Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0241/01

ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2

P.M. MONDAY, 30 January 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**5**	
3.	**3**	
4.	**7**	
5.	**5**	
6.	**3**	
7.	**6**	
8.	**4**	
9.	**7**	
10.	**4**	
11.	**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 of the examination paper. In calculations you should show all your working.

0241 010001

JAN120241010 1

EQUATIONS

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

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

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

$$\text{Acceleration (or deceleration)} = \frac{\text{change in speed}}{\text{time}}$$

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

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

0241
010003

BLANK PAGE

Examiner only

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

1. Choose one phrase from the box below to complete each of the sentences about car safety. [2]

seat belt	air bag	head rest	crumple zone

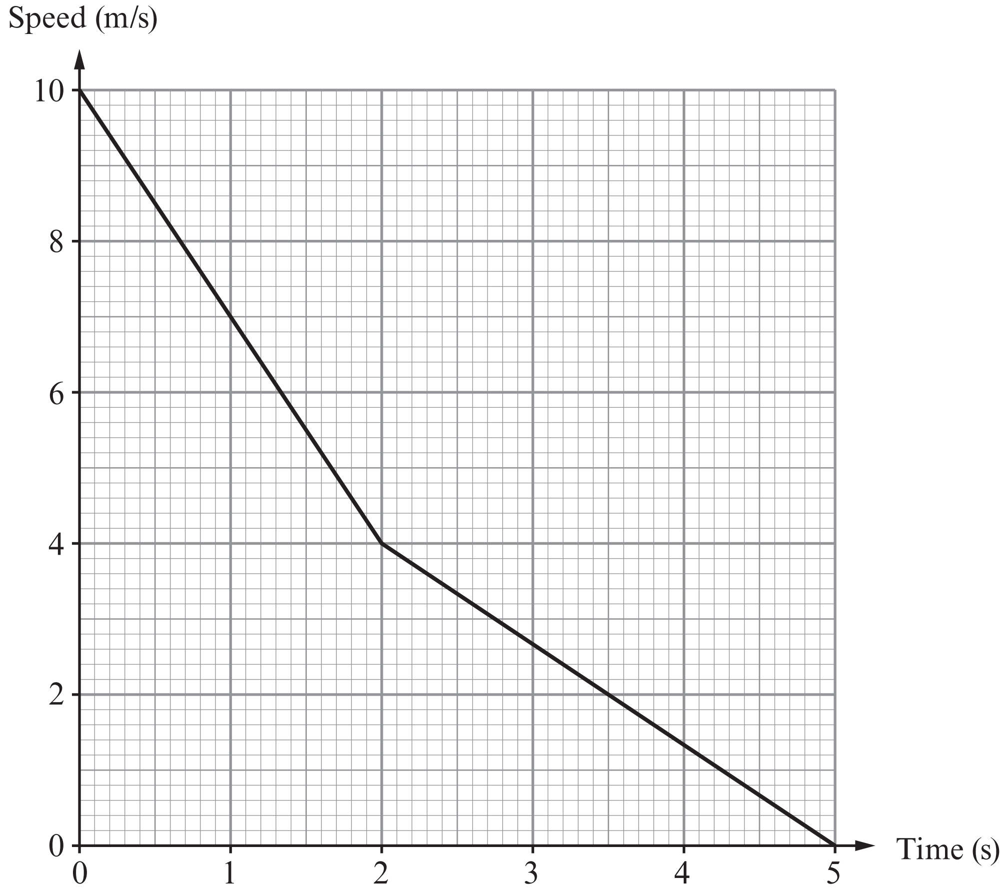
(a) In a collision from behind, injury to the driver is reduced by the ....

(b) The .... increases the time for a moving car to stop.

2

Examiner only

2. The graph shows how the speed of an athlete changes **after crossing** the finishing line of a race.



Use the graph to answer the following questions.

(a) What was his speed when he finished the race? .... [1]

(b) At what time was his speed equal to 2 m/s? .... [1]

(c) (i) Use the equation:

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

to calculate the deceleration in the first 2 seconds after finishing the race. [2]

Deceleration = ... m/s^2

(ii) How does the graph show that the athlete's deceleration between 2 s and 5 s is lower than that calculated in *(c)*(i)? [1]

....

