Centre Number

Candidate Number

cea

Rewarding Learning

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 3 (Physics)

Higher Tier

ML

[GSS32]

FRIDAY 24 FEBRUARY 2017, MORNING

TIME

1 hour 15 minutes, plus your additional time allowance.

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 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4(a)** and **8(a)**.

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

10958.02 **ML**

1 Shown below is a solar powered lamp.

These lamps use sunlight to charge a battery. Then at night this battery makes electricity to light the lamp.

A pupil investigated how long, on average, the lamp stayed lit each night. She did this for six months of the year. The results are shown below.
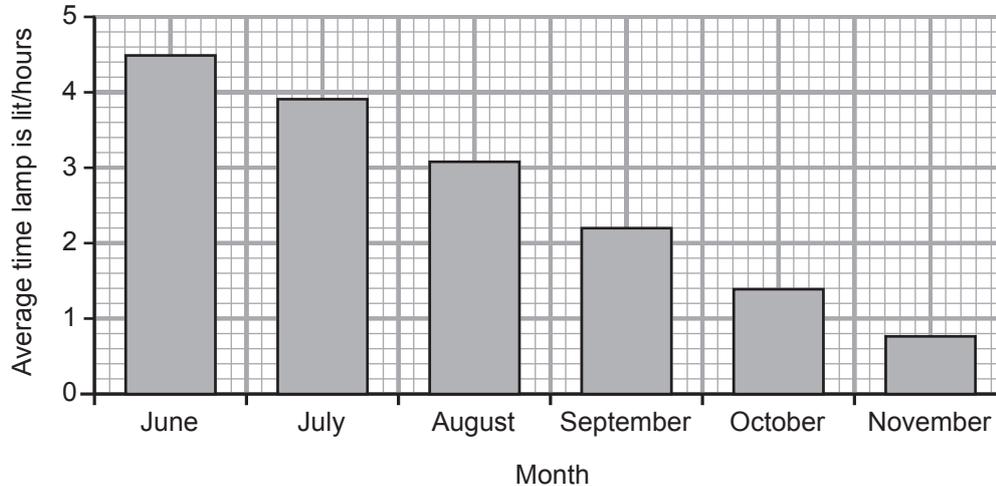

(a) Describe and explain the results of this investigation.

_____

_____

_____

_____ [3]

2

(b) Solar and wind power are renewable energy sources.

(i) What does the word 'renewable' mean?

_____

_____ [1]

(ii) Write down **one** environmental advantage of using wind power.

_____ [1]

(iii) Write down **one** environmental disadvantage of using wind power.

_____ [1]

(iv) Write down the name of **one** other renewable energy source.

_____ [1]

2 (a) Look at the diagram below. It shows the amount of radon gas that occurs naturally in Northern Ireland.
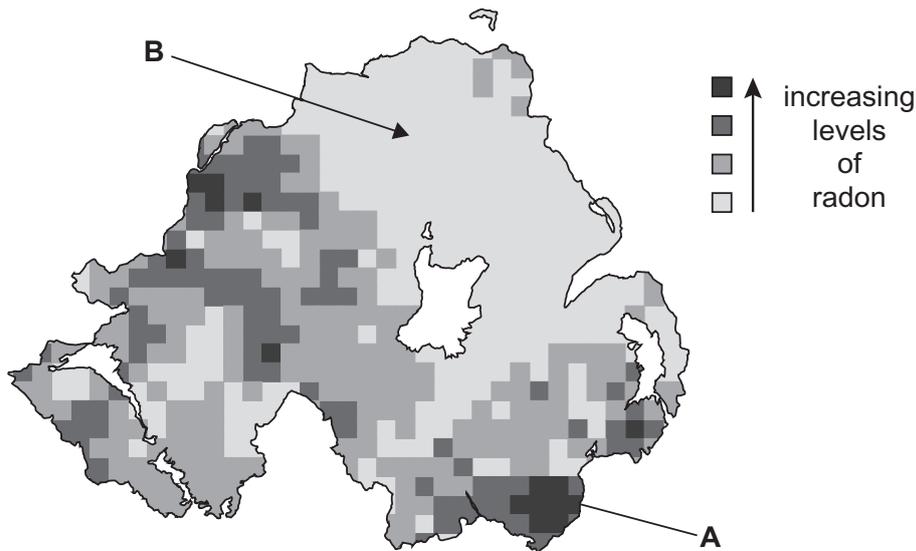
Based on Crown Copyright and reproduced with permission of Land & Property Services under delegated authority from the Controller of Her Majesty's Stationery Office, © Crown Copyright and database right 2014, EMOU 206.2
Radon Affected Area classification: Public Health England © Crown copyright and British Geological Survey © NERC 2015

