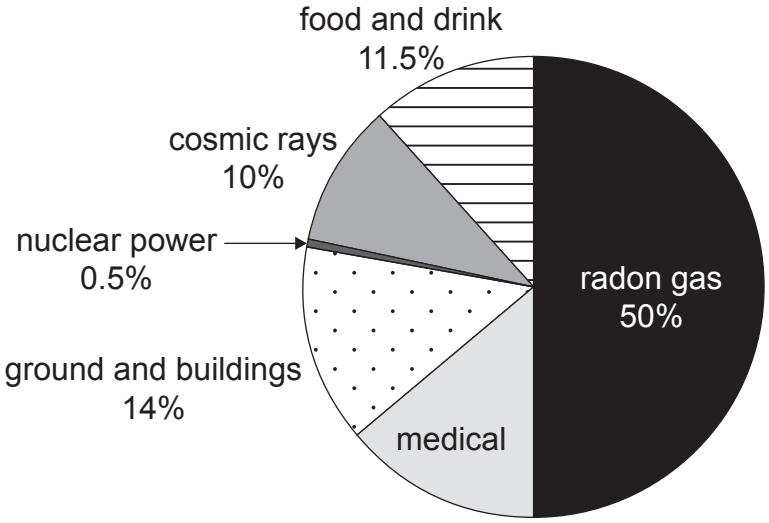
nuclear _____ when the nuclei of

a gas called _____ join together. [2]

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Examiner Only	
Marks	Remark

3 The pie chart below shows the sources of radiation that are all around us.



É Principal Examiner

(a) What name is given to radiation that is all around us?

_____ [1]

(b) Name the source of radiation shown in the pie chart which comes from Space.

_____ [1]

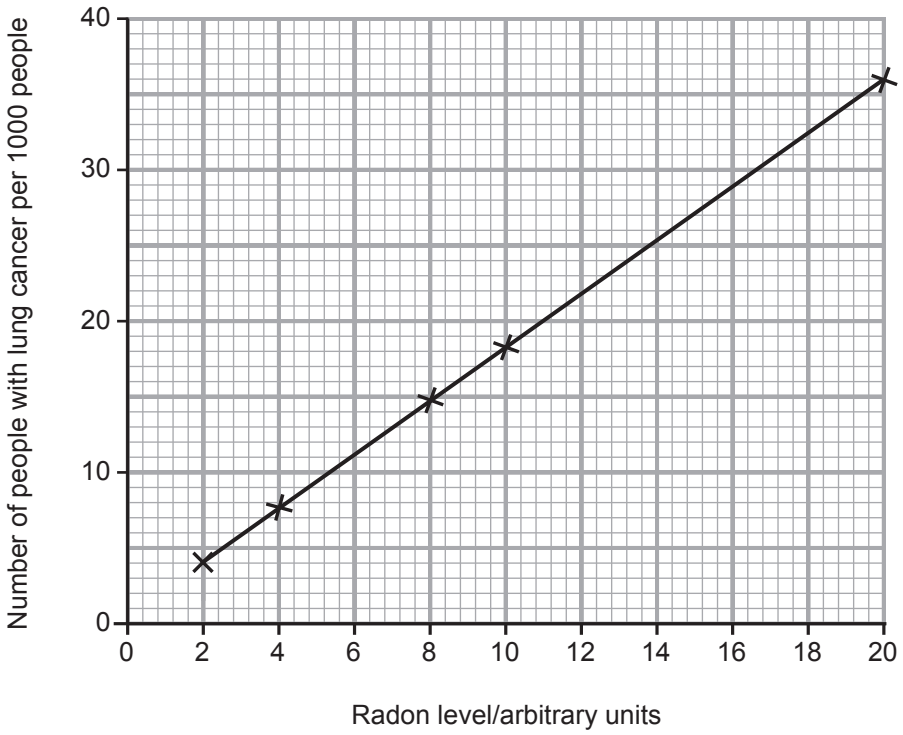
(c) Calculate the percentage of radiation which comes from medical sources.

(Show your working out.)

Answer _____ % [2]

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(d) The graph below shows the number of people who developed lung cancer after inhaling different levels of radon gas.



State the conclusion which can be made from these results.

_____

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The table below shows the thinking and braking distances of a vehicle at different speeds.

Speed/ mph	Thinking distance/ m	Braking distance/ m
20	6	6
30		14
40	12	24
50	15	38

(i) Complete the table by adding the thinking distance for 30 mph. [1]

(ii) Complete the following sentence to give a trend shown by this data.

As speed _____

_____ [1]

(b) The table below gives some factors which might affect thinking and braking distance.

Complete the table.

Choose from:

increased : no effect : decreased

Factor	Thinking distance	Braking distance
driving on a wet road		
worn tyres	no effect	increased
using a mobile phone		
drinking alcohol		

[3]

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(c) The table below shows how the chance of a pedestrian surviving a collision depends on the speed of the vehicle.

Speed/ mph	Chance of surviving collision/ %
20	96
25	90
30	80
35	50
40	10

Using the information above, explain why many people think that the speed limit outside schools should be reduced from 30 mph to 20 mph.

_____

_____ [1]

Examiner Only

Marks	Remark

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5 **(a)** The table below shows the electromagnetic spectrum.
Complete the table using the words given below.

infrared **microwaves** **ultraviolet**

Gamma rays	X-rays		Visible light			Radio waves

[2]

(b) State **one** feature these waves have in common.

_____ [1]

(c) Electromagnetic waves can be used while watching television.
Using lines, match each wave with its correct use.

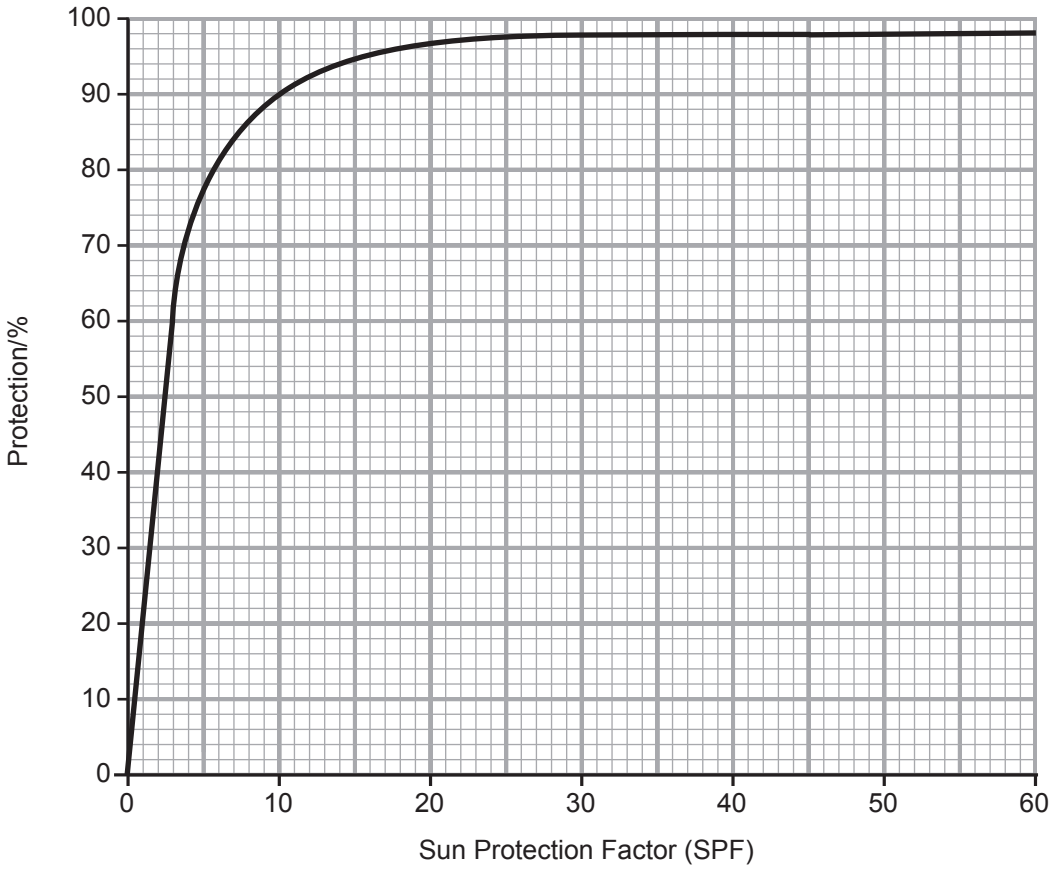
Electromagnetic wave	Use
infrared	carries signals to the television aerial
radio wave	carries picture signals from the television to the person
visible light	carries signals from the remote control to the television

[2]

Examiner Only

Marks	Remark

(d) The graph below shows the percentage protection against Sun damage provided by different factors of sun cream.



State fully the conclusion which can be made from this graph.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** Describe fully how fossil fuels were formed.

_____

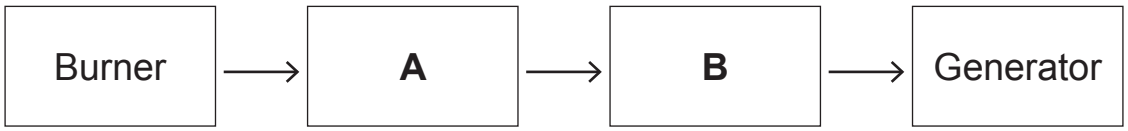
_____

_____

_____

_____ [3]

(b) Shown below are some parts of a fossil fuel power station.



(i) Name the parts **A** and **B** shown in the diagram above.

A _____

B _____ [2]

(ii) Explain fully how a generator produces electricity.

_____

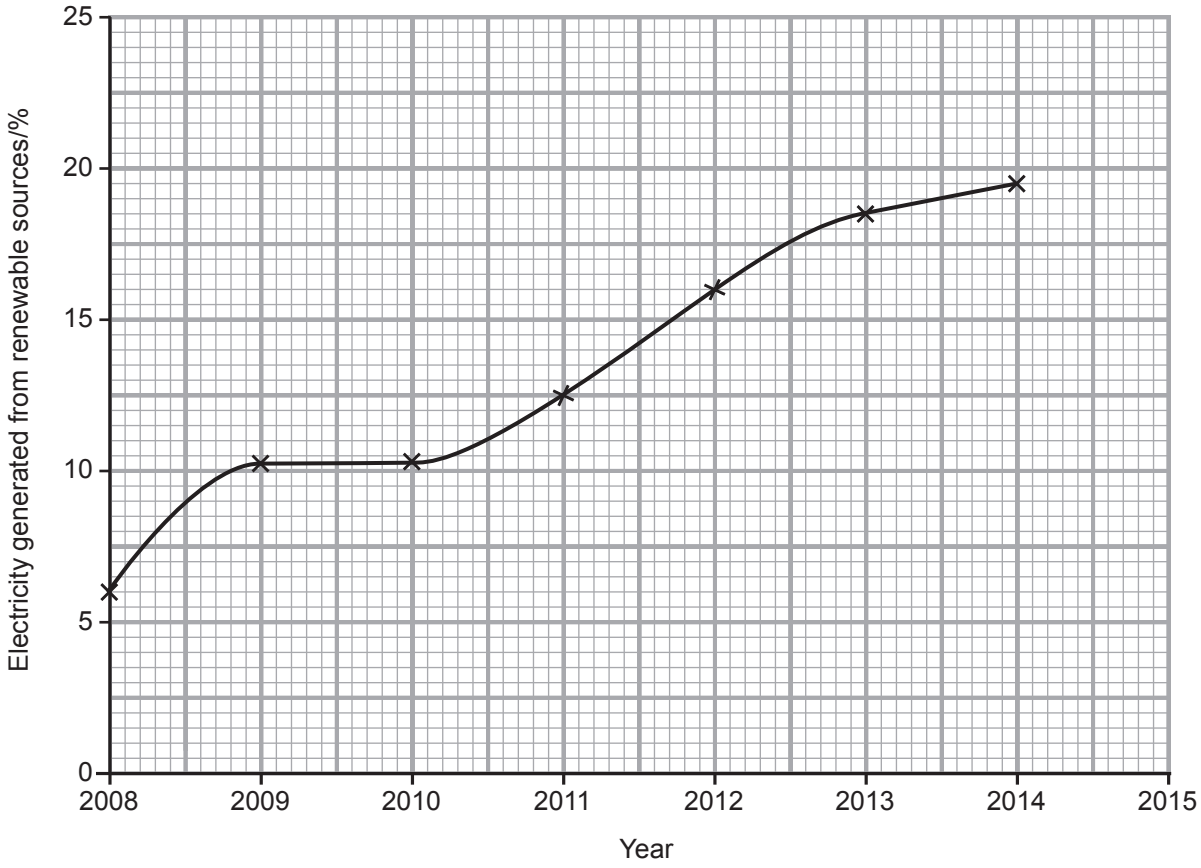
_____

_____ [2]

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Examiner Only	
Marks	Remark

(c) The graph below shows the percentage of electricity generated in Northern Ireland using renewable sources in recent years.



(i) Use the graph to predict the percentage of electricity generated from renewable sources in 2015.

Answer _____ % [1]

(ii) Suggest why the Northern Ireland Assembly wants more electricity produced from renewable sources.

_____

_____ [1]

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(d) The table below shows fuels which could be used to generate heat in a house.

Fuel	Fuel cost	Energy output/ kWh	Cost per kWh/p
wood pellets	£238 per tonne	4800/tonne	4.96
heating oil	49p per litre	10/litre	4.90
bottled gas	45p per litre	7.1/litre	6.30

Which fuel would be the best value for the householder to use? Explain your answer.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

7 The half-life of carbon-14 can be used to estimate the age of an object made from wood.

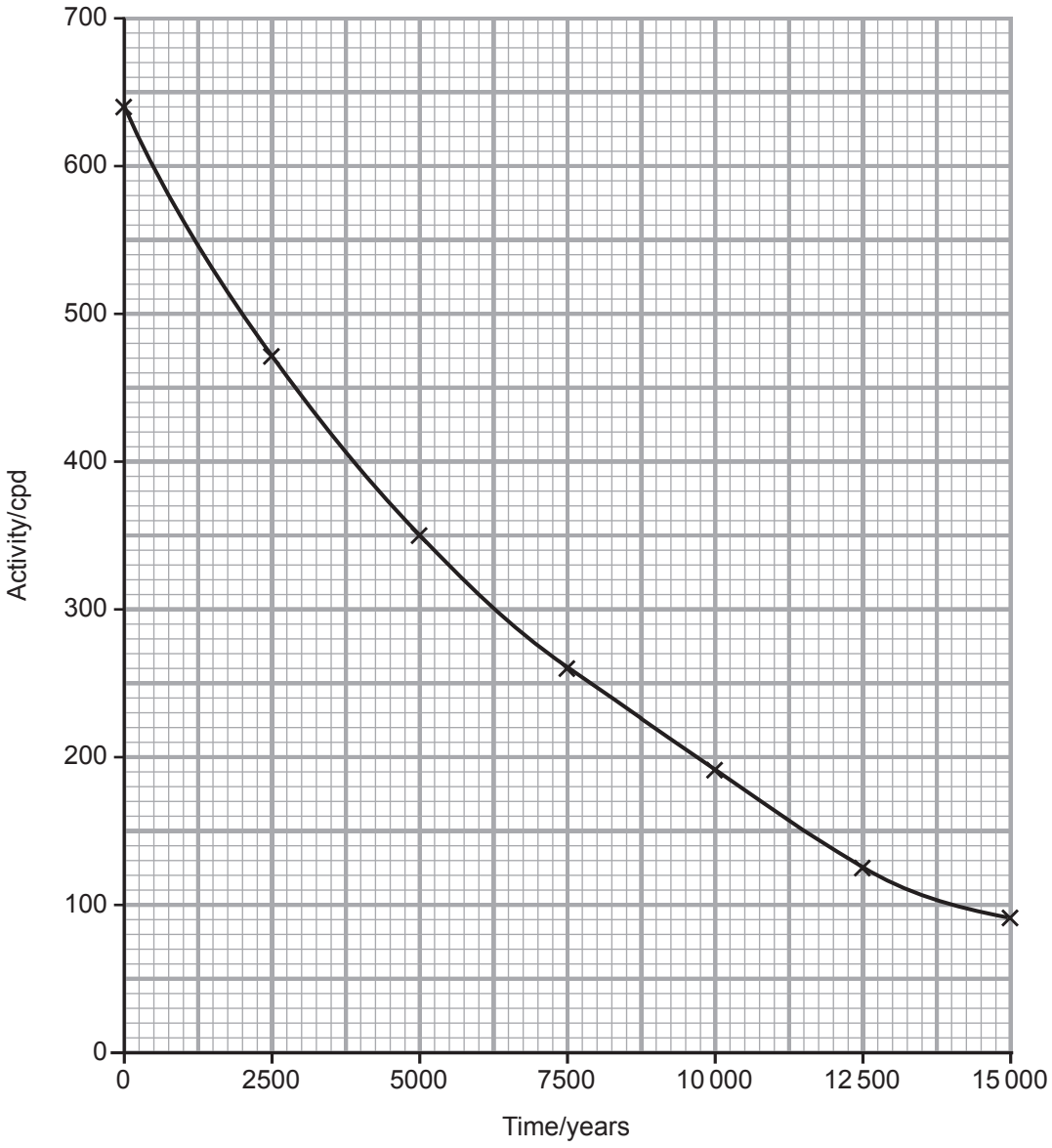
(a) What is meant by the term ‘half-life’?

_____

_____

_____ [2]

The graph below shows how the activity of carbon-14 changes with time.



(b) Use the graph to give the count rate of the carbon-14 after 7500 years.

Answer _____ cpd [1]

(c) **(i)** Brazil nuts contain radium-226 which has a half-life of 1600 years. What fraction of the radium-226 will be left after 3200 years?

Answer _____ [1]

(ii) The table below shows three isotopes of radium and the type(s) of radiation they emit.

Isotope	Radiation emitted
radium-224	alpha
radium-226	alpha, gamma
radium-228	beta

Describe the penetrating powers of these isotopes and how their radiation can be stopped.

_____

_____

_____

_____

_____ [3]

Examiner Only

Marks	Remark

8 Describe an investigation that will show how electrical resistance depends on the length of a piece of wire.

Your answer should include:

- the electrical circuit used;
- how to make the investigation valid (a fair test);
- what measurements would be taken, how they are used, and the conclusion you would expect.

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

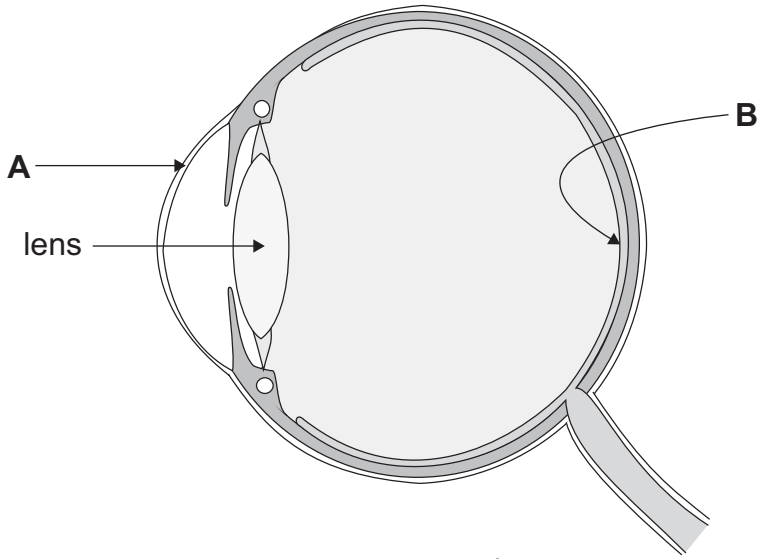
[6]

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Marks	Remark

Examiner Only	
Marks	Remark

9 The diagram below shows the eye.

(a) Name the parts labelled **A** and **B**.



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A _____

B _____ [2]

Long and short sight are eye defects that cause people difficulty in seeing objects clearly as shown in the table.

Person	Near object	Far object
A	blurry	clear
B	blurry	blurry
C	clear	blurry
D	clear	clear

(b) From the table above, which person **A**, **B**, **C** or **D** suffers from short sight?

Answer _____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

FRIDAY 26 FEBRUARY 2016, MORNING

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

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			AVAILABLE MARKS
1	**(a)**	C [1] A [1] [2]	
	(b)	**(i)** Neutral [1]	
		(ii) Plastic is an insulator [1] it prevents electrocution [1] [2]	
		(iii) 3 [1]	
		(iv) 230 × 2 [1] 460 W [2] [2]	8
2	**(a)**	**(i)** C [1]	
		(ii) Venus [1]	
		(iii) A [1]	
	(b)	Asteroid, Moon, Earth, Sun All 4 correct = 2 2 in correct order = 1 [2]	
	(c)	Fusion [1] hydrogen [1] [2]	7
3	**(a)**	Background [1]	
	(b)	Cosmic [1]	
	(c)	14 + 0.5 + 10 + 11.5 + 50 [1] 14 [2] [2]	
	(d)	As the concentration of radon increases, the number of cases of lung cancer increases [1]	5
4	**(a)**	**(i)** 9 m [1]	
		(ii) As speed increases braking distance increases/as speed increases thinking distance increases [1]	
	(b)		

Factor	Thinking distance	Braking distance
driving on a wet road	no effect	increased
using a mobile phone	increased	no effect
drinking alcohol	increased	no effect

1/2 mark each, rounded down. [3]

	(c)	There is a **higher/better/highest** chance of survival (if hit at 20 mph) allow converse [1]	6

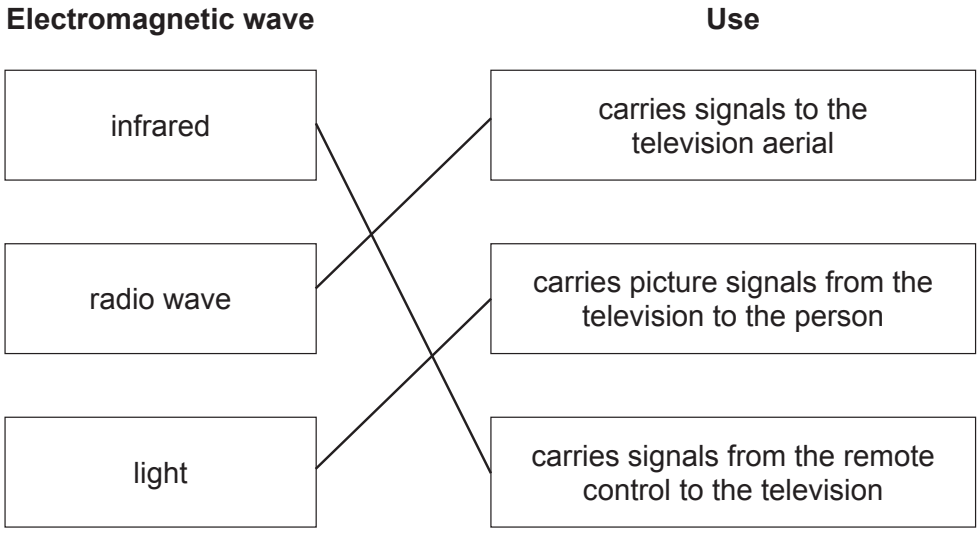
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AVAILABLE MARKS

5 **(a)** Ultraviolet, infrared, microwaves
all 3 in correct order [2]
1 in correct order [1] [2]

(b) They all **carry** energy/they all travel at the speed of light/they are all transverse/they can all travel through a vacuum [1]

(c)



1 correct [1]
all 3 correct [2] [2]

(d) As sun factor increases protection increases [1]/less change after 5/no change after 30 [1] [2] 7

6 **(a)** Dead plants and animals [1]
compressed/high temperature [1]
over millions of years [1] [3]

(b) **(i)** A – boiler [1]
B – turbine [1] [2]

(ii) Magnet and coil [1]
implied movement of magnet/coil [1] [2]

(c) **(i)** Answer between 20–22% [1]

(ii) To reduce the use of fossil fuels/reduce global warming [1]

(d) Heating oil [1]
cheapest per kWh [1] [2] 11

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		AVAILABLE MARKS
7	**(a)** The time [1] it takes the radioactivity to fall by half [1] [2]	
	(b) 260 [1]	
	(c) **(i)** $^1/_4$ [1]	
	(ii) radium-224 – (passes through air and) stopped by paper [1] radium-226 – passes through aluminium and stopped by lead [1] radium-228 – (passes through paper and) stopped by aluminium [1] [3]	7

8 **Indicative content**

- ammeter measures current
- voltmeter measures voltage
- voltmeter wired in parallel
- ammeter wired in series
- keep type of wire the same/width/power off between readings (temperature)
- change the length
- use formula V=IR
- the longer the wire the higher the resistance

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how to measure the resistance of different lengths of resistance wire (using at least **six** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, how to measure the resistance of different lengths of resistance wire (using **four or five** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how to measure the resistance of different lengths of resistance wire (using **one to three** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

6

9	**(a)** A – cornea [1] B – retina [1] [2]	
	(b) C [1]	3
	Total	**60**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)
Foundation Tier

GSS31

[GSS31]

FRIDAY 13 NOVEMBER 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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** The photograph below shows some electrical appliances found in the home.



© CCEA

(i) Name **two** appliances, shown in the photograph, that are used to produce heat.

1. _____

2. _____ [2]

(ii) Name the main type of energy a radio is designed to produce.

_____ [1]

(b) Appliances are connected to the mains with 3-pin plugs. Using lines, match each wire with its correct colour.

Wire	Colour
neutral	green/yellow
live	brown
earth	blue

[2]

(c) Some safety features of a 3-pin plug are:

Examiner Only	
Marks	Remark

fuse : earth wire : plastic cover : cable grip

Which safety feature:

(i) prevents too much current flowing to the appliance?

_____ [1]

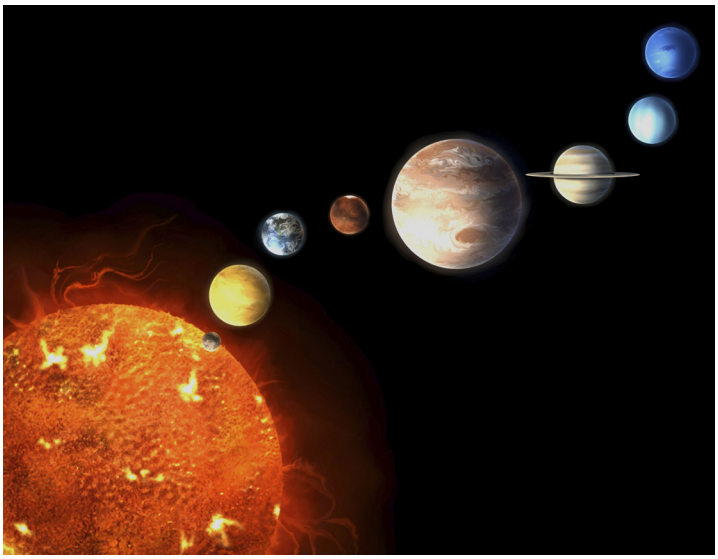
(ii) helps protect users when handling the plug?

_____ [1]

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Examiner Only	
Marks	Remark

2 The image below shows our Solar System.



© aaronrutten/ iStock/ Thinkstock.com

(a) Place the following objects in order of size starting with the smallest.

planet **moon** **asteroid** **star**

smallest _____

_____

_____

_____ [2]

(b) The table below contains information about five planets in our Solar System.

Planet	Distance from Sun/ million km	Diameter (size)/ km	Gravity/ N/kg
Mercury	58	4900	4
Venus	108	12 000	9
Earth	150	12 750	10
Jupiter	778	143 000	26
Saturn	1429	120 000	11

Using the table Mary made the following statement:

"As distance from the Sun increases, gravity increases."

(i) Explain how the data shows that gravity does **not** depend on distance from the Sun.

_____

_____ [1]

(ii) Gravity actually depends on the size of the planet.
Complete the following sentence to show this relationship.

As the size of the planets _____

_____ [1]

(c) What effect will increasing distance from the Sun have on the temperature of a planet?

_____

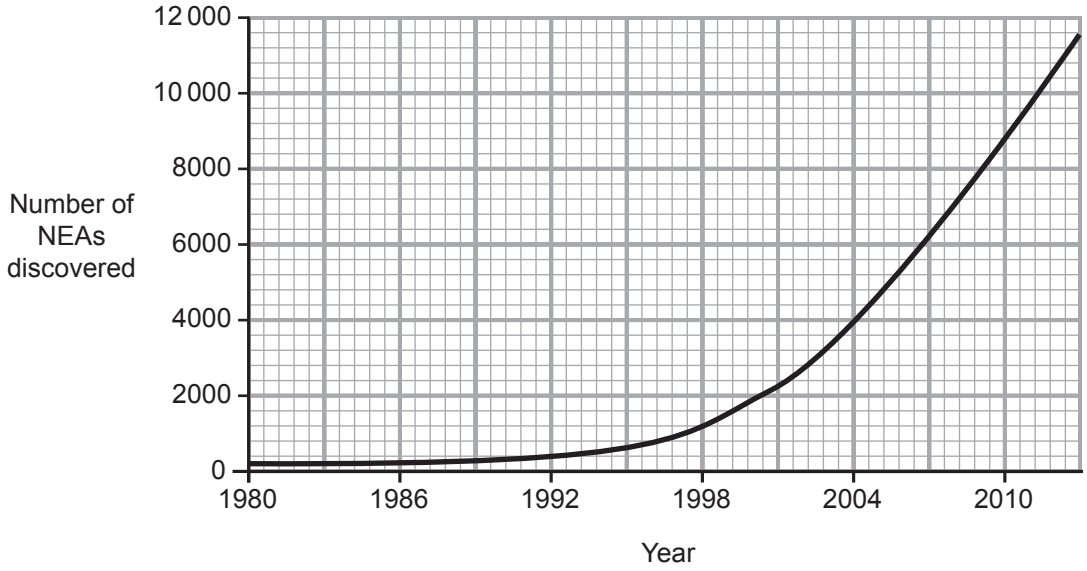
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(d) The graph below gives information about the number of Near-Earth asteroids (NEAs) discovered since 1980.



© Alan B. Chamberlin (JPL) NASA/ http://neo.jpl.nasa.gov/stats/

(i) How many NEAs had been discovered by 2010?

Answer _____ [1]

(ii) State the trend shown by this information.

_____

_____ [1]

(iii) Scientists are interested in NEAs because they may hit the Earth. Explain fully what could happen if a large asteroid struck the Earth.

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

3 **(a)** The table below shows the features of five sound waves.

Wave	Wavelength/ m	Frequency/ Hz	Speed/ m/s
A	33.00	10	330
B	17.50	20	330
C	11.00		
D	8.75	40	330
E	5.50	60	330

(i) Complete the table above to give the frequency and speed of wave **C**. [2]

(ii) Which wave (**A**, **B**, **C**, **D** or **E**) cannot be heard by humans?

Answer _____ [1]

(iii) Which equation below is used to calculate the speed of a wave?

Circle the correct answer.

speed = wavelength + frequency

speed = wavelength − frequency

speed = wavelength × frequency [1]

(b) Sounds above 20 kHz also cannot be heard by humans.
What name is given to these sounds?