....

5

0241
010005

0 5

Examiner only

3. Carbon-14 is present in all living material. It emits *beta particles* and has a half life of 5700 years.

(a) Name the part of the carbon-14 atom which emits a beta particle. .... [1]

(b) A sample of carbon-14 has an activity of 200 counts per minute.

(i) What will be the activity after 5700 years? [1]

Activity = ... counts per minute

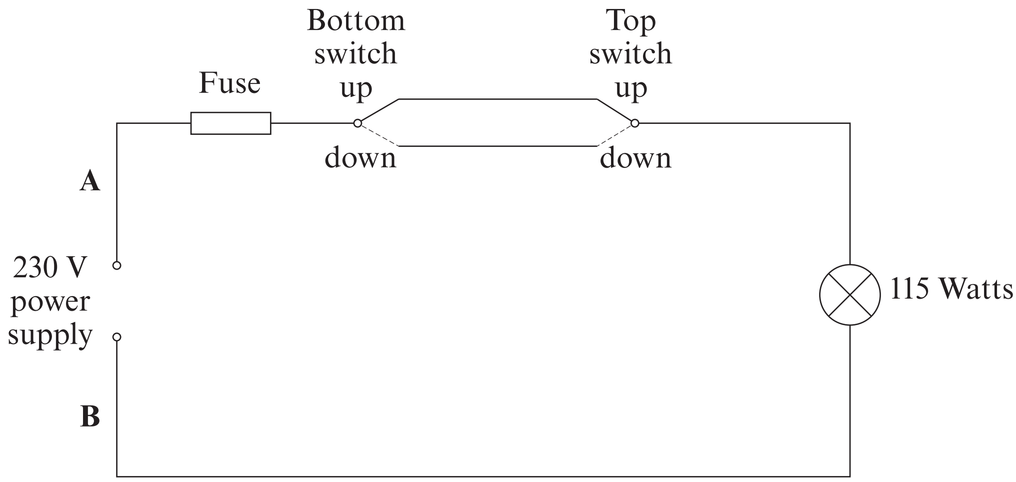
(ii) After how many years will the activity have fallen to 50 counts per minute? [1]

.... years

3

Examiner only

4. The following diagram shows a simple form of a 2-way switch circuit.
The switches in these circuits are used at the top and bottom of stairways, so that the lights can be turned on or off from either place.



(a) How can you tell from the diagram that wire **A** is the live lead? [1]

....

....

(b) Complete the following table. [2]

Bottom switch position	Top switch position	Lamp ON or OFF
UP	UP	ON
UP	DOWN	....
DOWN	DOWN	....

(c) Use the equation

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

to calculate the current flowing through the lamp. [2]

Current = ... A

(d) State why a 13 A fuse would be unsuitable for this circuit. [1]

....

....

(e) Which wire is included in mains circuits but is not shown in the circuit diagram? [1]

....

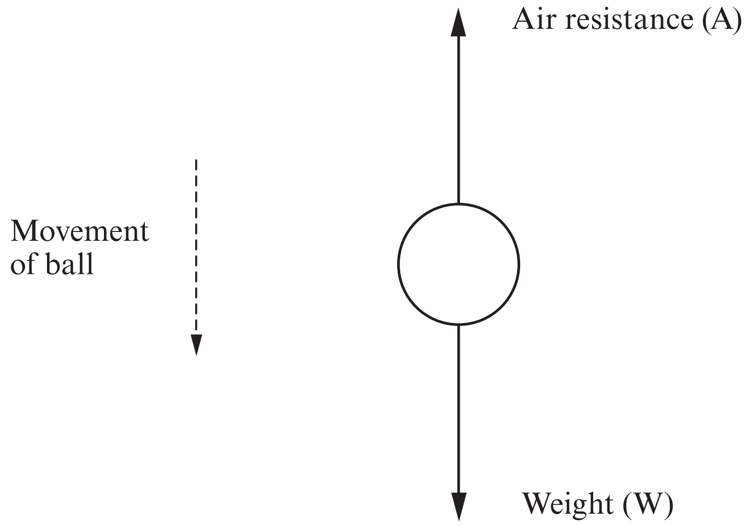
0241
010007

7

0 7

Examiner only

5. The diagram shows a ball falling through the air. It is acted upon by two forces, weight (W) and air resistance (A).



(a) Choose your answers from the phrases in the box.
Each phrase may be used once, more than once or not at all. [3]

