Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

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**	

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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

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

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

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

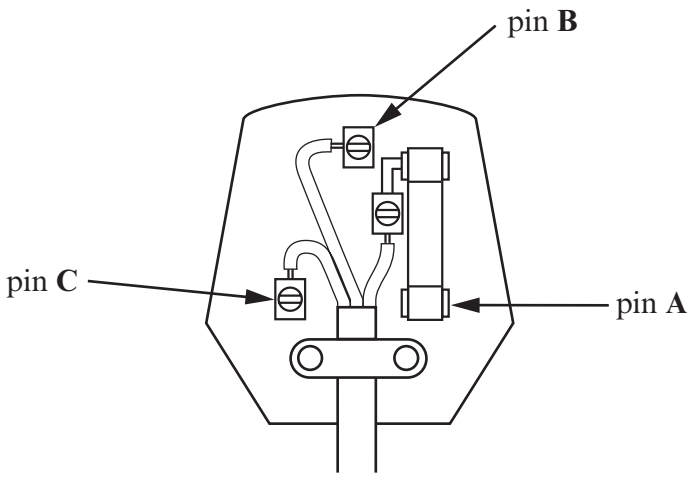
$$\text{Resultant force} = \text{mass} \times \text{acceleration}$$

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

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

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]

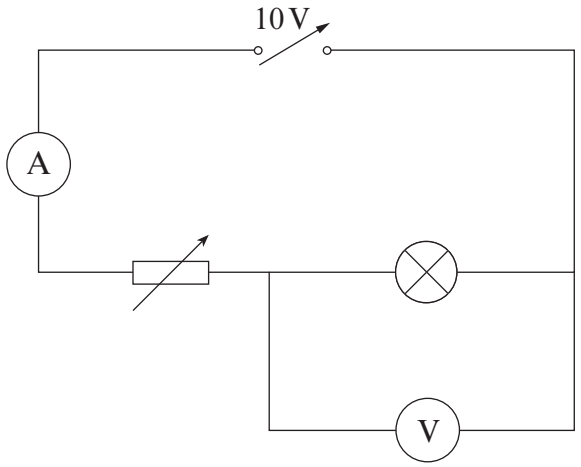
B				

6

Turn over.

