Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2010

Additional Science

Unit Physics P2

PHY2H

H

Physics

Unit Physics P2

Friday 28 May 2010 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

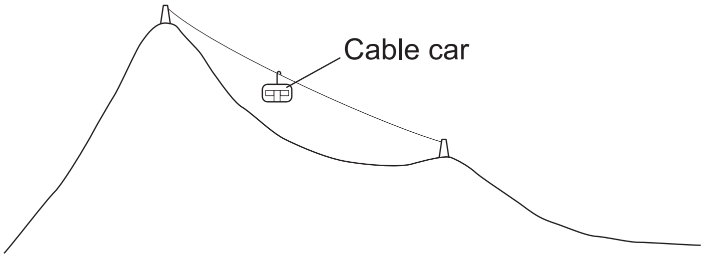
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 (a) The diagram shows a cable car used to take skiers to the top of a mountain.



1 (a) (i) The total mass of the cable car and skiers is 7500 kg.

Use the equation in the box to calculate the weight of the cable car and skiers.

weight = mass × gravitational field strength

gravitational field strength = 10 N/kg

Show clearly how you work out your answer and give the unit.

....

....

Weight = ...

(3 marks)

1 (a) (ii) The cable car moves at a constant speed. It lifts skiers through a vertical height of 800 metres in 7 minutes.

Use the following equation to calculate the work done to lift the cable car and skiers.

work done = force applied × distance moved in the direction of force

Show clearly how you work out your answer.

....

....

Work done = ... J

(2 marks)

1 (b) The diagram shows a skier who is accelerating down a steep ski slope.

1 (b) (i) Draw an arrow on the diagram to show the direction of the resultant force acting on the skier.

(1 mark)

1 (b) (ii) How and why does the kinetic energy of the skier change?

....

....

....

....

(2 marks)

Question 1 continues on the next page

Turn over ▶

Do not write outside the box

1 (c) Last year, 18 000 skiers suffered a head injury. It is thought that nearly 8000 of these injuries could have been avoided if the skier had been wearing a helmet. However, at present, there are no laws to make skiers wear helmets.

Suggest why skiers should be made aware of the benefits of wearing a helmet.

....

....

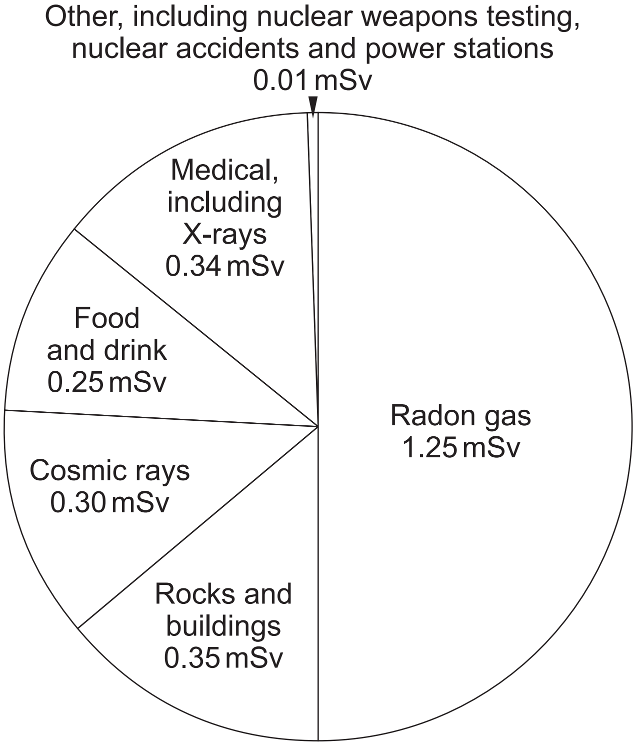
(1 mark)

9

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

2 The pie chart shows the sources of the background radiation and the radiation doses that the average person in the UK is exposed to in one year.
Radiation dose is measured in millisieverts (mSv).



2 (a) (i) What is the total radiation dose that the average person in the UK receives?

....

....

Total radiation dose = ... mSv
(1 mark)

2 (a) (ii) A student looked at the pie chart and then wrote down three statements.

Which **one** of the following statements is a correct conclusion from this data?

Put a tick (✓) in the box next to your answer.

In the future, more people will be exposed to a greater proportion of radon gas. ☐

People that have never had an X-ray get 50% of their radiation dose from radon gas. ☐

The radiation dose from natural sources is much greater than from artificial sources. ☐

(1 mark)

Question 2 continues on the next page

Turn over ▶

Do not write outside the box

2 (b) The concentration of radon gas inside a home can vary from day to day. In some homes, the level can build up to produce a significant health risk. It is estimated that each year 1000 to 2000 people die because of the effects of radiation from radon gas.