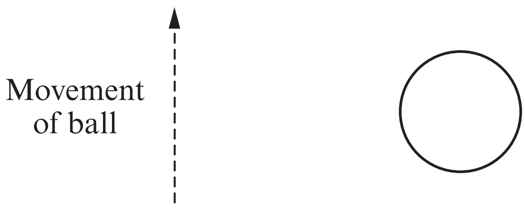
gets smaller	stays the same	gets bigger

(i) As the ball falls, the weight ....

(ii) As the ball falls, the air resistance ....

(iii) When the two forces are equal, the speed of the ball ....

(b) In the diagram below, the ball is now moving **upwards** in the air.
Draw the force arrows on the ball to show their directions.
Label each arrow with one of the letters A and W. [2]



5

Examiner only

6. Electric circuits in the home use the following devices:

residual current device (r.c.d.)	miniature circuit breaker (m.c.b.)	fuse

These devices break circuits for different reasons.
Use the devices named in the boxes to complete the table.
Each device may be used once, more than once or not at all. [3]

FAULT	DEVICE THAT OPERATES
The current in the live is very slightly different from the current in the neutral wire.	
It uses an electromagnetic switch to break the circuit very quickly when the current becomes too large.	
It breaks the circuit very quickly when the live wire touches the metal body of an appliance.	

3

Examiner only

7. Radioactive waste is dangerous to the public. The waste has to be disposed of safely.

(a) Explain why radioactive waste is dangerous to people. [2]

....

....

....

....

(b) Give **two** reasons for not sending the waste into space in rockets. [2]

1. ....

....

2. ....

....

(c) Radioactive waste can be buried underground.

(i) State why it needs to be monitored for many thousands of years. [1]

....

....

(ii) State a danger from storing waste underground. [1]

....

....

6

Examiner only

8. A moving vehicle makes an emergency stop and comes to rest in a total stopping distance of 82 metres.
The driver's reaction time was 0.6 s and the vehicle was travelling at a speed of 20 m/s.

(a) Use the equation

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

to calculate the distance travelled whilst the driver was reacting. [1]

Distance travelled = ... m

(b) (i) Calculate the **braking** distance for the vehicle. [1]

Braking distance = ... m

(ii) The vehicle's average speed during braking is 10 m/s.
Use the equation

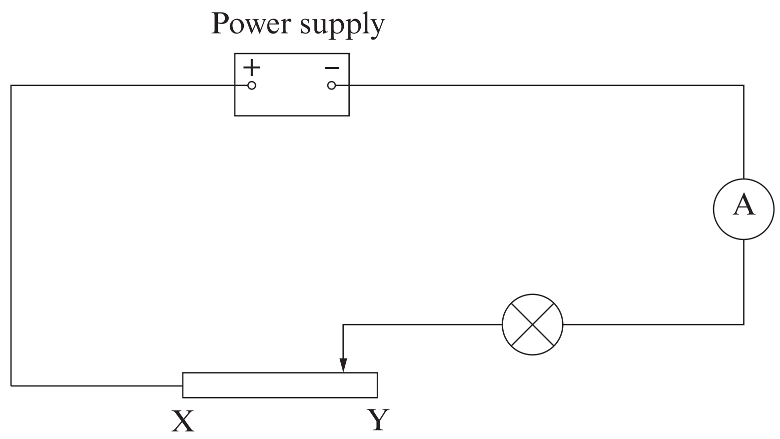
$$\text{time} = \frac{\text{distance}}{\text{average speed}}$$

to calculate the braking time. [2]

Braking time = ... s

4

9. A group of pupils set up the following circuit to investigate how the current through a lamp depends on the voltage applied to it.