Examiner only

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

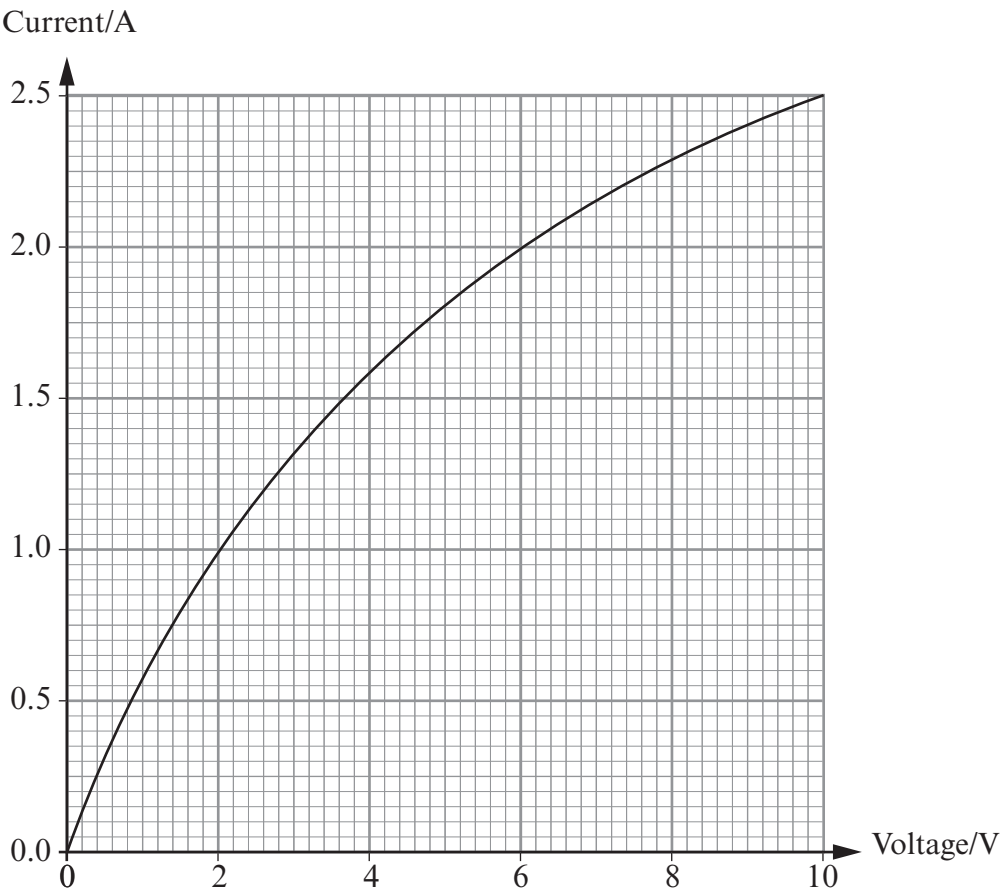


(a) State **two** ways of changing the current. [2]

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

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

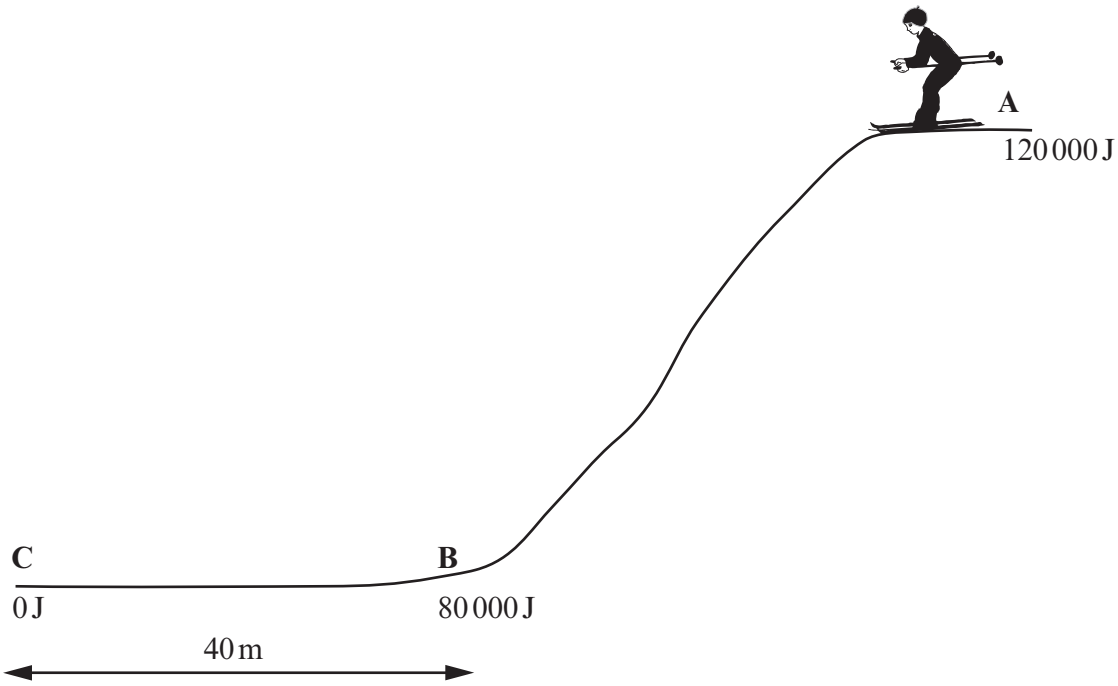
to calculate the power of the lamp when a current of 2.0 A flows through it. [2]