_____ [1]

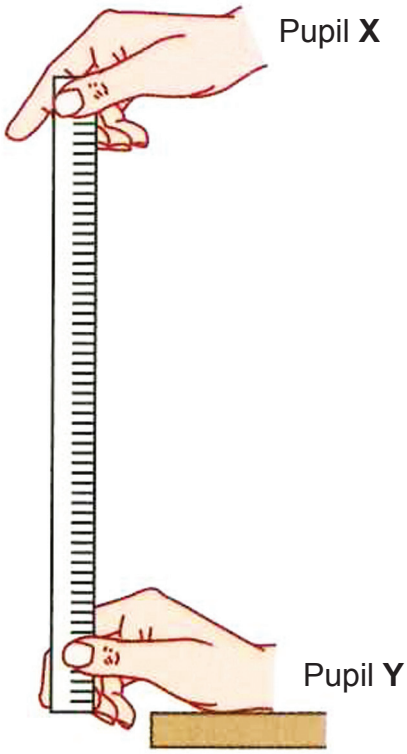
(c) What do all waves carry as they move from one place to another?

_____ [1]

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Examiner Only	
Marks	Remark

4 **(a)** The diagram below shows how speed of reaction can be investigated.



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(i) Describe fully how this equipment can be used to find which pupil (**X** or **Y**) has the faster reactions.

_____

_____

_____

_____

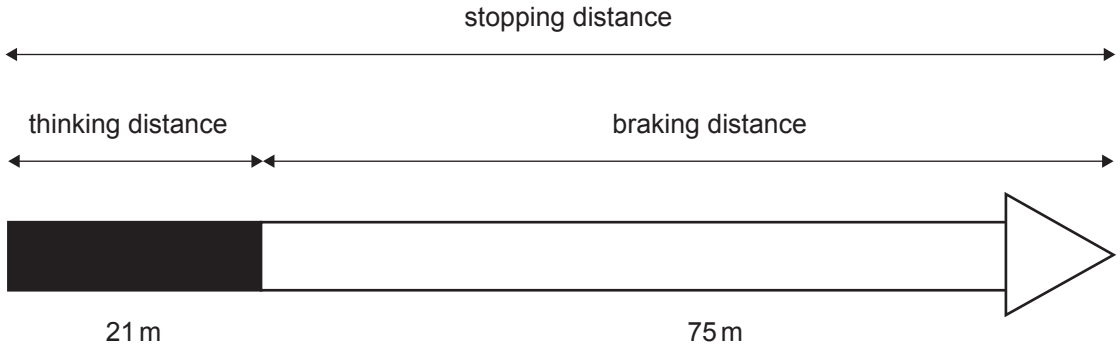
_____ [3]

(ii) Give **one** way that these pupils can make sure their results are reliable.

_____

_____ [1]

(b) The diagram below shows the stopping distance for a car travelling at 70 mph.



(i) Which distance (stopping, thinking or braking) is **not** affected by speed of reaction?

_____ [1]

(ii) Calculate the stopping distance at 70 mph.

Answer _____ m [1]

(iii) These distances are for a dry road. What effect, if any, will a wet road have on braking distance?

_____ [1]

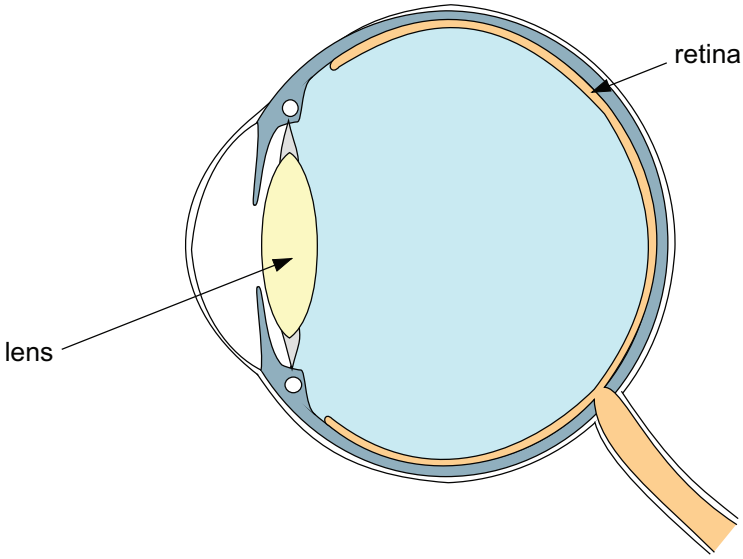
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Marks	Remark

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Examiner Only	
Marks	Remark

5 The diagram below shows the human eye.



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(a) Explain fully the function of the lens in the eye.

_____

_____

_____ [2]

(b) Complete the following sentences.

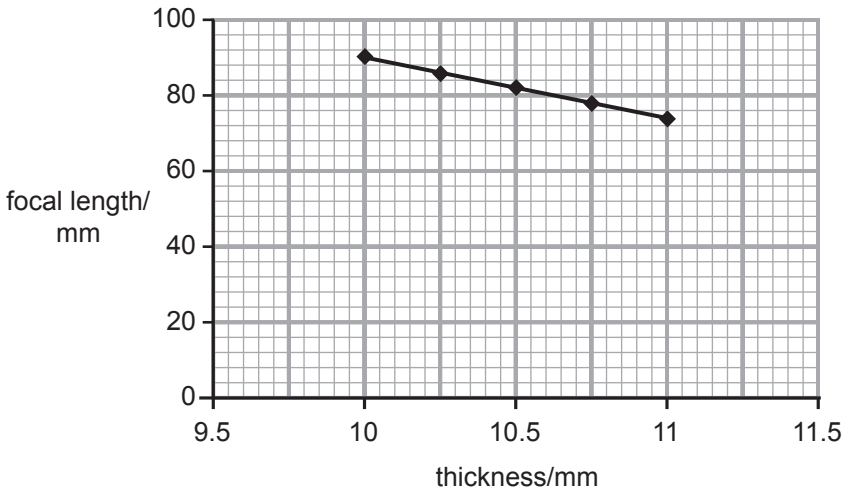
Choose from:

convex **close** **concave** **far**

John is short sighted. He can see _____ objects clearly but _____ objects appear blurry.

Short sight can be corrected using a _____ lens. [2]

(c) The graph below shows how the thickness of a convex lens affects the distance between the lens and the point at which it focuses (focal length).



(i) Describe the trend shown in the graph.

_____

_____ [1]

(ii) What will be the focal length of a lens with a thickness of 11.5 mm?

Answer _____ mm [1]

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Marks	Remark

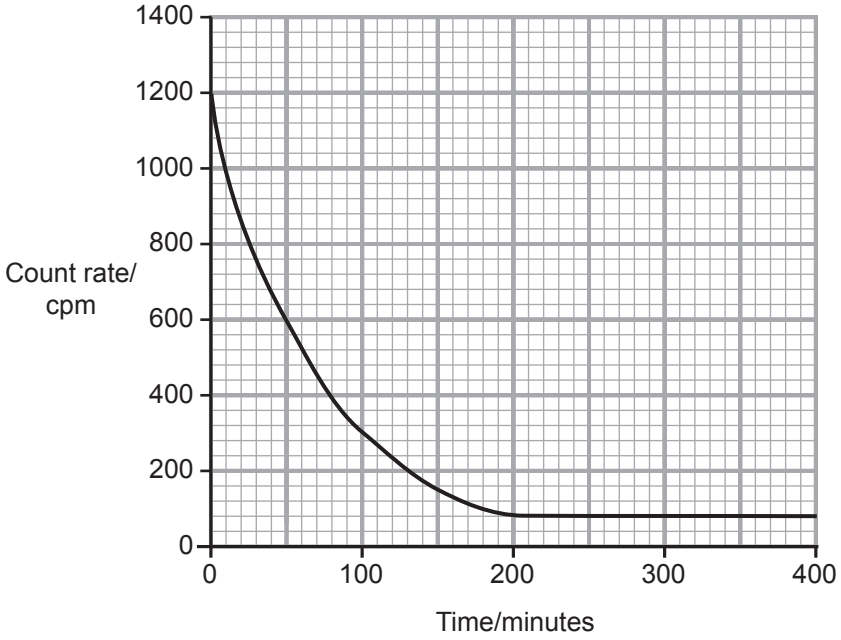
Examiner Only	
Marks	Remark

6 **(a)** The atoms of radioactive isotopes have unstable nuclei that disintegrate emitting radiation.

Name the **two** types of particle found in the nucleus of an atom.

_____ and _____ [2]

(b) The graph below shows how the count rate of a radioactive isotope changes with time.



(i) What is the count rate at 100 minutes?

Answer _____ cpm [1]

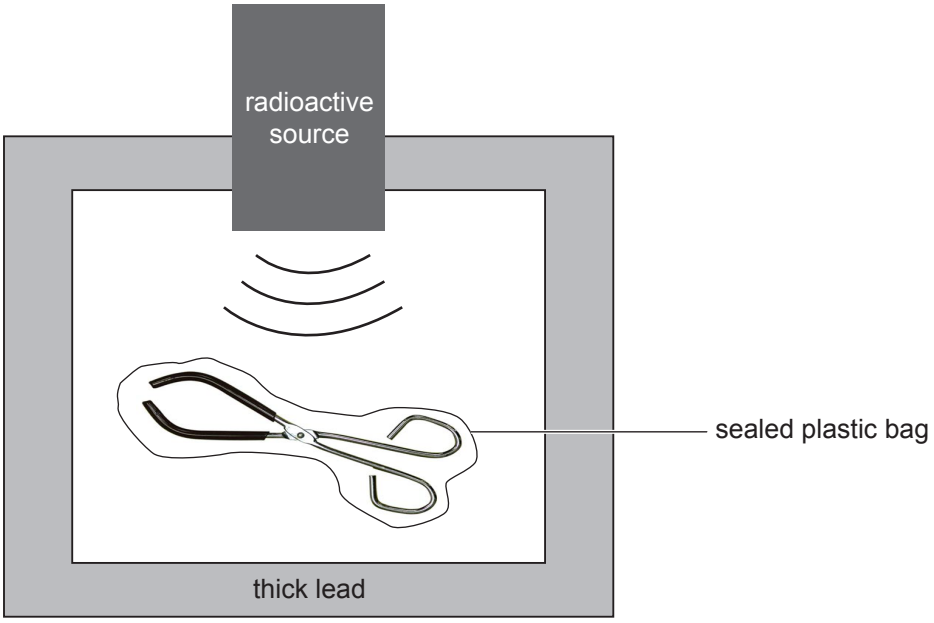
(ii) Suggest the value of background radiation.

Answer _____ cpm [1]

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Examiner Only	
Marks	Remark

(c) After operations in hospitals the surgical instruments need to be sterilised as shown in the diagram below.



(i) Name the type of radiation used to sterilise surgical instruments.

Answer _____ [1]

(ii) Explain fully why it is necessary to use the radioactive source inside thick lead.

_____

_____

_____ [2]

(iii) Fruit can also be treated with radiation before being transported long distances.

Explain fully why this is done and how it benefits shopkeepers.

_____

_____

_____

_____

_____ [3]

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Examiner Only	
Marks	Remark

7 **(a)** The table below shows the results of an investigation into the effect of the mass of a car on fuel consumption.

Car mass/kg	Fuel consumption/mpg
1000	70
1100	67
1200	64
1300	61
1400	58
1500	55

(i) State **two** things that the investigators must do to make this a fair test.

1. _____

_____

2. _____

_____ [2]

(ii) Explain how fuel consumption can be used as a measure of efficiency.

_____

_____ [1]

(iii) How can car manufacturers use the trend in these results to design more efficient cars?

_____

_____ [1]

(b) Petrol and diesel come from fossil fuels. Describe fully how fossil fuels are formed.

Examiner Only

Marks	Remark

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

8 **(a)** Modern Christmas tree lights use a parallel circuit. Explain why parallel circuits are better than series circuits.

Your answer should include:

- how bulbs are connected in each circuit
- the amount of current flowing through bulbs in each circuit
- **one** disadvantage with parallel circuits.

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

[6]

Examiner Only	
Marks	Remark

(b) Power NI use meter readings to calculate household electricity bills.
A meter shows the number of units used.
Each unit costs 15p.

Use the meter readings below to calculate the electricity bill for a house.

5 3 1 0 5	5 3 8 2 7
Previous reading 3 months ago	Present reading

(Show your working out.)

Answer _____ [2]

THIS IS THE END OF THE QUESTION PAPER

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2015–2016

Science: Single Award

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[GSS31]

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Kettle [1] toaster [1]	[2]	
		(ii)	Sound	[1]	
	(b)		Neutral = blue live = brown earth = green/yellow all 3 correct = 2 marks 1 or 2 correct = 1 mark	[2]	
	(c)	**(i)**	Fuse	[1]	
		(ii)	Plastic cover	[1]	7
2	**(a)**		Asteroid – moon – planet – star any 2 in correct order [1] all correct [2]	[2]	
	(b)	**(i)**	Saturn is further away than Jupiter but has less gravity (or converse)	[1]	
		(ii)	As size increases, gravity increases	[1]	
	(c)		Decreases	[1]	
	(d)	**(i)**	8800	[1]	
		(ii)	The number of asteroids discovered has increased in time	[1]	
		(iii)	Any **two** from: • craters/tsunamis • cloud of dust • extinctions/millions killed	[2]	9
3	**(a)**	**(i)**	30 [1] 330 [1]	[2]	
		(ii)	A	[1]	
		(iii)	Speed = wavelength × frequency	[1]	
	(b)		Ultrasound	[1]	
	(c)		Energy	[1]	6
4	**(a)**	**(i)**	X releases metre stick and Y catches (as quickly as possible) [1] pupils changing position [1] less distance dropped, faster reactions [1]	[3]	
		(ii)	Repeat/average	[1]	
	(b)	**(i)**	Braking distance	[1]	
		(ii)	96 m	[1]	
		(iii)	Increased	[1]	7

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				AVAILABLE MARKS
5	**(a)**	Bends/refracts light [1] converges/inwards/focus on retina [1]	[2]	
	(b)	Close : far [1] concave [1]	[2]	
	(c)	**(i)** As thickness increases, focal length decreases (allow converse)	[1]	
		(ii) 64–68 mm	[1]	6
6	**(a)**	Neutrons [1] protons [1]	[2]	
	(b)	**(i)** 300 cpm	[1]	
		(ii) 80 cpm	[1]	
	(c)	**(i)** Gamma	[1]	
		(ii) Stop radiation escaping [1] prevent cancer/tumour [1]	[2]	
		(iii) Kills bacteria [1] keeps food fresh longer/prevents fruit rotting/longer sell-by date [1] more profit/less waste [1]	[3]	10
7	**(a)**	**(i)** Any **two** from: • same driver • same speed • same road (conditions) • same car • same fuel type	[2]	
		(ii) More mpg = more efficiency	[1]	
		(iii) Lighter cars	[1]	
	(b)	Remains of plants/animals [1] compressed/pressure [1] millions of years [1]	[3]	7

AVAILABLE MARKS

8 (a) Indicative content

- Bulbs connected in branches in parallel
- Bulbs connected side by side in series
- If one bulb goes out, the rest stay lit in parallel/all go out in series/ easier to find broken bulb in parallel
- Bulbs are brighter in a parallel circuit
- More bulbs connected, same brightness in parallel/dimmer in series
- Current is split among the branches in parallel/every bulb gets a constant voltage in a series circuit
- Same current all around a series circuit/voltage is shared in a parallel circuit
- More wiring/more expensive

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully the differences between parallel and series circuits (using **6 or more** of the above points) to explain why a parallel circuit should be chosen in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially describe the differences between parallel and series circuits (using **3 to 5** of the above points) to explain why a parallel circuit should be chosen in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the differences between parallel and series circuits (using **1 or 2** of the above points) to explain why a parallel circuit should be chosen. However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(b) 722 units [1]
10830/£108.30 [1]
Correct answer gets full marks [2] 8

Total **60**

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 20 MAY 2015, AFTERNOON

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

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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.

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					AVAILABLE MARKS
1	(a)	(i)	Series	[1]	
		(ii)	They get dimmer/not as bright	[1]	
		(iii)	12 × 0.1 [1] 1.2 [1]	[2]	
		(iv)	Watt	[1]	
	(b)		One	[1]	6
2	(a)		The same [1] less [1]	[2]	
	(b)		Its size/radius/mass/diameter/how big it is/density	[1]	
	(c)		Asteroid [1] extinction of (some) plants and animals/extinction on its own [1]	[2]	
	(d)		Increases, orbital time increases/time to orbit/takes longer to orbit/ time to go round sun (star)	[1]	6

3 (a)

feature	description
echo	a reflected sound wave
amplitude	the height of a wave from the mid-point
frequency	number of vibrations per second
	length of one complete wave

[3]

(b) (i) 

[1]

(ii) Transverse [1]

(iii) Energy [1]

(c) A and D [1] 7

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				AVAILABLE MARKS
4	**(a)**	4	[1]	
	(b)	How good a device is at changing energy into useful energy	[1]	
	(c)	Heat/sound	[1]	
	(d)	Transformed/changed	[1]	4
5	**(a)**	Steady speed/pace 0–6 s [1] stationary from 6–8 s [1]	[2]	
	(b)	50/10 [1] 5 m/s [1]	[2]	
	(c)	9.4 s	[1]	
	(d)	Reduce speed of cars [1] fewer **serious** accidents [1]	[2]	7
6	**(a)**	A Microwave [1] B radio wave [1]	[2]	
	(b)	**(i)** (Higher levels) of **microwave** radiation [1] (increased chance) of cancer/kills/damages **cells/tissue**/mutations/ tumour [1]	[2]	
		(ii) Cell	[1]	5
7	**(a)**	**(i)** Any **one** from: • same thickness of aluminium sheet/type • beta source same distance from aluminium sheets each time • counter same distance from aluminium sheets each time • same beta source each time/same amount of beta	[1]	
		(ii) Any **two** from: • the thicker the aluminium the less radiation passes through • greater decrease in radiation count at lower thicknesses • above 10 (9 or 10) sheets the count is constant/remains at 100 cpm	[2]	
		(iii) Background radiation is present	[1]	
	(b)	Horizontal line starting at 4000	[1]	
	(c)		[3]	8

Position	Types of Radiation
A	alpha, beta, gamma [1]
B	beta, gamma [1]
C	none [1]

					AVAILABLE MARKS
8	**(a)**	**(i)**	Average speed cameras allow drivers to slow down/there are more instantaneous cameras [1]		
		(ii)	Number of people speeding increases with age/number of people speeding decreases [1] up to aged 40–54/5639 and then decreases [1]	[2]	
	(b)		03:00–05:59 [1] there are fewer cars on the road/fewer people on the road [1]	[2]	5
9	**(a)**		Refraction at lens [1] rays meet at retina [1]	[2]	
	(b)		lens too weak/eye**ball** too short/lens too thin [1] rays brought to focus behind the retina [1] close objects **blurry**/not clear/can't read close up/can't focus/distant objects clear [1]	[3]	
	(c)		The older you get the greater the minimum distance your eyes can focus	[1]	6

10 Indicative content

- friction is a force
- which opposes motion
- change height of slope/angle
- until block moves
- change the type of surface
- the greater the height the greater the friction
- use the same mass/weight of block/same block
- repeat the experiment 3 times/average the results for height

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using **seven to eight** of the above points) how friction can be measured. They use good spelling, punctuation and grammar and form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe and explain how friction can be measured (using **four to six** of the above points) in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe/explain how friction can be measured using **one to three** of the above points. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

Total

AVAILABLE MARKS

6

60

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

THURSDAY 26 FEBRUARY 2015, MORNING

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

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					AVAILABLE MARKS
1	**(a)**		Gravity increases	[1]	
	(b)	**(i)**	70 × 10 [1] 700 [1]	[2]	
		(ii)	Newton	[1]	
	(c)	**(i)**	Moons/satellites	[1]	
		(ii)	Heliocentric	[1]	6
2	**(a)**	**(i)**	Convex/converging lens	[1]	
		(ii)	Refracted	[1]	
	(b)		Retina	[1]	
	(c)		Short sight	[1]	4
3	**(a)**		Battery + bulb symbol [1] bulbs in series [1]	[2]	
	(b)		**Any 2 from:** • bulbs get brighter • voltage increases/power increases • current increases/energy increases	[2]	
	(c)		Both bulbs go out [1] current doesn't flow/gap in circuit [1]	[2]	
	(d)		All 3 in correct order (boiler → turbine → generator) [2] any 2 in correct order [1]	[2]	
	(e)	**(i)**	Relative movement	[1]	
		(ii)	More turns/faster movement stronger magnet	[1]	10
4	**(a)**	**(i)**	Heat/sound	[1]	
		(ii)	1500	[1]	
		(iii)	500/2000 [1] 0.25/25% [1]	[2]	
	(b)		Airbags [1] seat belts [1]	[2]	6

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					AVAILABLE MARKS
5	**(a)**	**(i)**	Gas	[1]	
		(ii)	Fossil fuels will decrease/coal/oil/gas will decrease [1] nuclear/renewable will increase [1]	[2]	
		(iii)	Transport/(home) heating/cooking	[1]	
	(b)	**(i)**	June + 30 degrees	[1]	
		(ii)	Energy increases with angle of tilt [1] above 30 degrees it decreases [1]	[2]	
		(iii)	Energy values will be less [1] less light in winter [1]	[2]	9
6	**(a)**	**(i)**	14 cpm	[1]	
		(ii)	2 days	[1]	
		(iii)	5 cpm	[1]	
	(b)		Nucleus is unstable [1] due to the combination of protons and neutrons [1]	[2]	
	(c)	**(i)**	D [1] gamma radiation most penetrating [1] lasts a long time/doesn't need replacing [1]	[3]	
		(ii)	Food preservation/sterilising surgical instruments/tracers/smoke alarm	[1]	9
7	**(a)**	**(i)**	10 s	[1]	
		(ii)	24 s	[1]	
		(iii)	225–135 [1] 90 [1]	[2]	
	(b)		Friction is reduced [1] increasing braking distance [1]	[2]	6

AVAILABLE MARKS

8 (a) Indicative content

- message sent to nearest mast
- area around mast is called a cell
- masts act as repeater stations
- signals are microwaves
- microwaves are absorbed by cells
- causing cancer/tumour
- shorter calls
- text rather than call/use loudspeaker

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully how mobile phones operate, the dangers associated and how these dangers can be reduced (using at least **6** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to partially describe how mobile phones operate, the dangers associated and how these dangers can be reduced (using **4 or 5** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe how mobile phones operate, the dangers associated and how these dangers can be reduced (using **1 to 3** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit.	[0]

[6]

(b) (i) Depth = 210 [1]

(ii) Any 2 correct distance/time figures from table [1]
1500 [1] [2]

(iii) Return time will be less [1]

10

Total **60**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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

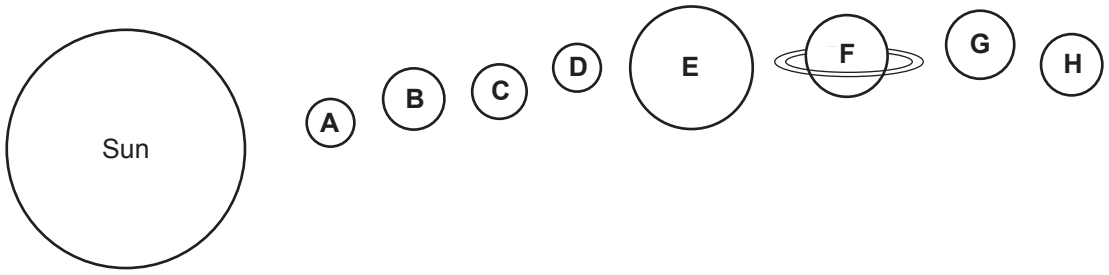
The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **10(c)**.

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)** The diagram below represents the Sun and its eight planets.



(i) Complete the following sentence.

The Sun and its eight planets are known as the

_____ [1]

(ii) Name the planets labelled **B** and **F**.

Choose from:

Mercury **Saturn** **Jupiter** **Neptune** **Venus** **Earth**

Planet **B** _____

Planet **F** _____ [2]

(iii) Suggest which planet (**A**, **B**, **C**, **D**, **E**, **F**, **G** or **H**):

1. takes the shortest time to orbit the Sun once. _____
2. is the coldest. _____ [2]

(b) Put the following in order of size, starting with the smallest.

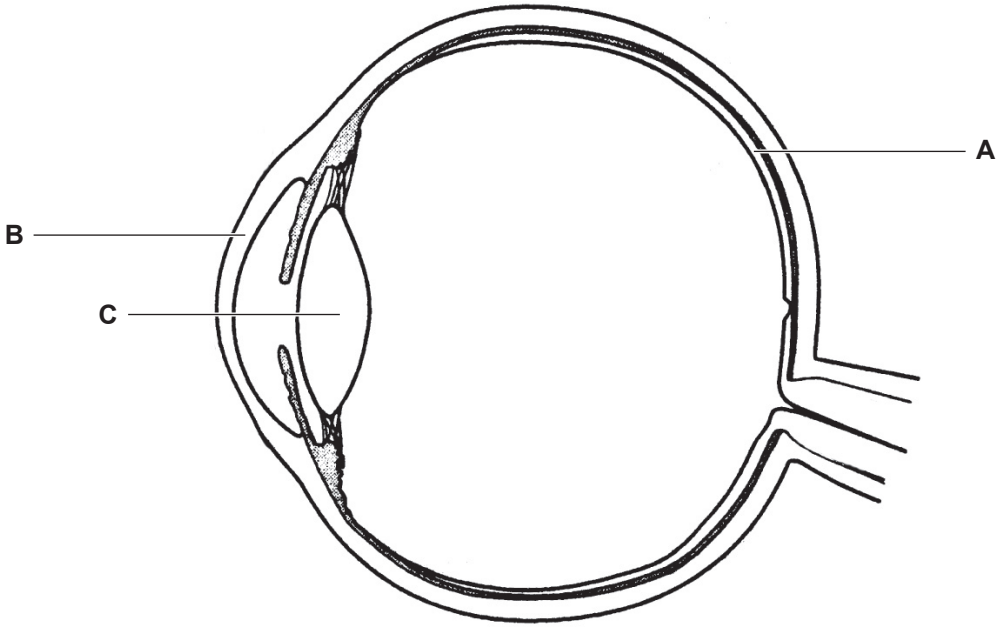
Universe : **Earth** : **Milky Way** : **Moon**

smallest ⟶ largest

[2]

Examiner Only	
Marks	Remark

2 The diagram below shows the human eye.



(a) Name the parts labelled **A** and **B**.

Choose from:

cornea **iris** **retina** **pupil**

A _____

B _____ [2]

(b) Name the type of lens labelled **C**.

Circle the correct answer.

convex **contact** **concave**

[1]

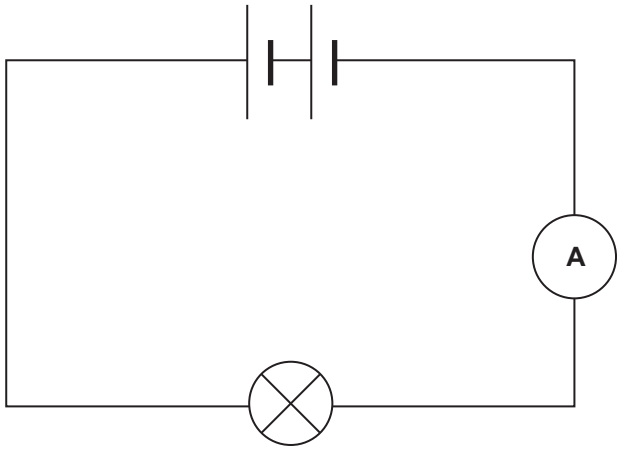
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 The circuit below was set up to measure the resistance of a bulb, but the voltmeter has still to be added.



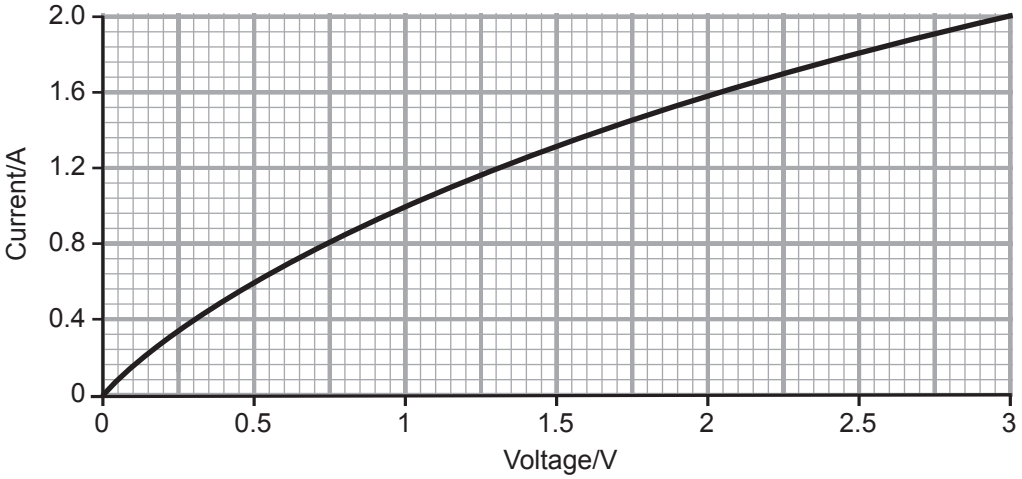
(a) Using the correct symbol, show how a voltmeter is connected in the circuit above to measure the voltage across the bulb. [2]

(b) State **one** way of changing the voltage in this circuit.

_____ [1]

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(c) The graph below shows the current through the bulb as the voltage changes.



(i) Use the graph to find the current when the voltage is 3 V.

Answer _____ A [1]

(ii) Use the equation:

$$\textbf{resistance} = \frac{\textbf{voltage}}{\textbf{current}}$$

to calculate the resistance of the bulb when the voltage is 3 V.

(Show your working out.)

