

Candidate Name	Centre Number	Candidate Number
		0



GCSE

241/01

**ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2**

A.M. WEDNESDAY, 19 January 2011

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark awarded
1.	6	
2.	7	
3.	5	
4.	7	
5.	5	
6.	5	
7.	5	
8.	6	
9.	4	
Total	50	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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. In calculations you should show all your working.

EQUATIONS

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

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

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

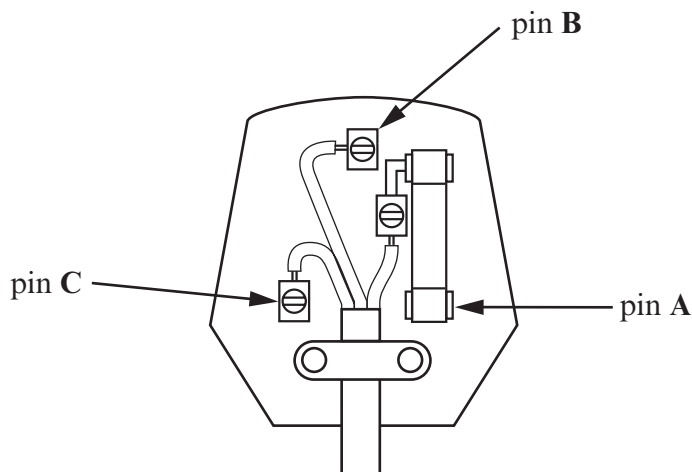
$$\text{Resultant force} = \text{mass} \times \text{acceleration}$$

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

$$\text{Force} = \frac{\text{Work done}}{\text{distance}}$$

Answer **all** questions.

1. (a) The diagram shows the inside of a plug. The wires from the three core cable entering the plug are covered with coloured plastic.



- (i) To which pin, **A**, **B** or **C**, is the brown coloured wire connected?
- (ii) State the colour of the plastic on the wire connected to pin C.
- (iii) Give a reason why the wires in the three core cable have a plastic covering.

.....
 [3]

- (b) When a fuse and earth wire protect users from electric shocks the following steps occur:

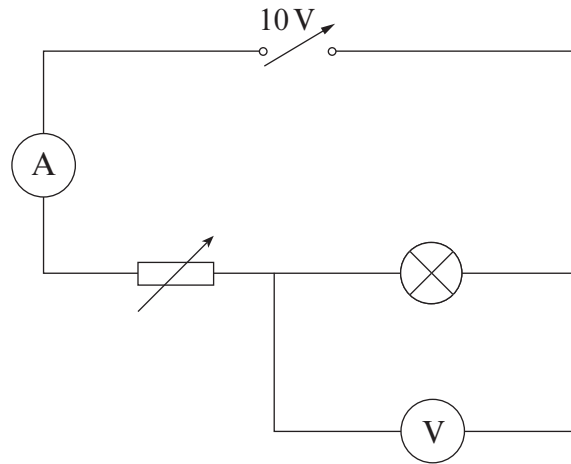
- A Fuse wire melts
- B Metal case becomes live
- C Circuit is broken
- D Large current flows through earth wire
- E User protected from electric shock.

Place the letters A to E in the correct order in the boxes below.
 The first box has been completed for you.

[3]

