Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

CYD-BWYLLGOR ADDYSG CYMRU

Tystysgrif Gyffredinol Addysg Uwchradd

241/01

ADDITIONAL SCIENCE

FOUNDATION TIER (Grades G-C)

PHYSICS 2

A.M. FRIDAY, 15 June 2007

(45 minutes)

For Examiner's use only	
Total Marks	

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.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

EQUATIONS

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

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

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

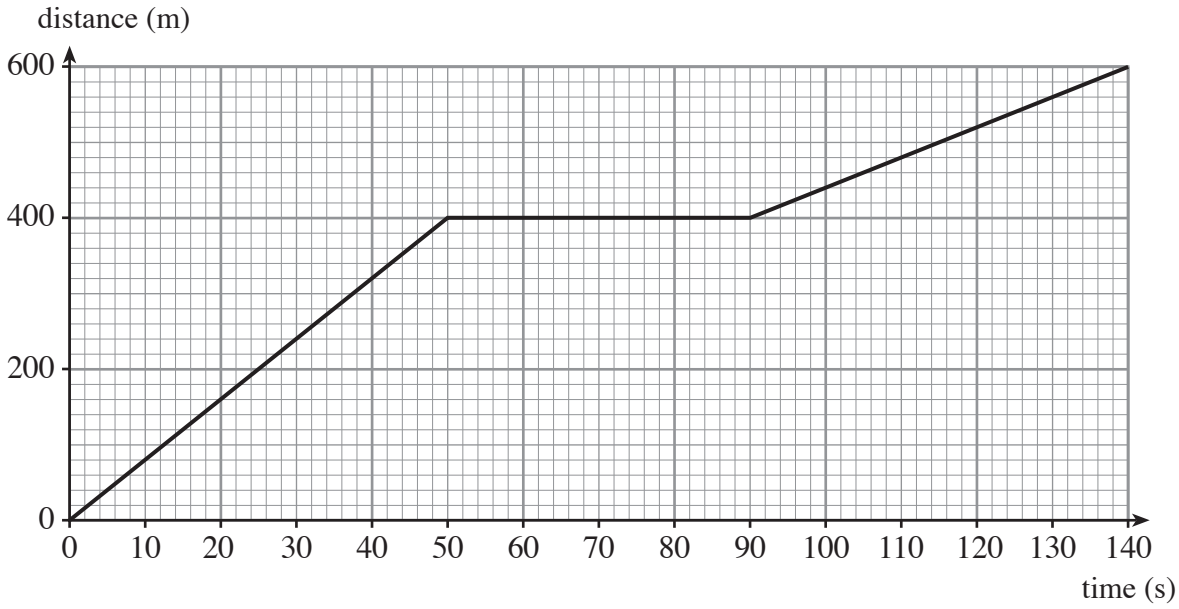
$$\text{acceleration} = \frac{\text{change in speed}}{\text{time}}$$

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

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

Answer **all** *questions.*

1. The distance-time graph shows a journey made by a cyclist.



(a) How far did the cyclist travel before stopping? [1]

Distance = ... m

(b) Using information from the graph and the equation

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

find the speed of the cyclist in the last 50 s of the journey (between 90 s and 140 s). [2]

Speed = ... m/s

(c) Explain how you can tell that the cyclist travelled faster during the first 50 s than in the last 50 s of the journey. [1]

.....

.....

2. Use words from the boxes to answer the questions that follow.

Earth wire	Miniature circuit breaker (m.c.b.)
Fuse	Residual current device (r.c.d.)

(i) Name the safety device that has to be replaced after 'breaking' an electrical circuit. [1]

.....

(ii) Name a safety device that can be reset after 'breaking' an electrical circuit. [1]

.....

(iii) Name a safety device that protects users from having an electric shock. [1]

.....

3

3. Complete the following sentences using words from the boxes.
Each word may be used once, more than once or not at all.

protons	alpha	beta	gamma	nuclei

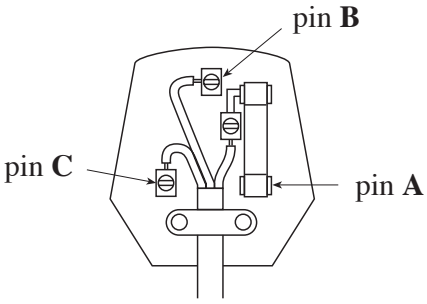
(i) Radioactive materials have atoms with unstable ..... . [1]

(ii) Radioactive materials decay by emitting particles and, in some cases, a burst of ..... radiation as well. [1]

(iii) The activity of a radioactive material is the number of ..... decaying per second. [1]

3

4. The diagram shows the inside of a mains electric plug.



(a) Complete the following sentence by inserting the correct letter, from the diagram, into the boxes provided.

