

Candidate Name	Centre Number	Candidate Number
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GCSE

241/02

ADDITIONAL SCIENCE

HIGHER TIER

PHYSICS 2

P.M. WEDNESDAY, 11 June 2008

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	8	
3.	8	
4.	8	
5.	12	
6.	7	
Total	50	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

A list of equations is printed on page 2 of the examination paper. In calculations you should show all your working.

EQUATIONS

$$\text{voltage} = \text{current} \times \text{resistance}$$

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

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

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time}}$$

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

$$\text{work} = \text{force} \times \text{distance}$$

$$\text{kinetic energy} = \frac{\text{mass} \times \text{speed}^2}{2}$$

$$\text{change in potential energy} = \text{mass} \times \frac{\text{gravitational field strength}}{\text{strength}} \times \text{change in height}$$

Answer **all** questions.

1. Read the following information about radon and answer the questions that follow.

Radon is a natural radioactive gas that comes mainly from the ground.

Radon is produced when the radioactive metal radium decays.

Radon and radium emit alpha particles.

Radon gas enters houses and can cause a dangerous rise in radiation levels.

Scientists measure radon levels in units called becquerel per cubic metre (Bq/m³).

The average radon level in UK homes is 20 Bq/m³.

The Government recommends that, if your indoor radon level reaches the **Action Level**, which is ten times the average, you should take steps to reduce it.

(a) (i) How does radon gas get into homes? [1]

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(ii) Explain why breathing in radon can be harmful. [2]

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(b) Calculate the **Action Level**. [2]

Action level = Bq/m³

(c) State **two** ways that the radon level in homes can be reduced. [2]

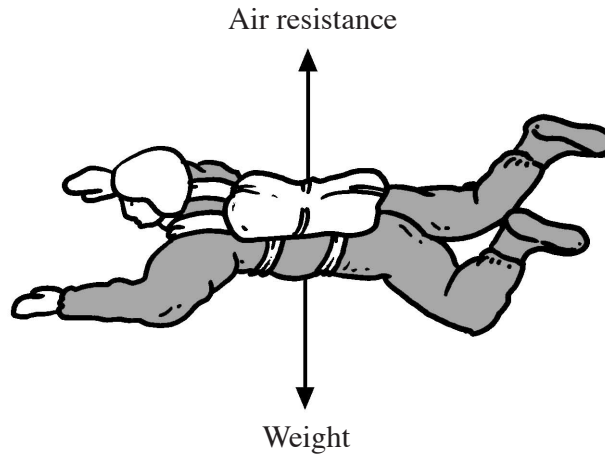
1.

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2.

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2. The diagram shows the forces acting on a skydiver falling through the air.



- (a) (i) As the skydiver falls, the air resistance increases.
Give a reason why. [1]

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- (ii) State what happens to the weight as the skydiver falls. [1]

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- (b) (i) Describe the motion of the skydiver when the air resistance is smaller than the weight. [1]

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- (ii) Describe the motion of the skydiver when the air resistance is equal to the weight. [1]

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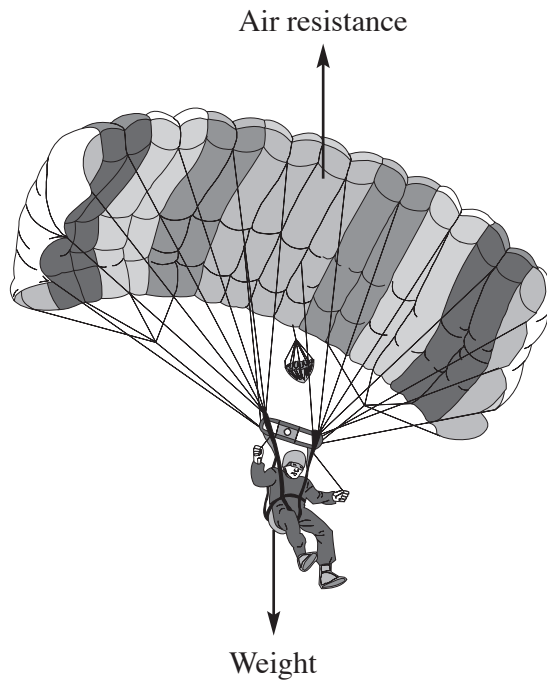
- (c) After jumping from an aeroplane, the skydiver's speed increases to 35 m/s after 7 s. Write down an equation, as it appears on page 2, and then use it to calculate the acceleration of the skydiver.