B				
---	--	--	--	--

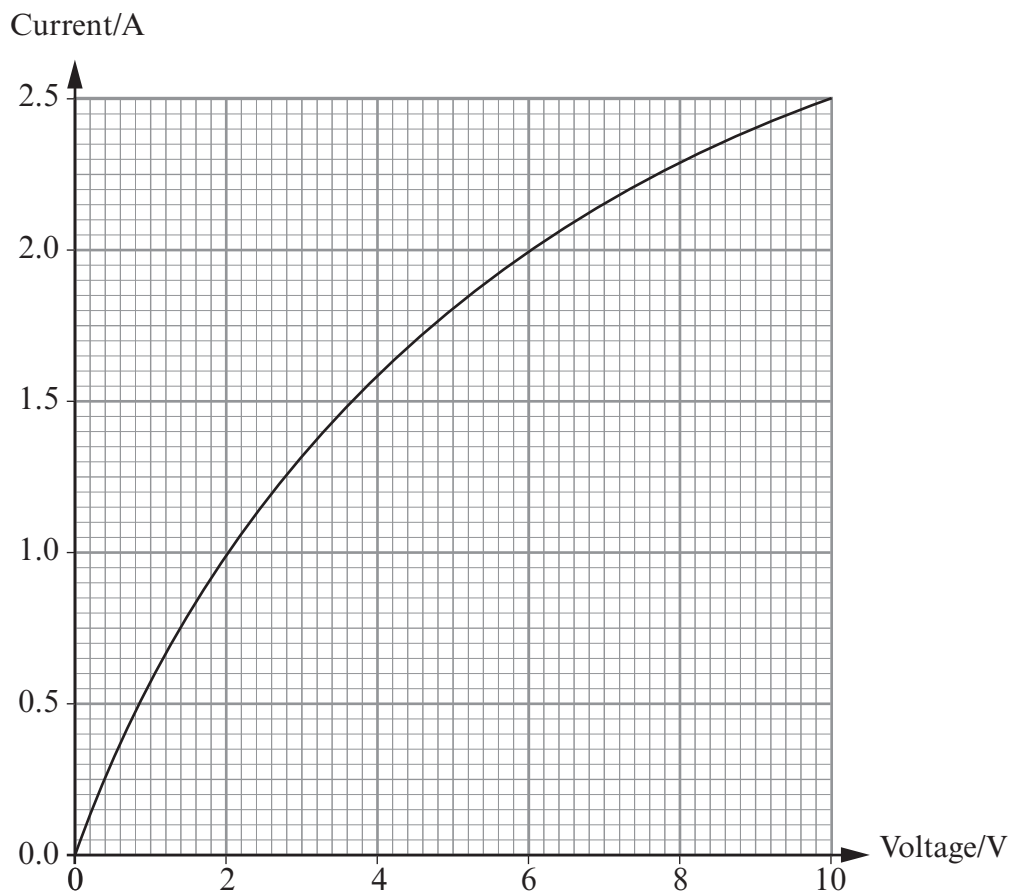
2. Students use this circuit to investigate how the resistance and power of a lamp change as they alter the current through it.



- (a) State **two** ways of changing the current. [2]

1.
2.

- (b) They record the values of the current across the lamp as the voltage changes and plot this graph.



- (i) Use the graph to find the value of the voltage when the current is 2.0 A. [1]

Voltage = V

(ii) Use the equation

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

to calculate the resistance of the lamp when the voltage is 2.0 V.

[2]

Resistance = Ω

(iii) Use the equation

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

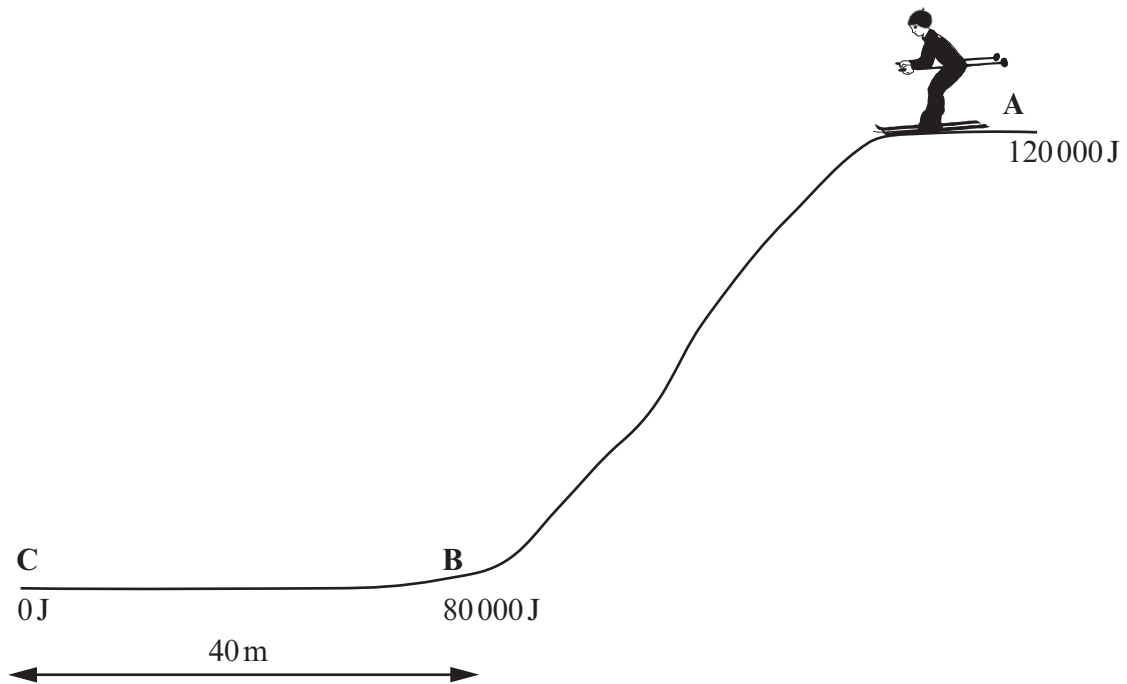
to calculate the power of the lamp when a current of 2.0 A flows through it.