Answer _____ Ω [2]

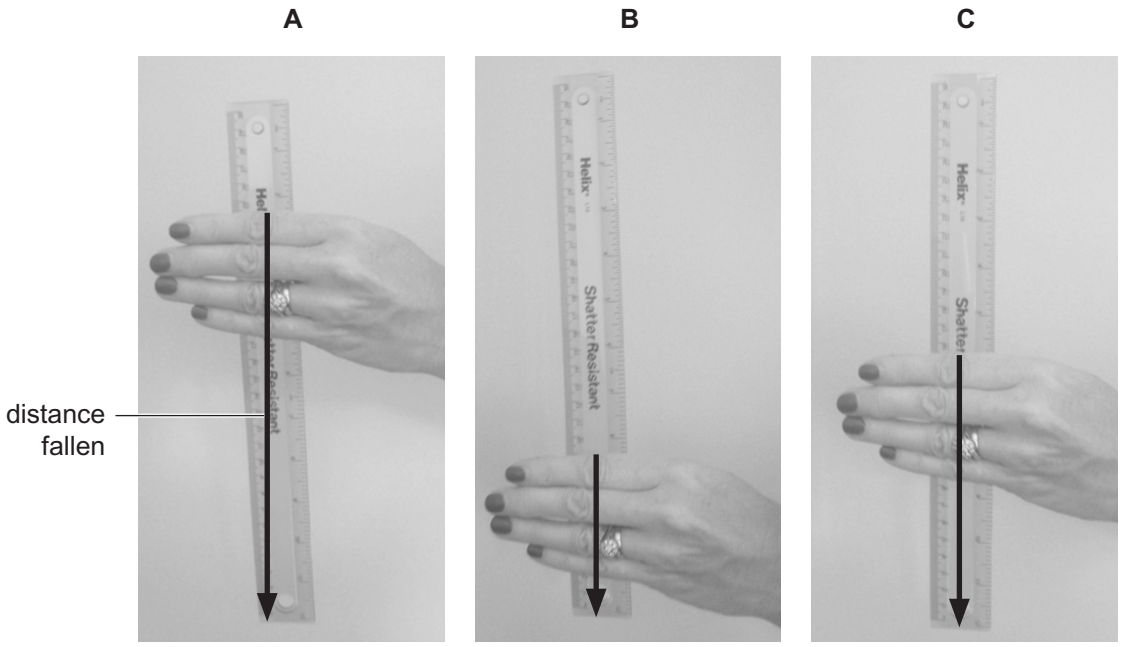
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 The photographs below show how reactions can be measured by catching a falling ruler. The ruler is released by one student and caught by another.



Source: Principal Examiner

(a) Which photograph (**A**, **B** or **C**) showed the quickest reaction? Explain your answer.

_____

_____

_____ [2]

(b) The results for a similar investigation are shown below.

Attempt	Reaction time/s
1	0.25
2	0.20
3	0.15

(i) Calculate the average reaction time for these results.

Answer _____ s [1]

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(ii) What change, if any, would you expect to see in the average reaction time if the person drank alcohol before the investigation?

_____ [1]

(c) The table below shows the blood alcohol content for men of different body mass after drinking alcohol.

	Blood alcohol content/%		
Body mass / **Number of alcoholic drinks**	50 kg	60 kg	70 kg
1	0.04	0.03	0.02
2	0.08	0.06	0.05
3	0.12	0.11	0.08

Give **two** trends from this data.

1. _____

_____

2. _____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 **(a)** The table below shows the lowest and highest frequencies of sound that can be heard by four birds.

Bird	Lowest frequency/Hz	Highest frequency/Hz
Mallard	300	8000
Starling	700	8700
Chaffinch	200	29 000
House sparrow	675	18 000

(i) Name the bird which can hear the **smallest range** of frequency.

_____ [1]

(ii) Name the bird that can hear ultrasound. Explain your answer.

_____

_____

_____ [2]

(iii) The house sparrow can hear up to 18 000 Hz. Convert this into kHz.

Answer _____ kHz [1]

(b) What is the lowest frequency that humans can hear?

Answer _____ Hz [1]

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Examiner Only	
Marks	Remark

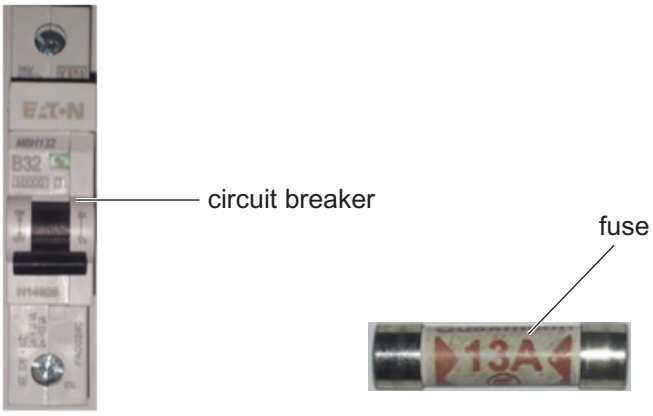
6 **(a)** Explain fully how a fuse operates as a safety device.

_____

_____

_____ [2]

(b) Circuit breakers are also used as electrical safety devices.



Source: Principal Examiner

Give **two** advantages of using circuit breakers instead of fuses.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

7 **(a)** Given below are the names of some telescopes and the electromagnetic wave they detect.

Name of telescope	Electromagnetic wave
Lovell	radio
COBE	microwave
Spitzer	infrared
Hubble	visible
Galaxy Evolution Explorer	ultraviolet
XMM Newton	X-rays
Fermi Large Area	gamma

(i) All electromagnetic waves can travel through a vacuum. Give **one** other feature of all electromagnetic waves.

_____

_____ [1]

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Each type of electromagnetic wave comes from a main source in Space as shown in the table below.

Source	Electromagnetic wave
cool gas	radio
background radiation	microwave
cool stars	infrared
surface of stars	visible
very hot stars	ultraviolet
hot gas	X-rays
materials around black holes	gamma

Use the information from both tables to answer the following questions.

(ii) Name the telescope which could be used to observe very hot stars.

_____ [1]

(iii) Which **source** will be detected using the XMM Newton telescope?

_____ [1]

(b) European astronomers have discovered a planet the same size as Earth orbiting a star in the Alpha Centauri system. The Alpha Centauri system is 4.3 light years away. Explain fully why astronauts could not travel to this planet.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

8 **(a)** The table below shows the amount of natural radiation which occurs in some foods. This forms part of the radiation that constantly surrounds us.

	Radioactive isotope	
Food	**Potassium/ pCi/kg**	**Radon/ pCi/kg**
Bananas	3520	1.00
Carrots	3400	1.30
Potatoes	3400	1.75
Lima beans	4640	3.50

(i) What name is given to this radiation that constantly surrounds us?

_____ [1]

(ii) Name the food which gives the **lowest** combined dose of radiation.

_____ [1]

(b) A person receives about 30 millirem of radiation each year from these sources. Radiation of 1 millirem shortens a person's life by 70 seconds.

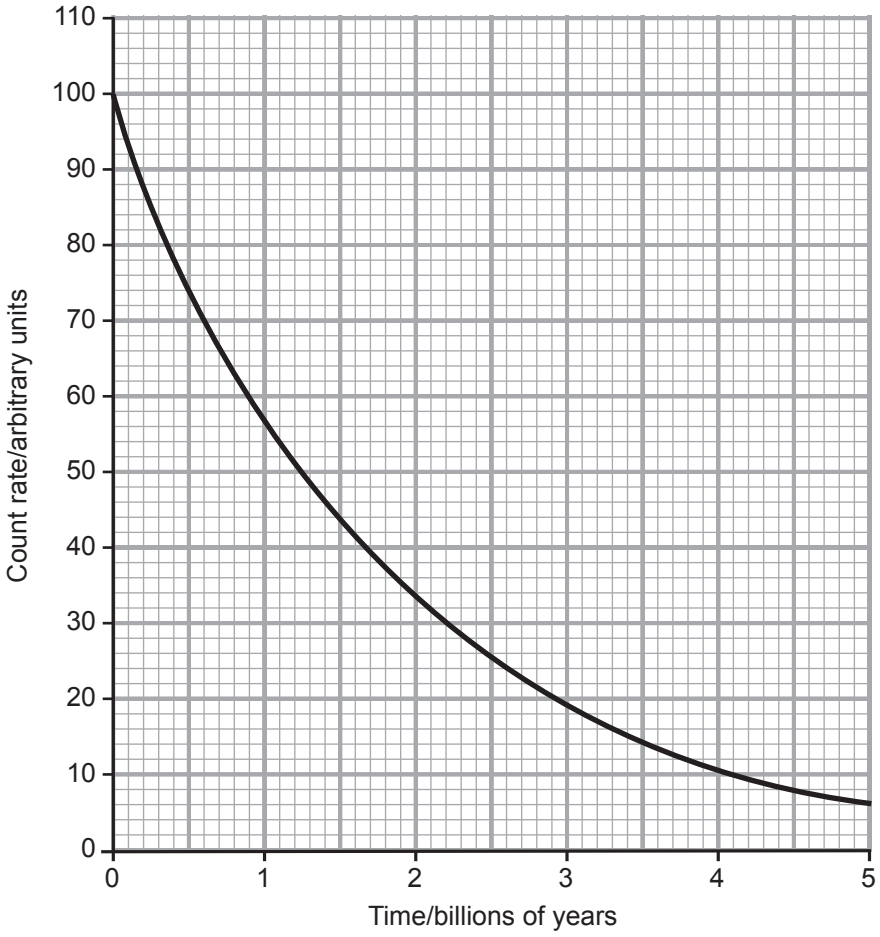
Explain why we should **not** be concerned about eating foods containing natural radiation.

_____

_____ [1]

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(c) The graph below shows how the count rate of potassium-40 varies with time.



(i) Describe fully the trend shown by these results.

_____

_____

_____ [2]

(ii) Use the graph to find the half-life of potassium-40.

Answer _____ billion years [1]

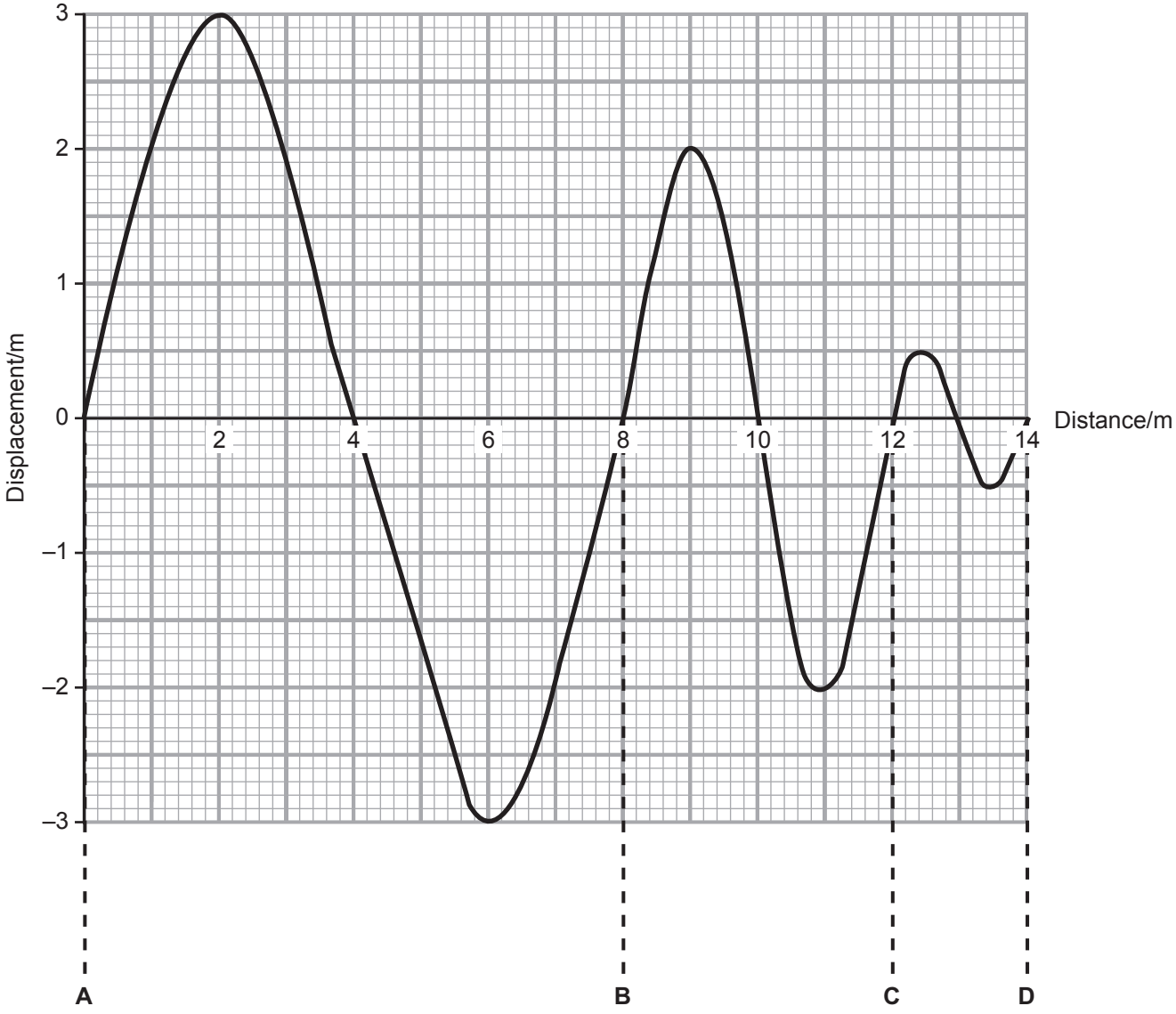
(iii) A radioactive source has a half-life of five days.
What fraction of the original source will be left after ten days?

Answer _____ [1]

Examiner Only

Marks	Remark

9 The diagram below shows a sound wave travelling through the air.



Examiner Only	
Marks	Remark

(a) What is the amplitude of the section labelled **A**–**B**?

Answer _____ m [1]

(b) (i) What is the wavelength of the section labelled **B**–**C**?

Answer _____ m [1]

(ii) Sound waves travel at a speed of 330 m/s in air.

Use the equation:

$$\textbf{frequency} = \frac{\textbf{speed}}{\textbf{wavelength}}$$

to calculate the frequency of the section labelled **B**–**C**.

(Show your working out.)

Answer _____ Hz [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

10 (a) Explain fully how fossil fuels are formed.

_____

_____

_____

_____ [3]

(b) The table below shows the electrical energy (GWh) generated in Northern Ireland from different energy sources between 2008–2012.

Year / Energy source	2008	2009	2010	2011	2012
Coal	2077	1402	1858	1450	2403
Hydroelectric	26	31	36	20	21
Wind, wave, solar	568	754	639	893	1047
Oil	369	112	107	88	79
Gas	6568	5674	4884	5397	3732
Total	**9608**	**7973**	**7524**	**7848**	**7282**

(i) Name all the fossil fuels shown in the table above.

_____ [1]

(ii) Give the trend in **total** energy generated between 2008–2012. Describe the significant changes in the energy sources used over this period.

_____

_____

_____

_____ [3]

(c) A company is proposing to develop an offshore wind farm fifteen kilometres off the coast of Northern Ireland. This would involve up to 100 turbines.
Discuss the advantages and disadvantages of the plan to build this wind farm.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

FRIDAY 14 NOVEMBER 2014, 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.

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Solar System	[1]	
		(ii)	Venus [1] Saturn [1]	[2]	
		(iii)	1. A [1] 2. H [1]	[2]	
	(b)		Moon, Earth, Milky Way, Universe 4 in right order [2] any 2 in right order [1]	[2]	7
2	**(a)**		A – Retina [1] B – Cornea [1]	[2]	
	(b)		Convex	[1]	3
3	**(a)**		Correct symbol for voltmeter [1] wired in parallel across the bulb [1]	[2]	
	(b)		Change the number of cells/batteries/higher voltage battery	[1]	
	(c)	**(i)**	2A	[1]	
		(ii)	3/2 [1] 1.5 Ω [1]	[2]	6
4	**(a)**		Ruler B [1] the ruler fell the shortest distance [1]	[2]	
	(b)	**(i)**	0.20	[1]	
		(ii)	The reaction time would be more	[1]	
	(c)		More drinks increase alcohol content [1] higher the body mass the less blood alcohol content [1]	[2]	6
5	**(a)**	**(i)**	Mallard	[1]	
		(ii)	The chaffinch [1] it has a hearing range above 20000 Hz/20 kHz [1]	[2]	
		(iii)	18 kHz	[1]	
	(b)		20 Hz	[1]	5

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					AVAILABLE MARKS
6	**(a)**		Current too high [1] fuse wire melts and breaks/gap in circuit [1]	[2]	
	(b)		Quicker to reset/does not need replacing [1] quicker to switch off under fault conditions [1] (either order)	[2]	4
7	**(a)**	**(i)**	Any **one** from: • they all travel at the speed of light • all carry energy • all transverse	[1]	
		(ii)	Galaxy Evolution Explorer	[1]	
		(iii)	Hot gas	[1]	
	(b)		Unable to survive for the length of time to reach the planet/distance too great [1] cannot carry sufficient food/water/fuel/oxygen [1]	[2]	5
8	**(a)**	**(i)**	Background	[1]	
		(ii)	Carrots	[1]	
	(b)		It would only reduce their life expectancy 2100 seconds per year makes little difference.	[1]	
	(c)	**(i)**	Count decreases with time [1] faster decrease at start [1]	[2]	
		(ii)	1.25 (1.2 – 1.3)	[1]	
		(iii)	$\frac{1}{4}$	[1]	7
9	**(a)**		3 m	[1]	
	(b)	**(i)**	4 m	[1]	
		(ii)	$\frac{330}{4}$ [1] 82.5 [1]	[2]	4

10 (a) Dead plants/animals [1]
compressed/under pressure/high temperature [1]
for millions of years [1] [3]

(b) (i) Coal, oil and gas [1]

(ii) Total generated has decreased over time [1]
oil/gas has decreased [1]
wind, wave and solar has increased [1] [3]

(c) Indicative content

- renewable
- good for economy/creates jobs
- reduce use of fossil fuels
- no gas (CO_2) emissions/no polluting gases
- unreliable – not always windy or switch off at high speeds
- hazard to shipping/destroys habitats
- expensive to build
- unsightly
- expensive to get electricity from farm to main-land

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, the advantages and disadvantages of using offshore wind farms (using at least **seven** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, the advantages and disadvantages of using offshore wind farms (using **three to six** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe the advantages and disadvantages of using offshore wind farms (using **one to two** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit.	[0]

[6] 13

Total **60**

AVAILABLE MARKS

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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(b)**.

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

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Examiner Only	
Marks	Remark

1 Shown below are devices which change electrical energy into other types of energy.



Iron
© iStock/Thinkstock



MP3 Player
© iStock/Thinkstock



Torch
© iStock/Thinkstock



Drill
© Stockbyte/Thinkstock

(a) Use lines to match each device with the main type of energy it produces.

Device	Energy type
Iron	Sound
MP3 Player	Heat
Torch	Movement
Drill	Light

[3]

(b) The drill has a power rating of 805 W and is connected to the 230 V mains.

Examiner Only

Marks	Remark

(i) Use the equation:

$$\textbf{current} = \frac{\textbf{power}}{\textbf{voltage}}$$

to calculate the amount of current flowing to the drill.

(Show your working out.)

Answer _____ [2]

(ii) What size of fuse should be fitted in the plug of the drill?

Circle the correct answer.

1 **3** **5** **13** **30**

[1]

(iii) Apart from the fuse, name **one** other safety feature of a 3-pin plug.

_____ [1]

(iv) Name the unit of current.

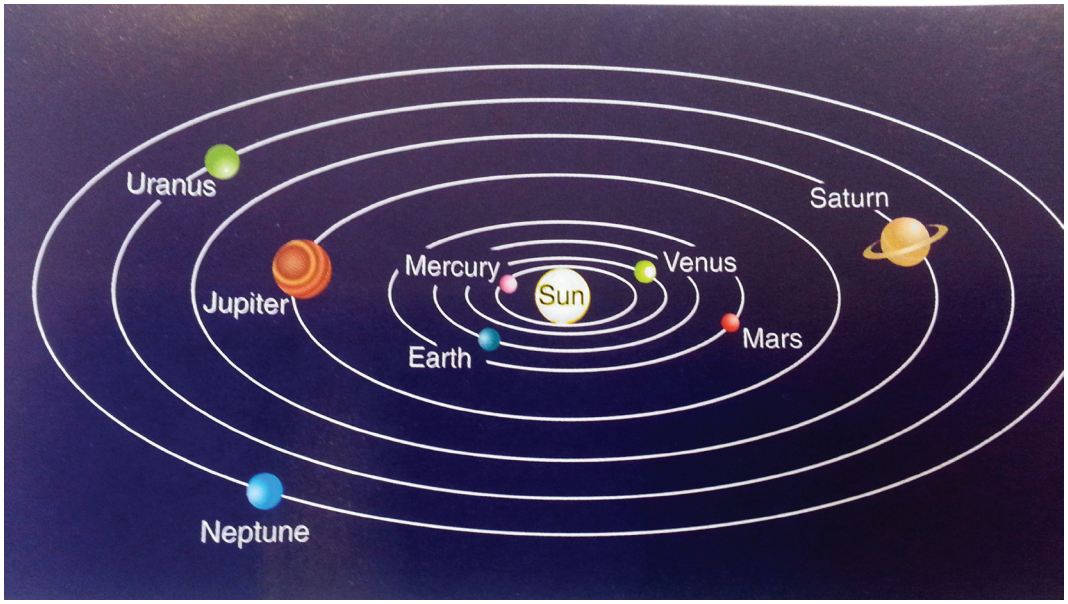
Choose from:

volt **watt** **amp** **joule**

Answer _____ [1]

Examiner Only	
Marks	Remark

2 The diagram below shows our Solar System.



© Barking Dog Art

(a) (i) Suggest which planet will be coldest. Explain your answer.

Planet _____

Explanation _____

_____ [2]

(ii) Name this model of the Solar System.

Circle the correct answer.

geocentric **concentric** **heliocentric**

[1]

(b) The table below gives information about four planets in our Solar System.

Planet	Diameter/ km	Gravity/ N/kg	Number of moons
Jupiter	142 800	26	67
Uranus	51 118	11	27
Neptune	49 528	12	13
Mars	6790	4	2

Use the table to answer the following questions.

(i) Describe the relationship between planet diameter and number of moons.

_____

_____ [1]

(ii) Using the information in the table, a student made the following suggestion.

"The bigger the diameter of a planet, the more gravity it will have."

Was the student correct? Explain your answer.

_____

_____ [1]

(c) NASA has stated that humans will land on Mars by 2025.
A major concern is the long distance to Mars. Explain fully why this might be a problem.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** The table below gives some factors which might affect thinking and braking distances. Complete the table.

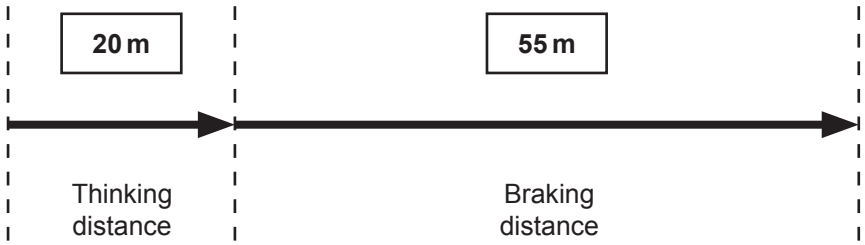
Choose from:

increased : **no effect** : **decreased**

Factor	Thinking distance	Braking distance
Wet road surface		
Faster speed		
Bald tyres	no effect	increased
New brakes		

[3]

(b) The information shown below is for a car travelling at 25 m/s.



Calculate the stopping distance for this car.

Answer _____ m [1]

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(c) The Lincolnshire Road Safety Partnership researched the effect that speed cameras had on speeding vehicles. Their results are shown in the table below.

	% vehicles exceeding the speed limit	
Speed limit/mph	**Before cameras introduced**	**After cameras introduced**
30	40	8
40	26	4
50	38	0.4
60	15	6
70	16	2

(i) What conclusion can be made from these results about the use of speed cameras?

_____

_____ [1]

(ii) At which speed limit did speed cameras produce the biggest change in the percentage of speeding vehicles?

Answer _____ mph [1]

(iii) Apart from speed cameras, name **one** other traffic calming measure.

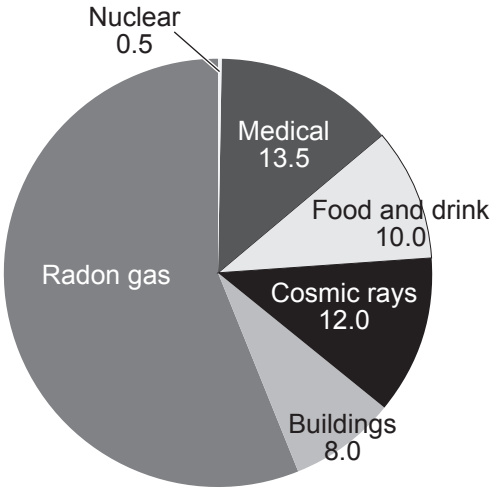
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 The pie chart below shows the percentage of each source of radiation that a person is exposed to in one year.



© CCEA

(a) (i) Calculate the percentage of radiation received from radon gas.

(Show your working out.)

Answer _____ % [2]

(ii) What collective name is given to these sources of radiation?

Choose from:

foreground **underground** **background**

_____ [1]

(b) Radiation can be used to keep food fresh for longer.

(i) Explain fully how radiation extends the shelf life of fresh food.

_____

_____

_____ [2]

(ii) Suggest how a longer shelf life will benefit a shopkeeper.

_____

_____ [1]

(c) The picture below shows a patient about to undergo radiotherapy. This involves a brain tumour (cancer) being targeted with radiation.



© Stevie Grand/Science Photo Library

Explain fully, in terms of the penetrating power of radiation, why gamma is used rather than alpha or beta.

_____

_____

_____

_____

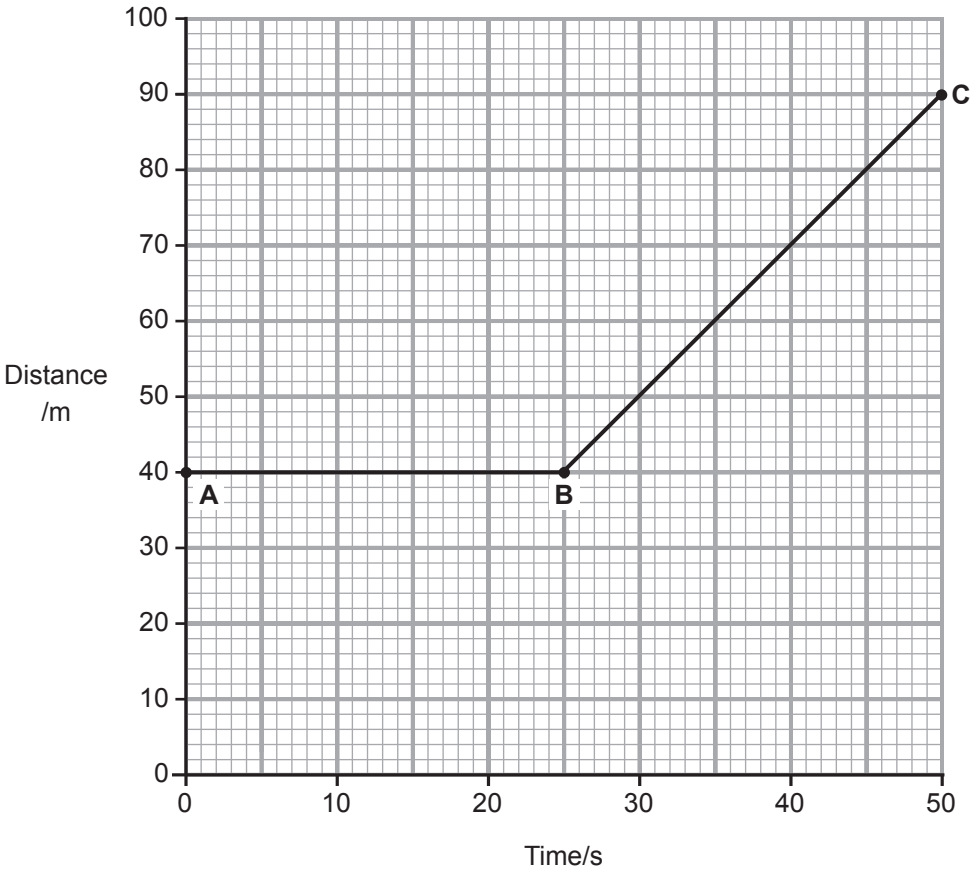
_____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** The distance–time graph for part of a train journey is shown below.



(i) Describe the motion of the train from:

A to **B** _____

B to **C** _____ [2]

Examiner Only	
Marks	Remark

(ii) Use the equation:

$$\textbf{average speed} = \frac{\textbf{distance}}{\textbf{time}}$$

to calculate the average speed of the train between **A** and **C**.

(Show your working out.)

Answer _____ m/s [2]

(b) Patrick investigated the average speeds of five racing cars (**A**, **B**, **C**, **D** and **E**) over a two lap race.

The results are shown in the table below.

Car	1st lap time/s	2nd lap time/s
A	40	55
B	50	50
C	55	55
D	55	45
E	40	75

If all the cars start at the same time, which **two** will finish together?

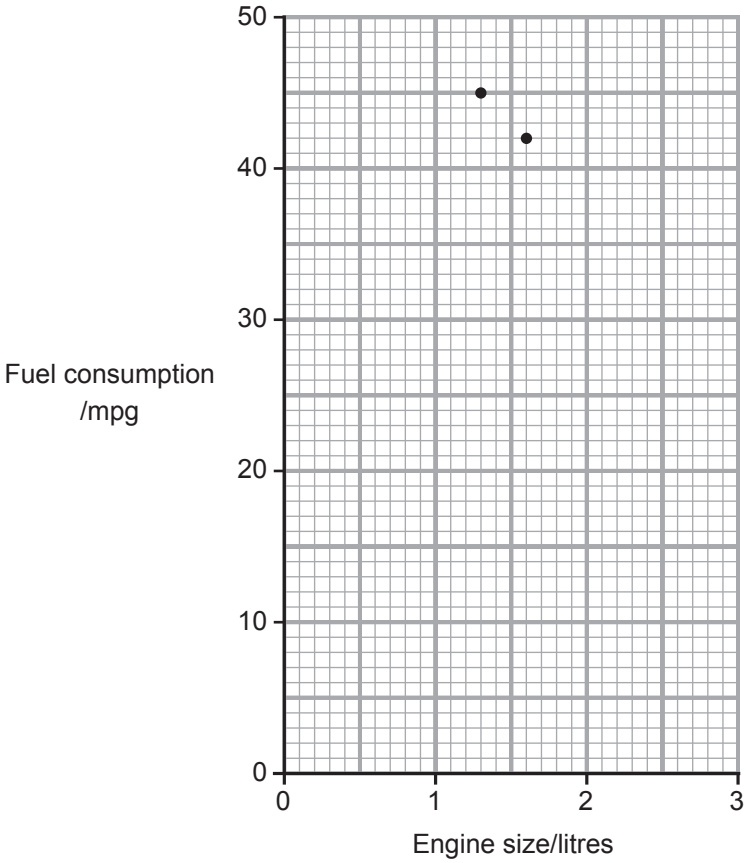
_____ and _____ [1]

Examiner Only	
Marks	Remark

6 **(a)** The table below gives information about five different makes of car.

Make	Engine size/ litres	Fuel consumption/ mpg
Aster	1.3	45
Lazio	1.6	42
Torino	1.8	39
Viva	2.0	37
Megro	2.5	32

(i) Use this information to complete the graph below, including a line of best fit.



[2]

(ii) Use your graph to find the fuel consumption of a 1.0 litre engine.

Answer _____ mpg [1]

(b) Car manufacturers are trying to make cars more efficient.

(i) Suggest **one** way car manufacturers are making cars more efficient.

_____

_____ [1]

(ii) Petrol and diesel are made from oil, a finite fossil fuel. Explain the term 'finite' and why it is important to have more efficient cars.