Equation:
 [1]

Calculation: [1]

Acceleration = m/s²

- (d) The diagram shows the skydiver just after the parachute opens.



- (i) State what happens to the air resistance as the parachute opens. [1]

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- (ii) Describe how the motion of the skydiver changes as the parachute opens. [1]

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3. The table shows the power rating and working current for a number of electrical appliances. Each of the appliances uses 230 volts.

appliance	power (W)	current (A)
cooker	6210	27
iron	4
dishwasher	1840

- (a) Write down an equation, as it appears on page 2, and then use it to complete the gaps in the table. [4]

Equation:

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Calculations:

- (b) The cooker circuit is protected by a **32A mcb** and an **rcd**.

- (i) Explain how the miniature circuit breaker (**mcb**) protects against fire. [2]

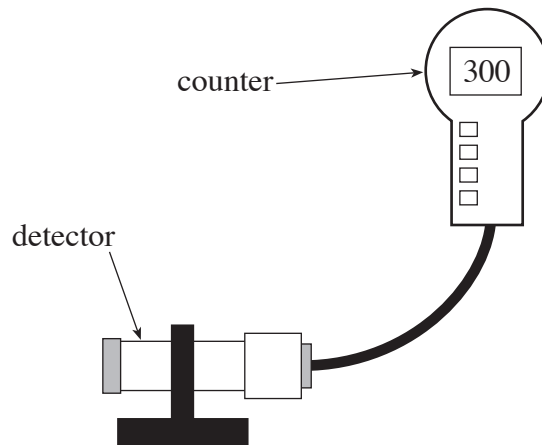
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- (ii) Explain how the residual current device (**rcd**) protects the user. [2]

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4. (a) The diagram shows a radiation detector being used to measure background radiation. It shows the radiation count ten minutes after the counter was reset to zero.

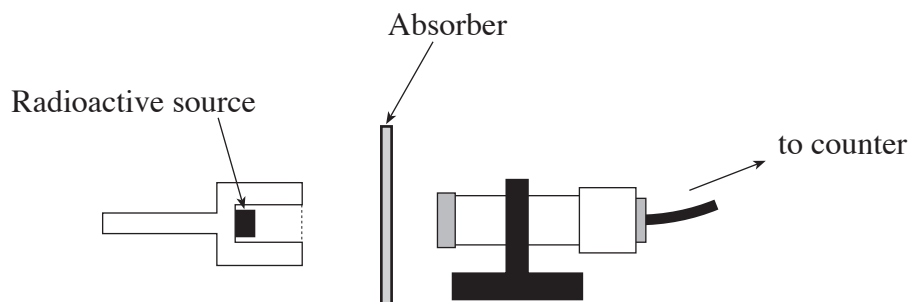


Calculate the average background radiation level in **counts per second**.

[2]

Background level = counts per second

- (b) The following apparatus is used to find the type of radiation that a radioactive source emits.



Different absorbers are placed one at a time between the detector and the radioactive source. For each absorber, the average number of counts per second received by the detector is worked out.

The results are shown in the table.

Type of absorber	Average counts per second
No absorber	44.0
paper	44.0
thick aluminium	0.5

Explain how these results are used to determine the type of radiation emitted by the radioactive source. [3]

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(c) Cobalt 60 is a radioactive source which has a half life of 5.25 years.
A sample of cobalt 60 has a mass of 40 mg.
Calculate the mass of undecayed cobalt 60 left after 21 years.
Show your working. [3]

Mass = mg

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5. The table shows some information about a car of mass 800kg travelling at different speeds.