[2]

Power = W

7

3. A skier slides down a slope from **A** and comes to rest at **C**. Her energies at points **A**, **B** and **C** are shown on the diagram.



- (a) Put a circle around the answer which completes each sentence. [2]

- (i) The energy lost in sliding down the slope from **A** to **B** is

40 000 J 80 000 J 120 000 J 200 000 J

- (ii) The work done against the force acting on the skier between **B** and **C** is

40 000 J 80 000 J 120 000 J 200 000 J

- (b) (i) Give a reason why energy is lost by the skier when she slides from **A** to **B**. [1]

.....

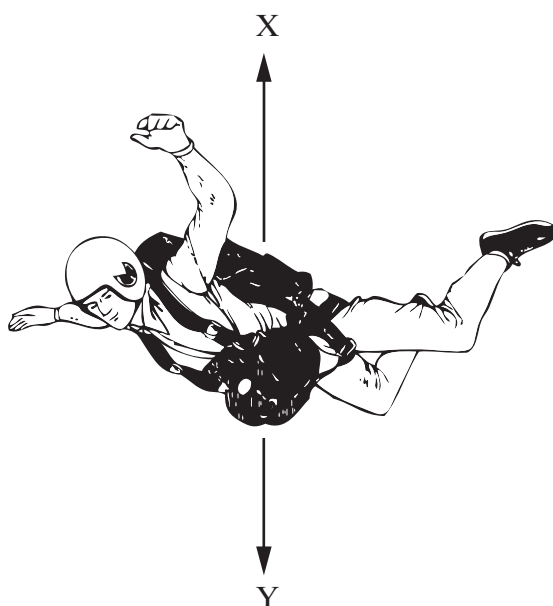
- (ii) Use the equation

$$\text{Force} = \frac{\text{Work done}}{\text{distance}}$$

to calculate the size of the force that brings the skier to rest at **C**. [2]

Force = N

4. The diagram shows the forces X and Y acting on a skydiver of mass 70 kg during free fall.



- (a) Underline the correct word in the brackets to correctly complete each of the sentences below. [4]

- (i) Force X is due to (air resistance, gravity, weight)
- (ii) Force Y is due to (air resistance, friction, gravity)
- (iii) During the fall, force X (decreases, stays the same, increases)
- (iv) During the fall, force Y (decreases, stays the same, increases)

- (b) Describe the motion of the skydiver when force X is equal to force Y. [1]

.....

.....

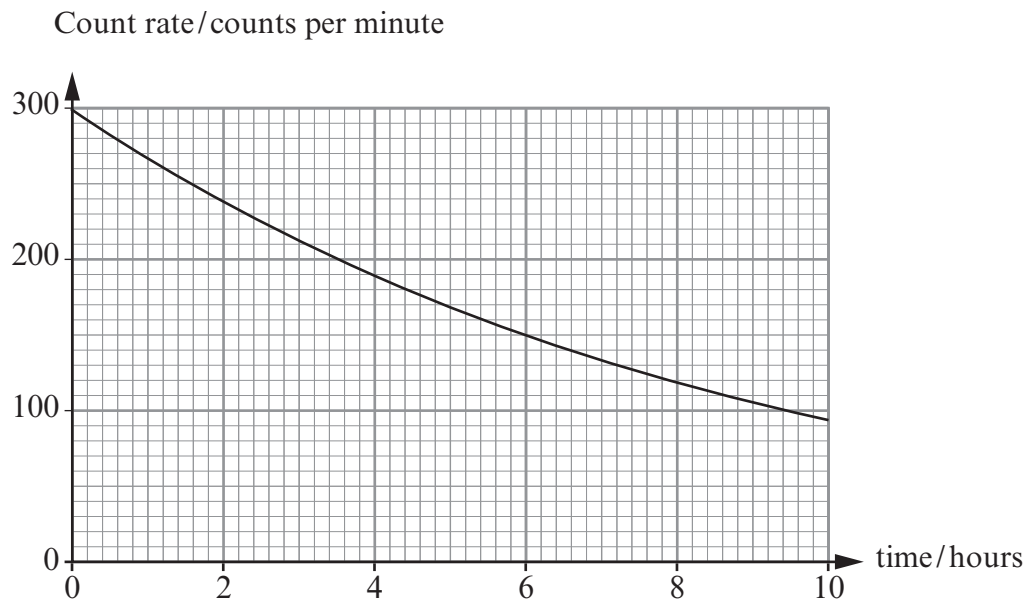
- (c) Use the information above and the equation

