Centre Number

Candidate Number

cea
Rewarding Learning

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 3 (Physics)
Higher Tier

GSS32

[GSS32]

FRIDAY 24 FEBRUARY 2017, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces
provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 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)**.

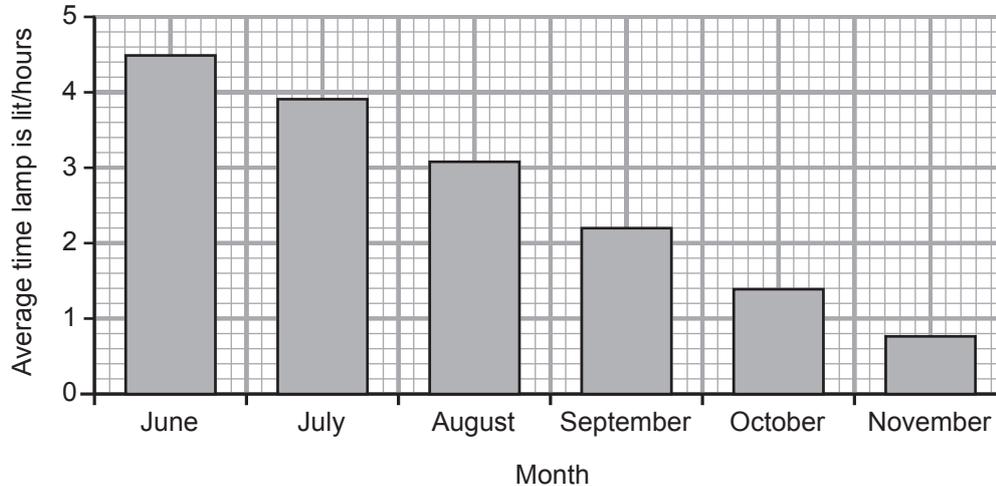| For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

10958

1 Shown below is a solar powered lamp.

© Martyn F. Chillmaid / Science Photo Library

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

A student investigated how long, on average, the lamp stayed lit each night during six months of the year. The results are shown below.

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

_____

_____

_____

_____ [3]

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

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

                                                               [1]

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

                                                               [1]

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

                                                               [1]

   (iv) Name **one** other renewable energy source.

                                                               [1]

10958

3

[Turn over

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

B

increasing
levels
of
radon

A
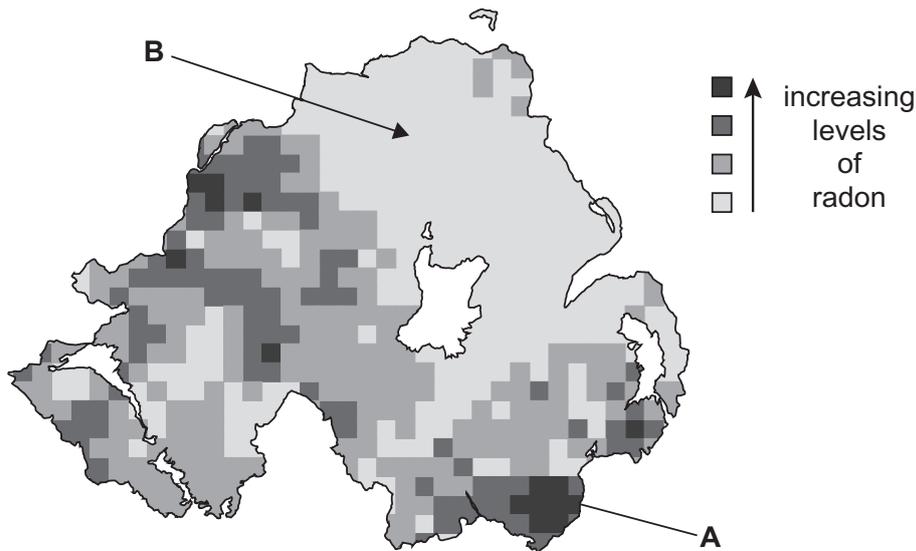
Based on Crown Copyright and reproduced with permission of Land & Property Services under delegated authority from the
Controller of Her Majesty's Stationery Office, © Crown Copyright and database right 2014, EMOU 206.2
Radon Affected Area classification: Public Health England © Crown copyright and British 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   **4**

If radon levels are 200 Bq/m^3 or higher, the government requires that action must be taken to reduce this radon level within a home.

