Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

241/01

ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2

A.M. FRIDAY, 28 May 2010

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**4**	
2.	**4**	
3.	**4**	
4.	**3**	
5.	**5**	
6.	**2**	
7.	**3**	
8.	**6**	
9.	**3**	
10.	**5**	
11.	**5**	
12.	**6**	
Total	**50**	

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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

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

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

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

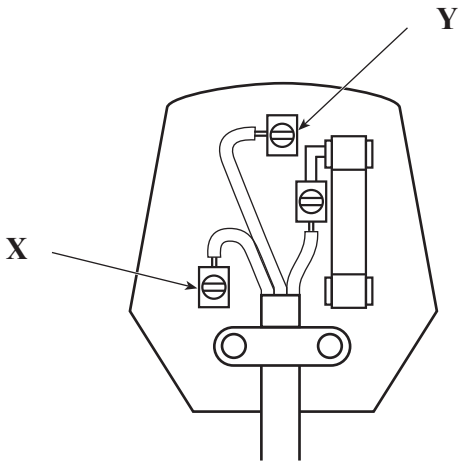
$$\text{Resultant force} = \text{mass} \times \text{acceleration}$$

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

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

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

1. The diagram shows the inside of a plug.



(a) (i) State the colour of the insulation on the wire connected to **X**. .....

(ii) Name the terminal **Y**. ..... [2]

(b) Explain how 5 A fuse protects the cable from overheating. [2]

.....

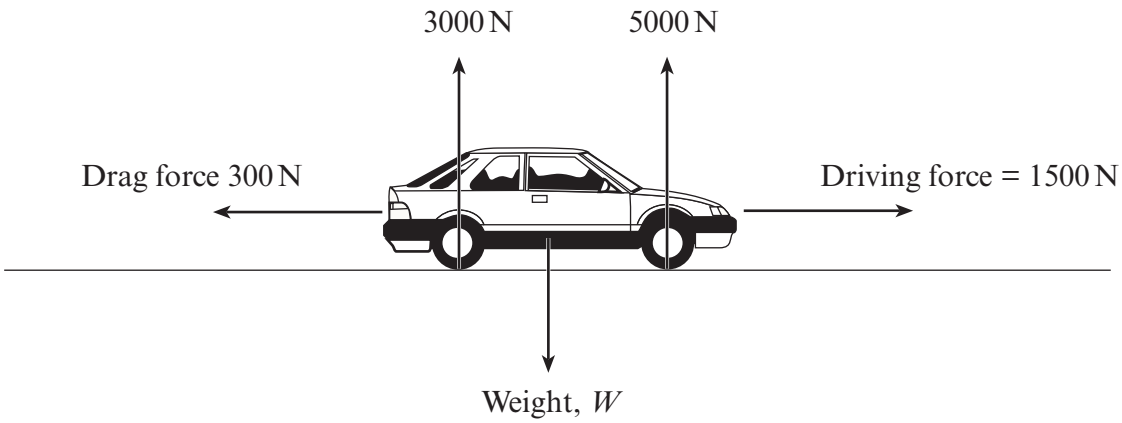
.....

.....

4

Examiner only

2. The diagram shows the forces acting on a moving car.



(a) The vertical forces are balanced. Write down the value of *W*. [1]

W = ... N

(b) The horizontal forces are unbalanced.

Put a ring around the size of the unbalanced force on the car. [1]

300 N 1200 N 1500 N 1800 N

(c) Underline the phrases that correctly complete the sentence below. [2]

The unbalanced force causes the car to move at (a constant speed / a decreasing speed / an increasing speed) in the direction of (the drag force / the driving force / the weight, *W*)

4

3. The power ratings of parts of an electric cooker are given below

Cooker part	Rating (W)
Oven	3000
Grill	2000
Rings	1400

(a) All parts of the cooker are being used.

(i) Calculate the total power required in W.

Power = ... W

(ii) Calculate the total power required in kW.

Power = ... kW
[2]

(b) The cooker is connected to the 230 V mains.

Use the equation

$$\text{Current} = \frac{\text{Power}}{\text{Voltage}}$$

to find the current in the cooker circuit when all parts of the cooker are being used. [2]

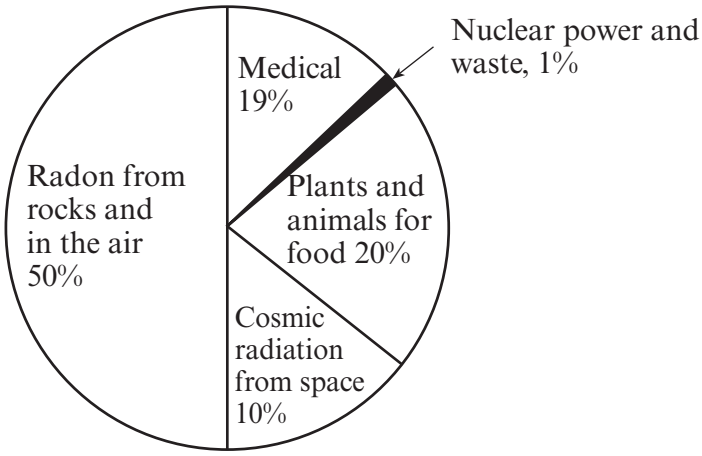
Current = ... A

4

Examiner only

4. The sources and percentages of background radiation are shown in the pie chart.

The pie chart is not drawn to scale.