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

- to calculate the resultant force on the skydiver when her acceleration is 5 m/s^2 . [2]

Force = N

5. To study the blood flow a doctor injects some technetium-99 (Tc-99) into a patient. The gamma radiation given out by the Tc-99 atoms is detected using a gamma camera outside the patient's body.
The graph shows how the count rate from a sample of Tc-99 changes with time.



- (a) (i) How many hours does it take for the count rate to fall from 300 counts per minute to 150 counts per minute? [1]

Number of hours =

- (ii) What is the half life of Tc-99? [1]

Half life =

- (iii) How long will it take for the count rate to fall from 300 to 75 counts per minute? [1]

Time taken =

- (b) Explain why an alpha emitting source would be unsuitable to study blood flow. [2]

.....

.....

.....

6. The table shows the average annual dose of background radiation everybody receives in a year.

Radiation Source	Average Annual Whole Body Dose (units)
Cosmic	29
Rocks	29
Radon	200
Air	40
X-ray	39
Nuclear Medicine	14
Food	11
TOTAL

- (a) (i) Complete the table to find the total average annual dose. [1]
- (ii) Which radiation source produces the largest background dose? [1]
- (iii) What is the annual dose from man made sources? units [1]
- (b) (i) Give a reason why people living at sea level receive a lower natural dose than those who live up a mountain. [1]

.....

.....

- (ii) State **one** method of reducing the build up of radon in homes. [1]

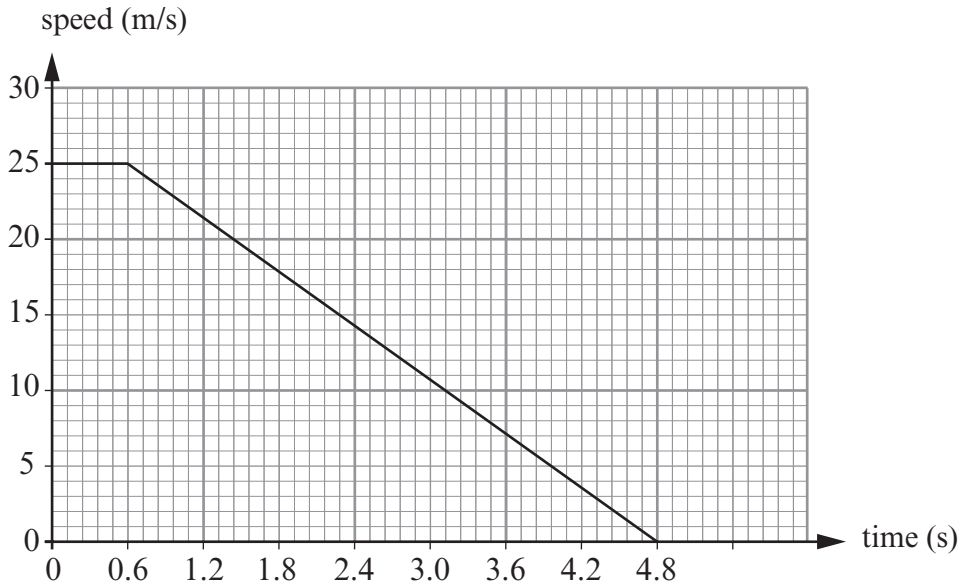
.....

.....

7. The overall stopping distance for a car is given by the equation below:

$$\text{Overall stopping distance} = \text{Thinking distance} + \text{Braking distance}$$

The graph below is the speed-time graph for a car initially travelling at a constant speed. The time starts from the moment the driver sees an obstacle on the road.