The table below gives information on percentage (%) increased risk of death from lung cancer due to radon.

Radon level/ Bq/m^3	Increased risk of death by lung cancer/%
0	0
100	0
200	0.6
300	1.0
400	1.4
500	1.8
600	2.2
700	2.6
800	3.0

© BMJ 2009;338:a3110

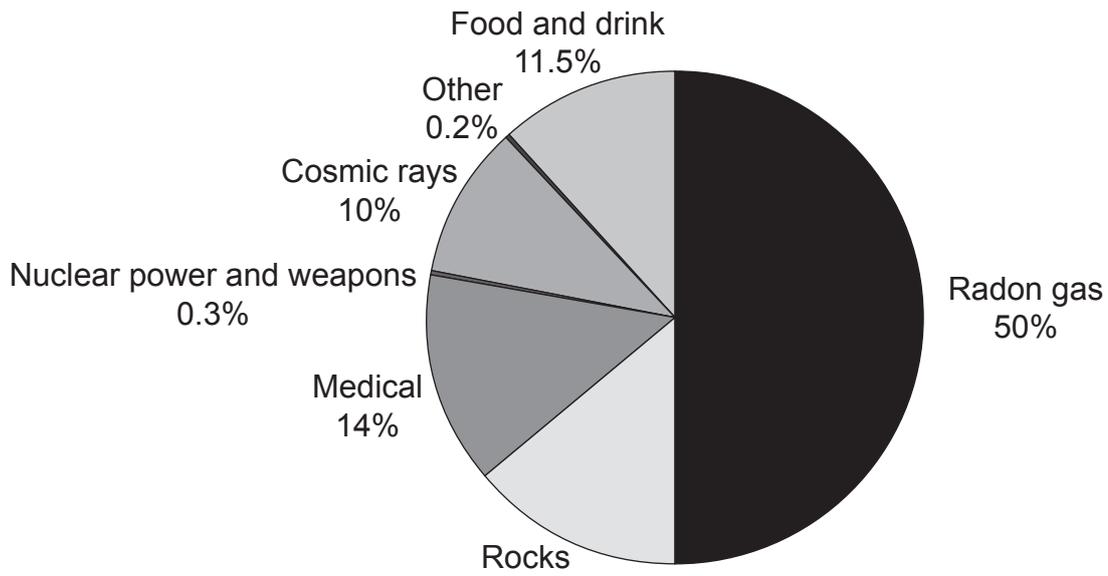**(i)** Use the information above to explain fully why it would be safer to live in area **B** than area **A**.

_____

_____

_____ [2]

10958.02 **ML**

4

Radon levels within a home **must not** be higher than 200 Bq/m^3.

(ii) Use information from the table to say why you think this level is set at 200 Bq/m^3.

_____

_____ [1]

(b) The pie chart below shows typical sources of background radiation.

(i) What does the term 'background radiation' mean?