(i) The neutral lead is connected to pin ☐ . [1]

(ii) The fuse is connected to both the live wire and pin ☐ . [1]

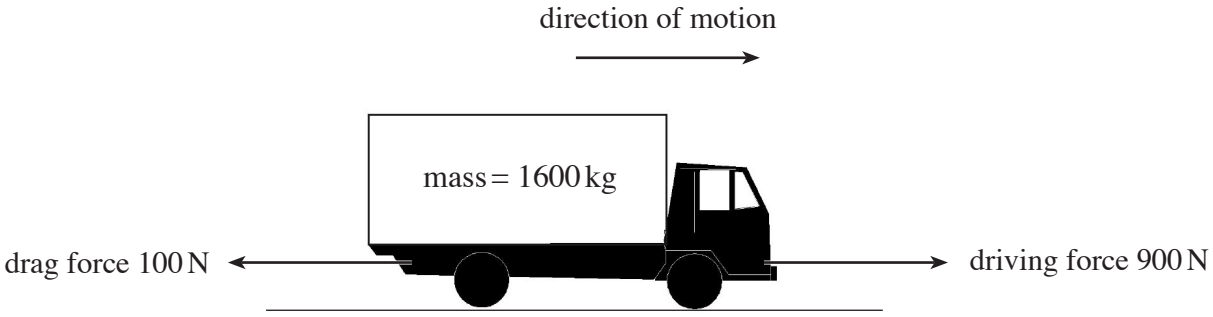
(b) Explain why mains plugs are made of plastic or rubber. [1]

.....

.....

3

5. The diagram shows an **empty** lorry which is acted on by two forces and moving in the direction shown.



(a) (i) Use the information in the diagram to calculate the resultant force on the lorry. [1]

Resultant force = ... N

(ii) Use the equation

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

to calculate the acceleration of the lorry. [2]

Acceleration = ... m/s^2

(b) The lorry is now **fully loaded** and the engine produces the same driving force. What effect does this have on the acceleration of the lorry? [1]

.....

.....

4

6. *(a)* Background radiation is all around us

- Some rocks on Earth are radioactive.
- Radioactive rays shower down upon us from space.
- Nuclear power stations add a small amount to nature's radioactivity.

Explain, giving a clear reason for your answer, which of the following statements below contains the most truth. [2]

(i) Background radiation is completely harmless.

(ii) Background radiation can cause harm but very few people are affected by it.

(iii) Background radiation will kill us.

.....

.....

.....

.....

(b) The table shows readings of background radiation, taken using a Geiger counter. The readings are all taken in the same place.

Counts in one minute	27	20	28	18	15

(i) Calculate the average (mean) background count in one minute. [2]

Average (mean) count = ... counts per minute

(ii) Why do you think the numbers are different?

Put a tick (✓) in the box next to the statement which best explains why the numbers are different. [1]

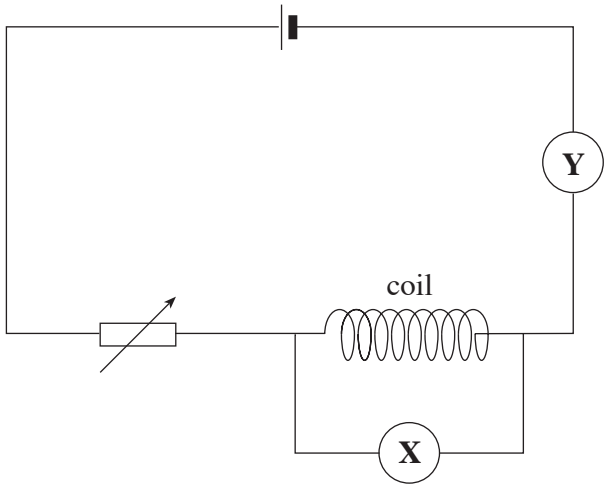
Experimental error ☐

Different numbers of radioactive particles are being produced each minute ☐

The readings were taken at different times of day. ☐

5

7. The circuit below may be used to find the resistance of a coil of wire.



(a) What are the following used for in the circuit?

(i) Meter **X**. .....

(ii) Meter **Y**. .....

(iii) The variable resistor. .....