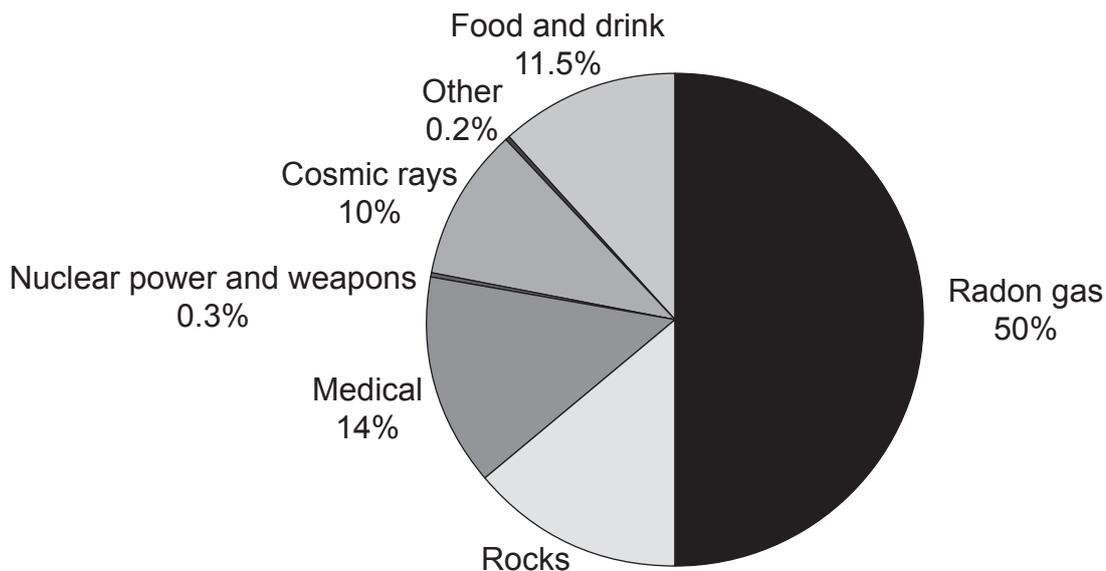**(ii)** Use information from the table to suggest why this level is set at 200 Bq/m^3.

_____

_____ [1]

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

Food and drink 11.5%
Other 0.2%
Cosmic rays 10%
Nuclear power and weapons 0.3%
Medical 14%
Rocks
Radon gas 50%

(i) What is meant by the term 'background radiation'?

_____

_____ [1]

(ii) Calculate the percentage of background radiation that is from rocks.

(Show your working out.)

Answer _____ % [2]

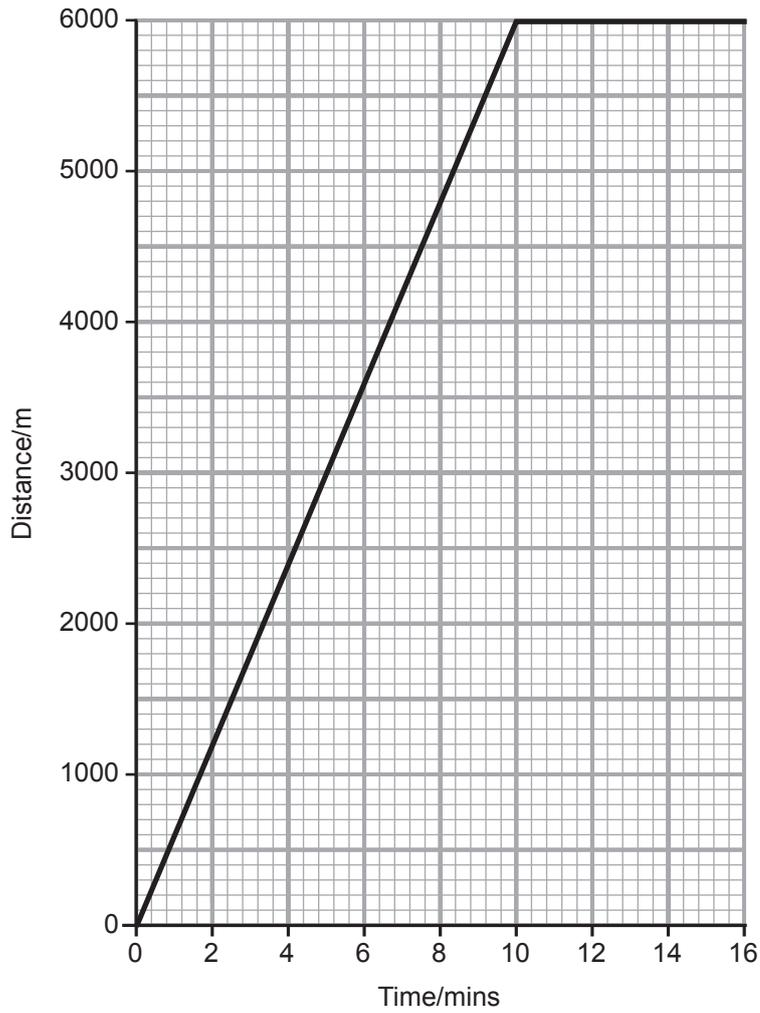**(iii)** Suggest **one** possible cause of the radiation from medical sources.