_____

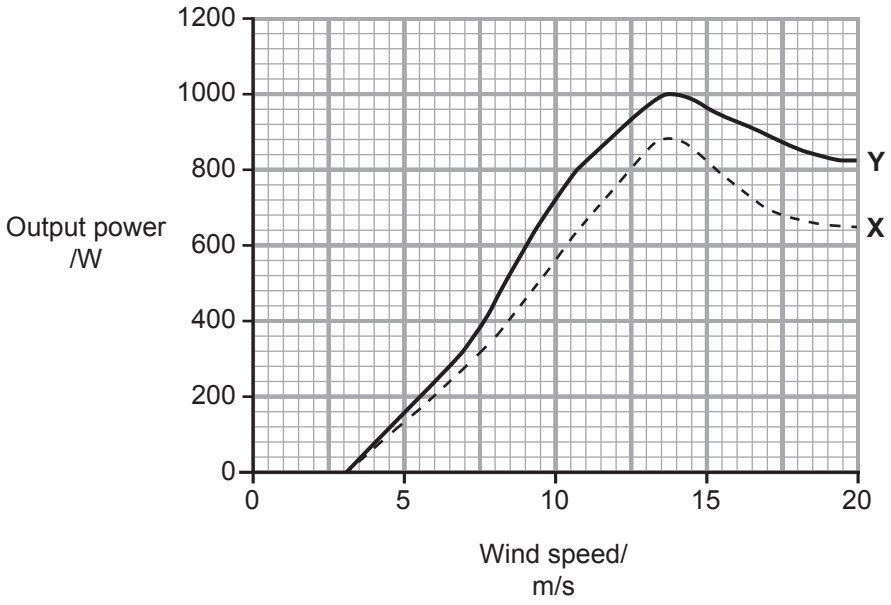
_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The graph below shows the performance of two types of wind turbine (**X** and **Y**).



(i) Calculate the difference between the maximum power produced by the two turbines.

(Show your working out.)

Answer _____ W [2]

(ii) Describe in detail how the output power of turbine **X** changes as the wind speed increases.

_____

_____

_____

_____

_____ [3]

(b) (i) Wind energy is classed as renewable. What does the term 'renewable' mean?

_____

_____ [1]

(ii) Give **one** environmental advantage and **one** disadvantage of using wind energy.

Advantage _____

_____

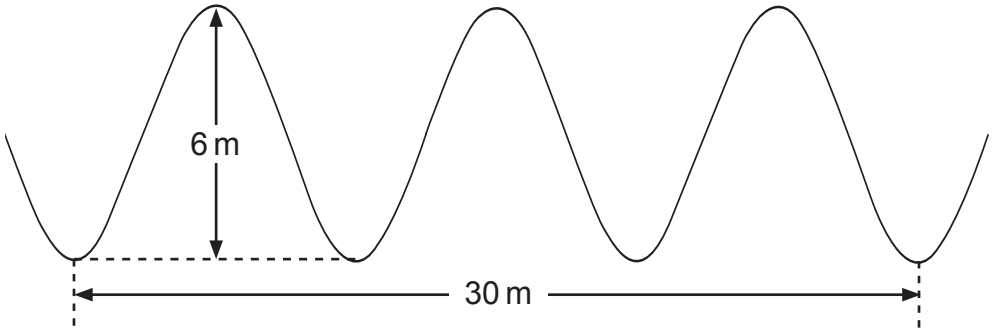
Disadvantage _____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** The diagram below shows some sea waves.



Use the information in the diagram to answer the following questions.

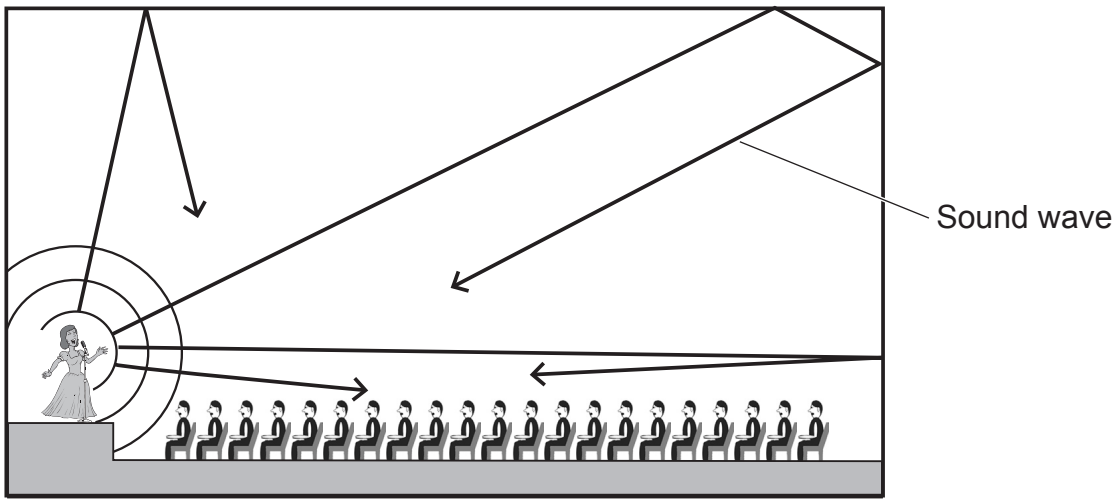
(i) What is the amplitude of these waves?

Answer _____ m [1]

(ii) What is the wavelength of these waves?

Answer _____ m [1]

(b) The diagram below shows the sound waves in a badly designed concert hall. Some of the audience complain that the sound they hear is not very clear.



Explain fully why some people may not hear the sound clearly.

Your answer should include:
- the cause of the problem
- what the audience will hear and why
- what can be done to correct the problem

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

[6]

(c) Explain fully what ultrasound is.

[2]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

MONDAY 19 MAY 2014, AFTERNOON

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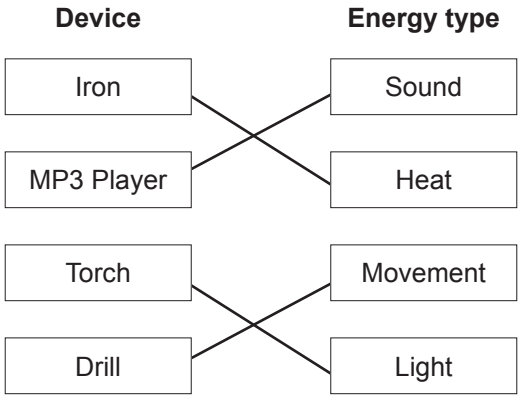
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			AVAILABLE MARKS
1	**(a)**	 All 4 correct = 3 marks 3/2 correct = 2 marks 1 correct = 1 mark [3]	
	(b) **(i)**	805/230 = 1 mark 3.5 = 2 marks [2]	
	(ii)	5 (Allow consequential on (i)) [1]	
	(iii)	plastic (insulator) cover/cable grip/earth wire [1]	
	(iv)	Amp [1]	8
2	**(a)** **(i)**	Neptune [1] as it is furthest away from sun [1] [2]	
	(ii)	Heliocentric [1]	
	(b) **(i)**	As planet diameter increases so does number of moons [1]	
	(ii)	Not correct as Uranus/Neptune doesn't fit the trend [1]	
	(c)	Journey time [1] or implied Difficult to carry enough food/oxygen/fuel [1] [2]	7
3	**(a)**		

Factor	Thinking distance	Braking distance
Wet road surface	**no effect**	**increased**
Faster speed	**increased**	**increased**
Bald tyres		
New brakes	**no effect**	**decreased**

½ mark each – round down [3]

	(b)	75 m [1]	
	(c) **(i)**	Speed cameras reduced the % of vehicles speeding [1]	
	(ii)	50 mph [1]	
	(iii)	Speed bumps/road narrowing [1]	7

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					AVAILABLE MARKS
4	**(a)**	**(i)**	0.5 + 13.5 + 10 + 12 + 8 = 44 [1] 100 – 44 = 56 [2]	[2]	
		(ii)	Background	[1]	
	(b)	**(i)**	Kills microbes [1] which causes decay (or implied) [1]	[2]	
		(ii)	They have longer to sell the food/more profit/less wastage	[1]	
	(c)		As alpha would be stopped by air [1] beta would be stopped by skin/bone [1] gamma would not be stopped by skin/bone [1]	[3]	9
5	**(a)**	**(i)**	A to B = stopped [1] B to C = steady speed [1]	[2]	
		(ii)	50/50 [1] 1.0 [1]	[2]	
	(b)		B and D	[1]	5
6	**(a)**	**(i)**	3 points plotted correctly [1] Line of best fit [1]	[2]	
		(ii)	48 mpg (from script)	[1]	
	(b)	**(i)**	Streamlined/lighter/other appropriate response	[1]	
		(ii)	Fossil fuels/energy sources are running out/non-renewable [1] more efficient uses less fuel [1]	[2]	6
7	**(a)**	**(i)**	1000 – 880 [1] 120 [1]	[2]	
		(ii)	Any 3 from: • no power produced until speed reaches 3 m/s (at low wind speed) • (as wind speed increases), output power increases • up to a maximum of 880 W/14 m/s (unit not required) • then power decreases (after maximum/at high wind speed)	[3]	
	(b)	**(i)**	Will not run out	[1]	
		(ii)	Less air pollution/(**less**) carbon dioxide/(**less**) global warming [1] Unsightly/noisy [1]	[2]	8

8 (a) (i) 3 [1]

(ii) 10 [1]

(b) Indicative content
- echoes
- reflected sound
- hard surfaces
- hear the same sound at different times
- sound travels different distances
- use soft materials (named surface)
- to absorb sound

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, why some people may not hear the sound clearly (using **6 or more** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, why some people may not hear the sound clearly (using **4** or **5** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe why some people may not hear the sound clearly (using **1**, **2**, or **3** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit.	[0]

[6]

(c) Sounds with a frequency [1]
greater than 20kHz [1] [2]

Total

AVAILABLE MARKS

10

60

STEMUP.CO.UK

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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 nine** questions.

INFORMATION FOR CANDIDATES

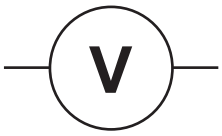
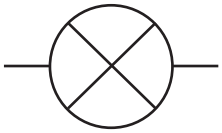
The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7**.

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

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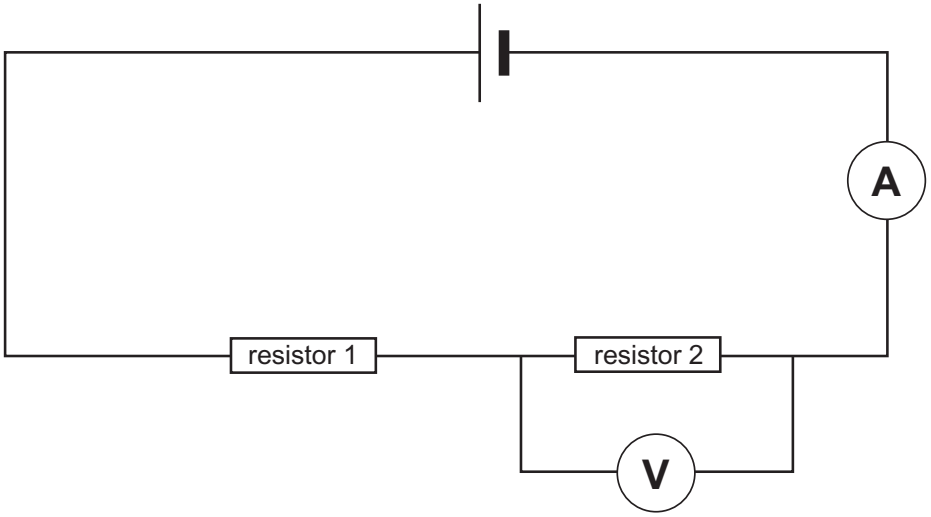
Examiner Only	
Marks	Remark

1 **(a)** Below are some electrical symbols. Using lines, match each symbol with its correct description.

Symbol	Description
	cell
	voltmeter
	bulb

[2]

(b) The diagram below was set up to measure the resistance of a resistor.



(i) Complete the following sentence.

Choose from:

series **short** **parallel**

In the diagram above the resistors are connected

in a _____ circuit. [1]

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(ii) The voltmeter had a reading of 2 V and the ammeter had a reading of 4 A.

Use the equation:

$$\textbf{resistance} = \frac{\textbf{voltage}}{\textbf{current}}$$

to calculate the resistance of resistor 2.
(Show your working out.)

Answer _____ [2]

(iii) Name the unit of resistance.

Choose from:

volt **watt** **amp** **ohm**

Answer _____ [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

2 **(a)** The diagram below gives stopping distances for a car travelling at different speeds on a **dry** road.

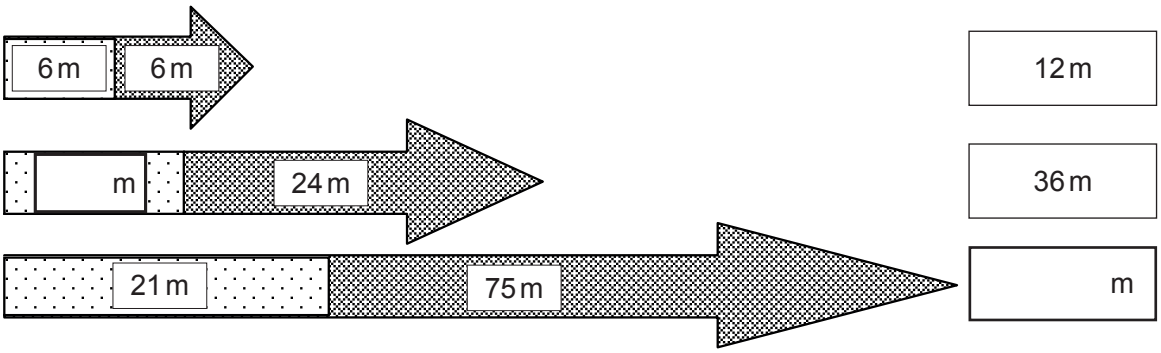
(i) Use the equation:

thinking distance + braking distance = stopping distance

thinking distance braking distance stopping distance

to complete the diagram below.

Two answer boxes need completed.



[2]

(ii) If the road was **wet**, what effect, if any, would this have on the:

braking distance?

_____

thinking distance?

_____

stopping distance?

_____ [3]

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(b) The table below shows the stopping distance for different depths of tyre tread.

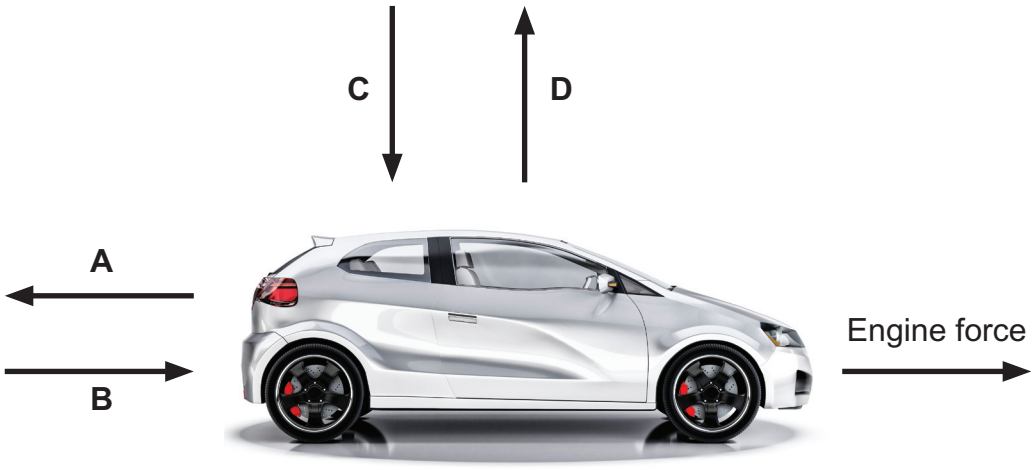
Tread depth/mm	Stopping distance/m
8.0 (new tyre)	25.9
3.0 (part worn)	31.7
1.6 (legal limit)	39.5

Use the information to state how stopping distance changes as tread depth decreases.

_____

_____ [1]

(c) The diagram below shows a car moving to the right.



© tridland/iStock/Thinkstock

Which arrow **A**, **B**, **C** or **D** shows the direction of the force of friction?

Answer _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 A group of students investigated how energy drinks affect reaction times. The same student carried out the test for each drink.

The results are shown in the table below.

Drink	Reaction time before taking drink/ms	Reaction time after taking drink/ms
Water	315	316
Energy drink A	321	298
Energy drink B	318	288

(a) (i) Using the information, describe the effect of energy drinks on reaction times.

_____

_____ [1]

(ii) Compare the effect of energy drink A and energy drink B on reaction times.

_____

_____ [1]

(b) Suggest why reaction times before and after drinking water were measured.

_____

_____ [1]

(c) Why was the same student used for each test?

_____

_____ [1]

(d) State how the reliability of the investigation could be improved.

_____ [1]

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4 The photograph below shows a speaker which produces sound waves.

Examiner Only	
Marks	Remark



© Gustoimages/Science Photo Library

(a) Complete the following sentence.

Choose from:

reflections **vibrations** **energy** **pictures**

All sound waves are caused by _____ and they carry _____ from one place to another. [2]

(b) Suggest which feature of a sound wave increases as the volume of the sound gets louder.

Circle the correct answer.

frequency **amplitude** **wavelength**

[1]

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(c) The table below shows the percentage of sound reflected at different frequencies for different materials.

	Percentage of sound reflected at different frequencies			
Material	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**
Brick	98	97	96	95
Carpet	76	43	31	29
Curtain	65	42	30	28
Glass	75	82	88	93

(i) Which material reflects most sound over a range of frequencies?

_____ [1]

(ii) A concert hall needs to reduce echoes to improve sound quality. Use the information and your knowledge to suggest which material should be used. Explain your answer.

_____

_____

_____ [3]

Examiner Only

Marks	Remark

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(d) (i) The table below shows the electromagnetic spectrum.
Complete the table using the words given below.

infrared **microwaves** **ultraviolet**

gamma rays	X-rays		visible light			radio waves

[2]

Examiner Only	
Marks	Remark

(ii) State **one** feature these waves have in common.

_____ [1]

(iii) State **one** feature that is different for each of these waves.

_____ [1]

(e) Electromagnetic waves can be used in communications. Using lines, match each wave with how it is used.

Wave	Use
infrared	television aerial
microwave	optical fibre
	satellite

[2]

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Examiner Only	
Marks	Remark

5 Pilots are exposed to higher levels of radiation because they spend long periods of time at high altitudes (heights).



© *Victor De Schwanberg/Science Photo Library*

The table below shows the amount of radiation (dose) received by pilots travelling to different destinations from Belfast.

Destination	Flight time/hrs	Amount of radiation/ mSv
Paris	1.75	8.34
New York	7.7	50.00
Sharm El Sheikh	6.2	24.18
Manchester	1.0	1.82

(i) State the trend shown by this data.

_____

_____ [1]

(ii) Background radiation causes this increase in dose. Suggest **one** possible source of radiation which could affect the pilots at this height.

_____

_____ [1]

(iii) The maximum safe radiation dose for pregnant women is 2000 mSv. Use this information to calculate the maximum number of return flights a woman should make to New York during a pregnancy. (Show your working out.)

Answer _____ [2]

(iv) Explain fully how radiation can harm humans.

_____

_____

_____ [2]

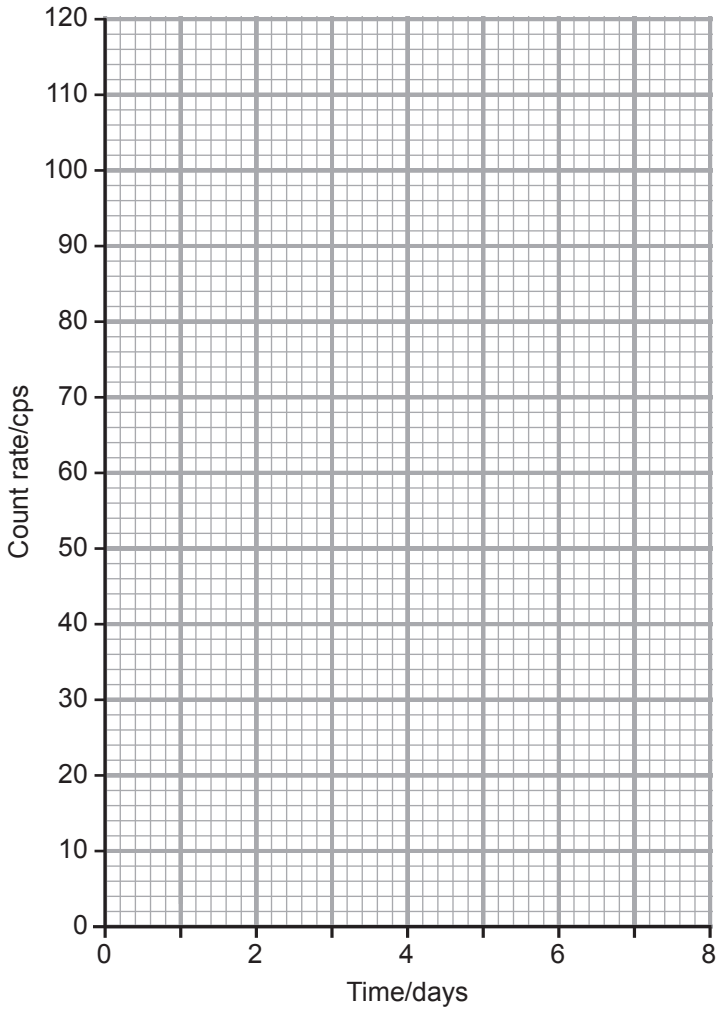
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** The table below shows the count rate of a radioactive isotope.

Time/days	Count rate/ cps
0	120
2	76
4	48
6	30
8	19

(i) Plot these points on the axes below and draw a curve of best fit.



[3]

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(ii) Use the graph to find the half-life of the radioactive isotope.

Answer _____ days [1]

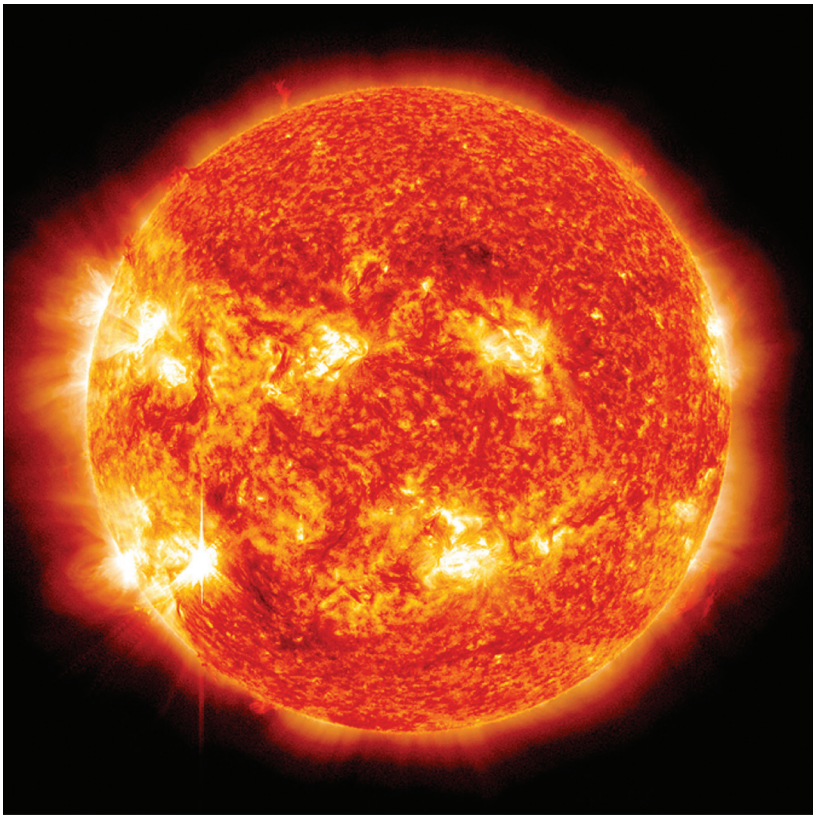
(b) Radioactive phosphorus has a half-life of 20 days. What fraction of the original mass of phosphorus will be left after 40 days?

Answer _____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 The photograph below shows the Sun, our closest star.



© NASA/SDO

Describe fully the formation of the Sun, naming the gases and forces involved.

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

[6]

8 **(a)** The table below shows information on generating electrical power.

	Tidal	Coal	Wind	
			Onshore	Offshore
Power output/ MW	12	1600	24	94
Life expectancy/ years	15	30	20	20
Annual operating costs per kW/£	56	24	24	57
Generating costs per kWh/p	6.63	3.33	5.35	7.19

(i) The government want to replace fossil fuel power stations with alternative sources.
Use the information to explain fully why this might not be the best option.

_____

_____

_____

_____ [3]

(ii) Give **two** reasons why more alternative energy sources are being introduced.

1. _____

2. _____ [2]

(b) Explain fully the formation of fossil fuels from dead plants and animals.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

(c) Given below are some of the processes involved in producing electricity using a coal fired power station.

A	The coal produces heat	The boiler produces steam	The steam turns the blades of the turbine to make electricity directly
B	The coal produces heat	The heat turns the blades of the turbine	The turbine turns the generator which produces electricity
C	The boiler produces steam	The steam turns the blades of the turbine	The turbine turns the generator which produces electricity
D	The turbine heats the boiler	The boiler produces steam	The steam turns the generator which produces electricity

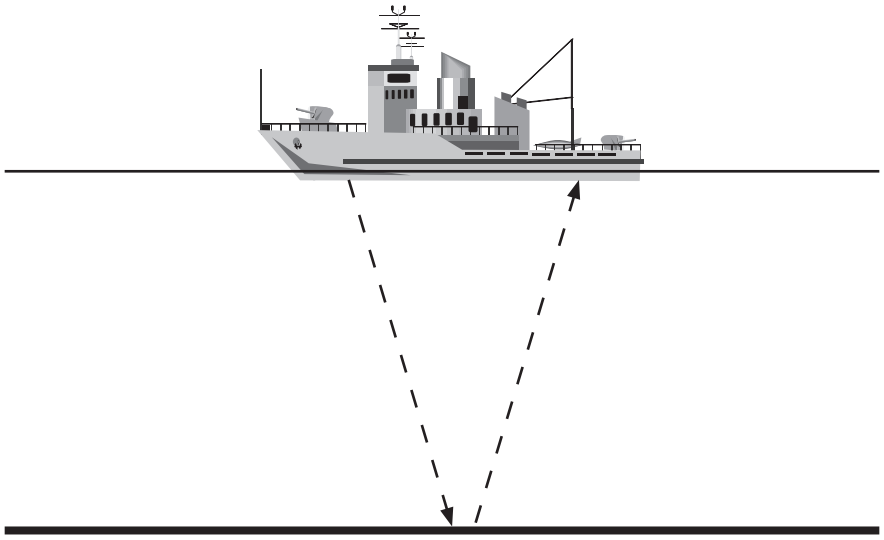
Which letter **A**, **B**, **C** or **D** gives the correct order of processes?

Answer _____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 Ultrasound can be used to measure the depth of the sea as shown in the diagram below.



Ultrasound travels at 1500 m/s in water.

(a) The ship sends out an ultrasound pulse and the echo returns 6 seconds later.

Use the equation:

distance = speed × time

to calculate the depth of the water.
(Show your working out.)

Answer _____ m [3]

(b) How will the captain of the ship know if a shoal of fish swims under the ship?

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

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

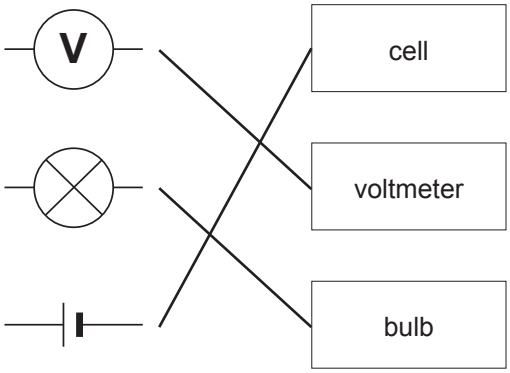
Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

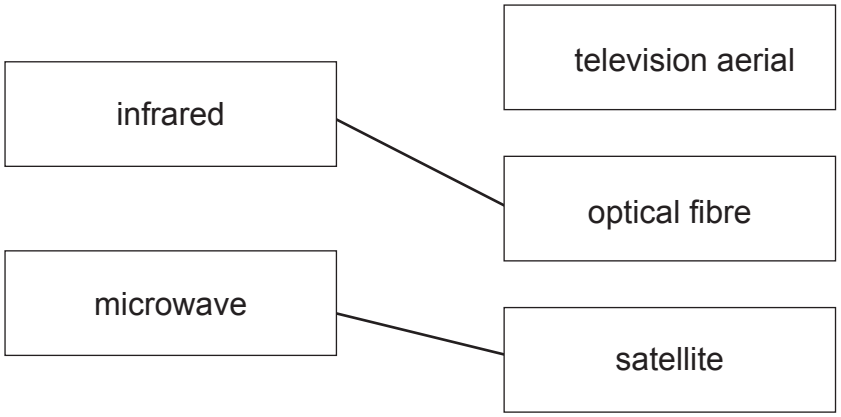
The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

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	**(a)**	**Symbol** **Description**		
				
		all 3 correct [2] 1 correct [1]	[2]	
	(b)	**(i)** series	[1]	
		(ii) 2/4 [1] 0.5 [1]	[2]	
		(iii) ohm	[1]	6
2	**(a)**	**(i)** 12 [1] 96 [1]	[2]	
		(ii) longer [1] same [1] longer [1]	[3]	
	(b)	Stopping distance higher	[1]	
	(c)	A	[1]	7
3	**(a)**	**(i)** Reaction time decreases after energy drink	[1]	
		(ii) Energy drink A reduces reaction time **less than B**	[1]	
	(b)	For comparison/control/rule out other factors	[1]	
	(c)	Fair test/valid	[1]	
	(d)	Repeat	[1]	5

			AVAILABLE MARKS
4	**(a)** vibrations [1] energy [1]	[2]	
	(b) amplitude	[1]	
	(c) **(i)** Brick	[1]	
	(ii) Curtain; reflect least sound; better at absorbing sound	[3]	
	(d) **(i)** ultraviolet infrared microwave all 3 correct [2] 1 correct [1]	[2]	
	(ii) carry energy/transverse/travel at the same speed in a vacuum	[1]	
	(iii) wavelength/frequency/energy	[1]	
	(e) **Electromagnetic Wave** / **Use**  All correct [2] 1 correct [1]	[2]	13
5	**(i)** The longer the flight time the greater the dose	[1]	
	(ii) Cosmic	[1]	
	(iii) $\frac{2000}{50}$ [1]		
	40 ÷ 2 = 20 [1]	[2]	
	(iv) Damage cell [1] cause cancer [1]	[2]	6

	AVAILABLE MARKS

6 **(a)** **(i)** All points correctly plotted [2]
(4 points correctly plotted [1])
Curve of best fit [1] [3]

(ii) 3 days [1]

(b) $\frac{1}{4}$ [1] 5

7 Indicative content
- clouds
- hydrogen
- pulled together
- by gravity
- helium formed
- nuclear fusion

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using **five or six** of the above points) star formation in a logical sequence. They use good spelling, punctuation and grammar and form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe and explain star formation (using **three or four** of the above points) in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe/explain star formation using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6] 6

					AVAILABLE MARKS
8	**(a)**	**(i)**	Alternative sources Lower output power [1] Less life expectancy [1] Higher generating costs [1]	[3]	
		(ii)	Reduce the use of fossil fuels [1] renewable [1]	[2]	
	(b)		Millions of years [1] high pressure/compression [1]	[2]	
	(c)		C	[1]	8
9	**(a)**		1500 × 6 [1] 1500 × 3 [1] 4500 m [1]	[3]	
	(b)		Echo returns quicker	[1]	4
				Total	**60**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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**.