(a) The ammeter measures the current through the lamp.
Draw a voltmeter on the circuit above that measures the voltage across the lamp. [1]

(b) The slider on the variable resistor is moved to the end Y.

(i) State what effect this has on the current through the lamp. [1]

....

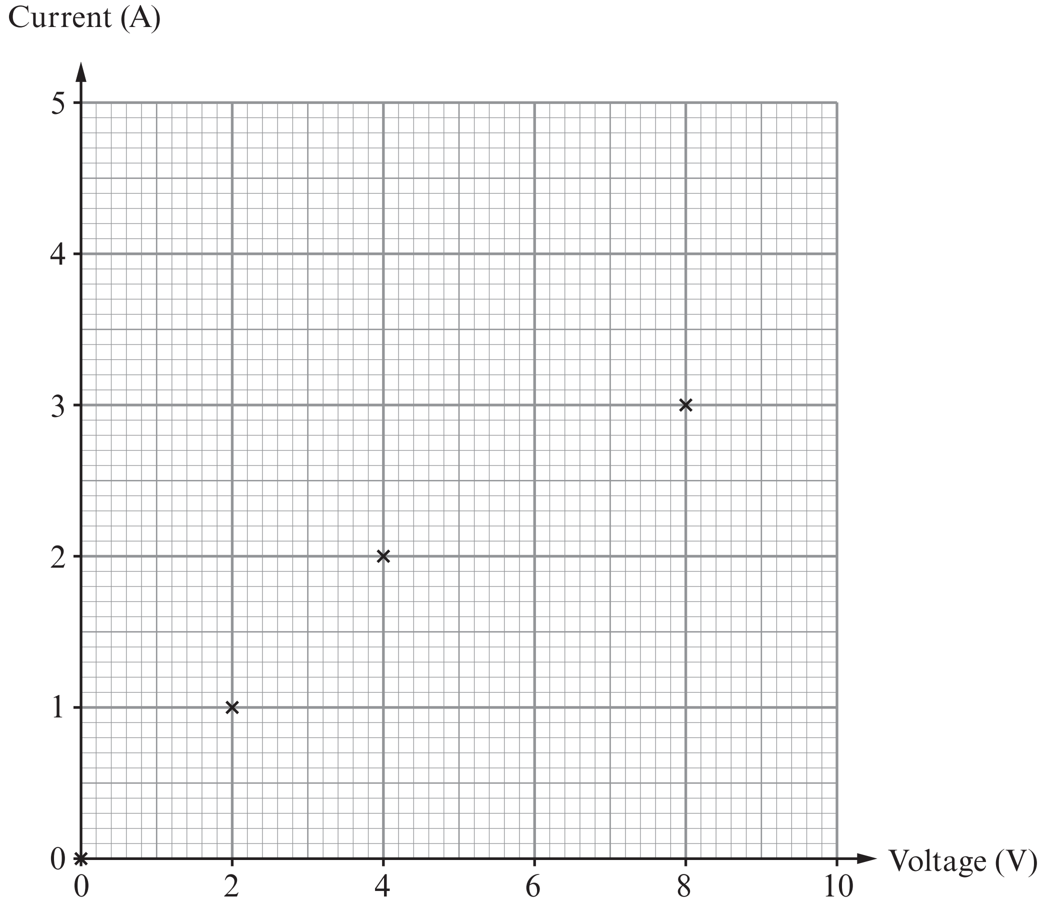
(ii) State what effect this has on the voltage across the lamp. [1]

....

(c) They obtained the following results and plotted them on the grid on the next page.