_____

_____ [1]

10958   **5**   **[Turn over**

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

(a) Describe fully the motion of the bike.

_____

_____

_____ [2]

10958

6

(b) The table below gives 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) On the grid opposite, use these values to draw the distance–time graph for this bike. [3]

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

_____

_____ [1]

10958

7

[Turn over

4 **(a)** The most common fuels used to make electricity are fossil fuels.

Describe how fossil fuels were formed and are now used to produce 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]

10958

8

(b) To supply electricity to any appliance three-pin plugs are used.
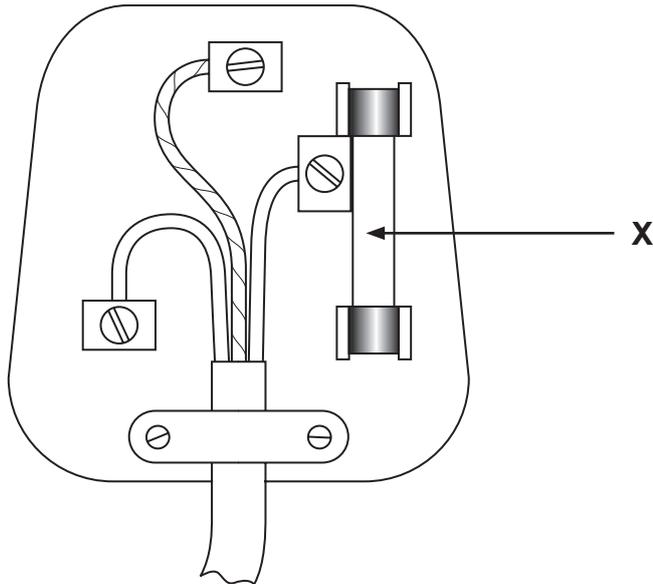
Source: Principal Examiner

Name the part labelled **X** in the diagram and explain how it works.

_____

_____

_____

_____ [3]

9

5 **(a)** Shown below are 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
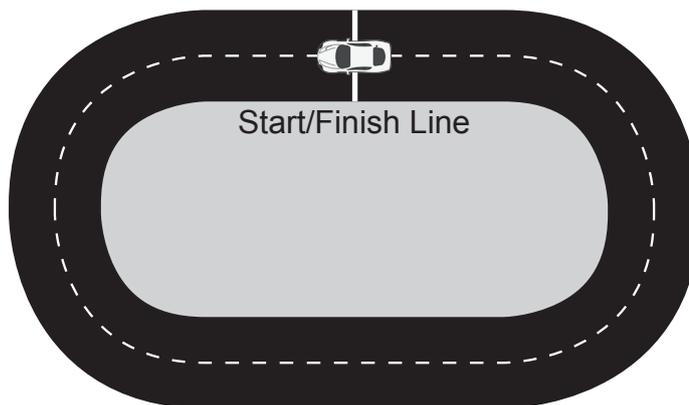
(ii) Explain fully why average speed is used in this investigation rather than instantaneous speed.