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

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Examiner Only	
Marks	Remark

1 **(a)** The pictures below show some electrical appliances.



© iStock / Thinkstock

kettle



© Ryan McVay / Photodisc / Thinkstock

microphone



© iStock / Thinkstock

loudspeaker



© iStock / Thinkstock

television

(i) Which appliance above produces most light energy?

Answer _____ [1]

(ii) Which appliance changes sound energy into electrical energy?

Answer _____ [1]

(b) Complete the following sentence.

Choose from:

carried **destroyed** **created** **changed**

The law of conservation of energy states that energy cannot be _____ or _____ , it can only be _____ from one form to another.

[2]

(c) The table below shows the power of some electrical appliances.

Appliance	Power/watts
kettle	2000
oven	4000
toaster	800
television	200

(i) Which appliance is **not** designed to produce heat?

Answer _____ [1]

(ii) Which appliance has a power rating of 2 kW?

Answer _____ [1]

(d) The oven uses a current of 17 amps. Which fuse should the oven have fitted?

Circle the correct answer.

5 A **15 A** **30 A** **45 A**

[1]

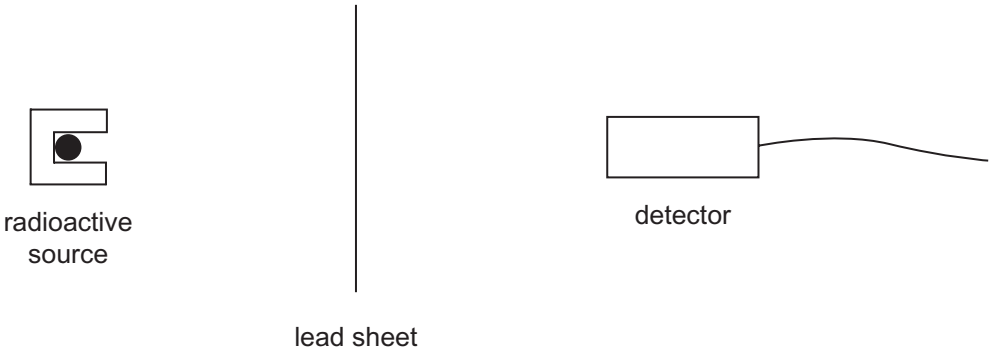
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 The equipment below measures the amount of gamma radiation stopped by different thicknesses of lead.



(a) State **two** things that have to be kept the same to make the test fair.

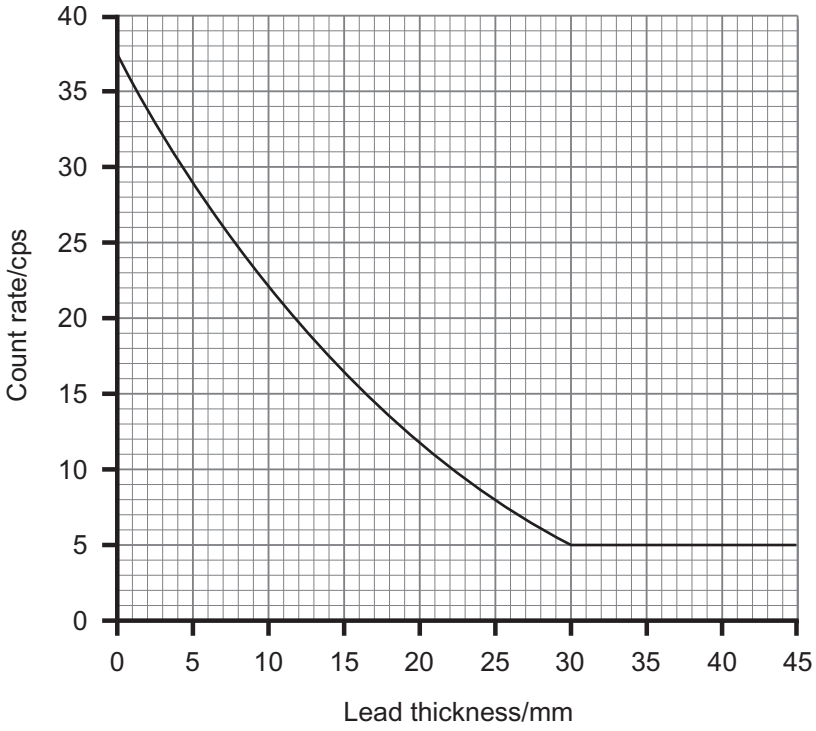
1. _____

_____

2. _____

_____ [2]

(b) The results of the experiment are shown in the graph below.



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(i) Complete the following sentence to describe fully the conclusion that can be made from these results.

As the thickness of lead increases _____

_____

_____ [2]

(ii) Complete the sentence below.

Choose from:

surround **underground** **background**

The count rate never falls to zero because of the radiation that is always around us. This is called _____ radiation. [1]

(iii) What is the minimum (smallest) thickness of lead needed to stop all the gamma radiation from this source?

Answer _____ mm [1]

(c) Give **one** use for gamma radiation.

_____ [1]

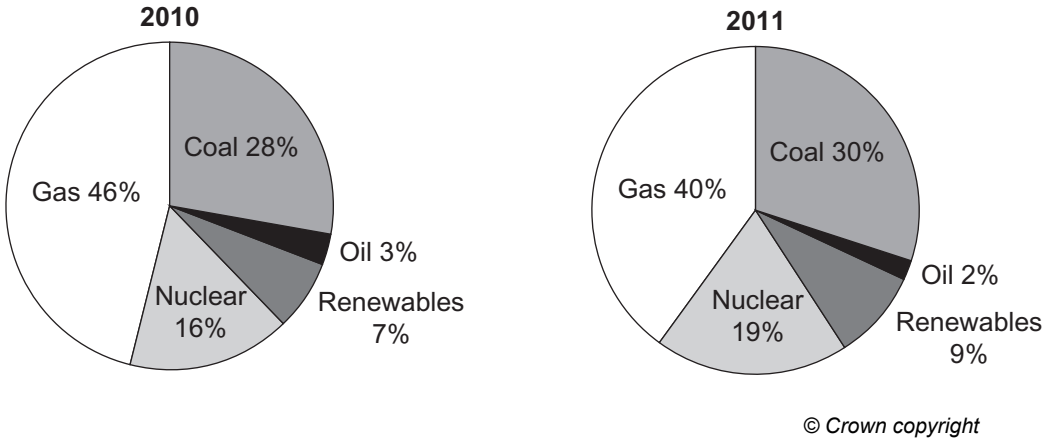
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Marks	Remark

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Marks	Remark

3 The pie charts below show the energy sources used to produce the UK's electricity in 2010 and 2011.



© Crown copyright

(a) (i) Name **one** fossil fuel that was used less in 2011 than in 2010.

Answer _____ [1]

(ii) Calculate by how much the percentage use of this fossil fuel has fallen.

Answer _____% [1]

(b) The percentage of renewable energy sources used has increased between 2010 to 2011.

(i) What is meant by the term 'renewable'?

_____ [1]

(ii) Give **one** example of a renewable energy source.

_____ [1]

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(c) Below are the number of units shown by an electricity meter 3 months ago and today.

6 4 3 9 0	6 5 3 6 5
3 months ago	**today**

(i) Calculate the number of units used in these 3 months.

Answer _____ [1]

(ii) Use the equation:

cost = number of units used × cost per unit

to calculate the cost of using electricity over these 3 months.
Each unit of electricity costs 20p.

(Show your working out.)

Answer _____ [2]

(iii) Suggest **two** ways that any household can reduce the amount of electricity used.

1. _____

_____

2. _____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The table below gives advice on how a person can prevent damage due to ultraviolet (UV) radiation.

UV Index	Safe time in Sun/mins	Protection
1–2	120	Hat
3–4	90	Hat + sunglasses
5–6	60	Hat, sunglasses and factor 10 sunscreen
7–9	40	Hat, sunglasses, factor 20 sunscreen and T-shirt
10+	30	Hat, sunglasses, factor 30 sunscreen, T-shirt and shady area

(i) Name the condition caused by too much exposure to UV radiation.

_____ [1]

(ii) During her summer holidays, Jane is leaving an area of UV Index 8 and travelling to an area of UV Index 12. From the table give **two** extra things she should do to help prevent damage due to UV radiation.

1. _____

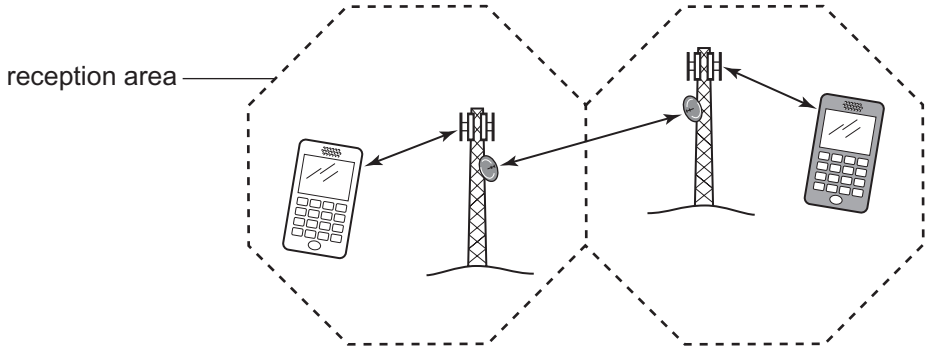
_____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

(b) The diagram below shows how mobile phones transmit signals from one phone to another.



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(i) Name the type of electromagnetic wave used to carry mobile phone signals.

_____ [1]

(ii) What name is given to the reception area around a phone mast?

_____ [1]

(c) Below are some electromagnetic waves and their uses.
Using lines match each wave with its use.

Wave	Use
	Pictures of broken bones
Radio waves	
	Preserving food
X-rays	
	Television broadcasting

[2]

(d) Give **one** feature that is the same and **one** feature that is different between electromagnetic waves.

Same _____

Different _____ [2]

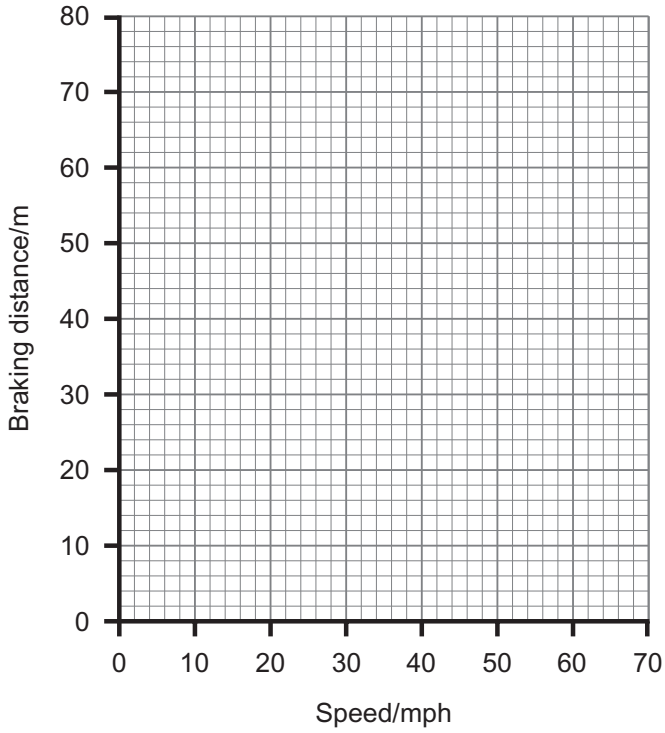
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Examiner Only	
Marks	Remark

5 **(a)** The table below shows the braking distance for a car at different speeds.

Speed/mph	Braking distance/m
0	0
20	6
30	14
50	38
70	75

(i) Plot and draw a line graph for these results.



[3]

(ii) State the trend shown by these results.

_____

_____ [1]

(iii) These results are for a dry road. On the same grid above, sketch the line you would expect if the road was wet. [1]

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(b) The table shows the increased risk that drivers will crash as their Blood Alcohol Content (BAC) rises.

BAC/ mg/100 ml	Increased risk of having a crash
40	1.4
80	3.8
120	14.7
160	32.2

The legal limit for a driver's BAC is 80 mg/100 ml. Using the information and your knowledge, describe and explain fully the effect that alcohol has on driving and why many road safety campaigners suggest that the current limit is too high.

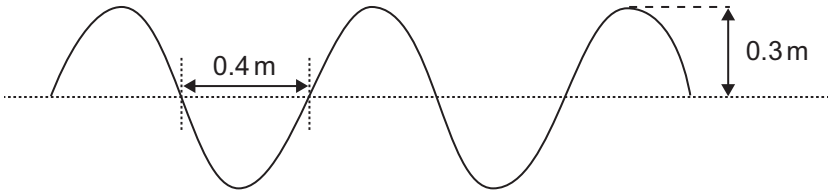
[3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 The diagram below represents a sound wave.



(a) What is the wavelength of this sound wave?

Answer _____ m [1]

(b) **(i)** Use the equation:

speed = wavelength × frequency

to describe how wavelength changes as frequency increases.

(Assume speed remains the same.)

_____ [1]

(ii) State the units of frequency.

Answer _____ [1]

(c) The device below is used to measure distance.



© Victor De Schwanberg / Science Photo Library

To find the length of a hall the device measures the time taken for an ultrasound wave to travel to a wall and back.

(i) Describe fully why we cannot hear the sound produced by this measuring device.

_____

_____

_____ [2]

(ii) A signal takes 0.4 s to travel from one wall of a hall to the opposite wall and back. The speed of sound in air is 330 m/s.

Use the equation:

distance = speed × time

to calculate the length of the hall.

(Show your working out.)

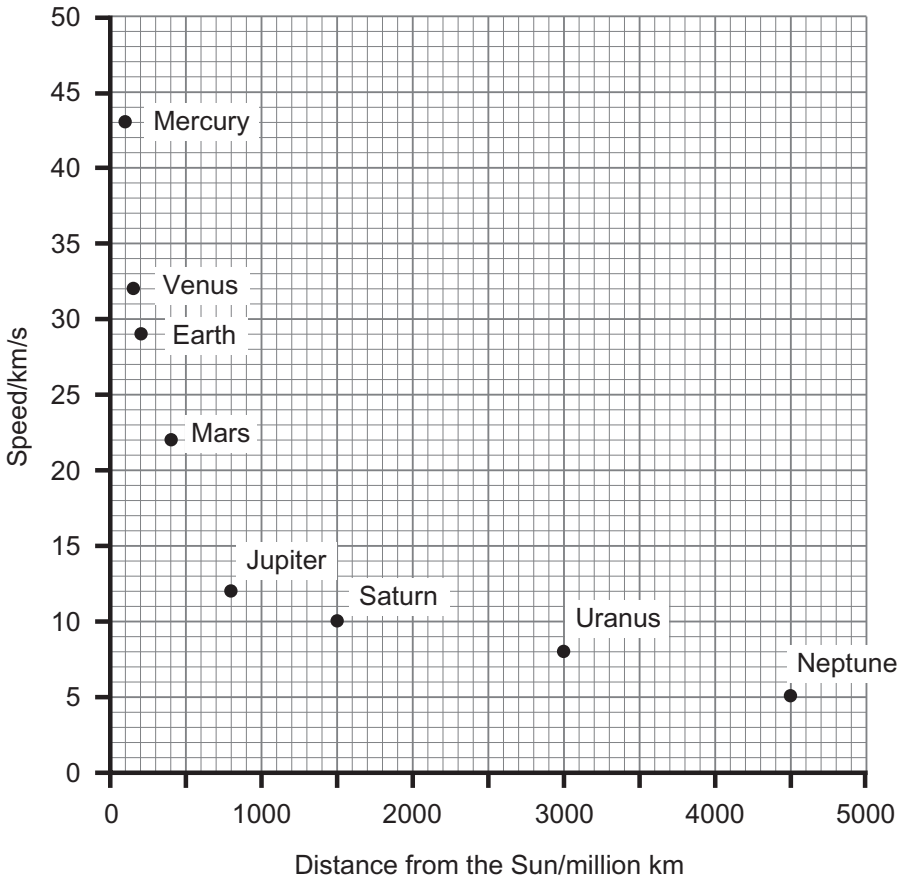
Answer _____ m [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The graph below shows how the (orbital) speed of a planet relates to its approximate distance from the Sun.



(i) Use the graph to find how far Venus is from the Sun.

Answer _____ million km [1]

(ii) Using information from the graph, compare the speed and distance from the Sun of Mercury and Neptune.

_____

_____

_____

_____ [3]

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(b) This information describes the Heliocentric model of the Solar System.

Give **two** differences between this model and the Geocentric model.

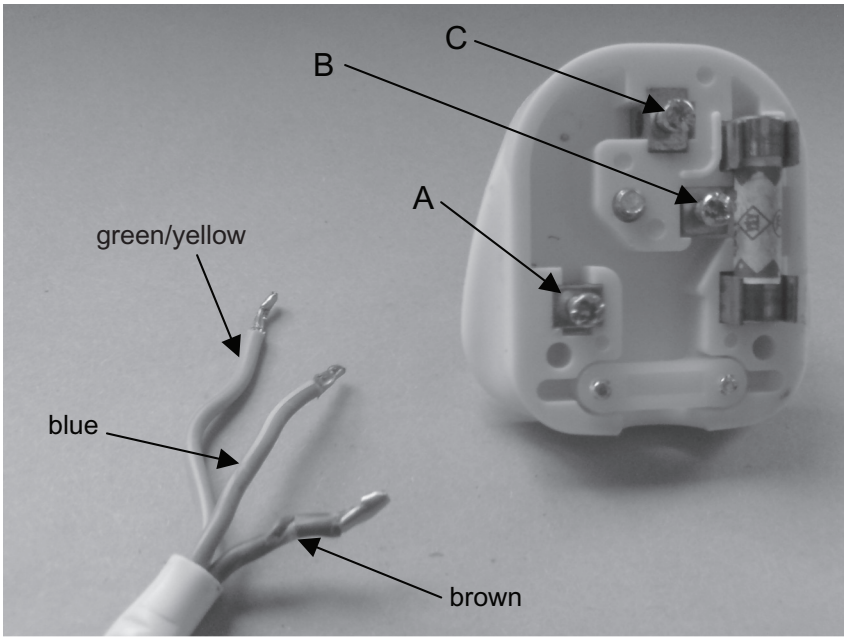
1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

8 The picture below shows a 3-pin plug about to be wired.

The colours of each wire and the plug pins are labelled.



Source: Principal Examiner

Describe fully how the plug should be wired correctly, naming and explaining one safety feature found in the plug.

Your answer should:

- use the labels provided
- name the labelled parts.

Examiner Only	
Marks	Remark

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

Examiner Only	
Marks	Remark

[6]

THIS IS THE END OF THE QUESTION PAPER

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113974

Rewarding Learning

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

FRIDAY 15 NOVEMBER 2013, 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.

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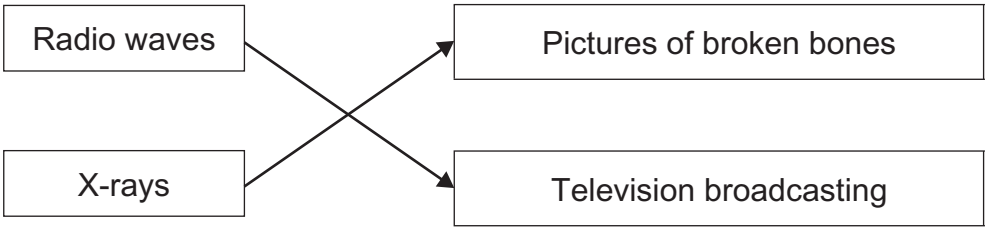
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					AVAILABLE MARKS
1	(a)	(i)	TV	[1]	
		(ii)	Microphone	[1]	
	(b)		Created/destroyed [either way round = 1 mark] Changed [1]	[2]	
	(c)	(i)	Television	[1]	
		(ii)	Kettle	[1]	
	(d)		30A	[1]	7
2	(a)		**Any 2 from** • same distance between source + detector • same source/amount of radiation • same distance between lead + source • same distance between lead + detector	[2]	
	(b)	(i)	Count rate falls [1] to a minimum of 5cps [1]	[2]	
		(ii)	Background	[1]	
		(iii)	30 mm	[1]	
	(c)		Sterilisation/preservation of food/kills cancer cells	[1]	7
3	(a)	(i)	Gas/Oil	[1]	
		(ii)	6%/1%	[1]	
	(b)	(i)	Will not run out	[1]	
		(ii)	Wind/hydroelectric/wave/solar	[1]	
	(c)	(i)	65365 – 64390 = 975	[1]	
		(ii)	975 × 20 [1] 19500p/£195 [2]	[2]	
		(iii)	**Any 2 from** • energy saving bulbs • do not leave TV on standby • other acceptable response	[2]	9

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					AVAILABLE MARKS
4	(a)	(i)	Skin cancer	[1]	
		(ii)	**Any 2 from** • reduce exposure time • shady area • higher factor sunscreen	[2]	
	(b)	(i)	Microwaves	[1]	
		(ii)	Cell	[1]	
	(c)				
			1 mark each	[2]	
	(d)		Similarity = **any one from** • travel at same speed/speed of light (in a vacuum) • transverse waves/travel through a vacuum • all carry energy [1]		
			Difference = wavelength/frequency/energy amounts [1]	[2]	9
5	(a)	(i)	5 points correct = 2 marks 4/3 points = 1 mark correct line = 1 mark	[3]	
		(ii)	As speed increases, braking distance increases	[1]	
		(iii)	Line starting from 0,0 and with greater gradient	[1]	
	(b)		More alcohol increases risk of crashing [1] as it slows reactions/increasing thinking distance [1] legal levels of alcohol still increased risk [1]	[3]	8

				AVAILABLE MARKS
6	**(a)**	0.8	[1]	
	(b)	**(i)** Wavelength decreases	[1]	
		(ii) Hertz/Hz	[1]	
	(c)	**(i)** Frequency/pitch [1] too high for humans to hear/above 20 kHz [1]	[2]	
		(ii) 330 × 0.4 [1] 330 × 0.2 [2] 66 m [3]	[3]	8
7	**(a)**	**(i)** 150 million km	[1]	
		(ii) **Any 3 from** • Neptune further • By 4400 million km • Mercury is faster • By 38 km/s	[3]	
	(b)	Geocentric has earth in middle/Heliocentric has sun at centre [1] Heliocentric more planets [1]	[2]	6

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8 Indicative content:

- blue wire connects to pin A
- brown wire connects to pin B
- green/yellow wire connects to pin C
- name blue wire/pin A as neutral
- name brown wire/pin B as live
- name green/yellow wire or pin C as earth
- naming 1 other safety feature from:
  Cable grip/plastic cover/fuse
- correct explanation of safety feature

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence how to wire a 3-pin plug safely including another safety feature (using at least **seven** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, how to wire a 3-pin plug safely including another safety feature (using **four to six** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe how to wire a 3-pin plug safely including another safety feature (using **one to three** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit	[0]

[6] 6

Total **60**

AVAILABLE MARKS

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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 60.
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**.

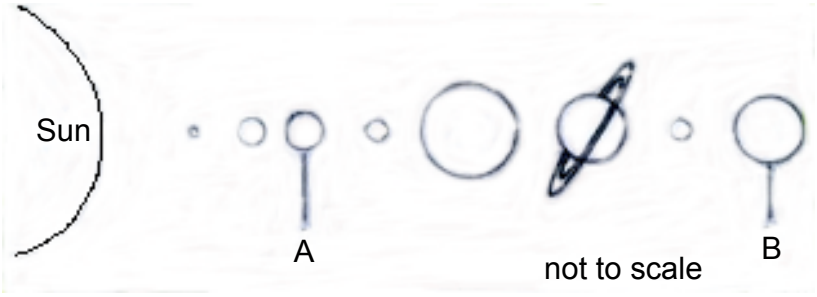
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** The diagram below shows the Sun and its eight planets.



© GCSE Science Single Award for CCEA by James Napier, Alyn G McFarland and Roy White, published by Hodder Education, 2013. ISBN 978-1-444-195729. Reproduced by permission of Hodder Education

(i) Name the planets labelled A and B.

Planet A _____

Planet B _____ [2]

(ii) Complete the following sentence.

The Sun and its planets are known as the _____ [1]

(b) Complete the following sentences.

Choose from:

moon **star** **galaxy** **planet**

A _____ is a huge collection of stars.

A _____ is an object that orbits a planet.

A _____ is an object that orbits a star. [3]

(c) Place a tick (✓) in the correct box, to describe the movement, if any, of the galaxies.

They are not moving ☐

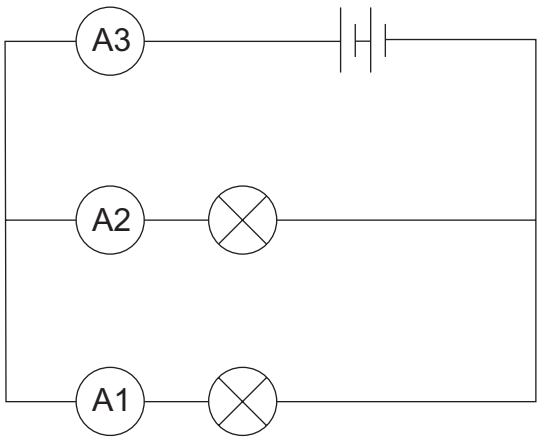
Staying the same distance apart ☐

Moving away from each other ☐ [1]

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Examiner Only	
Marks	Remark

2 **(a)** The diagram below shows an electrical circuit.



(i) What word is used to describe how the bulbs are arranged in this circuit?

_____ [1]

(ii) Ammeter A1 has a reading of 4 amps. What will be the reading on:

- ammeter A2? _____ A
- ammeter A3? _____ A [2]

(b) Give **two** changes that take place when more batteries are added to the circuit above.

1. _____

2. _____ [2]

(c) A microwave oven uses 750 W of power and is connected to a voltage of 250 V.

Use the equation:

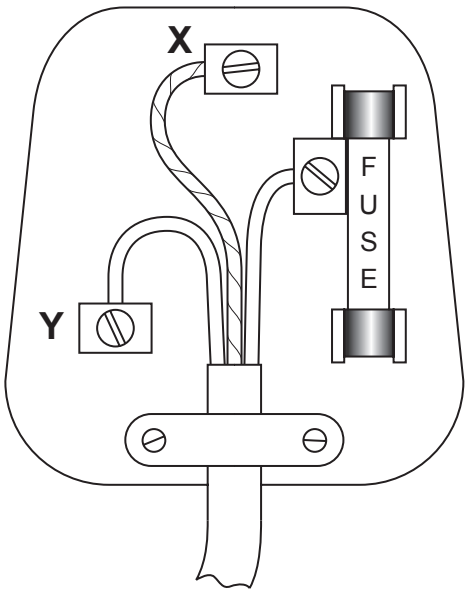
$$\textbf{current} = \frac{\textbf{power}}{\textbf{voltage}}$$

to calculate the current.
(Show your working out.)

_____ A [2]

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(d) The diagram below shows a three-pin plug.



Complete the table below.

Terminal	Name of terminal	Colour of wire connected to terminal
X		yellow and green
Y	neutral	

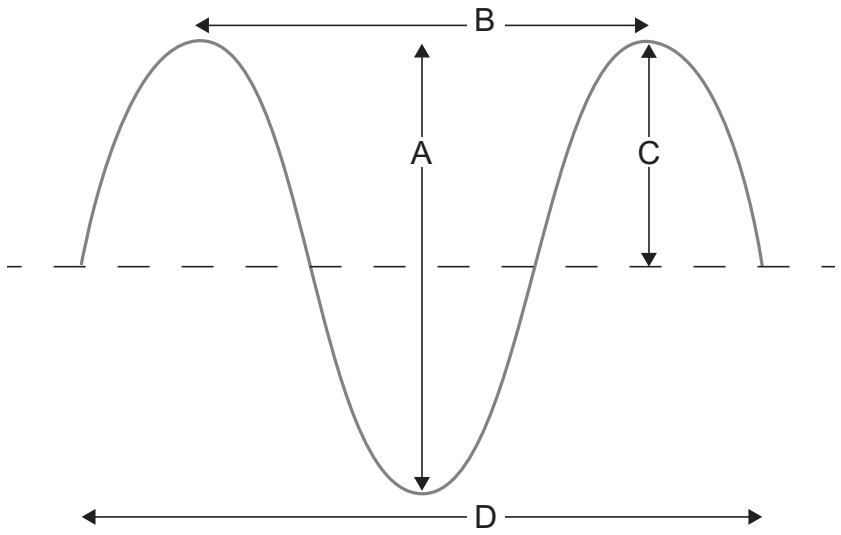
[2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** The diagram below shows a wave.



Which line (A, B, C or D) shows the:

1. wavelength? _____

2. amplitude? _____ [2]

(b) Complete the following sentences.

Choose from:

frequency **audible** **ultrasound**

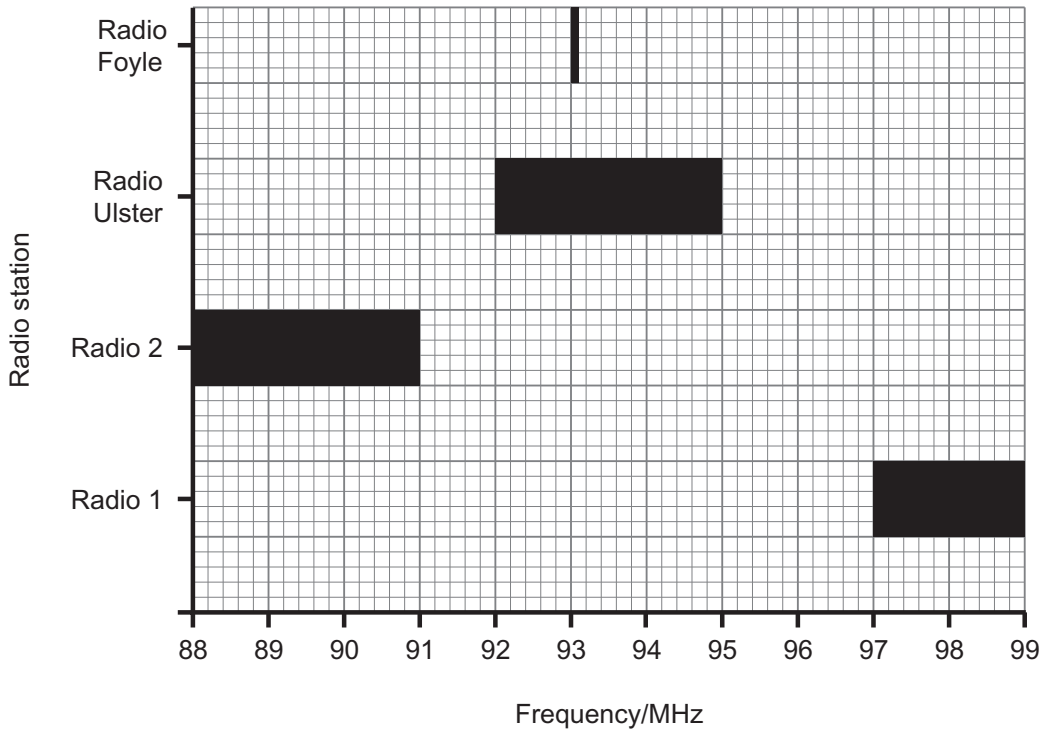
X-rays **energy**

Humans can hear sound with a _____ between 20 Hz and 20 kHz. This is called the _____ range.