Speed (m/s)	Braking distance (m)	Kinetic energy (J)
10	7	40 000
15	16	90 000
20	30	160 000
25	46	250 000
30	65

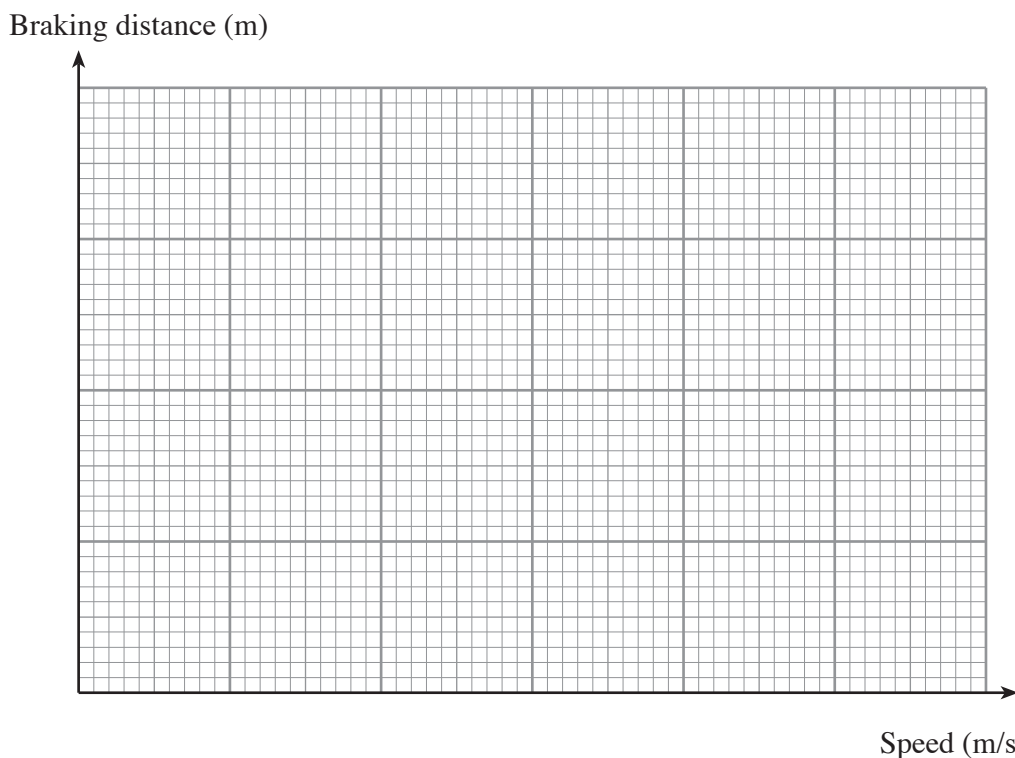
(a) Write down an equation as it appears on page 2, and then use it to calculate the missing value in the table.

Equation:
 [1]

Calculation: [2]

(b) It is proposed that braking distance is directly proportional to speed.

(i) Plot a graph to test this proposal. [3]



(ii) **Explain** whether or not the graph supports the proposal. [1]

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(c) Write down an equation as it appears on page 2, and then use it to calculate the average braking force acting on the car to bring it to rest if it was travelling at 20 m/s.

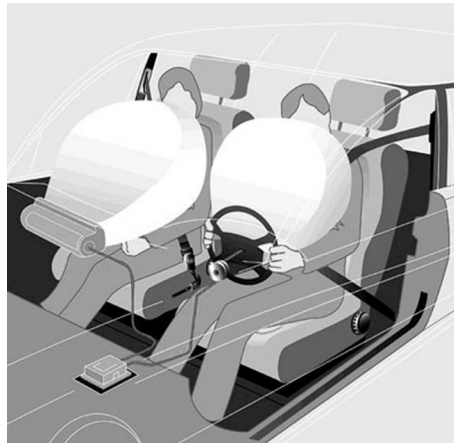
Equation:

..... [1]

Calculation: [2]

Braking force = N

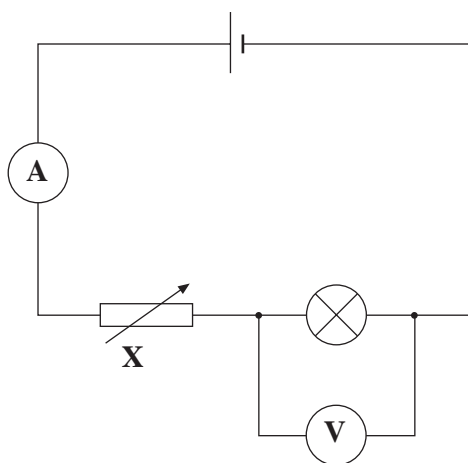
(d) During a car accident, head injuries are caused when the driver's head hits the steering wheel.
The risk of injury can be reduced by using inflatable air bags.