(i) What is the reaction (thinking) time of the driver of this car? [1]

(ii) Use the equation

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

to calculate the distance travelled by the car during the driver's thinking time. [2]

distance = m

(iii) Use the equation

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

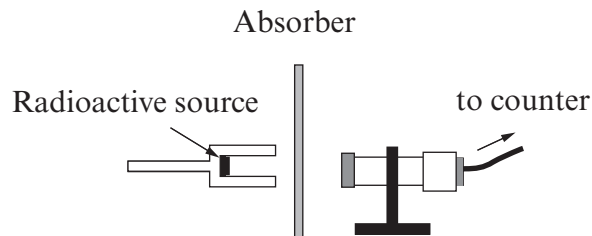
to calculate the deceleration of the car during the time when the brakes are applied. [2]

Deceleration = m/s²

5

BLANK PAGE

8. (a) The diagram shows the apparatus used to investigate the radiation emitted from two sources, **Y** and **Z**.



The table below shows the **counts per minute** obtained when different materials were placed between the sources and the detector. All the readings do not include background radiation.

Radioactive Source	No absorber Present (counts/min)	Paper Absorber (counts/min)	Aluminium absorber 4 mm thick (counts/min)	Lead absorber 3 cm thick (counts/min)
Y	320	320	320	50
Z	315	180	180	0

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

- (i) How can you tell that source **Y** only emits one type of radiation? [1]

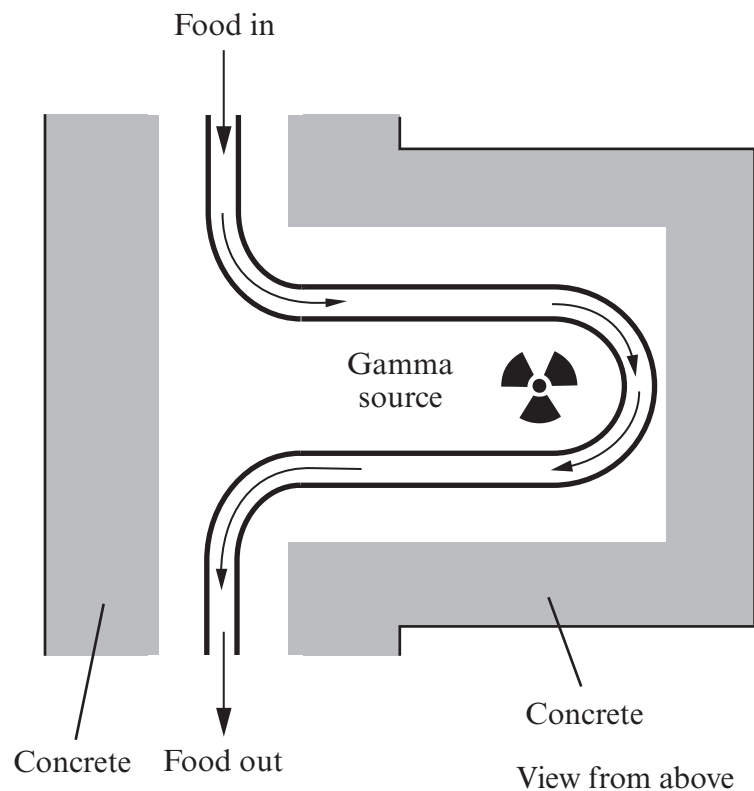
.....

- (ii) Explain how you can tell that source **Z** emits alpha and gamma radiation but not beta. [2]

.....

.....

- (b) Fresh fruit and vegetables can be treated with gamma radiation to kill the bacteria that make them rot.
The diagram shows how the food on a conveyor belt passes a gamma source.



- (i) The food is packed in crates.
Give a reason why a gamma source must be used rather than alpha or beta. [1]

.....

.....

- (ii) Explain why the food treatment area must be enclosed with thick concrete. [2]

.....

.....

.....

.....

9. Domestic circuits consist of live, neutral and earth wires.

(i) Describe the purpose of the neutral wire. [1]

.....
.....

(ii) In modern homes, fuses have been replaced with miniature circuit breakers (mcb).
What are the advantages of using mcb instead of fuses? [2]

.....
.....
.....
.....

(iii) State the type of fault that would cause an mcb to break a circuit. [1]

.....
.....

4