Unborn babies are scanned using _____ .

[3]

(c) Shown below are the frequencies of four radio stations.



(i) Radio waves are part of the electromagnetic spectrum. What type of waves are radio waves?

_____ [1]

(ii) What is the frequency range used by Radio Ulster?

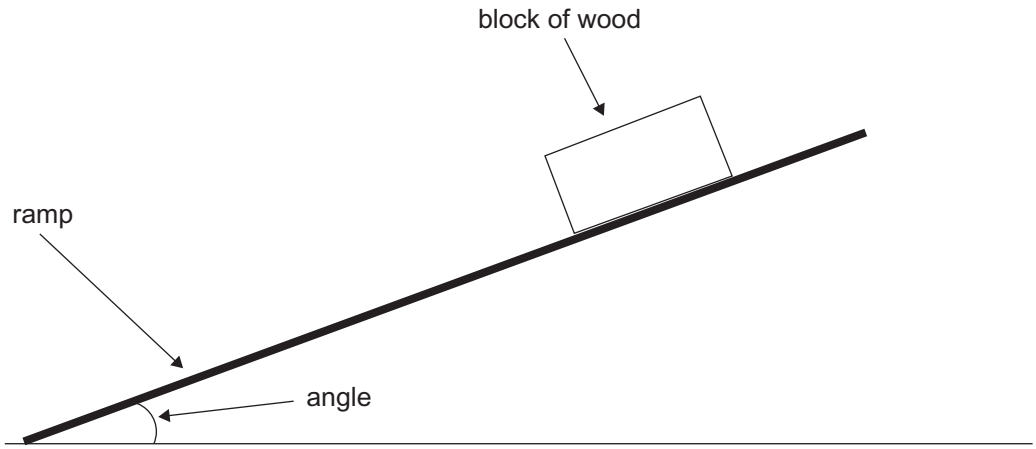
_____ MHz [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The apparatus below was used to investigate friction. The angle was increased until the block started to slide.



The ramp was covered with four different surfaces.

The results are shown in the table below.

Surface	Angle
sandpaper	34°
polystyrene	30°
plastic	18°
cork	24°

(i) State **one** thing that must be done to make the results valid (fair test).

_____ [1]

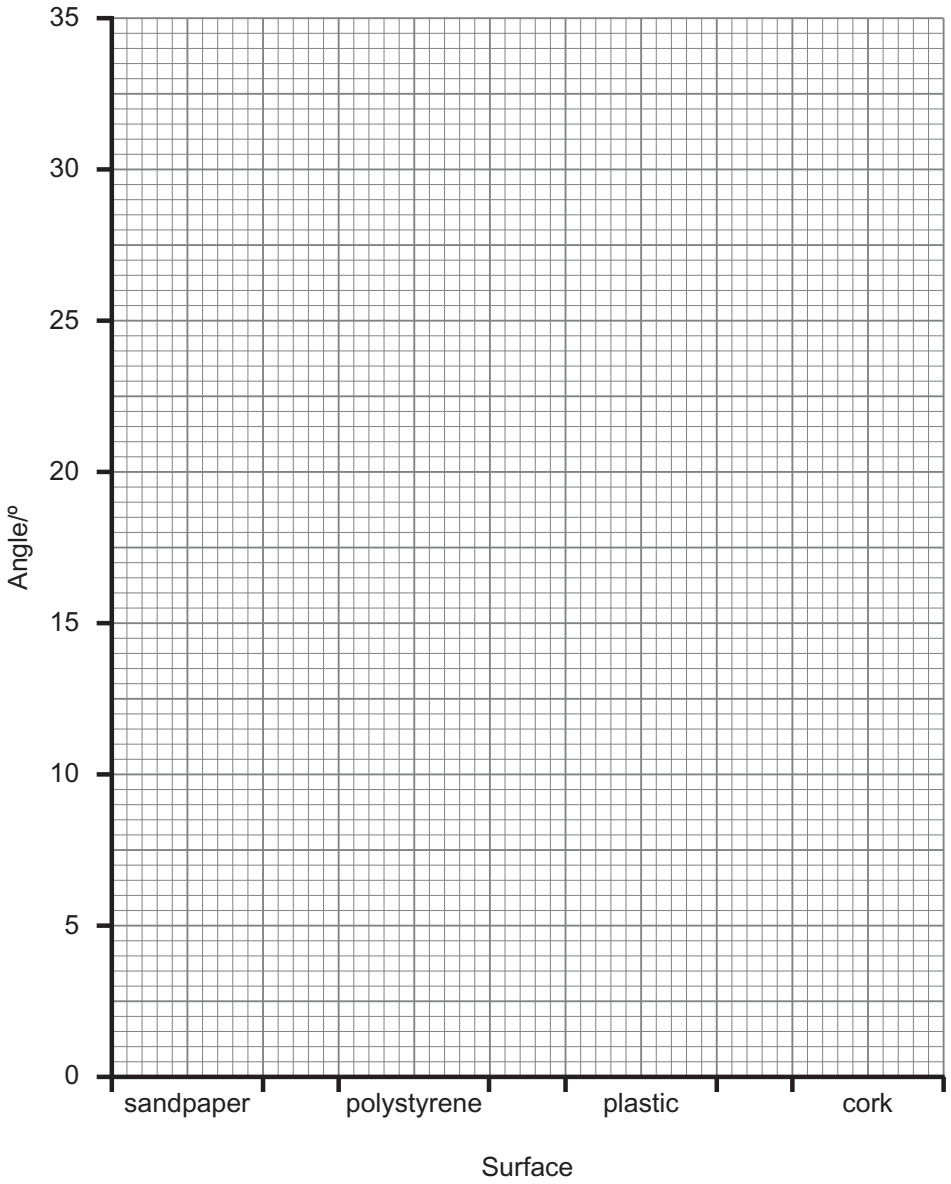
(ii) How could the investigation be made more reliable?

_____

_____ [1]

Examiner Only	
Marks	Remark

(iii) On the grid below draw a **bar graph** of these results.



[2]

(iv) Which surface has the most friction?

_____ [1]

(v) If the wooden block was heavier, what effect, if any, would it have on the amount of friction?

_____ [1]

(b) Complete the sentence below.

Friction is a _____ which tries to _____ moving objects.

[2]

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5 The table below shows how the percentage of children wearing seat belts in a car has changed from 1995 to 2012.

	Year				
Age group	**1995**	**2000**	**2005**	**2010**	**2012**
Under 1 year	96	97	98	98	100
1–4	65	82	92	96	97
5–9	49	68	82	94	94
10–13	47	65	82	93	95
All children	**59**	**74**	**86**	**93**	**96**

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(a) State **two** trends that can be seen in this data.

1. _____

_____

2. _____

_____ [2]

(b) The government are still advertising the need for children to wear seat belts. Use the information in the table to suggest why this is necessary.

_____

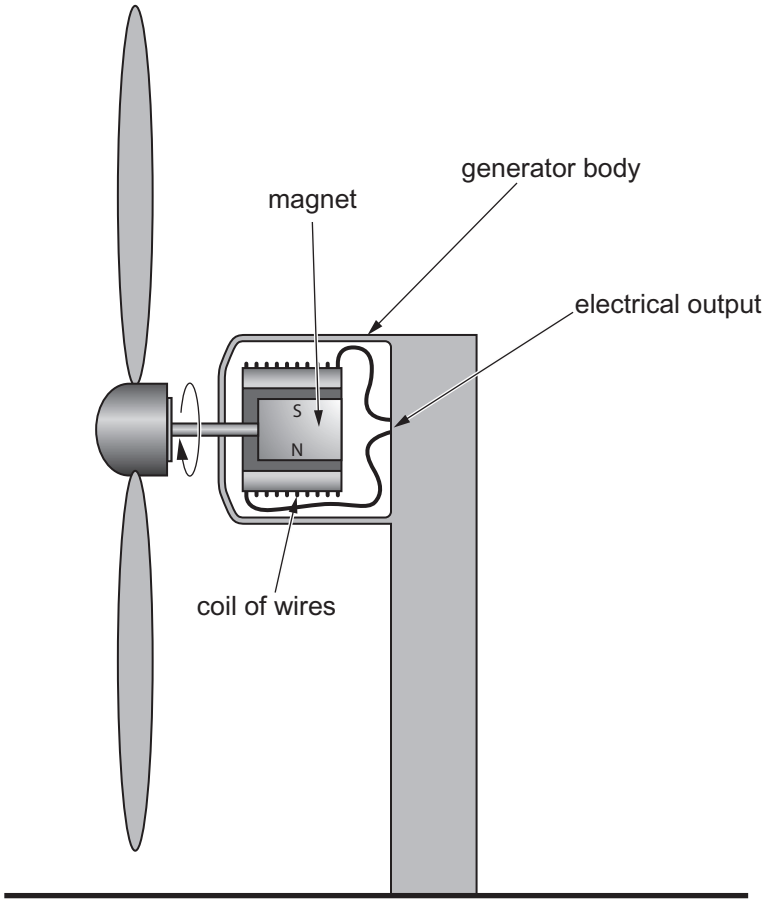
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 The diagram below shows a cross-section through a wind turbine. When the blade spins a current is produced.



© CCEA GCSE Single Award in Science Foundation Tier by A McFarland, C Murphy & J Napier, published by Hodder Education 2009

(a) Suggest the effect on the amount of current produced if:

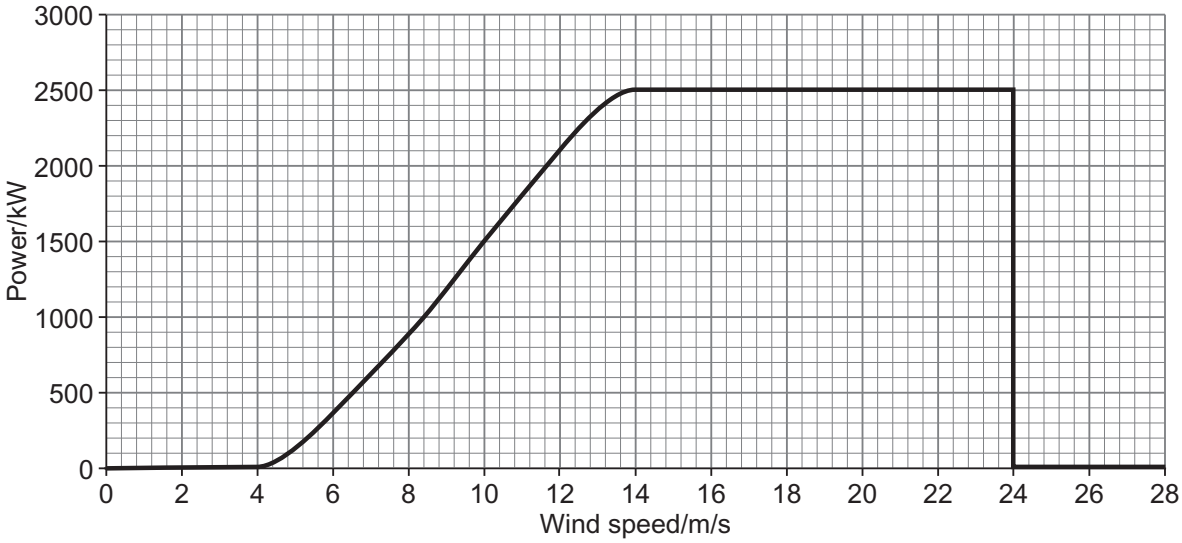
1. a weaker magnet is used.

_____

2. more coils of wire are used.

_____ [2]

(b) The graph below shows how the wind speed affects the amount of power produced.



(i) Describe fully how the power produced by the turbine changes with wind speed.

_____

_____

_____

_____ [3]

(ii) Suggest why the turbine is designed to stop at high wind speeds.

_____

_____ [1]

(c) Explain fully why the government has introduced more wind turbines in the past ten years.

_____

_____

_____ [2]

(d) Suggest **one** reason why some people object to wind turbines near their home.

_____

_____ [1]

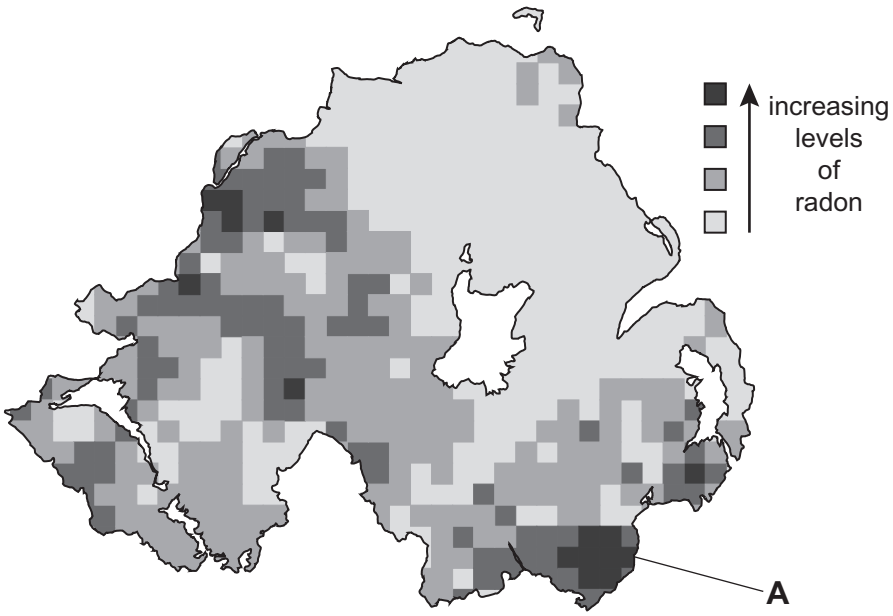
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

7 **(a)** The diagram below shows the amount of radon gas which occurs naturally in Northern Ireland.



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(i) Radon gas is a source of background radiation. What is meant by the term background radiation?

_____

_____ [1]

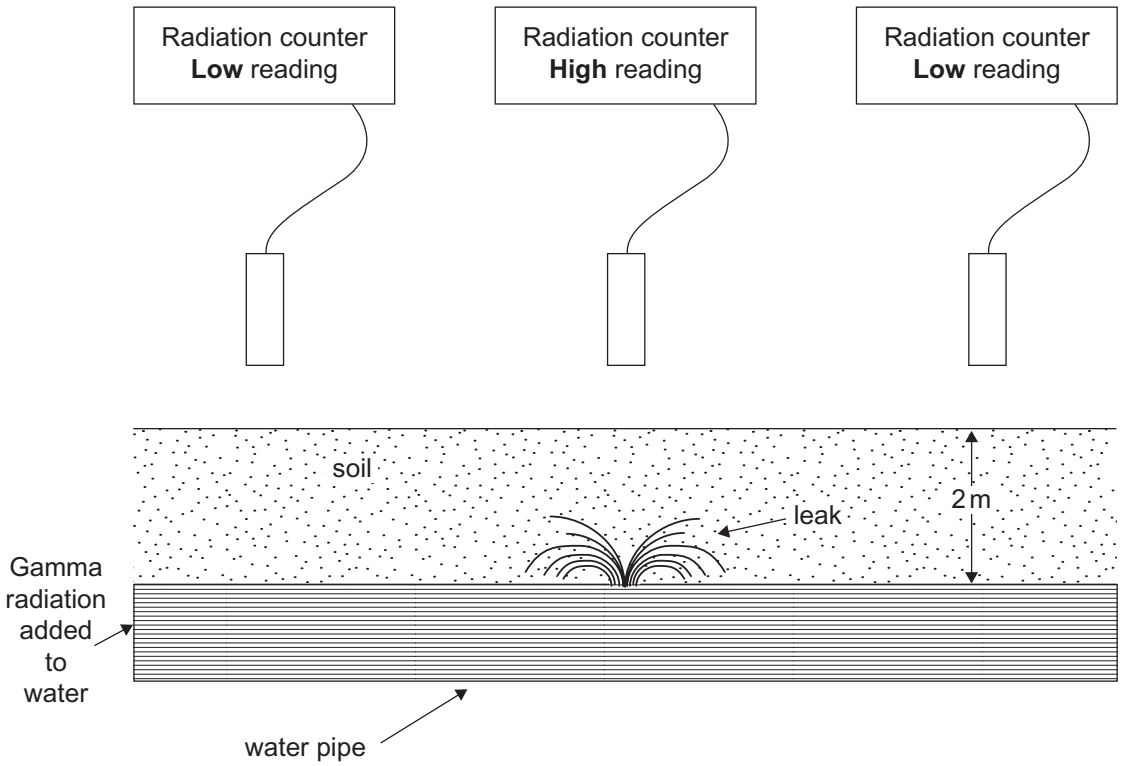
(ii) Explain fully why someone living in area **A** could be concerned about their health.

_____

_____

_____ [2]

(b) Gamma radiation can be used to check for leaks in water pipes.



Explain fully why gamma radiation is the best source to use.

_____

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 The information below shows information about three types of bulb. Each bulb produces the **same** light power output.

	Energy saving bulb	Filament bulb	LED spotlight
	 © CCEA	 © CCEA	 © CCEA
Power input/W	11	60	7
Cost to run for 1000 hours	£1.87	£10.20	£1.19
Average life/hours	10 000	1000	20 000
Cost to buy	£3.50	£0.90	£10.00

(a) Which bulb is the most efficient?

_____ [1]

(b) Which bulb, including the cost to buy, would be the cheapest to run for 1000 hours?

_____ [1]

(c) The energy saving bulb uses 11 J of energy per second and has an efficiency of 0.6. What is its light energy output per second?

Use the equation:

light energy output = efficiency × energy input

(Show your working out.)

Answer _____ J [2]

(d) Calculate how much energy this bulb wastes per second.

Answer _____ J [1]

(e) The efficiency of a filament bulb is much less than the efficiency of an energy saving bulb. Explain fully why the government has recommended that the use of filament bulbs should be stopped.

_____

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 Long sight is a common eye defect. Explain fully the **cause**, the **effect** and the **correction** of long sight. Your answer should refer to the parts of the eye involved and the passage of light through the eye.



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

[6]

THIS IS THE END OF THE QUESTION PAPER

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113287

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Earth [1] Neptune [1]	[2]	
		(ii)	Solar System	[1]	
	(b)		galaxy [1] moon [1] planet [1]	[3]	
	(c)		Moving away from each other	[1]	7
2	**(a)**	**(i)**	parallel	[1]	
		(ii)	4A [1] 8A [1]	[2]	
	(b)		**Any 2 from** ● increased current ● increased voltage ● bulbs brighter	[2]	
	(c)		750/250 [1] 3A [1]	[2]	
	(d)		X earth [1] Y blue [1]	[2]	9
3	**(a)**		B [1] C [1]	[2]	
	(b)		Frequency [1] audible [1] ultrasound [1]	[3]	
	(c)	**(i)**	transverse	[1]	
		(ii)	92–95	[1]	7
4	**(a)**	**(i)**	Size/mass/weight/material of block	[1]	
		(ii)	Repeat the test	[1]	
		(iii)	2–3 bars correct [1] All bars correct [2]	[2]	
		(iv)	Sandpaper	[1]	
		(v)	Increase the friction	[1]	
	(b)		force [1] slow down/stop/oppose [1]	[2]	8

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			AVAILABLE MARKS
5	**(a)**	**Any 2 from** ● more children now wear seat belts ● greatest increase in 10–13 year olds wearing seat belts ● older children are less likely to wear seat belts [2]	
	(b)	Not all children are wearing seat belts [1]	3
6	**(a)**	less current [1] more current [1] [2]	
	(b)	**(i)** **Any 3 from** ● at wind speeds up to 4 m/s no power is produced ● rapid increase up to 14 m/s ● from 14–24 power produced remains constant ● no power produced after 24 m/s [3]	
		(ii) Wind turbine shuts down to prevent damage [1]	
	(c)	**Any 2 from** ● renewable source of energy ● saves fossil fuels ● produces no air pollution [2]	
	(d)	Wind turbines are a visual eyesore/noise [1]	9
7	**(a)**	**(i)** Radiation which is always around us [1]	
		(ii) Increased radon levels [1] causes cancer [1] [2]	
	(b)	**Any 2 from** ● alpha and beta cannot pass through/gamma can pass through the soil ● more water present, gamma is in high concentration [1] [2]	5
8	**(a)**	LED spotlight [1]	
	(b)	Energy saving bulb [1]	
	(c)	0.6×11 [1] 6.6 J [1] [2]	
	(d)	$11 - 6.6 = 4.4$ [1]	
	(e)	More energy is wasted using filament light [1]	6

9 Indicative Content:

- lens too weak/eyeball too short/lens too thin
- light not refracted enough by the lens/cornea
- light would be focused behind the retina
- near images are not clear/blurry
- far images are clear
- convex lens used to correct
- this converges light more

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using **five or more** of the above points) long sight in a logical sequence. They use good spelling, punctuation and grammar and form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to describe and explain long sight (using **three or four** of the above points) in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe/explain long sight (using **one or two** of the above points.) However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit	[0]

[6] 6

Total **60**

AVAILABLE MARKS

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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	
Total Marks	

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Examiner Only	
Marks	Remark

1 The picture shows a television, an energy changing device.



© Ton Kinsbergen / Science Photo Library

(a) Complete the following sentences.

Choose from:

light **heat** **chemical** **sound** **electrical**

The energy input into the television is _____ energy.

The useful energy output from the screen is _____ energy.

Some energy is wasted in the form of _____ energy. [3]

(b) The table below shows the energy input and output figures for three televisions. However, one value has been recorded incorrectly.

Television	Energy input/J	Useful energy output/J
A	480	100
B	350	500
C	600	400

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

Explain your answer.

_____

_____ [2]

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(c) An energy efficient television saves £12 per year in running costs compared to a less efficient model. However, it costs £60 more to buy.

Calculate how many years it takes to save the extra £60.

(Show your working out.)

Answer _____ years [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** Given below are some sound wave frequencies.

200 Hz **20 Hz** **2000 Hz** **30 kHz** **2 kHz**

(i) Which frequency is the lowest humans can hear?

_____ [1]

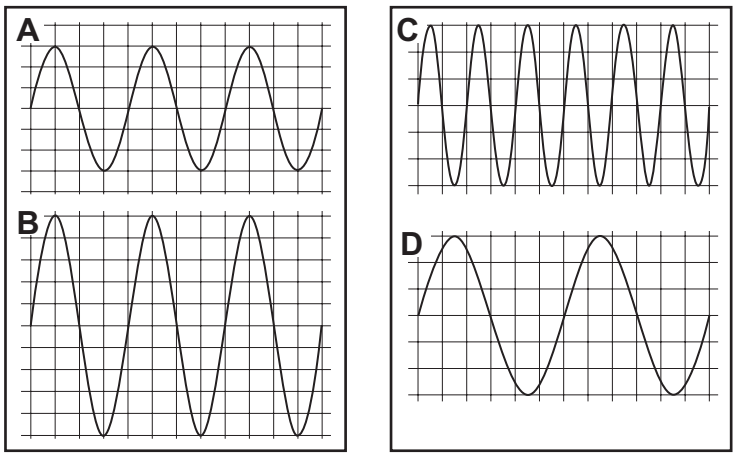
(ii) Which **two** frequencies are the same?

_____ and _____ [1]

(iii) Which frequency is in the ultrasound range?

_____ [1]

(b) The diagrams below represent sound waves taken over the same time.



Which wave **A**, **B**, **C** or **D** has:

(i) the longest wavelength? _____ [1]

(ii) the biggest amplitude? _____ [1]

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(c) (i) Complete the following sentence.

Sound is an example of a longitudinal wave whereas light is an example of a _____ wave. [1]

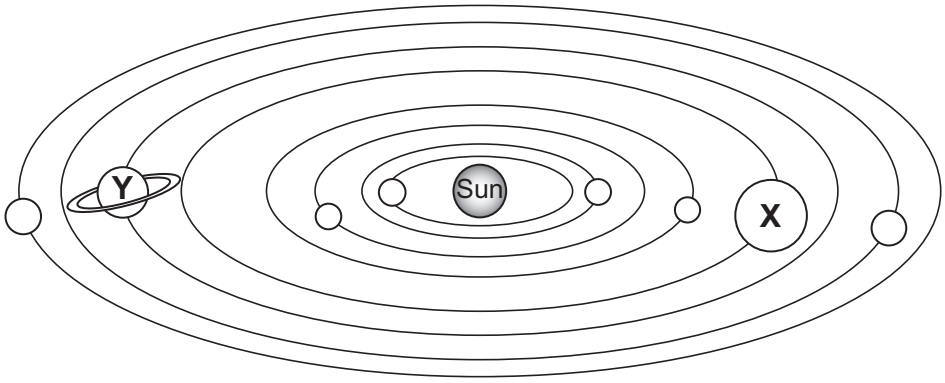
(ii) What do waves carry from one place to another?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** The diagram below shows the Sun and its eight planets.



(i) Name the planets labelled **X** and **Y**.

X is _____

Y is _____ [2]

(ii) What name is given to this model of the Solar System?

Circle the correct answer.

concentric **geocentric** **heliocentric** [1]

(iii) What name is given to the old model used by the ancient Greeks?

Circle the correct answer.

concentric **geocentric** **heliocentric** [1]

(iv) What is the main difference between the two models?

_____

_____ [1]

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(b) The table below gives the strength of gravity on four planets.

Planet	Strength of gravity N/kg
A	9
B	10
C	4
D	26

(i) On which planet **A**, **B**, **C** or **D** would your weight be the lowest?

_____ [1]

(ii) Use the equation:

weight = mass × gravity

to calculate the weight of a person with a mass of 60 kg on planet **A**.

(Show your working out.)

Answer _____ N [2]

(iii) What does the strength of a planet's gravity depend on?

Tick (✔) the correct answer.

The planet's distance from the Sun ☐

The planet's size ☐

The number of moons the planet has ☐ [1]

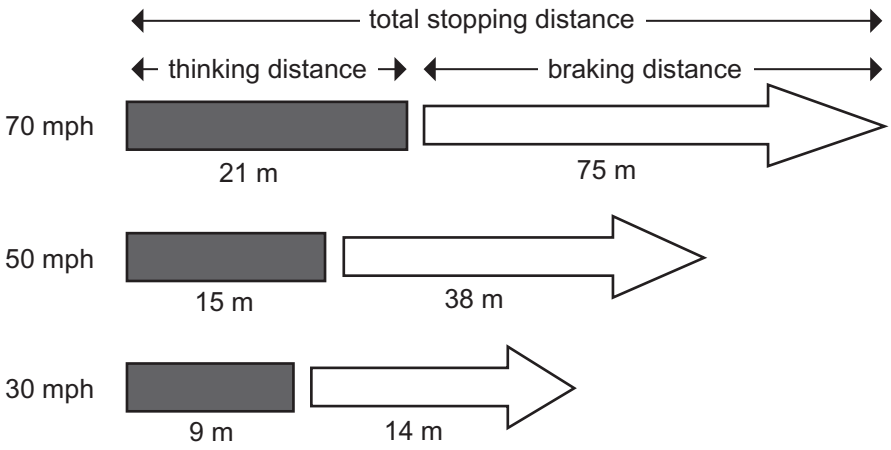
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** The diagram below shows the total stopping distances for cars travelling at different speeds.



(i) Calculate the total stopping distance at 70 mph.

_____ m [1]

(ii) From the diagram state **two** effects of increasing speed.

1. _____

_____

2. _____

_____ [2]

(b) Complete the table below to show what effect (if any) each condition may have on thinking and braking distance.

Choose from:

increased **none** **decreased**

Condition	Thinking distance	Braking distance
Wet road surface		
Worn tyres	none	increased
Driver after drinking alcohol		

[2]

(c) **(i)** Name the force that opposes motion.

_____ [1]

(ii) Name the unit of force.

_____ [1]

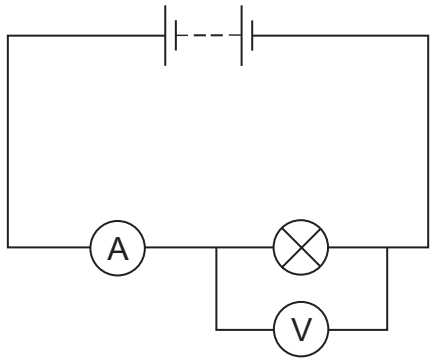
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 **(a)** Pupils set up the circuit below to investigate the effect of adding extra batteries.



The pupils' results are shown in the table below.

Number of batteries	Voltage/V	Current/A
1	1.5	0.10
2	3.0	0.19
3	4.5	0.30
4	6.0	0.41
5	7.5	0.50

(i) Name the meter shown in the diagram that measures current.

_____ [1]

(ii) State **two** trends shown by these results.

1. _____

_____

2. _____

_____ [2]

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(b) The pupils then used a light meter to measure how the brightness of a bulb was affected by the number of batteries.

The results are shown below.

Number of batteries	Bulb brightness/lux
1	14
2	22
3	35
4	35
5	35

(i) Explain the advantage of using only three batteries with this bulb.

_____

_____

_____ [2]

(ii) Use the table opposite and the equation:

power = voltage × current

to calculate the power used when three batteries are connected to this bulb.

(Show your working out.)