2 (b) (i) It is not possible to give an exact figure for the number of deaths caused by the effects of radiation from radon gas. Why?

....

....

(1 mark)

The table gives data for the radiation levels measured in homes in 4 different parts of the UK. The radiation levels were measured using two detectors, one in the living room and one in the bedroom. The measurements were taken over 3 months.

Area of the UK	Number of homes in the area	Number of homes in the sample	Average radiation level in Bq/m^3	Maximum radiation level in Bq/m^3
A	590 000	160	15	81
B	484 000	130	18	92
C	221 000	68 000	162	10 000
D	318 000	35 300	95	6 900

2 (b) (ii) Give **one** reason why the measurements were taken over 3 months using detectors in different rooms.

....

....

(1 mark)

2 (b) (iii) Use information from the table to suggest why a much higher proportion of homes were sampled in areas **C** and **D** than in areas **A** and **B**.

....

....

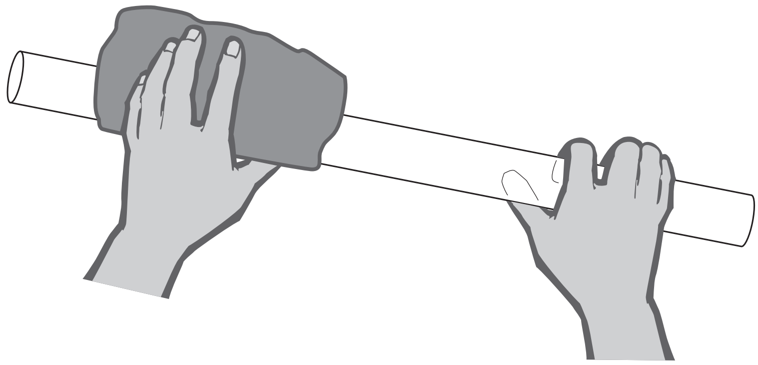
....

(2 marks)

6

Do not write outside the box

3 (a) When a glass rod is rubbed with a woollen cloth, the rod becomes positively charged.



3 (a) (i) Explain why the glass becomes positively charged.

....

....

....

....

(2 marks)

3 (a) (ii) A glass TV screen, polished with a dry cloth on a dry day, soon becomes dusty again.

Explain why.

....

....

....

....

(2 marks)

Question 3 continues on the next page

Turn over ▶

3 (b) Many devices use electrostatic charge to work.
The following sentences describe how a photocopier works using electrostatic charge.
The sentences are in the wrong order.

J A strong light is used to form an image of the page to be copied on the roller.

K The charged areas of the roller attract particles of black toner powder.

L The charge left on the roller has the same pattern as the dark parts of the original page.

M The toner melts and sticks to the paper. This is now a photocopy of the original.

N A roller coated with a photoconducting material is given a charge.

O Where light hits the roller, the charge leaks away.

P A blank piece of paper is heated and pressed against the roller.

3 (b) (i) Arrange the sentences in the correct order.
Three of the sentences have been put into the correct places.

N → ☐ → ☐ → **L** → ☐ → ☐ → **M**

(3 marks)

3 (b) (ii) Why is it important that the blank piece of paper is heated?

....

....

(1 mark)

8

Do not write outside the box

4 (a) Uranium atoms do not always have the same number of neutrons.
What are atoms of the same element that have different numbers of neutrons called?

....
(1 mark)

4 (b) By emitting an alpha particle, an atom of uranium-235 decays into an atom of thorium.

An alpha particle, which is the same as a helium nucleus, is represented by the symbol $^{4}_{2}He$.

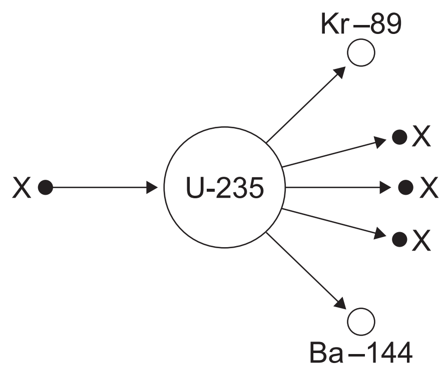
The decay can be represented by the equation below.

Complete the equation by writing the correct number in each of the two boxes.

$$^{235}_{92}U \longrightarrow \, ^{\boxed{}}_{\boxed{}}Th + \, ^{4}_{2}He$$

(2 marks)

4 (c) The diagram shows an atom of uranium-235 being split into several pieces.



4 (c) (i) Name the process shown in the diagram.