_____

_____ [1]

(ii) Calculate the percentage of background radiation that is from rocks.
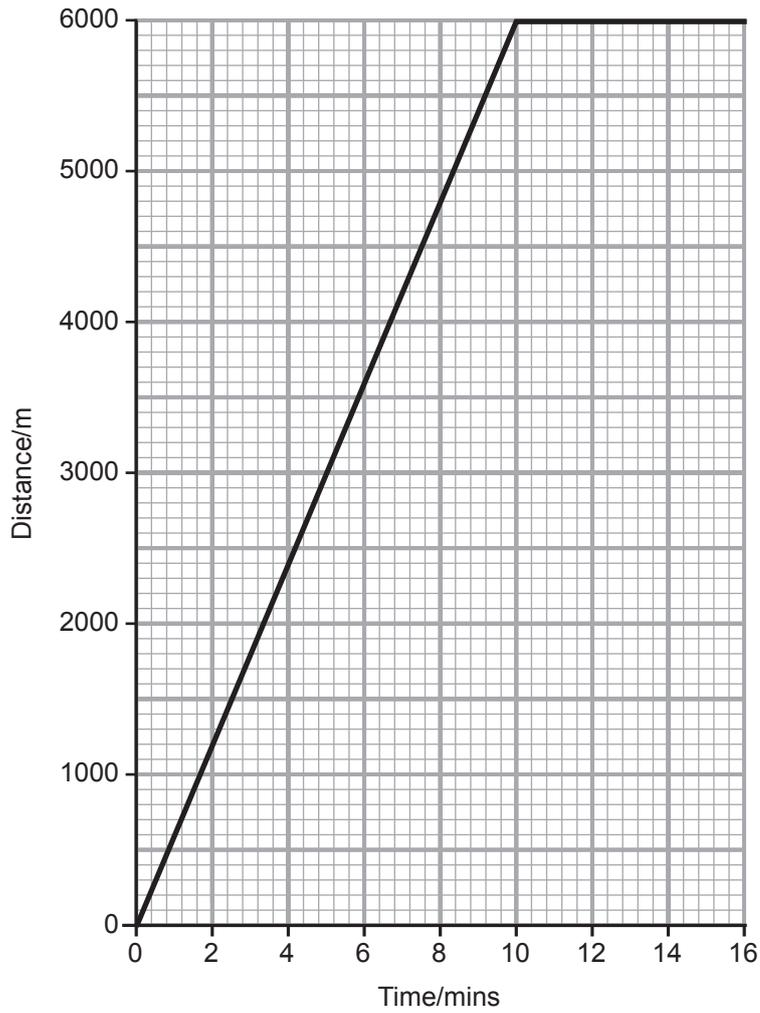
(Show your working out.)

Answer _____ % [2]

(iii) Write down **one** possible cause of radiation from medical sources.

_____

_____ [1]

3 The distance–time graph below is for a pizza delivery bike.

(a) Describe fully the motion of the bike.

_____

_____

_____ [2]

(b) Look at the table below. It shows the distance travelled and time taken for the journey of another bike.

Time/mins	Distance/m
0	0
4	2000
7	3500
10	5000
11	5500
14	5500
16	5500

(i) Use these values to draw the distance–time graph for this bike. Do this on the grid opposite. [3]

(ii) How can you tell from the graph which bike was faster?

_____

_____ [1]

10958.02 **ML**

7

[Turn over

4 **(a)** Fossil fuels are the most common fuels used to make electricity.

Describe how fossil fuels were formed. Then describe how fossil fuels are now used to make electricity.

Your answer should include:
- the names of three fossil fuels;
- how fossil fuels were formed;
- what happens inside a fossil fuel power station.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(b) Three-pin plugs are used to supply electricity to appliances.

X

Source: Principal Examiner

What is the name of the part labelled **X** in the diagram?
Explain how it works.

_____

_____

_____

_____ [3]

10958.02 **ML**   **9**   **[Turn over**

5 **(a)** Look at the table below. It shows the results of an investigation to find how speed affects the efficiency of a racing car.

Average lap speed/ miles per hour	Lap time/ minutes	Efficiency/ miles per gallon
96	3.13	15.0
98	3.06	13.5
100	3.00	12.8
102	2.94	12.4
104	2.88	11.9
106	2.83	11.0
110	2.73	10.5

(i) Describe the effect speed has on lap time and efficiency.