_____

_____

_____ [3]

10958   **10**

(iii) In a 125 mile race, each car is given 10 gallons of fuel.
Using the table, explain fully why this car travelling at an average speed of 110 mph will **not** win the race.

_____

_____

_____ [2]

(b) (i) A 900 W washing machine takes 90 mins to complete a 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 which are useful and some of which are wasted.

Name **two** useful types of energy and **one** type which is wasted.
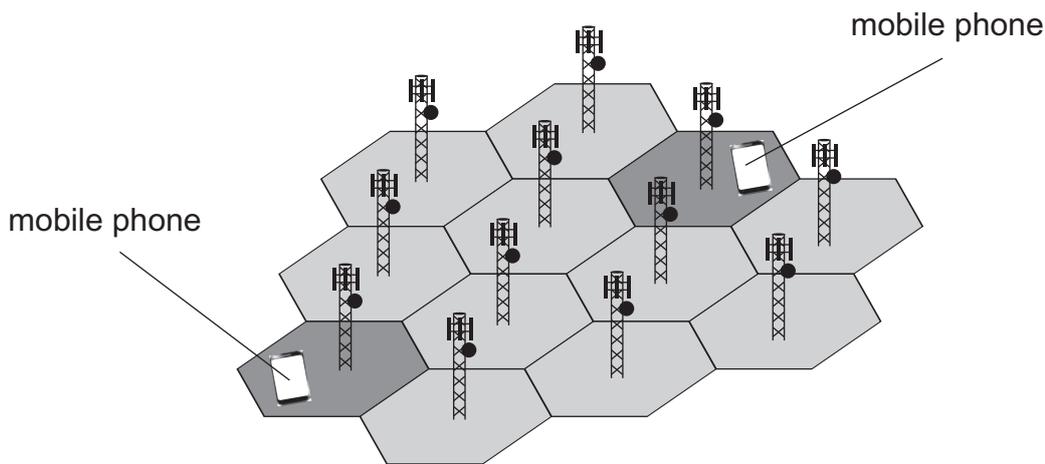
Useful: _____

_____

Wasted: _____ [2]

11

[Turn over

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 name is given to the area around a mast?

Answer _____ [1]

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

_____

_____

_____ [2]

12

(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

Use this information and your knowledge to explain fully why the internet router could cause the most harm to our health.

_____

_____

_____

_____ [3]

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

(i) Name another electromagnetic wave type used in communication and state its use.

_____

_____

_____ [2]

(ii) Give **two** features all electromagnetic waves have in common.