....
(1 mark)

4 (c) (ii) Name the particles labelled X.

....
(1 mark)

4 (d) Uranium-235 is used as a fuel in some nuclear reactors.
Name another substance used as a fuel in some nuclear reactors.

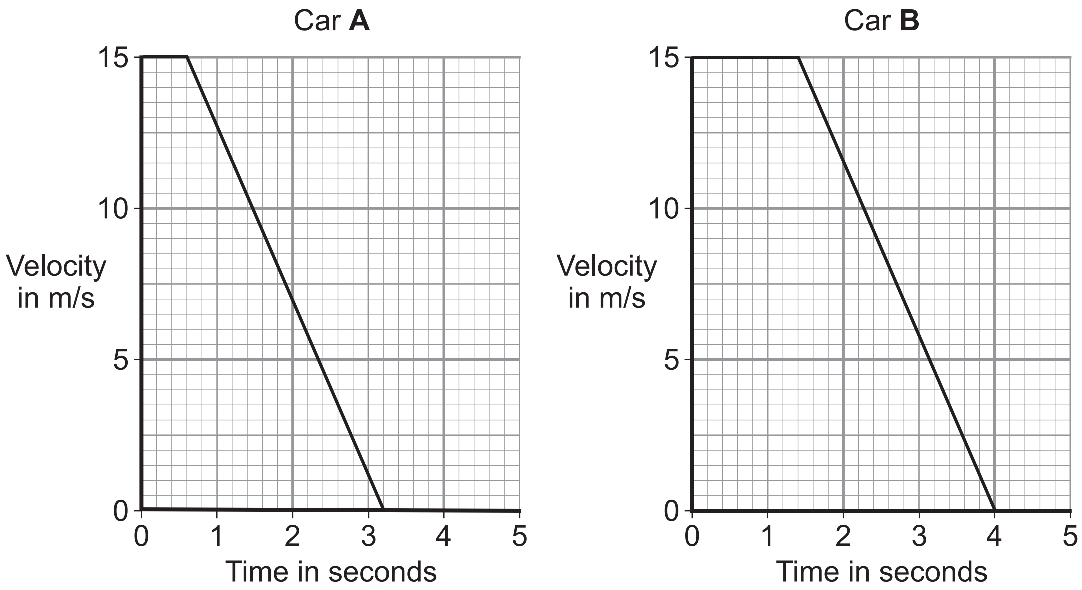
....
(1 mark)

6

Turn over ▸

Do not write outside the box

5 (a) The graphs show how the velocity of two cars, **A** and **B**, change from the moment the car drivers see an obstacle blocking the road.



One of the car drivers has been drinking alcohol. The other driver is wide awake and alert.

5 (a) (i) How does a comparison of the two graphs suggest that the driver of car **B** is the one who has been drinking alcohol?

....

....

(1 mark)

5 (a) (ii) How do the graphs show that the two cars have the same deceleration?

....

....

(1 mark)

5 (a) (iii) Use the graphs to calculate how much further car **B** travels before stopping compared to car **A**.

Show clearly how you work out your answer.

....

....

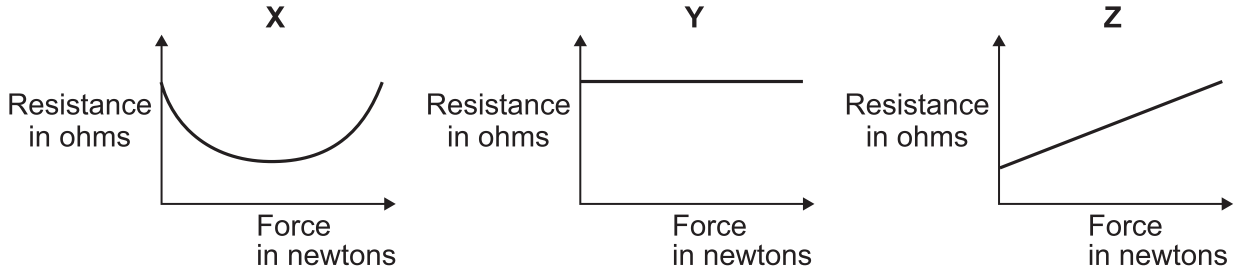
....

Additional stopping distance = ... m

(3 marks)

Do not write outside the box

5 (b) In a crash test laboratory, scientists use sensors to measure the forces exerted in collisions. The graphs show how the electrical resistance of 3 experimental types of sensor, **X**, **Y** and **Z**, change with the force applied to the sensor.



Which of the sensors, **X**, **Y** or **Z**, would be the best one to use as a force sensor?

....

Give a reason for your answer.

....

....

....

....