_____

_____

_____ [2]

The diagram below shows the type of race track used to get these results.

Start/Finish Line
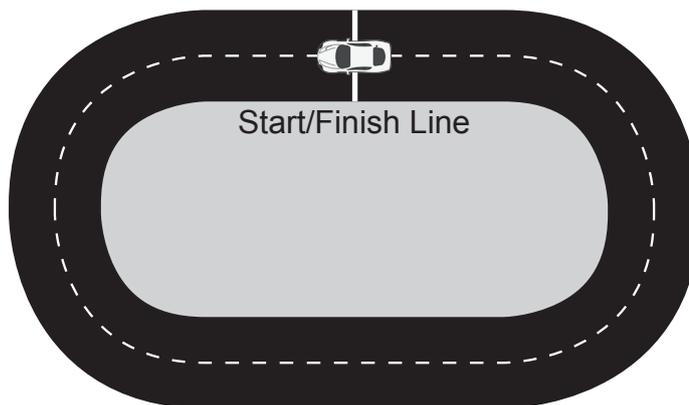
(ii) Explain fully why average speed is used in this investigation rather than instantaneous speed.

_____

_____

_____ [3]

(iii) In a 125 mile race, each car gets 10 gallons of fuel.
Explain fully why the car travelling at an average speed of
110 mph will **not** win the race. Use the table to answer this
question.

[2]

(b) (i) A 900 W washing machine takes 90 mins to do a full wash cycle.
Each unit (kWh) of electricity costs 20p.

Use the equations:

units used = power × time

and

cost = units used × cost per unit

to calculate the cost of this wash cycle.

(Show your working out.)

Answer _____ [3]

(ii) Washing machines transfer electrical energy into other types of
energy. Some of these types of energy are useful and some are
wasted.

Write down the names of **two** useful types of energy and the
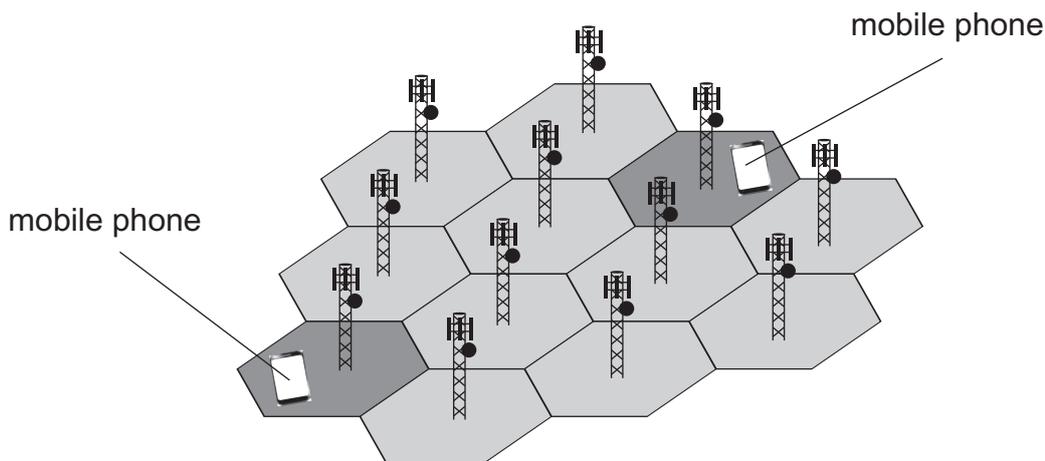name of **one** type of energy that is wasted.

Useful: _____

_____

Wasted: _____ [2]

6 (a) The diagram below shows the mobile phone network across part of Northern Ireland.

mobile phone

mobile phone

© GCSE Science Single Award for CCEA Foundation and Higher Tier by James Napier, Alyn G McFarland and Roy White. Published by Hodder Education, 2013. (ISBN: 9781444195729) "Reproduced by permission of Hodder Education".

Mobile phones send signals using microwaves.

(i) What is the name given to the area around a mast?