1. _____

_____

2. _____

_____ [2]
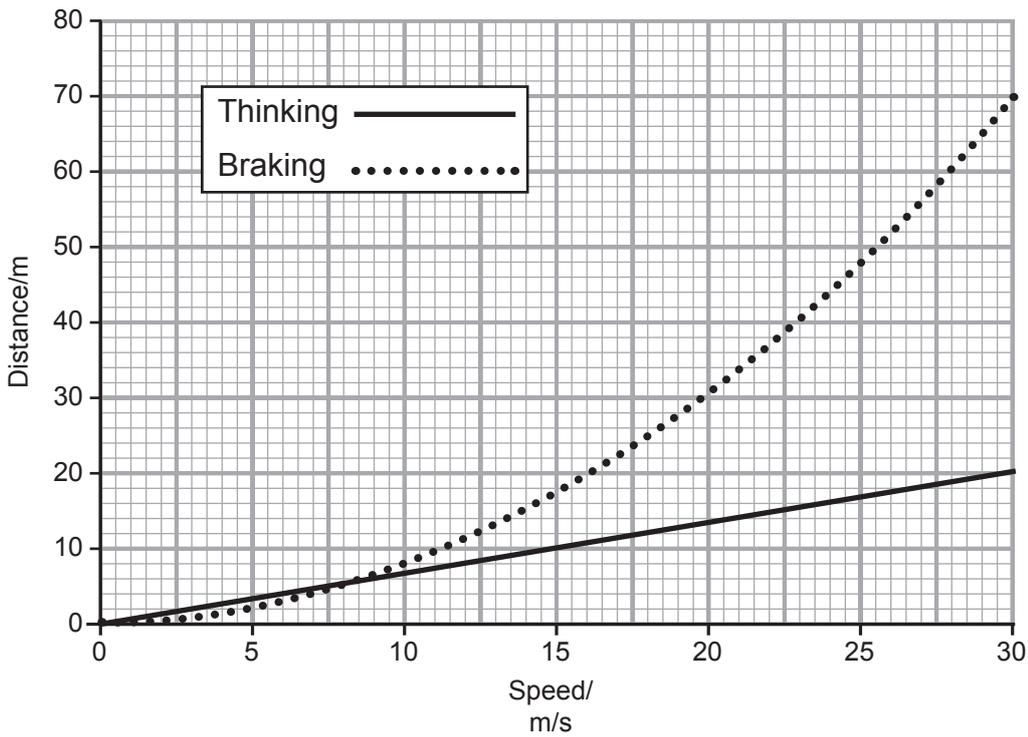
10958   **13**   **[Turn over**

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

(i) Give **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]

15

[Turn over

8 Shown below are two students experimenting to find the speed of sound using the flash-bang method.

Honk! Honk!
Honk!
Honk!

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(a) Describe how this method will allow these students 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 alert a driver as to how close they are to an obstacle.
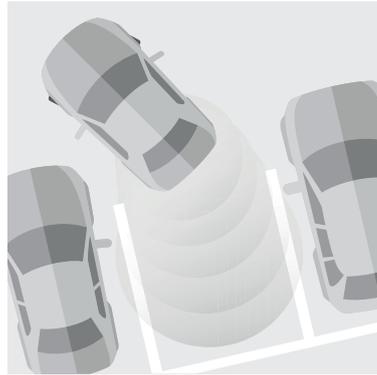
(i) Explain fully what ultrasound is.

_____

_____

_____ [2]

The table below shows how the sound heard by the driver changes with distance to the obstacle.

Distance to obstacle/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 obstacle.

_____

_____ [1]
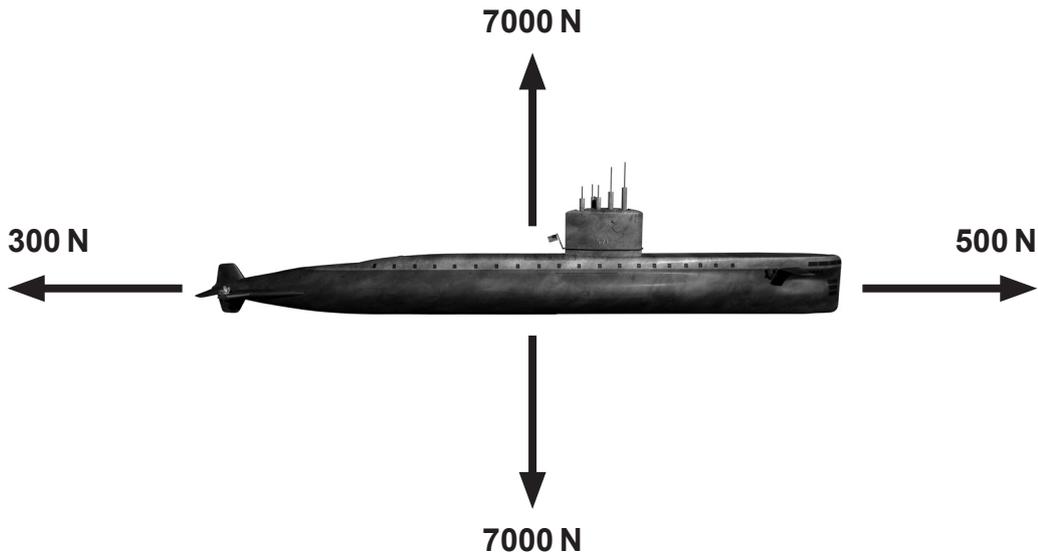
(iii) Give **one** other example for the use of ultrasound.

_____ [1]

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17

[Turn over

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 state 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:

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

Using your knowledge of car design and this equation, suggest how the size of the force on the driver could be reduced.

_____

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

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