(a) (i) What percentage of background radiation comes from natural sources?

..... [1]

(ii) Use the pie chart to explain why an increase in nuclear power generation would only produce a small increase in the background radiation. [1]

.....

.....

.....

(b) Give a reason why background radiation varies from place to place. [1]

.....

.....

3

5. The **overall stopping distance** of a car is made up of two parts: thinking distance and braking distance.

The table shows the thinking distance and braking distance for a car travelling at 20 m/s.

Speed (m/s)	Thinking distance (m)	Braking distance (m)
20	12	40

(a) Use the equation

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

to find the thinking time for a driver. [2]

Thinking time = ... s

(b)

no change	increases	decreases

Use one word or phrase from the boxes above to complete each empty box in the following table. Some boxes have been completed for you. [3]

Condition	Effect on thinking distance	Effect on braking distance	Effect on overall stopping distance
Poor brakes	**no change**	**increases**	**increases**
Driver under the influence of alcohol	.....	.....	**increases**
Driver drives at a lower speed	**decreases**	.....	.....
wet road	.....	**increases**	.....

5

Examiner only

6. A radioactive sample contains 20 000 atoms of strontium which has a $\frac{1}{2}$-life of 28 years.

(i) How many **undecayed** atoms of strontium will be in the sample after 28 years?

Put a circle around your answer.

5000 10 000 15 000 20 000 40 000

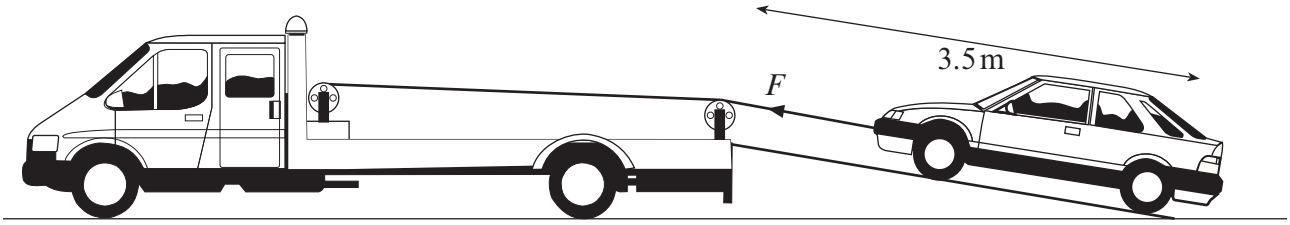
(ii) How many atoms of strontium **will have decayed** after 56 years?
Put a circle around your answer.

5000 10 000 15 000 20 000 40 000

[2]

2

7. The diagram shows a low-loader lorry winching a car up a ramp.



The winch of the lorry does 2450 J of work in lifting the car and 350 J of work against friction whilst pulling the car up the 3.5 m ramp.

(a) Calculate the total work done in raising the car onto the back of the lorry. [1]

Total work done = ... J

(b) Use the equation

$$\text{Force} = \frac{\text{total work done}}{\text{distance}}$$

to find the force *F*. [2]

F = ... N

3

Examiner only

8. *(a)* (i) Give a reason why radioactive waste is a health risk to the population, e.g. a cancer risk.

.....

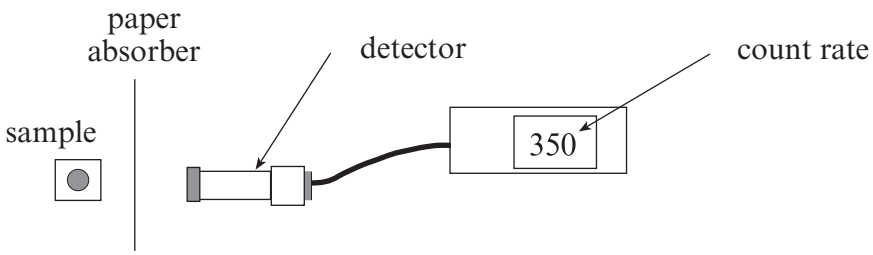
.....

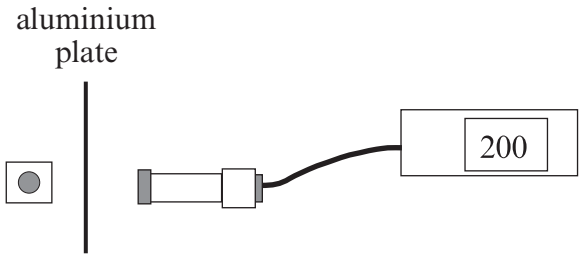
(ii) Give a reason why radioactive waste is expensive to dispose of safely. [2]

.....

.....

(b) A sample of radioactive waste emits alpha (α), beta (β) and gamma (γ) radiation. When placed in front of a detector the sample gives a reading of 450 count / minute. The diagrams below show the count rate when different absorbers are placed between the sample and the detector.





(i) How much of the 450 count / minute is due to alpha (α) radiation?

..... [1]

(ii) How much of the 450 count / minute is due to gamma (γ) radiation ?

..... [1]

(iii) Explain why the aluminium absorber reduces the original count rate by 250 count / minute. [2]

.....

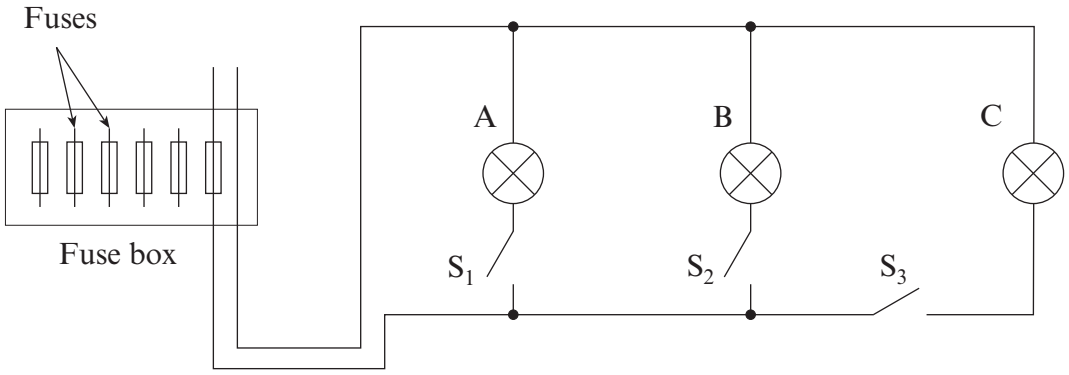
.....

.....

.....

Examiner only

9. The diagram shows part of a mains lighting circuit protected by a fuse in the household fuse box (consumer unit). A, B and C are lamps; S_1, S_2 and S_3 are switches.



(a) Underline **one** word which correctly completes the sentence below. [1]

For safety reasons the fuse and switches must always be placed in the (neutral / live / earth) lead.

(b) For a lamp to light there must be a complete circuit.

(i) State which lamp(s) are lit when S_1 and S_2 are closed (on) and S_3 open (off). [1]

Lamp(s) lit .....

(ii) State which lamp(s) are lit when S_3 is closed (on) and S_1 and S_2 open (off). [1]

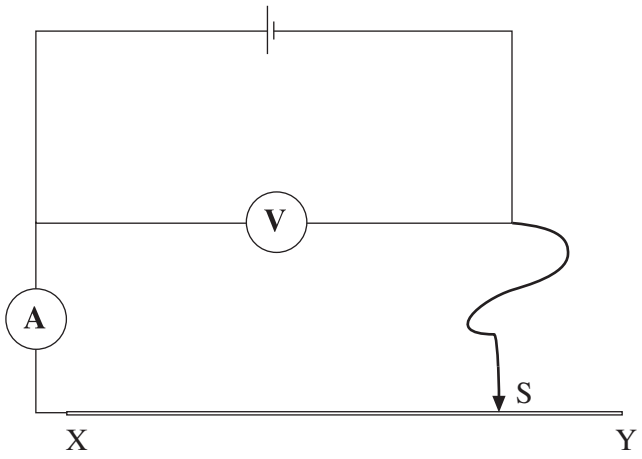
Lamp(s) lit .....

3

Examiner only

10. The following circuit shows an ammeter (A) and a voltmeter (V) connected to a power supply and a resistance wire XY.

A connector, S, allows the length of wire in the circuit to be changed.



(a) With S in the position shown, the voltmeter reads 6 V and the ammeter 1.2 A. Use the equation

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

to calculate the resistance of the wire between X and S. [2]

Resistance = ... Ω

(b) The connector S is moved towards Y. State the effect, **if any** this would have on:

(i) the resistance in the circuit; .....

(ii) the ammeter reading; .....

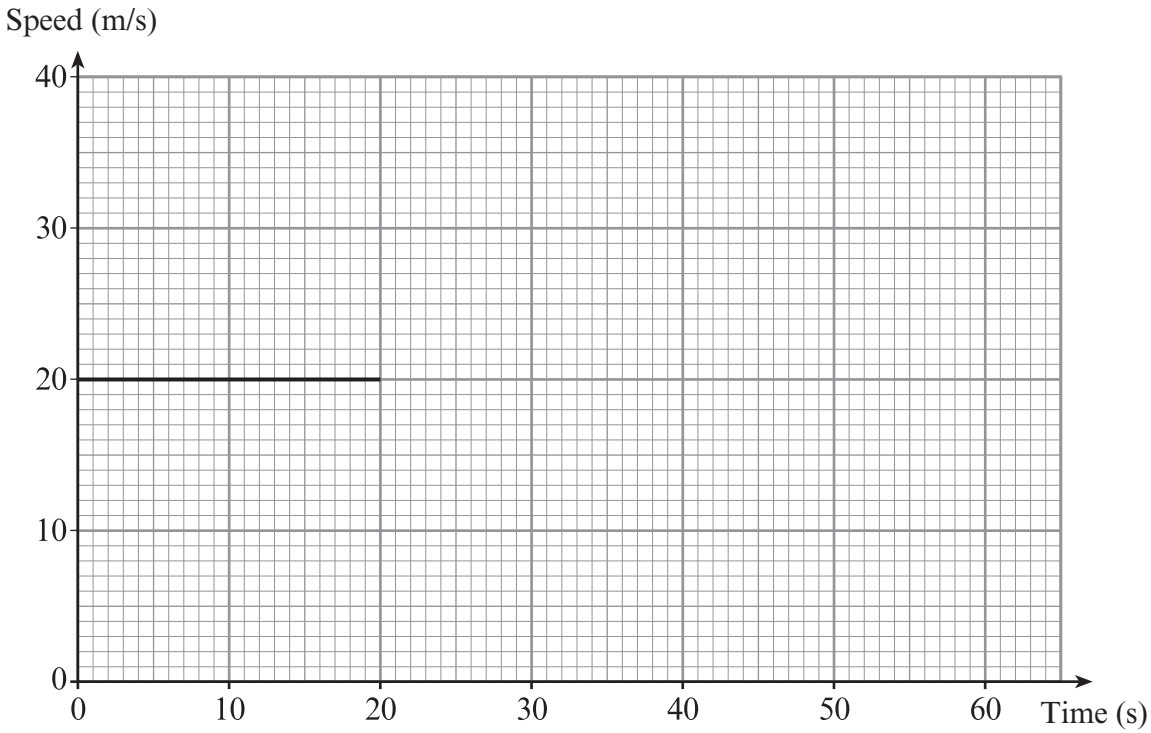
(iii) the voltmeter reading. .....

[3]

5

Examiner only

11. The graph shows the first 20 s of the motion of a van already moving at a constant speed.



At 20 s the driving force is increased and the van accelerates for 20 s to reach a new constant speed of 30 m/s. The van continues at this new constant speed for a further 20 s.

(a) Complete the graph to show the motion of the van between 20 s and 60 s. [2]

(b) Write down an equation from page 2 and use it to calculate the average acceleration of the van during the period when it is accelerating.

Equation: .....

.....

[1]

Calculation: [2]

Acceleration = ... m/s^2

5

Examiner only

12. Read the passage carefully before answering the questions.

Radiotherapy is a branch of medicine used for the treatment of cancerous tumours.

External radiotherapy uses a powerful gamma emitter which is heavily shielded. The gamma-ray beam is aimed at the tumour for short periods of time from different directions. This allows the tumour to receive the largest possible amount of radiation without doing much damage to healthy cells around it. The tumour cells are killed by absorbing large amounts of heat from the energy of the radiation.

Internal radiotherapy is generally used for tumours which are easy to locate. It is carried out by inserting a small radioactive source, which has a short $\frac{1}{2}$-life, directly into the tumour. The radiation emitted by the source destroys the tumour from the inside. Healthy cells around the tumour suffer little damage. Internal radiotherapy is less dangerous for the patient and is generally more effective than external radiotherapy.

(i) Give **two** reasons why the gamma-ray beam in external radiotherapy is directed at the tumour for short periods of time from different directions. [2]

.....

.....

.....

(ii) What precaution is taken to protect the patient and radiotherapist in external radiotherapy? [1]

.....

.....

(iii) Explain why internal radiotherapy is considered to be more effective than external radiotherapy. [2]

.....

.....

.....

(iv) Explain how the cancer cells are killed by the radiation. [1]

.....

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