(2 marks)

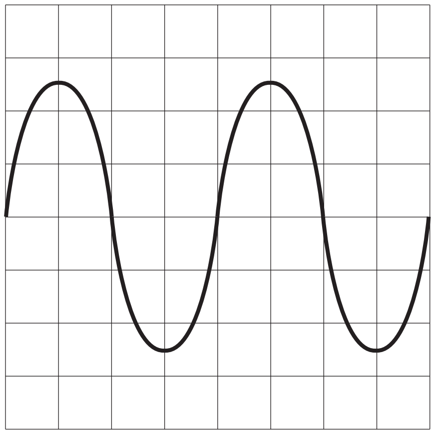
7

Turn over for the next question

Turn over ▶

Do not write outside the box

6 An oscilloscope is connected to an alternating current (a.c.) supply.
The diagram shows the trace produced on the oscilloscope screen.



Each horizontal division on the oscilloscope screen represents 0.002 s.

6 (a) Calculate the frequency of the alternating current supply.

Show clearly how you work out your answer and give the unit.

....

....

....

Frequency = ...

(3 marks)

6 (b) What is the frequency of the a.c. mains electricity supply in the UK?

....

(1 mark)

4

Do not write outside the box

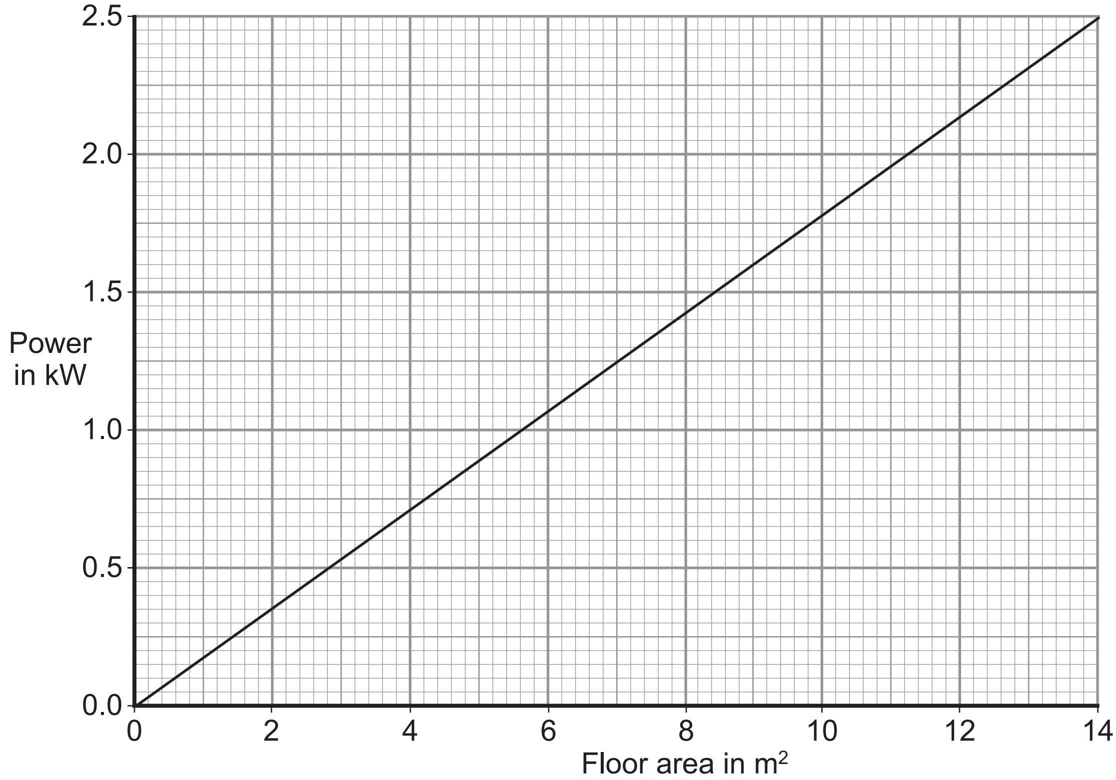
7 A homeowner has installed electric underfloor heating in the kitchen. When the heating is switched on, an electric current flows through wires running under the tiled floor surface.

7 (a) What is an electric current?

....

(1 mark)

7 (b) The graph shows how the power output of an underfloor heating system depends on the area of the floor that is heated.



The area of the homeowner's kitchen floor is $9.0\,m^2$.

Use the graph and the equation in the box to calculate the current drawn from the 230 V mains supply by the heating system.

power = current × potential difference

Show clearly how you work out your answer and give the unit.

....

....

....

....

Current = ...

(4 marks)

5

END OF QUESTIONS

There are no questions printed on this page

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