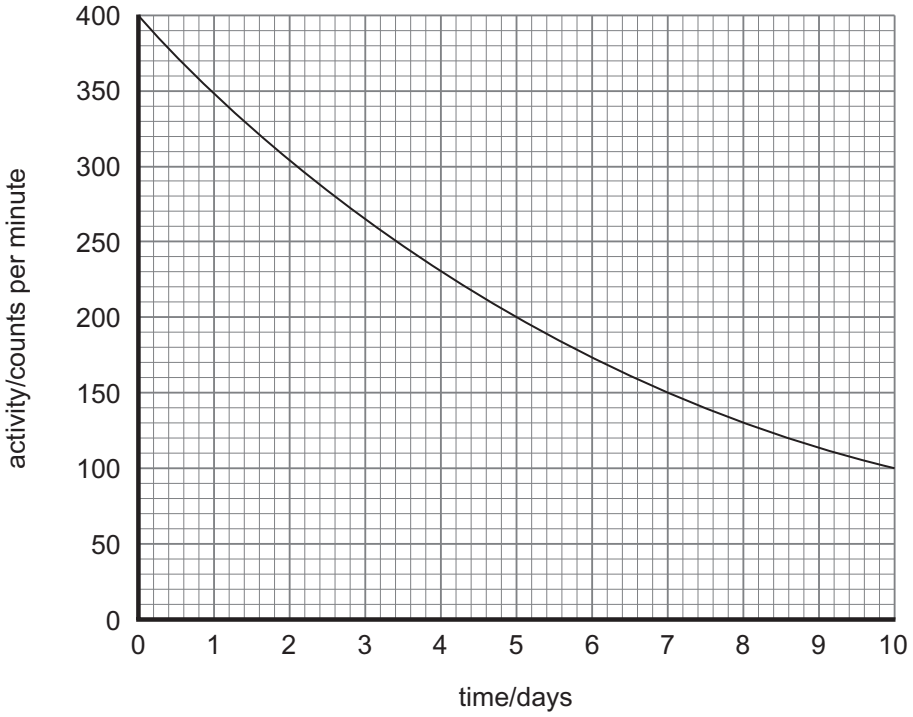
Answer _____ W [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** The graph below shows how the activity of a radioactive isotope varies with time.



(i) What is the activity at 7 days?

_____ counts per minute [1]

(ii) Describe the trend shown by this graph.

_____

_____ [1]

(iii) Use the graph to give the half-life of this isotope.

_____ days [1]

(b) Explain fully why some nuclei are radioactive.

_____

_____

_____ [2]

This isotope produces gamma radiation.

(c) Explain fully why gamma radiation can be used to treat cancer within the body.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

7 The Northern Ireland government has recently announced that there will be an increase in the amount of electricity generated from sources other than fossil fuels.

Explain fully what fossil fuels are, how they are formed, and why the emphasis on developing alternative sources has increased in recent years.

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

8 The table below gives information on the different types of wave in the electromagnetic spectrum.

Type	Wavelength/m	Energy/ arbitrary units
Gamma	0.00000000001	300 000
X-rays	0.0000000001	3000
	0.00000001	30
Visible light	0.0000005	6
	0.00001	0.3
Microwaves	0.03	0.001
Radio waves	1000	0.00003

(a) State the relationship between wavelength and energy in the table above.

_____

_____ [1]

(b) Complete the table by correctly naming the other **two** types of electromagnetic radiation. [2]

(c) All these waves travel at the same speed (300 000 000 m/s).

(i) Use the equation:

$$\textbf{frequency} = \frac{\textbf{speed}}{\textbf{wavelength}}$$

to calculate the frequency of radio waves.

(Show your working out.)

Answer _____ Hz [2]

(ii) Use the equation to suggest how frequency will change when wavelength increases.

_____

_____ [1]

(d) (i) Microwaves are used in mobile phone communications. Suggest **one** other use of microwaves.

_____ [1]

(ii) Using the information provided and your knowledge, explain fully why microwaves are more likely than X-rays to affect the health of young people.

_____

_____

_____

_____ [2]

(iii) Name the medical condition associated with exposure to electromagnetic radiation.

_____ [1]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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113807

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 27 FEBRUARY 2013
9.30 am–10.30 am

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)**	electrical/light/heat	[3]		
	(b)	B [1] output cannot be greater than input [1]	[2]		
	(c)	60/12 [1] 5 years [1]	[2]		7
2	**(a)**	**(i)** 20Hz	[1]		
		(ii) 2000Hz and 2kHz	[1]		
		(iii) 30kHz	[1]		
	(b)	**(i)** D	[1]		
		(ii) B	[1]		
	(c)	**(i)** transverse	[1]		
		(ii) energy	[1]		7
3	**(a)**	**(i)** X = Jupiter [1] Y = Saturn [1]	[2]		
		(ii) heliocentric	[1]		
		(iii) geocentric	[1]		
		(iv) has Earth at centre	[1]		
	(b)	**(i)** C	[1]		
		(ii) 60 × 9 [1] 540 [1] (correct answer = 2 marks)	[2]		
		(iii) the planet's size	[1]		9

AVAILABLE MARKS

4 **(a)** **(i)** 96 m [1]

(ii) **Any two from**
- increased thinking distance
- increased braking distance
- increased stopping distance [2]

(b)

Condition	Thinking distance	Braking distance
Wet road surface	**None**	**Increased**
Worn tyres		
Driver with alcohol taken	**Increased**	**None**

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

(c) **(i)** friction [1]

(ii) Newtons [1] 7

5 **(a)** **(i)** ammeter [1]

(ii) **Any two from**
more batteries = more volts
more volts = more current
more batteries = more current [2]

(b) **(i)** Brightness is maximum using 3 batteries [1]
Extra batteries do not increase brightness/saves money [1] [2]

(ii) 4.5×0.3 [1]
1.35 [1] (allow 1.4) [2] 7

6 **(a)** **(i)** 150 [1]

(ii) the longer the time, the lower the activity [1]

(iii) 5 days [1]

(b) protons and neutrons [1]
disintegrate/split/unstable [1] [2]

(c) gamma penetrates through the body [1]
to kill cancer/cells [1] [2] 7

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7 indicative content

- remains of animals + plants
- lived millions of years ago
- pressure
- fossil fuels are running out/non-renewable/ alternative sources are renewable/will not run out
- developing alternative sources will save fossil fuels
- named fossil fuel/named alternative source
- relevant environmental impact for alternatives

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to explain fully, in a logical sequence, what fossil fuels are and why we need to find alternative energy sources (using **6** or **7** of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to partially explain, in a logical sequence, what fossil fuels are and why we need to find alternative energy sources (using **4** or **5** of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates explain what fossil fuels are and why we need to find alternative energy sources (using **1** to **3** of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit.	[0]

[6]

AVAILABLE MARKS

6

				AVAILABLE MARKS
8	**(a)**	as wavelength increases, energy decreases	[1]	
	(b)	ultraviolet [1] infrared [1]	[2]	
	(c)	**(i)** $\frac{300,000,000}{1000}$ [1] 300,000 [1]	[2]	
		(ii) frequency decreases	[1]	
	(d)	**(i)** use of microwave oven/satellite TV + radio/wireless computer connections	[1]	
		(ii) X-rays have more energy [1] although the exposure time is far less [1]	[2]	
		(iii) cancer/sunburn	[1]	10
			Total	**60**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** The table below gives some information about the planets in our Solar System.

(i) Complete the table below by naming the first planet. [1]

Planet	Distance from the Sun /million km	Surface temperature /°C
	58	430
Venus	108	470
Earth	150	22
Mars	228	−23
Jupiter	778	−150
Saturn	1427	−180
Uranus	2870	−210
Neptune	4497	−220

(ii) Using the information above suggest why humans would find it impossible to live on Venus.

_____

_____ [1]

(b) Complete the following sentences.

Choose from:

fusion : star : friction

planet : gravity : fission

The Sun is our nearest _____, it is made from a gas called hydrogen. This gas is pulled together by the force of _____. This gas is used to make energy in a nuclear process called _____. [3]

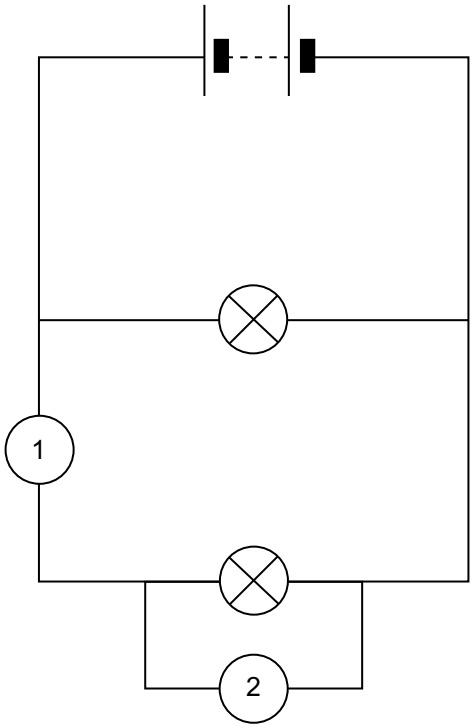
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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

2 **(a)** The circuit below uses meters 1 and 2 to measure current and voltage.



(i) What type of meter is placed at position 1 to measure current?

Circle the correct answer.

newtonmeter : ammeter : voltmeter [1]

(ii) Complete the following sentences.

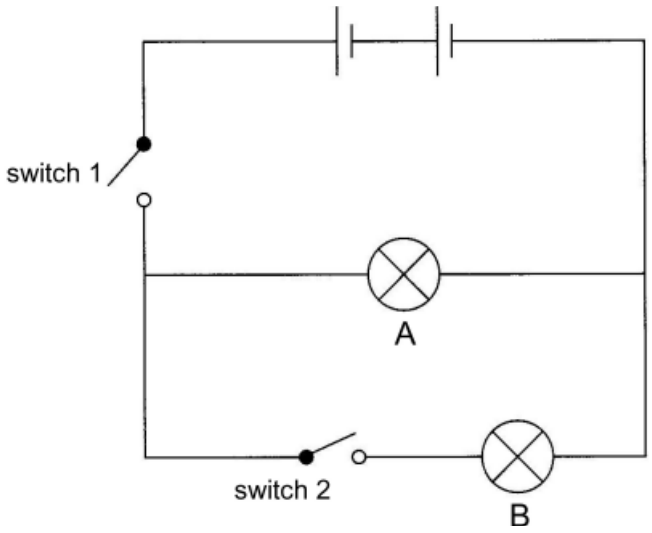
Choose from:

parallel : goes out

gets dimmer : stays lit : series

In this circuit meter 2 is connected in _____ and the bulbs are connected in _____. If one of the bulbs is broken the other bulb _____. [3]

(b) A student set up the following circuit.



Complete the table to show if the bulbs are lit or not lit for the switch positions given.

Use a tick (✓) to show if the bulb is lit and a cross (✓) if it is not lit.

Switch 1	Switch 2	Bulb A	Bulb B
open	open		
closed	open		

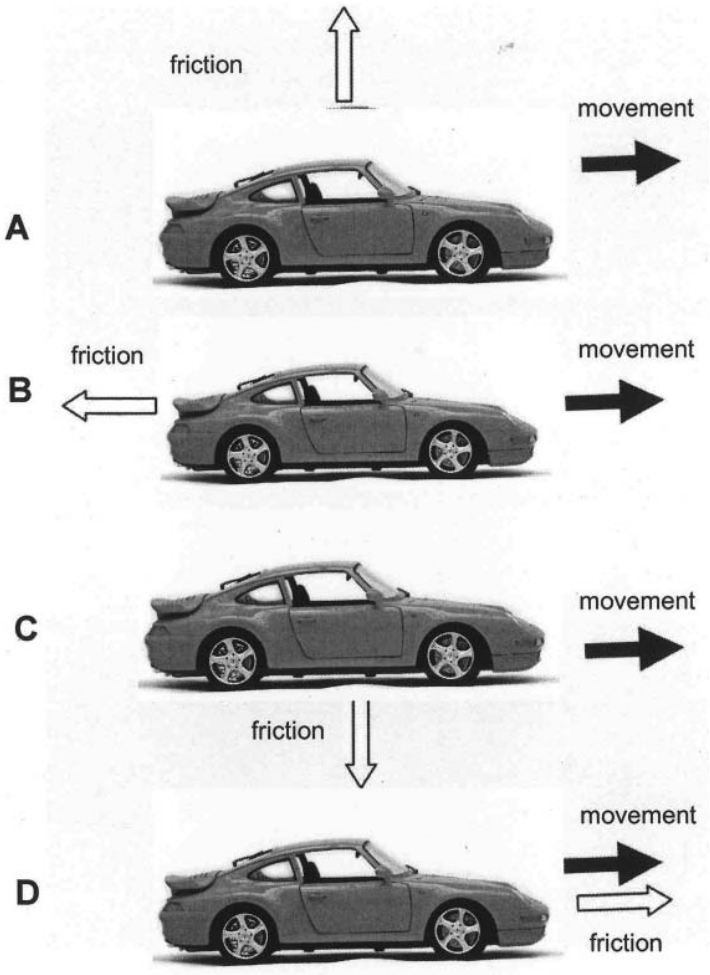
[2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 The diagram below shows a car moving on a flat straight road.



© Hemera / Thinkstock

(a) Which diagram **A**, **B**, **C** or **D** shows the correct direction in which friction acts?

Answer _____ [1]

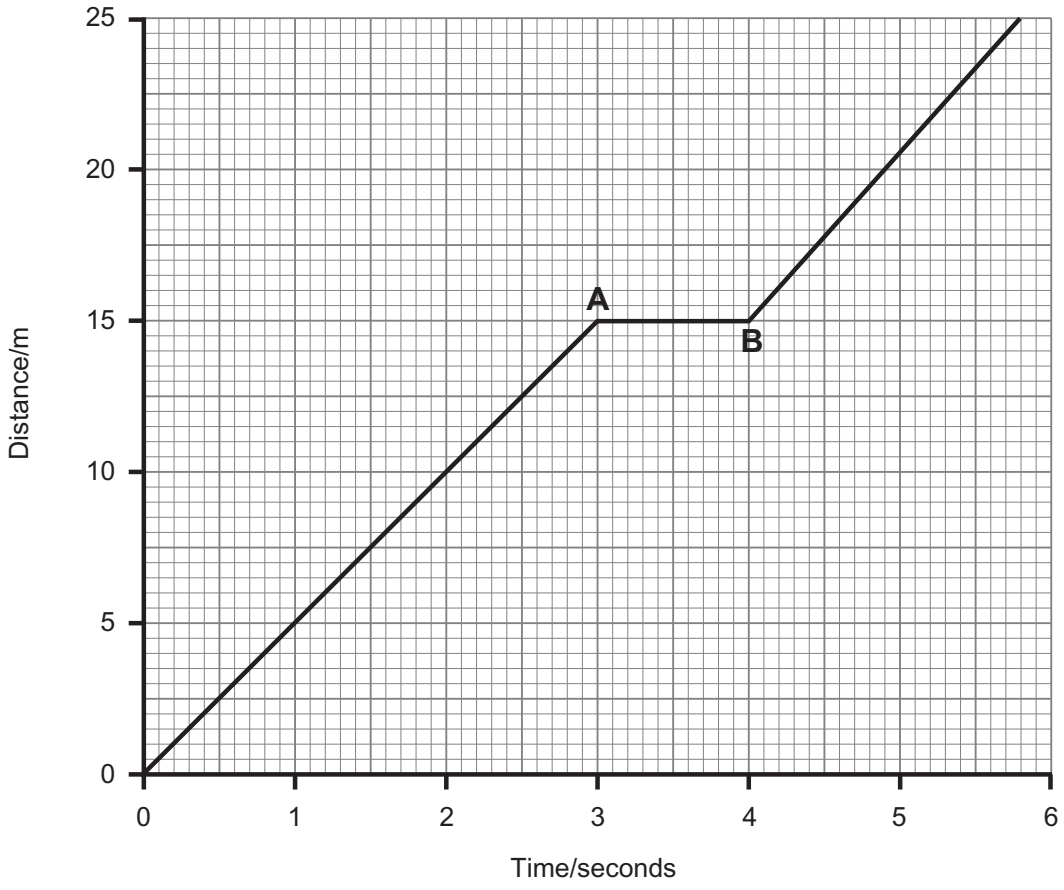
(b) Complete the sentence below.

Friction is a _____ which _____

moving objects. [2]

Examiner Only	
Marks	Remark

(c) Shown below is a distance–time graph for a car.



(i) Describe the motion of the car from **A** to **B**.

Choose from:

stopped : steady speed : accelerating

Answer _____ [1]

(ii) Use the graph to find the distance the car travels in the first two seconds.

Answer _____ m [1]

(iii) Use the equation:

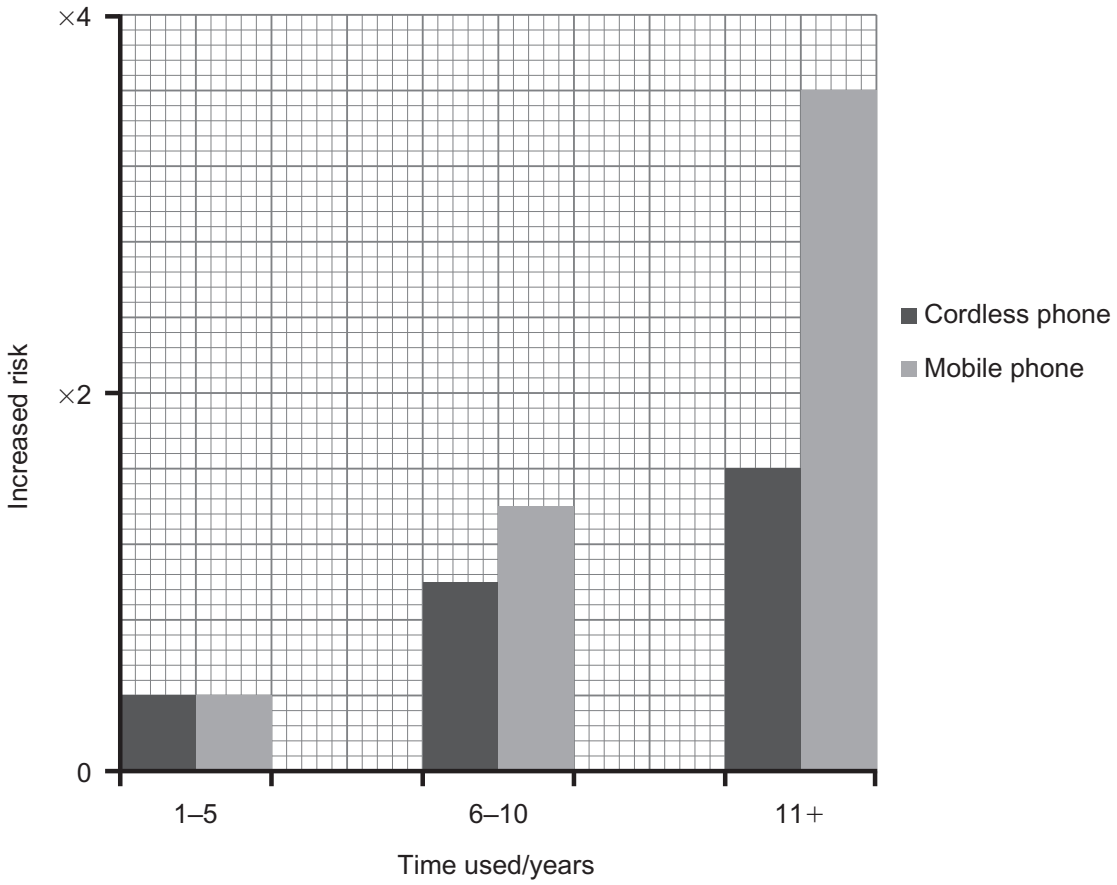
$$\textbf{speed} = \frac{\textbf{distance}}{\textbf{time}}$$

to calculate the speed of the car in the first two seconds.

Answer _____ m/s [1]

Examiner Only	
Marks	Remark

4 **(a)** The bar graph below shows how the use of two types of phone increases the risk of developing cancer.



(i) State **two** trends shown by this graph.

1. _____

_____

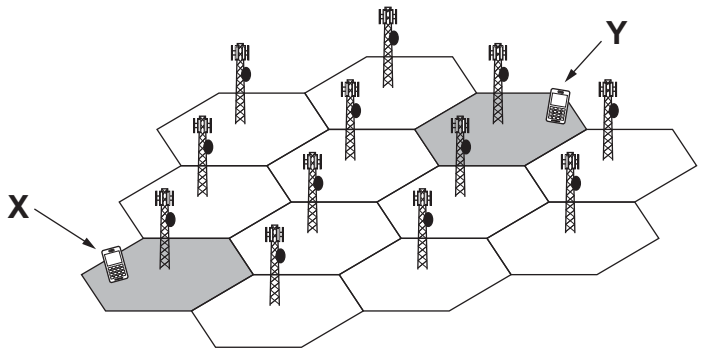
2. _____

_____ [2]

(ii) Name the part of the body most likely to develop cancer when using these phones.

_____ [1]

The diagram below shows a mobile phone network.



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(b) Using the diagram explain fully how a signal goes between phone **X** and phone **Y**.

_____

_____

_____ [2]

(c) Given below are some types of electromagnetic radiation and some uses. Using lines link each type to **one** common use.

Radiation	Use
X-rays	to treat cancer
infrared	T.V. remote controls
gamma rays	sun tanning
	to look at broken bones

[3]

Examiner Only

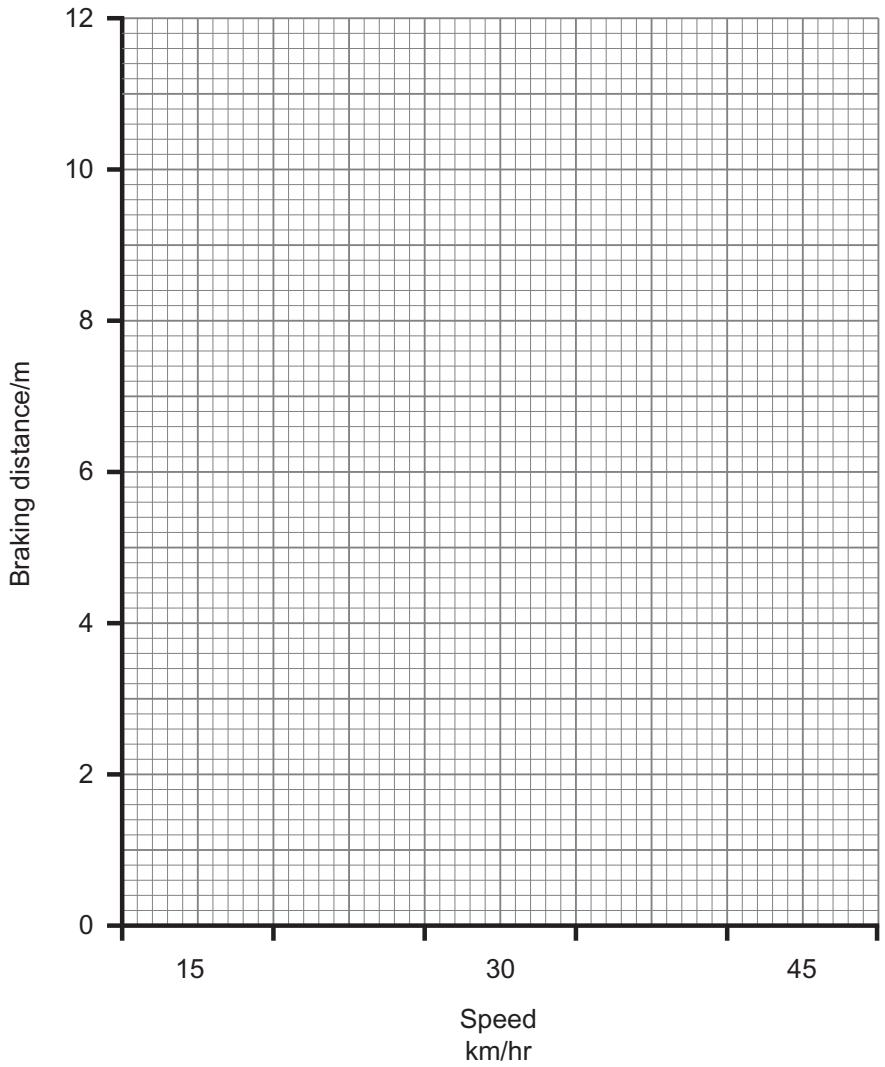
Marks	Remark

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5 **(a)** The table below shows the braking distance at different speeds.

Speed km/hr	Braking distance/m
15	1
30	5
45	12

Draw a **bar graph** for the braking distance on the grid below.



[2]

Examiner Only

Marks	Remark

(b) The table below shows how the braking and thinking distances can be affected by the number of people in a car at different speeds.

Speed km/hr	braking distance/m		thinking distance/m	
	car and driver only	car, driver and three passengers	car and driver only	car, driver and three passengers
15	1	3	3	3
30	5	7	6	6
45	12	14	8	8
60	21	23	11	11

(i) Calculate the **stopping** distance for a car with a driver and three passengers travelling at 60 km/hr.

Answer _____ m [1]

(ii) Explain fully what is meant by the term 'braking distance'.

_____

_____ [1]

(iii) In what way, if any, does the thinking distance change if the car has passengers?

_____

_____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

(c) The table below is used by crash investigators to work out how fast a car was travelling before a collision. They do this by measuring the length of a skid.

Length of skid /m	Initial speed on different surfaces km/hr		
	Dry tarmac	Wet tarmac	Ice
1	13.4	11.8	6.2
2	18.8	16.7	8.7
3	23.1	20.5	10.7
4	26.7	23.6	12.3
5	29.8	26.4	13.4

(i) Suggest **two** factors which must have been kept the same to make sure the results were valid.

1. _____

2. _____ [2]

(ii) How many **times** longer is a skid on ice compared to a skid on dry tarmac at 13.4 km/hr?

_____ [1]

(iii) State **two** conclusions that can be seen from the results in the table.

1. _____

2. _____ [2]

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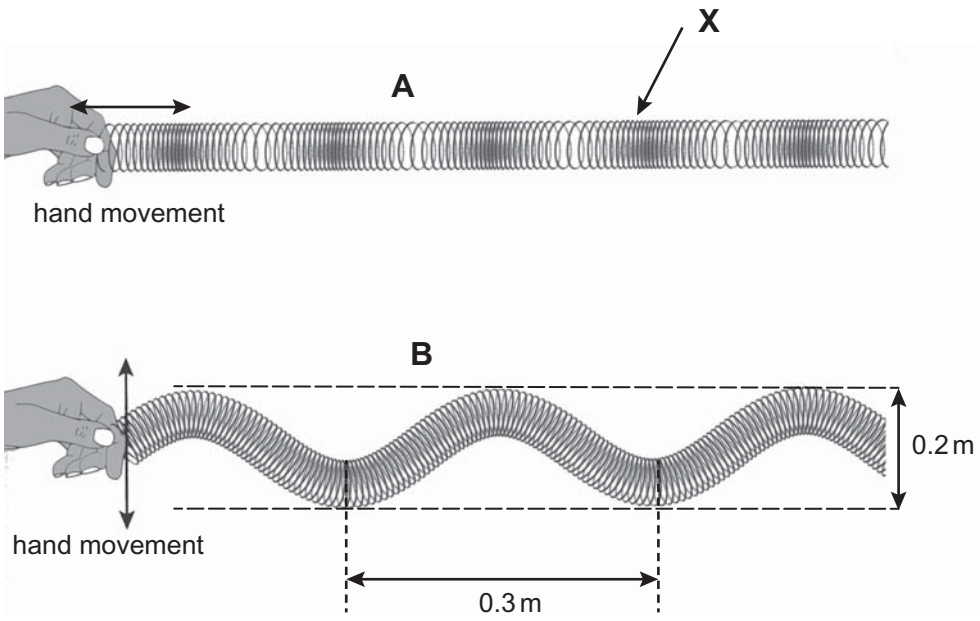
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Examiner Only	
Marks	Remark

6 **(a)** Slinky springs are often used to demonstrate waves as shown in the diagrams **A** and **B** below.



© CCEA GCSE Single Award in Science Foundation Tier by A McFarland, C Murphy & J Napier, page 109, published by Hodder Education, 2009. ISBN 9780340974728. "Reproduced by permission of Hodder Education".

(i) Name the type of wave represented by diagram **A**.

_____ [1]

(ii) Describe fully how point **X** moves as the wave passes along the slinky in diagram **A**.

_____

_____ [2]

(iii) What is the amplitude of the wave represented by diagram **B**?

Answer _____ m [1]

(iv) What is the wavelength of the wave represented by diagram **B**?

Answer _____ m [1]

(b) Wave **B** produces 20 complete waves in 5 seconds.

Calculate the frequency of the wave.

Answer _____ Hz [1]

(c) Use the equation:

speed = frequency × wavelength

to calculate the speed of a wave with a frequency of 20 Hz and a wavelength of 90 m.

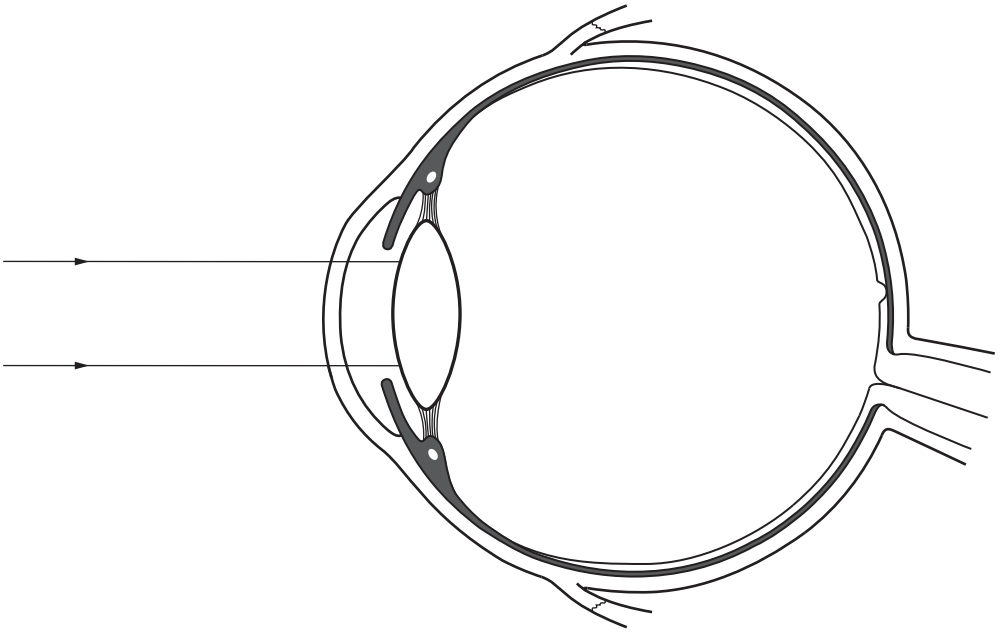
(Show your working out.)

Answer _____ m/s [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The diagram below shows two parallel rays of light entering the eye. Complete the diagram to show the path of the rays in the formation of a clear image.



[2]

(b) **(i)** Short sight is a common eye defect. Explain fully the cause and effect of short sight.