Answer _____ [1]

(ii) Explain fully the role of masts in the network.

_____

_____

_____ [2]

(b) The table below gives information on three appliances that transmit microwaves.

Appliance	Frequency range/ MHz
microwave oven	2400–2500
mobile phone	900–2200
internet router (WiFi)	2400–5000

Explain fully why the internet router could cause the most harm to our health. Use the information in the table and your own knowledge to answer this question.

_____

_____

_____

_____ [3]

(c) Microwaves are one type of electromagnetic wave that can be used in communication.

(i) Write down the name of another electromagnetic wave type used in communication and what it is used for.

_____

_____

_____ [2]

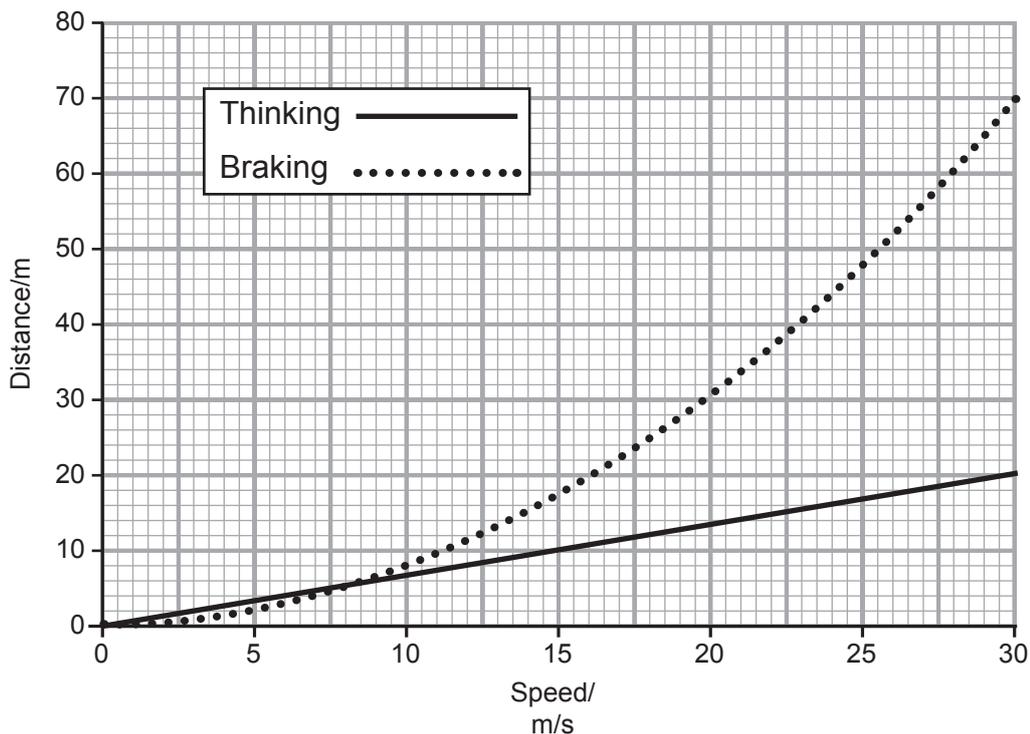**(ii)** Write down **two** features that all electromagnetic waves have in common.

1. _____

_____

2. _____

_____ [2]

7 **(a)** Look at the graph below. It shows the effect that speed has on thinking and braking distances.

(i) Write down **one** similarity and **one** difference in the effect that speed has on thinking and braking distances.

Similarity _____

_____

Difference _____

_____ [2]

(ii) Calculate the total stopping distance at 25 m/s.

(Show your working out.)

Answer _____ m   [2]

(b) Describe the effect, if any, that alcohol has on thinking distance and braking distance. Explain any effect.

_____

_____

_____

_____ [3]

8 Two pupils are doing an experiment to find the speed of sound using the flash-bang method as shown below.

© GCSE Science Single Award for CCEA Foundation and Higher Tier by James Napier, Alyn G McFarland and Roy White. Published by Hodder Education, 2013. (ISBN: 9781444195729) "Reproduced by permission of Hodder Education".