Power = ... W

7

Examiner only

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

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

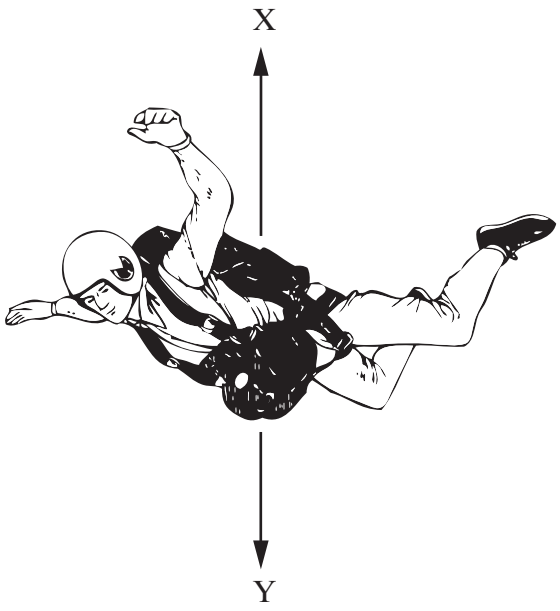
to calculate the size of the force that brings the skier to rest at **C**. [2]

Force = ... N

5

Examiner only

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]

.....

.....

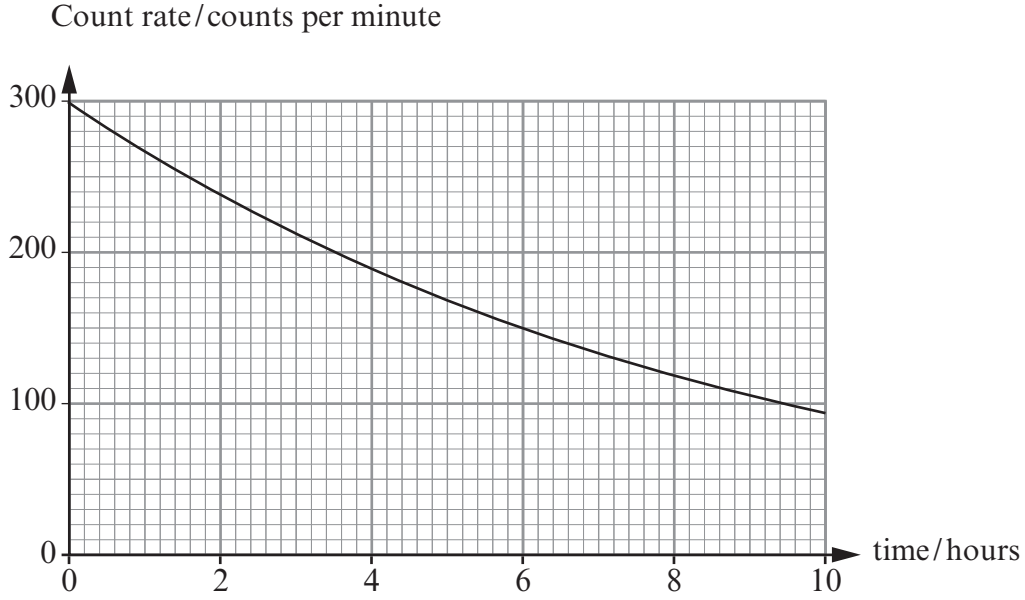
(c) Use the information above and the equation

resultant force = mass × 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]

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Examiner only

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]

.....

.....