_____

_____

_____

_____ [3]

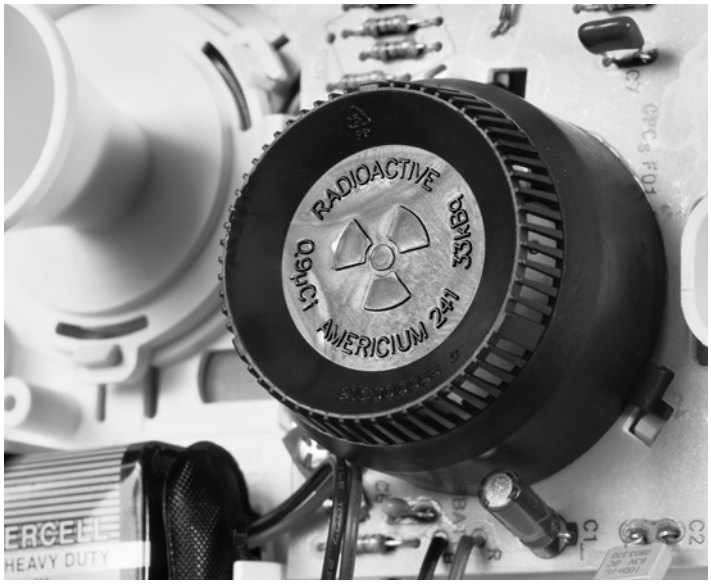
(ii) Name the type of lens used to correct short sight.

_____ [1]

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Examiner Only	
Marks	Remark

8 **(a)** The photograph below shows the radioactive source found in a smoke alarm.



© Martin Bond / Science Photo Library

Describe a simple experiment to show which type of radiation (alpha, beta or gamma) is emitted by the radioactive source in the smoke alarm.

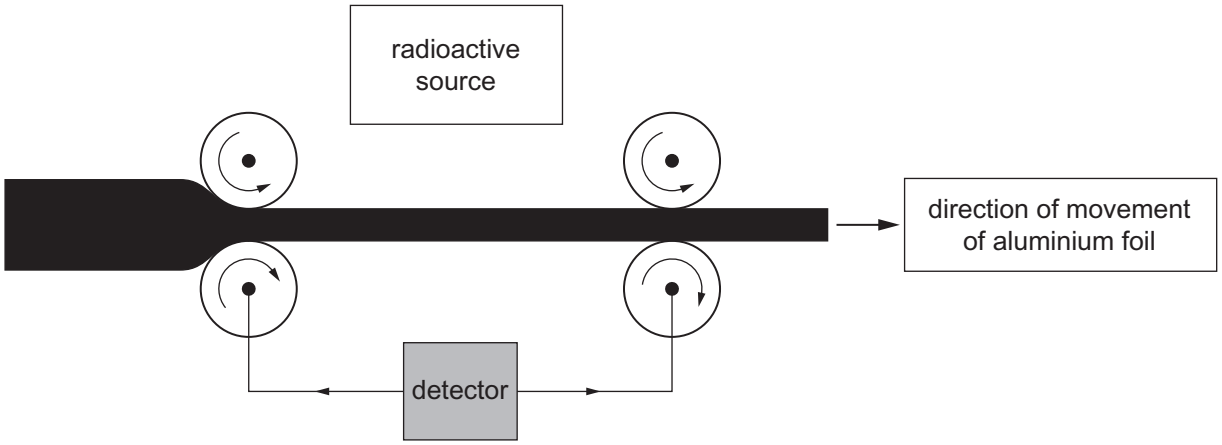
Your answer should include one way to ensure valid results.

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) The equipment shown below is used in industry to monitor the thickness of aluminium foil.



Examiner Only	
Marks	Remark

The table below gives possible radioactive sources which could be used.

Radioactive source	Radiation emitted	Half-life
A	alpha	1000 years
B	beta	1000 years
C	beta	2 minutes
D	gamma	4 years

(i) Explain fully what is meant by the term 'half-life'.

_____

_____ [2]

(ii) Which source, **A**, **B**, **C** or **D** would be best to monitor the thickness of the aluminium? Explain your answer.

Source _____ [1]

Explanation _____

_____

_____ [2]

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 14 NOVEMBER 2012
1.30 pm–2.30 pm

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Mercury	[1]	
		(ii)	Its surface temperature is too hot [not just 470°C]	[1]	
	(b)		star [1] gravity [1] fusion [1]	[3]	5
2	**(a)**	**(i)**	ammeter.	[1]	
		(ii)	parallel [1] parallel [1] stays lit [1]	[3]	
	(b)				

Switch 1	Switch 2	Bulb A	Bulb B
open	open	✗	✗
closed	open	✓	✗

			one mark for each correct row.	[2]	6
3	**(a)**		B	[1]	
	(b)		force [1] slows down/stops/resists/opposes/heats [1]	[2]	
	(c)	**(i)**	stopped	[1]	
		(ii)	10 m	[1]	
		(iii)	5 m/s [ncm]	[1]	6

AVAILABLE MARKS

4 **(a)** **(i)** *Any two from:*

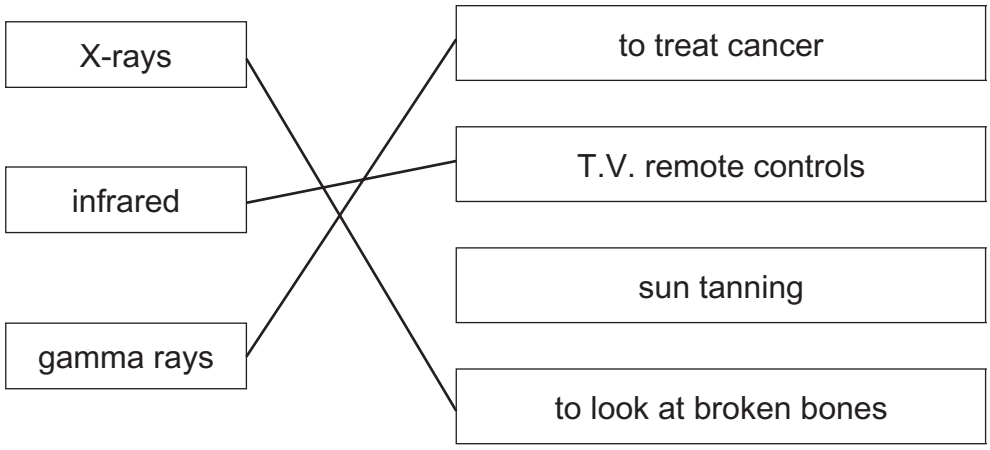
- short term use [1–5 yrs.] no difference in risk
- longer use more risk
- increased use using mobile compared to cordless [2]

(ii) Brain [1]

(b) *Any two from:*

- signal to mast/base station/transmitter
- relay
- microwave [2]

(c)



[3] 8

5 **(a)** Two bars correct [1]
All 3 bars correct [2] [2]

(b) **(i)** 34 m [1]

(ii) The distance it takes for the car to come to rest once the brakes have been applied. [1]

(iii) No change in the thinking distance [1]

(c) **(i)** *Any two from:*

- same car
- same type of tyres
- same driver [2]

(ii) 5× [1]

(iii) The faster you go the longer the skid [1]
the length of the skid depends on the type of surface [1] [2] 10

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				AVAILABLE MARKS
6	**(a)**	**(i)**	longitudinal [1]	
		(ii)	vibrate/move backwards and forwards [1] in same direction as hand movement/parallel to direction of hand movement [1] [parallel to direction of energy flow/wave travel = 2] [2]	
		(iii)	0.1 m [1]	
		(iv)	0.3 m [1]	
	(b)		4 [1]	
	(c)		20 × 90 [1] 1800 m/s [2] [2]	8
7	**(a)**		Refracted by lens [1] Image forms on retina [1] [2]	
	(b)	**(i)**	Lens too strong/eyeball too long [1] Can see near things clearly/Cannot see far things clearly [1] Light focused in front retina [1] [3]	
		(ii)	Diverging lens/concave lens [1]	6

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AVAILABLE MARKS

8 **(a)** Indicative Content:

- Place sheet of lead/aluminium/paper in front of source
- Make sure distance between the source and sheet is constant
- Make sure distance between the radiation counter and sheet is constant
- Measure the amount of radiation which passes through
- If radiation stopped by lead it is gamma
- If radiation stopped by aluminium it is beta
- If radiation stopped by paper it is alpha
- Same thickness of sheet

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using **five** or more of the above points) the experiment in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to describe and explain the experiment (using **three or four** of the above points) in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
C	Candidates describe/explain the experiment using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
D	Response not worthy of credit	[0]

[6]

(b) **(i)** time it takes [1]
for the radiation count/radioactivity to fall by half [1] [2]

(ii) B [1]
Beta can be stopped by certain thicknesses of aluminium/ appropriate reference to either alpha or gamma [1]
has a long half-life [1]
or implied [2]

11

Total **60**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 29 FEBRUARY, 2012
9.30 am–10.30 am

GSS31

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 eight** questions.

INFORMATION FOR CANDIDATES

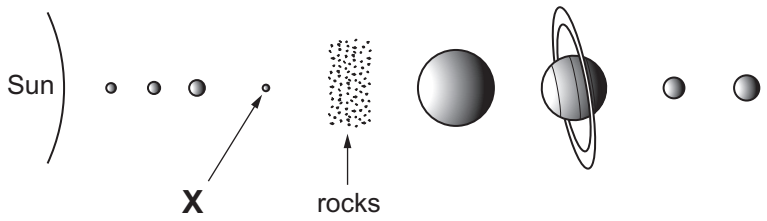
The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question **8(a)**.

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

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Examiner Only	
Marks	Remark

1 The diagram below shows some of the objects in our Solar System.



(a) (i) Name the planet labelled **X**.

Answer _____ [1]

(ii) What name is given to the rocks shown in the diagram?

Choose from:

stars **asteroids** **moons** **comets**

Answer _____ [1]

(b) Our Solar System has been described and named in two models, one of which we now know is wrong. Use lines to match each name with its correct description.

Name	Description
Heliocentric	The Sun is at the centre
Geocentric	The Moon is at the centre
	The Earth is at the centre

[2]

(c) The table below gives information on some planets in our Solar System.

Planet	Distance from Sun/ million km	Time to orbit the Sun/years
Mercury	60	0.2
Venus	110	0.6
Earth	150	1
Jupiter	780	12
Uranus	2900	84

(i) Complete the following sentence to describe the trend shown in the table.

As the distance from the Sun increases, the time to orbit the

Sun _____ [1]

(ii) Use the information in the table to suggest which planet will be the coldest. Explain your answer.

_____

_____

_____ [2]

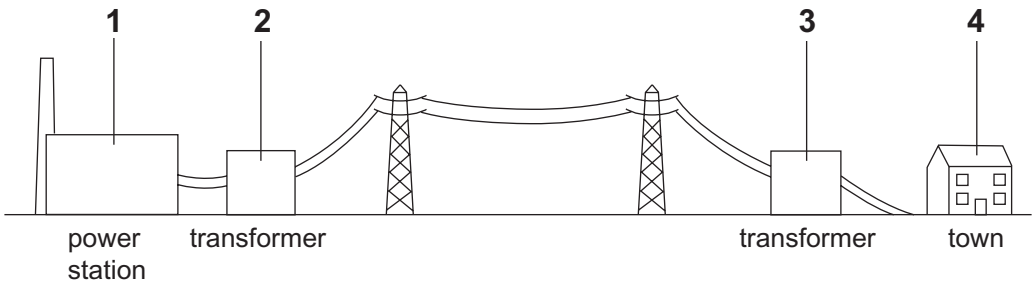
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 **(a)** The diagram below shows part of the National Grid.



Match the statements below with the correct label (**1**–**4**) from the diagram.

(i) Where is most electricity used?

Answer _____ [1]

(ii) Where is electricity produced?

Answer _____ [1]

(b) The picture below shows a television.



© Philips

Answer the following questions about the television.

Choose from:

heat **sound** **light** **electrical**

(i) Name the type of energy the television set uses.

_____ [1]

(ii) Name the type of energy the television wastes.

_____ [1]

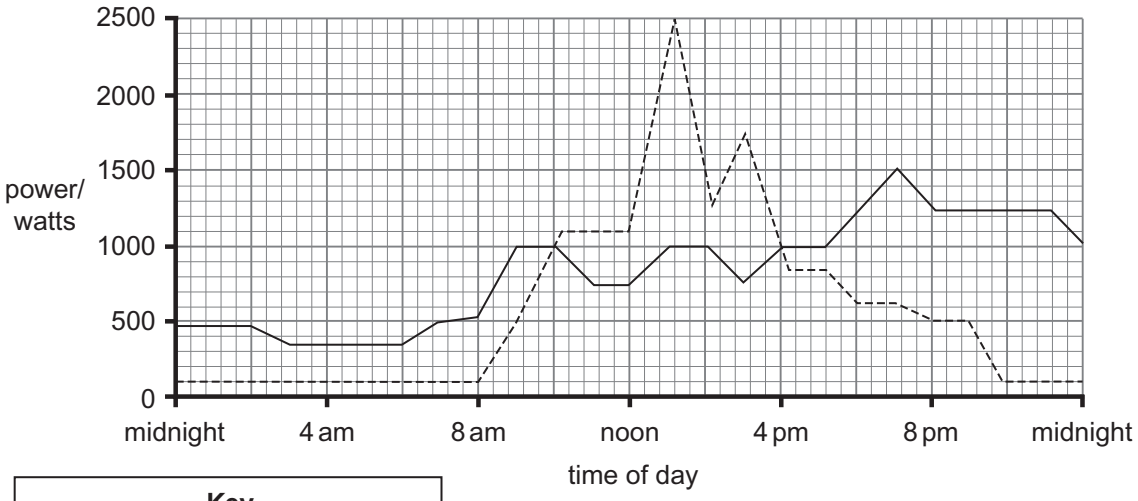
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(c) The picture below shows a house that uses a wind turbine to generate some of its electricity.



© *iStockphoto / Thinkstock*

The graph below shows the power output from the wind turbine and the household demand for electricity over a 24 hour period.



Key	
———	Output from wind turbine
------	Household demand

(i) During which period of the day is the household demand greater than the wind turbine output?

Choose from:

4 am to 10 am : **10 am to 4 pm** : **4 pm to 10 pm**

Answer _____ [1]

(ii) What is the maximum power output from the **turbine**?

Answer _____ watts [1]

Examiner Only

Marks	Remark

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(iii) Suggest **one** reason for the household demand being low from 10 pm to 8 am.

_____

_____ [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

3 The table below gives information for two different types of light bulb.

	Low-energy bulb	Ordinary bulb
Electrical power input	15 W	60 W
Light power output	3 W	3 W
Cost to buy	£3.50	£0.50
Expected lifetime	8 years	1 year
Annual running cost	£1.00	£4.00

(a) (i) Give two reasons for choosing a low-energy light bulb.

1. _____

2. _____ [2]

(ii) Give **one** reason for choosing the ordinary light bulb.

_____ [1]

(b) Calculate the efficiency of the **low-energy** bulb using the equation:

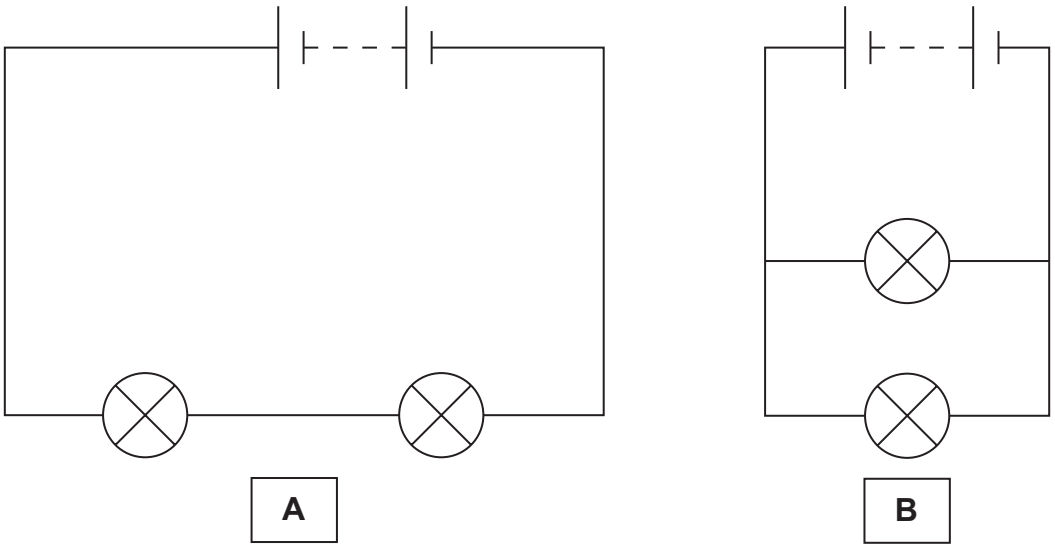
$$\textbf{efficiency} = \frac{\textbf{light power output}}{\textbf{electrical power input}}$$

(Show your working out.)

Answer _____ [2]

Examiner Only	
Marks	Remark

4 Shown below are two simple electrical circuits.



(a) Complete the following sentences.

(i) The bulbs in circuit **A** are connected in _____ [1]

(ii) The bulbs in circuit **B** are connected in _____ [1]

(b) State what will happen in each circuit if one bulb is broken.

(i) Circuit **A**

_____

_____ [1]

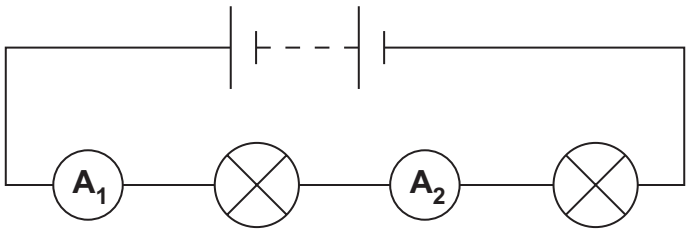
(ii) Circuit **B**

_____

_____ [1]

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(c) Below is another electrical circuit.



In the circuit above the ammeter reading $\mathbf{A_1}$ shows 2A.

(i) What is the meter reading on $\mathbf{A_2}$?

Choose from:

4A **1A** **2A**

Answer _____ [1]

(ii) The bulbs are connected to a 8 V power supply.

Use the equation:

$$\textbf{resistance} = \frac{\textbf{voltage}}{\textbf{current}}$$

to calculate the resistance of the circuit.
(Show your working out.)

Answer _____ ohms [2]

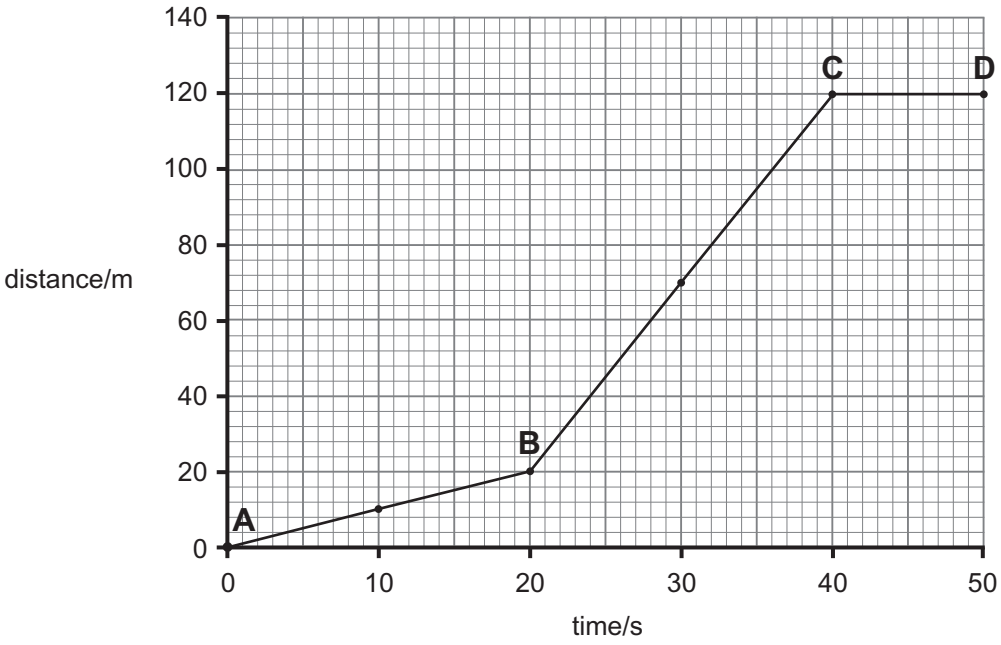
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 The distance–time graph for a car journey is shown below.



(a) Describe the motion of the car from:

1. **A** to **B** _____ [1]

2. **C** to **D** _____ [1]

(b) What happens to the motion of the car at point **B**?

Choose from:

slows down : turns a corner : gets faster

Answer _____ [1]

Examiner Only	
Marks	Remark

(c) Use the equation:

$$\textbf{average speed} = \frac{\textbf{total distance}}{\textbf{time taken}}$$

to calculate the average speed of the car from **A** to **C**.
(Show your working out.)

Answer _____ m/s [2]

(d) State two ways in which car designers have tried to reduce the risk of serious injuries to the driver and passengers in an accident.

1. _____

2. _____ [2]

(e) Speed bumps are a common feature in built-up areas.

(i) Explain fully the benefit of having speed bumps.

_____

_____

_____ [2]

(ii) Suggest a disadvantage in having speed bumps.

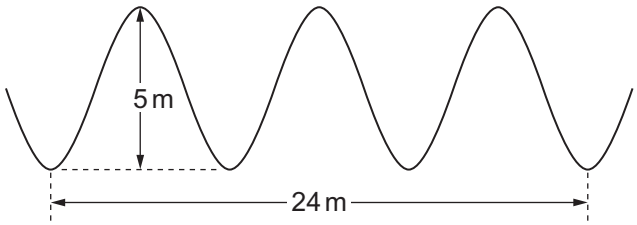
_____

_____ [1]

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Examiner Only	
Marks	Remark

6 The diagram below shows some sea waves.



(a) Use the information in the diagram to answer the following questions.

(i) What is the amplitude of these waves?

Answer _____ m [1]

(ii) What is the wavelength of these waves?

Answer _____ m [1]

(b) A student notes that **four** complete waves pass him in **two** seconds.

What is the frequency of these waves?

Answer _____ Hz [1]

(c) **(i)** Sea waves are transverse waves. Describe the motion of the particles in a transverse wave.

_____

_____ [2]

(ii) Name another example of a transverse wave.

_____ [1]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

7 **(a)** Complete the following equation about the stopping distance of a car.

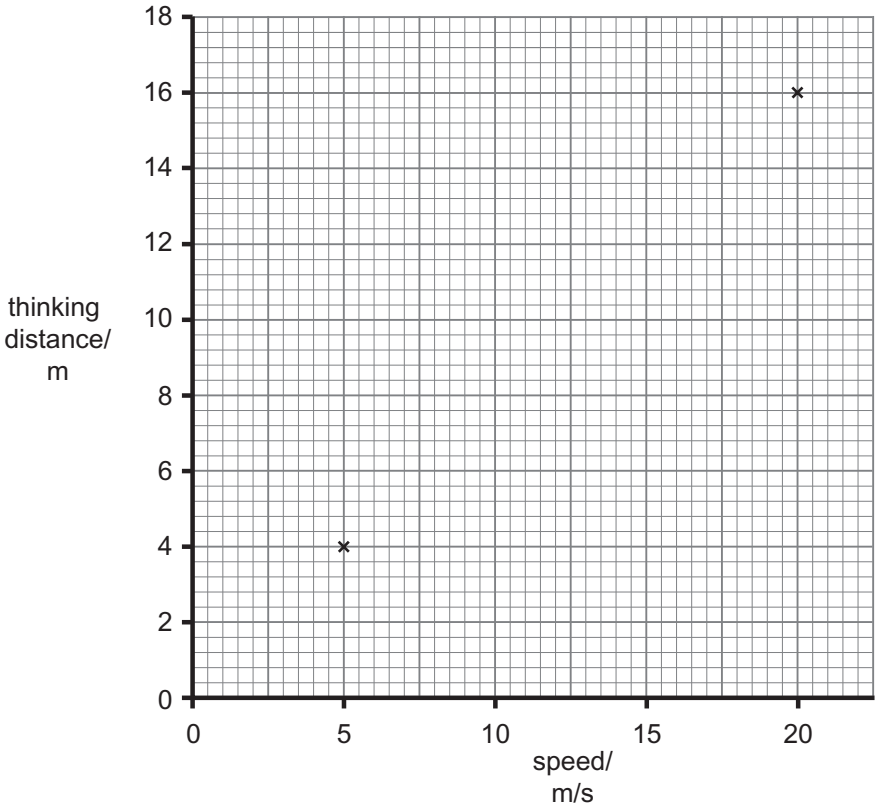
Stopping distance = thinking distance + _____ distance

[1]

(b) The table below gives the thinking distance at different speeds on a dry day.

Speed/ m/s	Thinking distance/ m
5	4
8	6.4
12	9.6
15	12
20	16

(i) Complete the plots for these values and draw a line graph on the grid below.



[2]

(ii) State the trend shown in this information.

_____

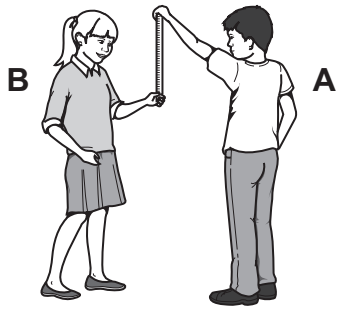
_____ [1]

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(iii) Suggest how the thinking distances shown in the table opposite will change, if at all, if taken on a wet day.

_____ [1]

(c) The picture below shows two people investigating how fast their reactions are.



The boy on the right (**A**) drops the metre stick and the girl on the left (**B**) catches it as quickly as possible.

(i) Explain fully how the distance the metre stick falls is used to show how good the girl's reactions are.

_____

_____

_____ [2]

(ii) State what can be done to make the results as:

1. reliable as possible.

_____

_____

2. accurate as possible.

_____

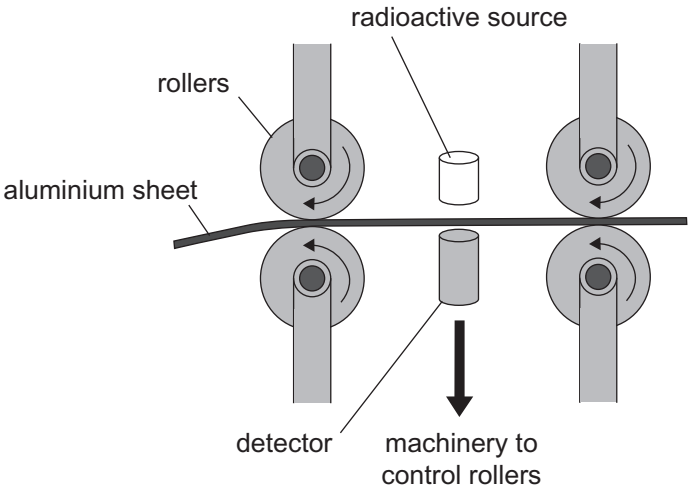
_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 The diagram below shows how a radioactive source is used to monitor the thickness of an aluminium sheet during manufacture. If the thickness of the aluminium sheet changes, the force applied to the rollers will adjust to maintain the correct thickness.



(a) Beta is the best type of radiation to use as a source. With reference to the penetration properties of all types (alpha, beta and gamma) explain fully why beta is the best.

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

[6]

Examiner Only	
Marks	Remark

(b) Radiation is used to kill bacteria and fungi found in fresh food to stop decay. The radiation is applied after packaging.

The table below gives details of some isotopes.

Isotope	Type of radiation emitted	Half-life
Radon-220	Alpha	54.5 seconds
Polonium-210	Alpha	138 days
Bismuth-83	Beta	61 minutes
Hydrogen-3	Beta	12 years
Technetium-99	Gamma	6 hours
Cobalt-60	Gamma	5 years

Which isotope would be best for a food producer to use with a packet of fresh strawberries? Explain your answer.

Isotope _____ [1]

Explanation _____

_____

_____ [2]

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 29 FEBRUARY, 2012
9.30 am–10.30 am

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**	**(i)**	Mars	[1]	
		(ii)	asteroids	[1]	
	(b)		heliocentric – Sun at the centre [1] geocentric – Earth at the centre [1]	[2]	
	(c)	**(i)**	increases/gets longer	[1]	
		(ii)	Uranus; furthest from Sun	[2]	7
2	**(a)**	**(i)**	4/town	[1]	
		(ii)	1/power station	[1]	
	(b)	**(i)**	electrical	[1]	
		(ii)	heat	[1]	
	(c)	**(i)**	10 am–4 pm	[1]	
		(ii)	1500 watts	[1]	
		(iii)	all in bed	[1]	7
3	**(a)**	**(i)**	uses less electrical energy/lasts longer/lower running cost/ more efficient/wastes less energy] do not allow cheaper *(any 2 = 1 mark each)*	[2]	
		(ii)	cheaper to buy	[1]	
	(b)		$\frac{3}{15}$ [1] $0.2(\frac{1}{5})$ [2] 20%	[2]	5
4	**(a)**	**(i)**	series	[1]	
		(ii)	parallel	[1]	
	(b)	**(i)**	the other bulb goes out/ref. to current flow	[1]	
		(ii)	the other bulb stays lit/gets brighter/ref. to current flow do not allow dimmer	[1]	
	(c)	**(i)**	2	[1]	
		(ii)	$\frac{8}{2}$ [1] 4 [2] e.c.f from [1]	[2]	7

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				AVAILABLE MARKS
5	**(a)**	**1.** steady speed	[1]	
		2. stopped/stationary	[1]	
	(b)	gets faster	[1]	
	(c)	$\frac{120}{40}$ [1] 3 m/s [2]	[2]	
	(d)	crumple zones/air bags/seat belts/side impact bars *(any 2 = 1 mark each)*	[2]	
	(e)	**(i)** slows *cars* down [1] less *serious* injuries/accidents [1]	[2]	
		(ii) slows emergency response time/uses more fuel accelerating and decelerating between them	[1]	10
6	**(a)**	**(i)** 2.5 m	[1]	
		(ii) 8 m	[1]	
	(b)	2 Hz	[1]	
	(c)	**(i)** vibrations at right angles/up and down [1] to wave travel [1]	[2]	
		(ii) any electromagnetic wave	[1]	6
7	**(a)**	braking	[1]	
	(b)	**(i)** 3 points correct [1] correct line [1] ± $\frac{1}{2}$ square	[2]	
		(ii) as speed increases, thinking distance increases	[1]	
		(iii) no change	[1]	
	(c)	**(i)** the shorter distance the stick falls [1] the quicker her reactions are [1]	[2]	
		(ii) repeat/average [1] 0 cm on ruler to be held just above hand [1]/implied	[2]	9

8 **(a)** Indicative Content

- Amount of beta going through will change with thickness of aluminium
- Thicker aluminium the less beta radiation detected (or vice versa)
- Alpha would be stopped by aluminium/paper/air
- Gamma would go straight through aluminium/stopped by lead
- Beta stopped by aluminium

Band	Response	Mark
A	Candidates use 4 or 5 of the above points in a logical sequence to explain fully why beta is best. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
B	Candidates use 3 of the above in a logical sequence to partially explain why beta is best. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
C	Candidates explain why beta is best using some 1 or 2 of the above points. However these are not presented in a logical sequence. They use limited spelling, punctuation and grammar.	1–2
D	Response not worthy of credit	0

[6]

(b) cobalt 60 [1]

Gamma; has most penetrating power/kills bacteria

Half-life is longest/doesn't need to be replaced often [1] [2]

Total

AVAILABLE MARKS
9
60