Explain how the air bag reduces the risk of head injury in an accident. [2]

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6. The circuit below is used to investigate how the resistance of a lamp changes.



- (a) Explain how component X allows a set of results to be obtained. [2]

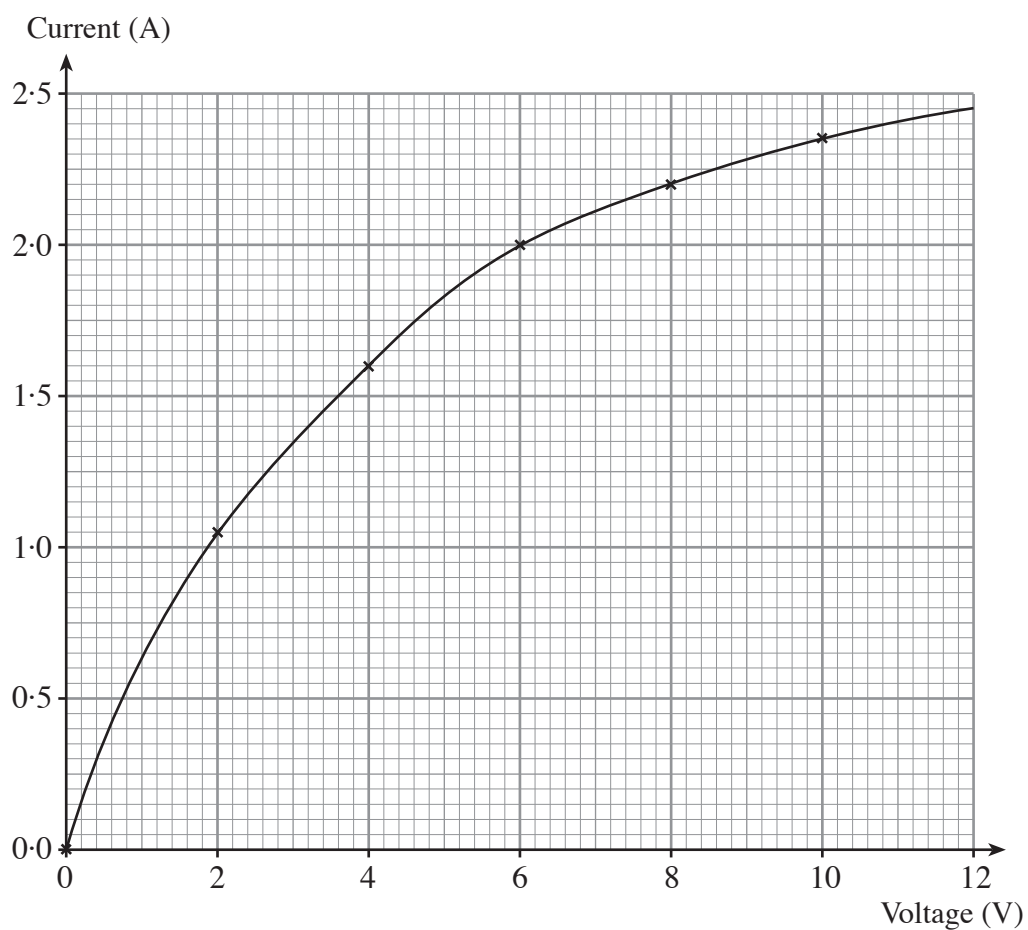
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- (b) The results obtained are used to plot a graph.



- (i) Write down in words an equation from page 2 and use it to calculate the resistance of the lamp when the voltage is 4 V.

Equation:

..... [1]

Calculation: [3]

Resistance = Ω

- (ii) Explain how the graph shows that the resistance of the lamp increases as the voltage increases. [1]

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