Current (A)	Voltage (V)
0.0	0
1.0	2
2.0	4
2.7	6
3.0	8

Examiner only



(i) One point is missing from the grid.
Plot the missing point on the grid and draw the graph line. [2]

(ii) Use the equation

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

to calculate the resistance of the lamp when the voltage is 8 V. [2]

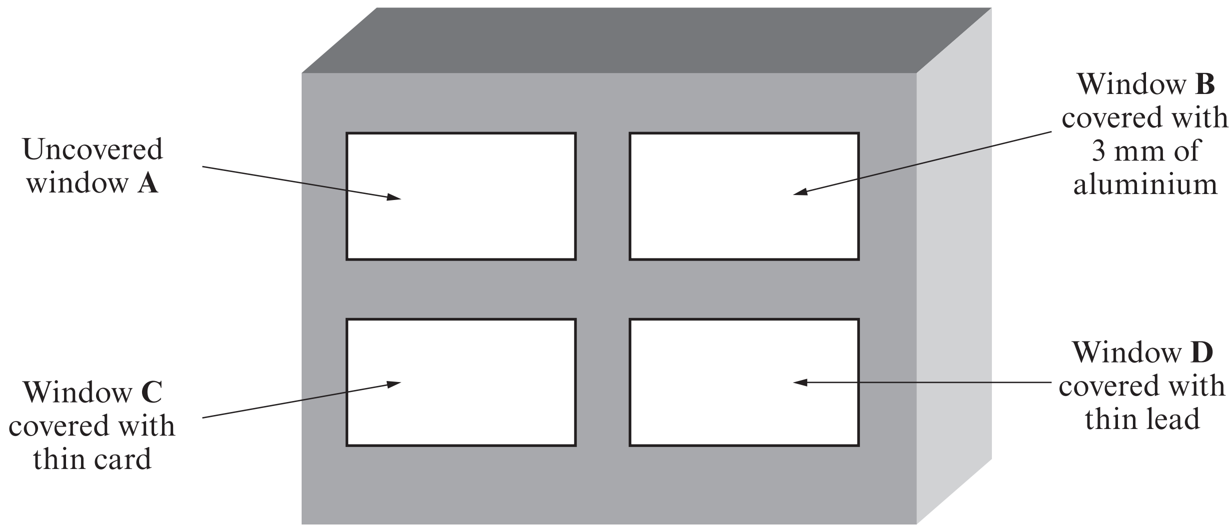
Resistance = ... Ω

7

Turn over.

Examiner only

10. A radiation film badge is used by scientists who work near radioactive materials. The badges consist of four windows, behind which is a radiation sensitive film. Each badge is inspected at the end of the month and a new one is issued.



(a) What is the purpose of having an uncovered window, **A**? [1]

....

....

(b) At the end of a particular month, the number of counts detected at the windows was as follows:

Counts made in the month	Window at which these counts were detected	Types of radiations detected
9 500	A	Alpha, beta, gamma
5 500	B	....
6 250	C	....
4 800	D	Gamma

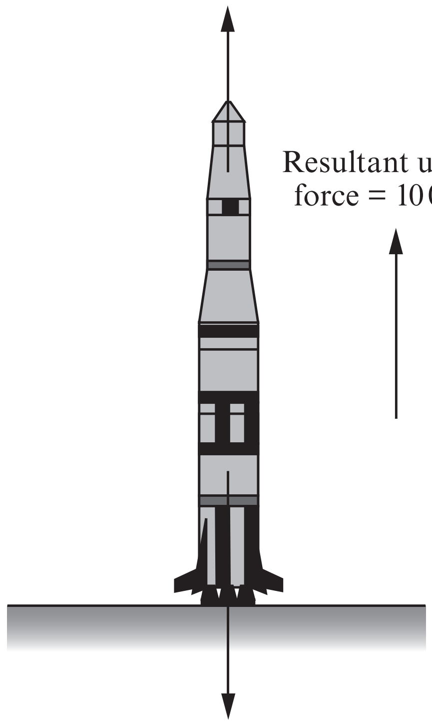
Complete the third column in the table. [2]

(c) How many of the counts were produced from just beta radiation? ....
[1]

4

Examiner only

11. The diagram shows a space rocket on its launch pad.



The rocket and fuel have a mass of 20 000 kg and weigh 200 000N.
It is powered by 3 rocket engines.
At lift-off, the resultant upwards force is 10 000 N.

(i) Calculate the upward thrust produced by **each** of the 3 rocket engines. [2]

Thrust = ... N

(ii) Use the equation:

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

to calculate the acceleration at lift-off. [2]

Acceleration = ... m/s^2

THERE ARE NO MORE QUESTIONS IN THE EXAMINATION.

4