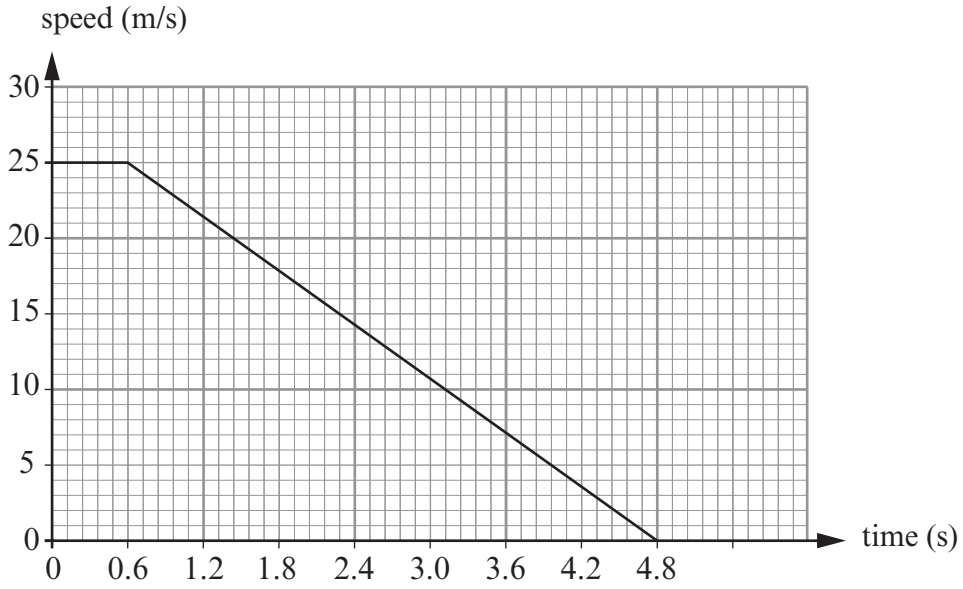
5

Examiner only

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

Overall stopping distance = Thinking distance + 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

distance = speed × 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/s^2

5

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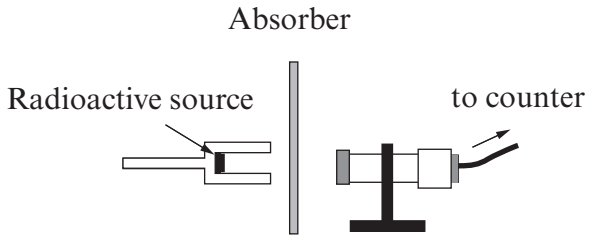
8. *(a)* The diagram shows the apparatus used to investigate the radiation emitted from two sources, **Y** and **Z**.



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]

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

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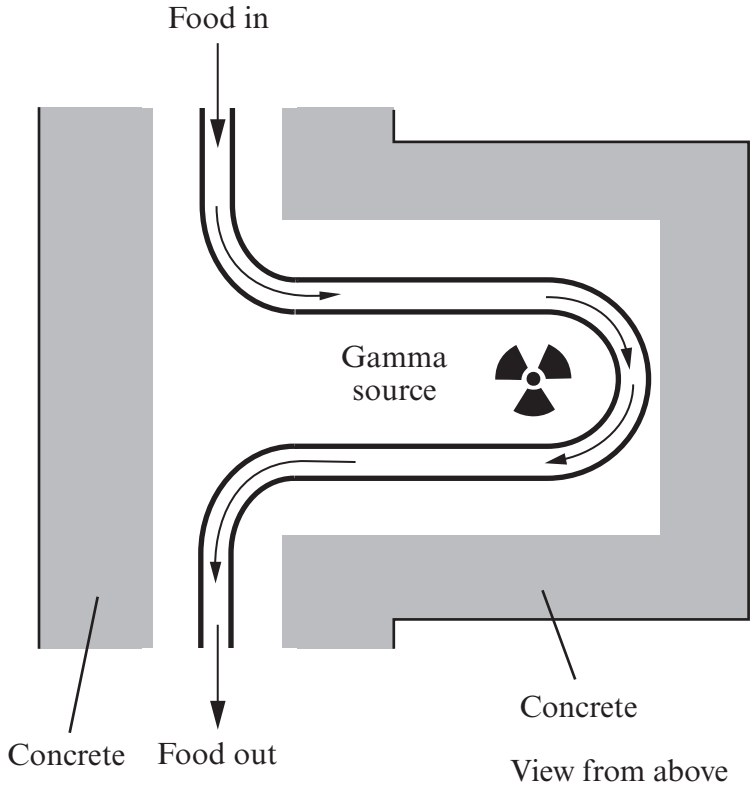
Examiner only

(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]

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

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6

Examiner only

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

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

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

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

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4