(a) Describe how this method will allow these pupils to find the speed of sound.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(b) Car parking sensor systems use ultrasound to let the driver know how close they are to an object.
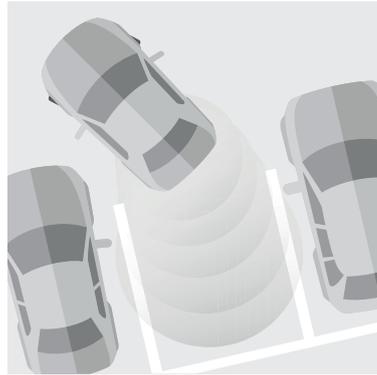
© *cihanterlan / iStock / Thinkstock*

(i) Explain fully what ultrasound is.

_____

_____

_____ [2]

Look at the table below. It shows how the sound heard by the driver changes with distance to the object.

Distance to object/m	Sound bleeps per second	Volume of sound/ dB
2.0	1	61
1.6	2	63
1.2	3	65
0.8	4	67
0.4	5	69

(ii) Describe fully what the driver will hear as the car gets closer to an object.

_____

_____ [1]

(iii) Write down **one** other example for the use of ultrasound.

_____ [1]

Examiner Only

Marks	Remark

9 **(a)** The diagram below shows four forces acting on a submarine.

7000 N

300 N

500 N

7000 N
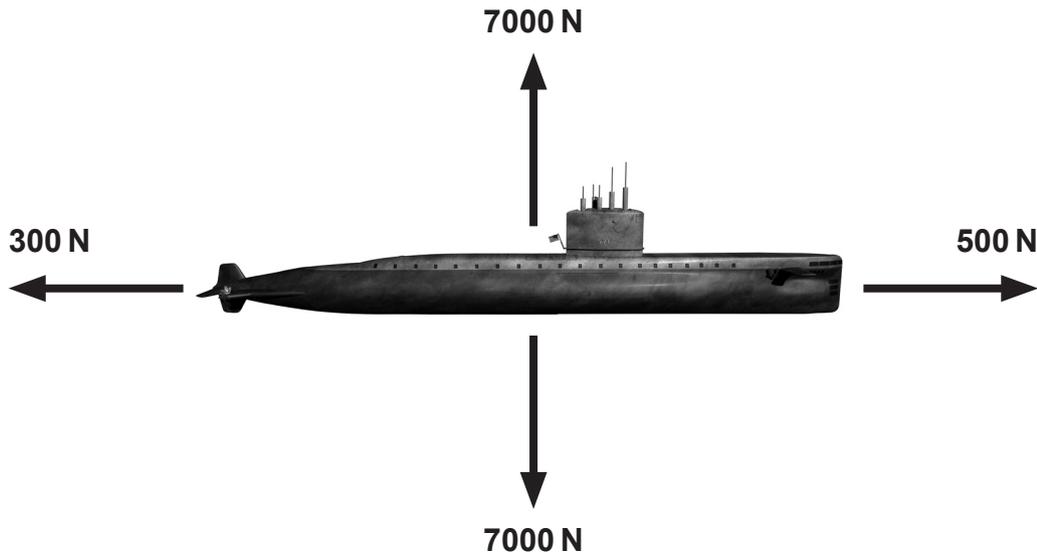
© Mikkel Juul Jensen / Science Photo Library

(i) In terms of forces, explain fully the horizontal motion of the submarine.

_____

_____

_____ [2]

(ii) Calculate the size of the resultant vertical force and write down the two effects this might have on the submarine.

_____

_____

_____

_____ [3]

(b) The photograph below shows a car crashing into a wall. When this happens the change in the car's momentum produces a force on the driver.

© TRL Ltd. / Science Photo Library

The size of this force can be calculated using the equation:

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

How do you think the size of the force on the driver could be reduced? Use your knowledge of car design and the equation above to help you answer this question.

_____

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER