Candidate Name	Centre Number	Candidate Number
		0

WJEC CBAC

GCSE

241/01

ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2

A.M. WEDNESDAY, 20 January 2010

45 minutes

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

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

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

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

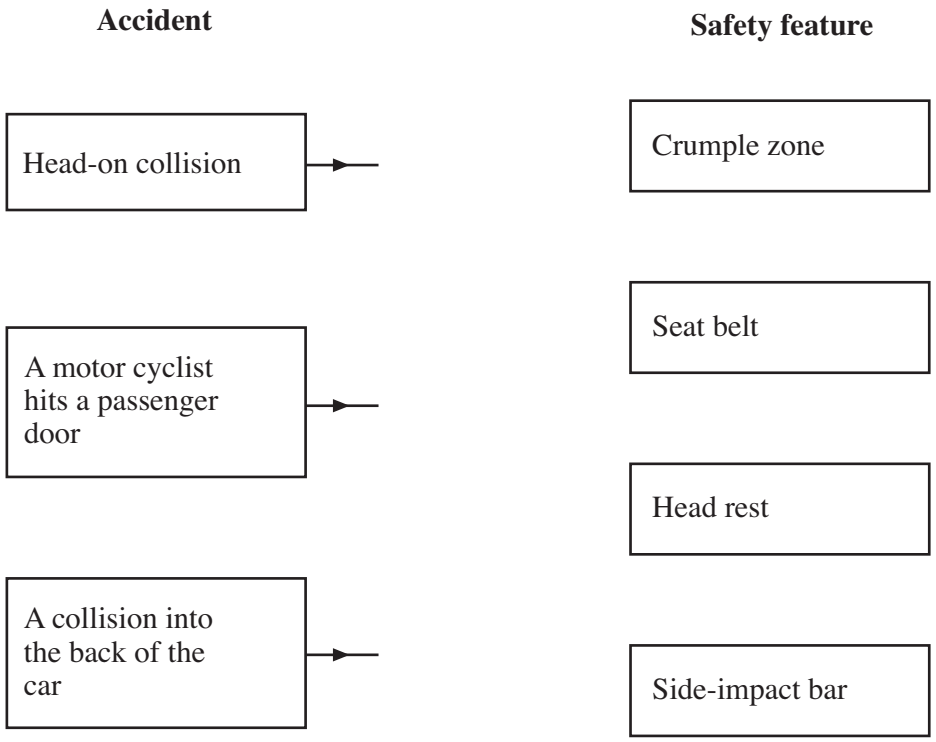
$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

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

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

Answer **all** *questions*.

1. Continue the arrows to join each accident to the safety feature in a car which gives protection.



[3]

3

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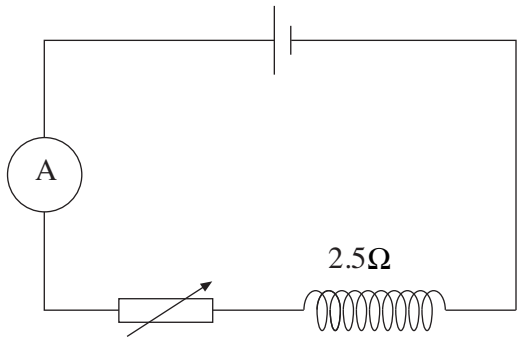
2. The circuit shows an ammeter and a power supply connected to a coil of wire of resistance 2.5Ω .



(a) Add a voltmeter (V) to the circuit to measure the voltage across the coil. [1]

(b) The voltmeter reads 3.0 V.

Use the equation

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

to find the ammeter reading. [2]

Ammeter reading = ... A

3

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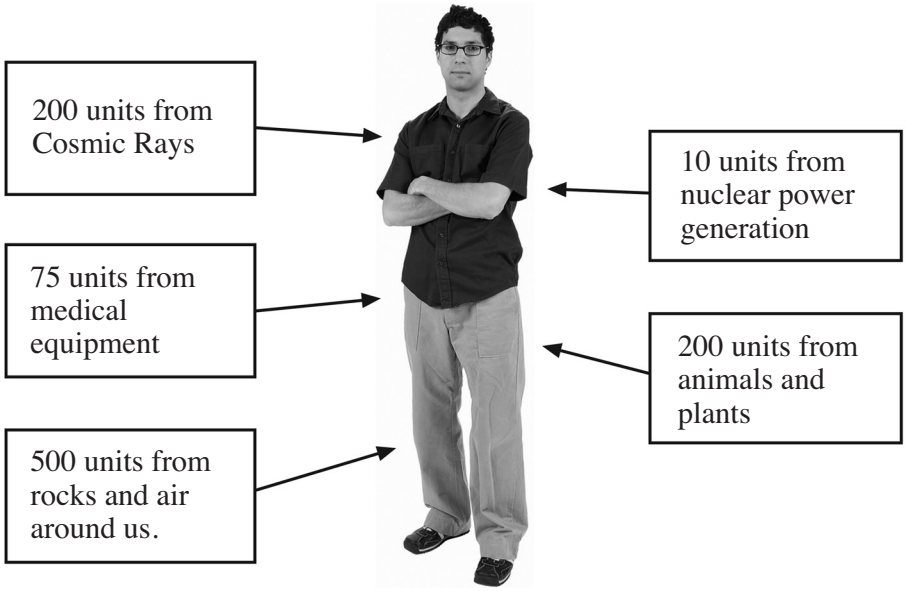
3. The diagram shows the radiation received per year from 5 sources of background radiation by a person in the British Isles.



(i) Calculate the number of units received from man-made sources.

Number of units = ...

(ii) Which of the 5 sources includes naturally occurring radon gas?

.....

[2]

2

Turn over.

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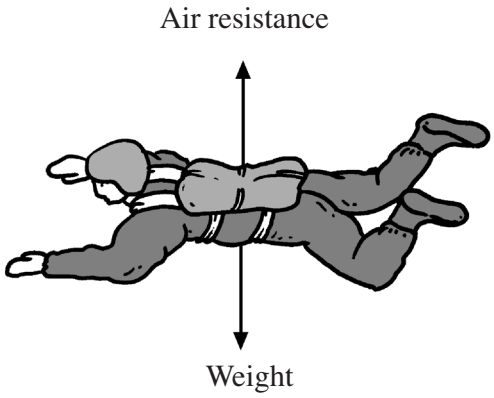
4. The diagram shows a parachutist falling through the air, together with the forces acting.

The parachutist weighs 500 N.



(a) Complete the sentences by choosing a phrase from the boxes below.

Each phrase may be used once, more than once or not at all.

Less than 500 N	Equal to 500 N	More than 500 N

(i) When the parachutist is speeding up the air resistance is .....

(ii) When the parachutist is speeding up the weight is .....

(iii) When the parachutist reaches terminal speed the air resistance is .....

[3]

(b) At some point the parachutist opens the parachute.

(i) State what effect this has, if any, on the two forces acting on the parachutist. [1]

.....

.....

(ii) State what effect this has on the motion of the parachutist. [1]

.....

.....

5

5. The table gives information about 4 electrical appliances.

Appliance	Power (W)	Power (kW)	Current (A)	Fuse value
hi fi	115	0.115	0.5	.....
kettle	2300	2.3		13 A
fire	1500	1.5	6.52	.....
microwave oven	800	.....	3.48	.....

(a) (i) Fill in the gap in the Power column to show the power of the microwave oven in kW. [1]

(ii) The following cartridge fuses are available.

3 A 5 A 13 A

Complete the fuse value column to show the most suitable fuse to use in the plug attached to each appliance. [1]

(b) The appliances all operate on the 230 V mains.
Use the equation

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

to find the current in the kettle. [2]

Current = ... A

4

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6. Use a word from the boxes below to complete the blanks in the paragraph about radioactive decay.

Each word may be used once, more than once or not at all.

element	radiation	nuclei	energy

The ..... of some radioactive atoms are unstable and will need to lose some ..... to become stable. Sooner or later the ..... will decay emitting ..... which carries away energy from the radioactive atoms. [4]

4

7. All metallic appliances use 3-core cable to connect to a plug. The cable contains a live, a neutral and an earth wire, each covered with coloured plastic.

(i) Name the two wires that complete the circuit for an appliance. [1]

..... and .....

(ii) Which wire in the cable has a blue plastic cover? ..... [1]

(iii) State the colour of the plastic covering the Earth wire. ..... [1]

(iv) Give a reason for the wires in 3-core cable being covered in plastic. [1]

.....

.....

4

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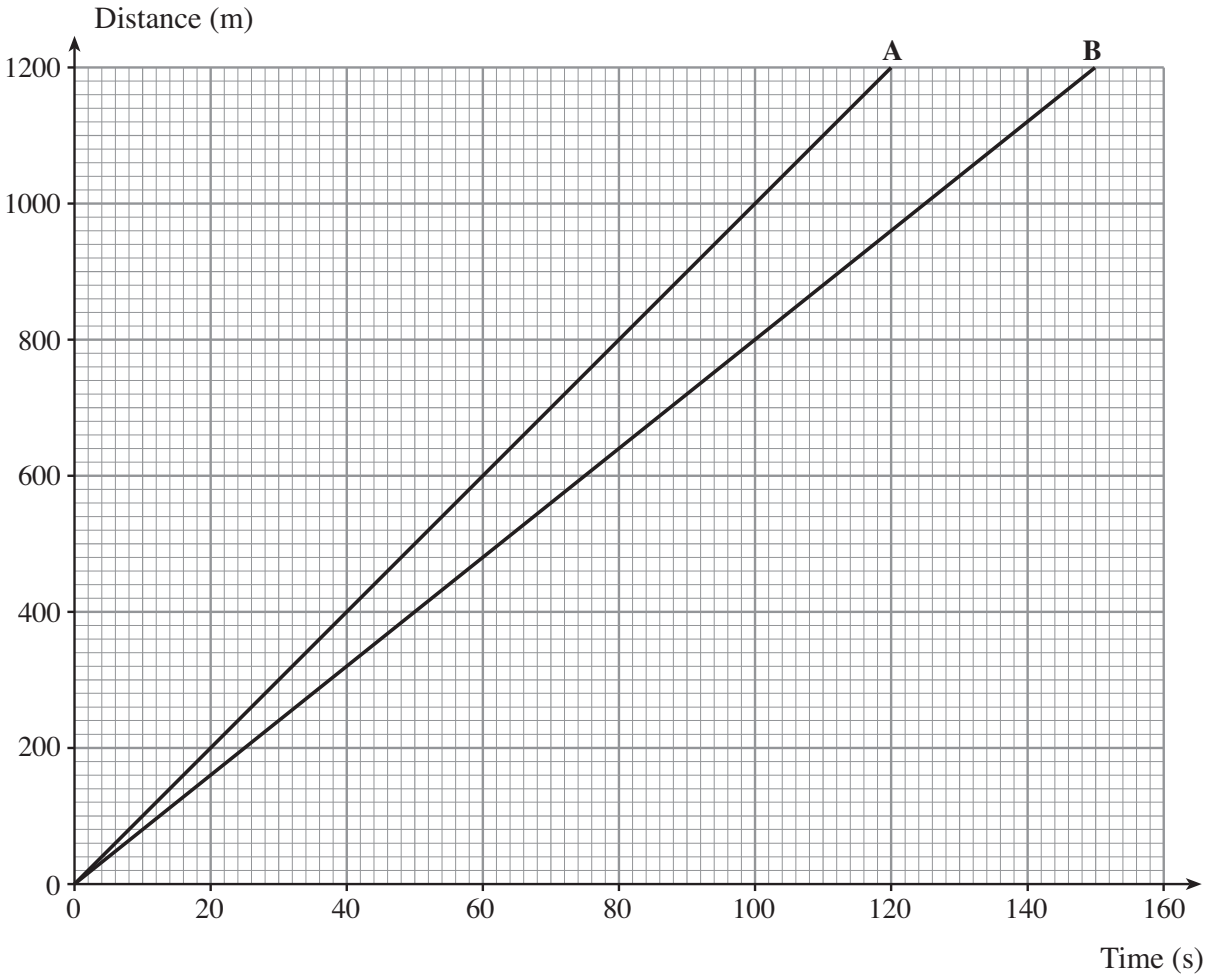
8. The graph shows how quickly two cyclists, **A** and **B**, covered the distance in a road race.



(a) Use the graph to find

(i) how far **B** was behind **A** after 100 s, distance = ... m

(ii) how long after **A** did **B** finish the race. time = ... s

[2]

(b) Use the equation

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

together with data from the graph to find the speed of cyclist **B**. [2]

Speed of **B** = ... m/s

4

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9. Read the information in the box before answering the questions that follow.

Nuclear medicine uses radioactive tracers to find out what is wrong with a patient. Gamma-emitting radioactive materials, with a short half life, are used as tracers to examine blood flow in a patient's body.
One tracer used is technetium-99 (Tc-99). It has a $\frac{1}{2}$ life of 6 hours. It only emits low energy gamma rays, which easily escape the body to be detected by gamma ray cameras. These cameras feed information to a computer which builds up a picture of the path taken by the tracer through the patient's body.
Tc-99 can be given to a patient by mouth or by injection. It produces no discomfort and after a few days there is no sign that the test was ever done.

(a) State how a picture of the path taken by the radioactive tracer is produced. [1]

.....

.....

(b) (i) Give **two** reasons why Tc-99 is a suitable material to use as a radioactive tracer. [2]

1. .....

.....

2. .....

.....

(ii) Explain why very little trace of Tc-99 can be found inside the patient's body a few days after treatment. [2]

.....

.....

.....

(c) Explain why a tracer emitting beta radiation is more dangerous than Tc-99. [1]

.....

.....

.....

6

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10. In the diagram, Figure **A** represents a 'ring main' circuit used in the home. A power point (socket) is shown correctly wired to the ring main. The switch is shown separately for clarity.
Figure **B** represents another switched power point.

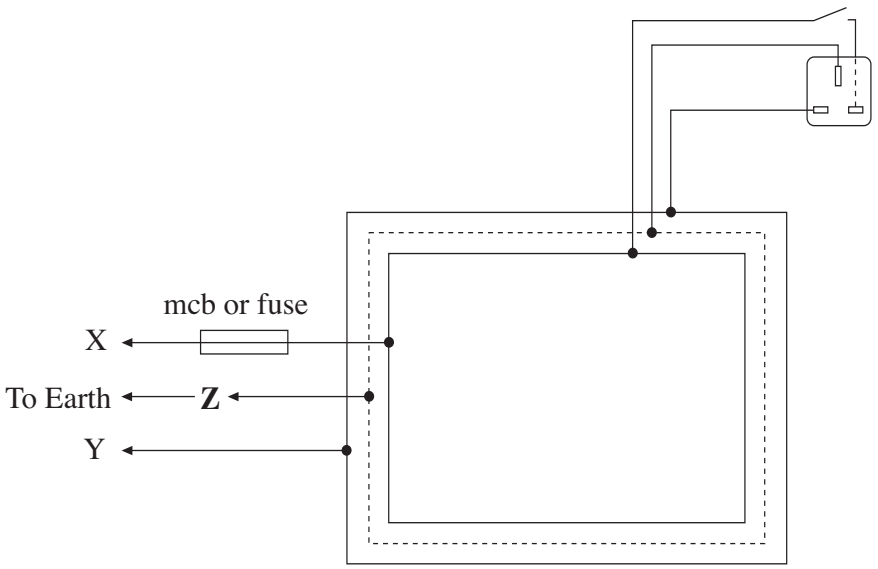

Figure **A**

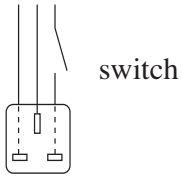

Figure **B**

(a) (i) **Complete the diagram** to show how the power point in Figure **B** should be correctly wired into the 'ring main'. [1]

(ii) Give a reason why **X** in Figure **A** must be the live lead. [1]

.....

(iii) An appliance is safely connected to one of these power points. Compare the currents in **X** and **Y** when the appliance is switched on. [1]

.....

(b) The metal body of all electrical appliances should be connected to the Earth wire. Explain how this gives protection to the user of the appliance. [2]

.....

.....

.....

.....

5

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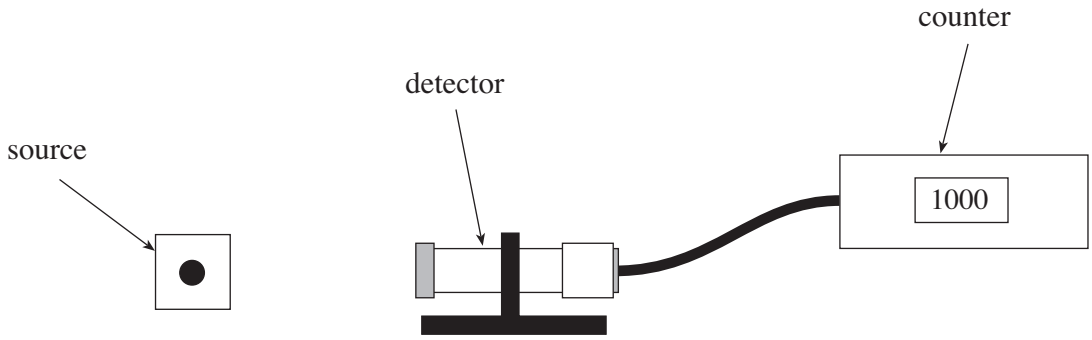
11. Some radioactive elements emit more than one type of radiation. The apparatus below was used to investigate the radiation emitted from a particular source which was placed close to the detector.



The table shows the average number of counts per minute when different absorbers were placed between the source and detector. All figures have been corrected for background radiation.

Original count / min with no absorber	Count / min with a paper absorber	Count / min with 3 mm Aluminium absorber	Count / min with 1 cm Lead absorber	Count / min with 2 cm Lead absorber
1000	900	900	100	0

(a) (i) By how much does the 1 cm of lead change the **original** count rate? [1]

.....

(ii) What type of radiation passes through 1 cm of lead? ..... [1]

(b) How much of the original count rate was produced by:

(i) alpha radiation? ..... count / min

(ii) beta radiation? ..... count / min

(iii) gamma radiation? ..... count / min [3]

5

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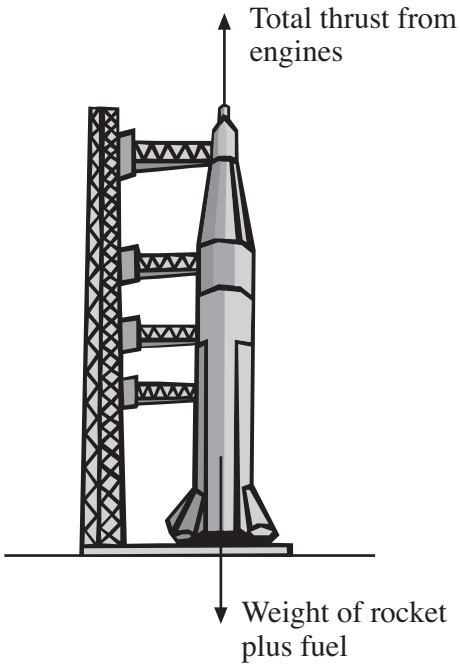
12. The diagram shows a test rocket on its launch pad.



The rocket is powered by 3 engines **each** of which produces a thrust of 2 000 N. The mass of the rocket and its fuel is 500 kg, so that its weight is 5 000 N.

When the engines are fired:

(i) Calculate the total thrust on the rocket.

Thrust = ... N

(ii) Explain why the rocket moves upwards.

.....

.....

(iii) Calculate the resultant force on the rocket.

Resultant force ..... N

(iv) Use the equation

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

to calculate the take-off acceleration of the rocket.

Acceleration = ... m/s^2

[5]

5