..... [3]

(b) Use the equation

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

to calculate the resistance of the coil if its voltage is 6 V and the current is 1·5 A. [2]

Resistance = ... Ω

5

8. Read the following passage carefully.

Radon is a naturally occurring radioactive gas, which emits alpha (α) particles. It comes from radioactive uranium which can be found in rocks and soil. When it is formed, radon gas rises through small cracks in the Earth's rocks and enters buildings through the floor.

In high risk areas, households install radon detectors and put in under-floor ventilation to stop the gas collecting. Ideally they seal the floors to stop radon entering in the first place.

Now use the information to answer the following questions.

(i) State **two** precautions that can prevent the build-up of radon gas in the home. [2]

1. .....

2. .....

(ii) Explain why it would be very dangerous to breathe in large amounts of radon gas. [2]

.....

.....

.....

4

9. *(a)* Crumple zones are safety features which are included in the design of most modern cars.

(i) What is a crumple zone?

.....

.....

(ii) Explain why it improves the safety of people in the car.

.....

.....

..... [2]

(b) A car travelling at a speed of 12 m/s, crashed into a wall and took 0·12 s to come to a stop.

Use the equation

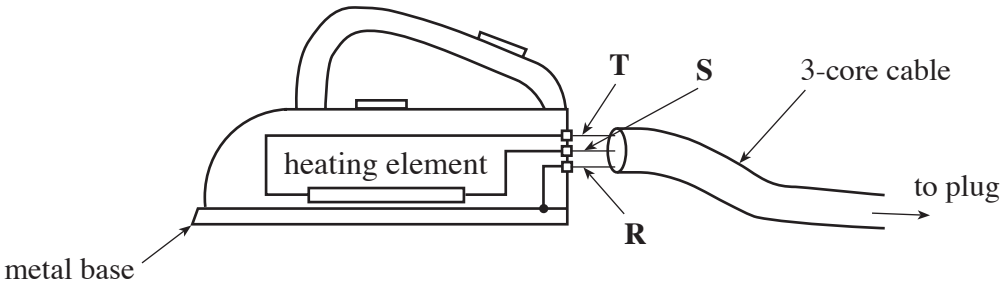
$$\text{deceleration} = \frac{\text{change in speed}}{\text{time}}$$

to calculate the deceleration of the car. [2]

Deceleration = ... m/s^2

4

10. The diagram shows an electric iron.
R, **S** and **T** are the wires of the cable which connects the iron to the mains plug.



(a) (i) Which wire, **R**, **S** or **T**, is the earth wire? .....

(ii) State the colour of the plastic insulation covering the Earth wire. ..... [2]

(b) (i) The iron is marked 230 V, 750 W.

Write down in words an equation from page 2 and **use it** to calculate the current flowing through the heating element when it is working normally. [3]

Equation .....

.....

Calculation

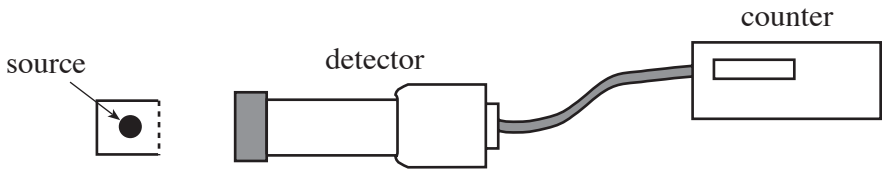
Current = ... A

(ii) State which size of fuse, 3 A, 5 A or 13 A, should be placed in the plug attached to the iron. [1]

.....

6

11. Some radioactive elements emit more than one type of radiation.



The above apparatus was used to investigate the radiation emitted from 3 sources, **A**, **B** and **C**. The sources were always placed at the same position, close to the detector.

The table below shows the mean counts per minute obtained when different materials were placed between the sources and the detector. All the readings have been corrected for background radiation.

Source	Mean counts / min with nothing between source and detector	Mean counts / min with thin **paper** in the way	Mean counts / min with 3 mm of **aluminium** in the way	Mean counts / min with 2 cm of **lead** in the way
A	256	256	256	85
B	135	80	80	0
C	310	310	188	0

(a) Which source has the biggest detected activity when 3 mm of aluminium is placed between the source and the detector? [1]

.....

(b) (i) How can you tell that source **A** is emitting gamma (γ) radiation? [1]

.....

(ii) How can you tell that source **B** is **not** emitting beta (β) radiation? [1]

.....

.....

(c) Which source, **A**, **B** or **C**, emits alpha (α) particles?
Give a reason for your answer. [2]

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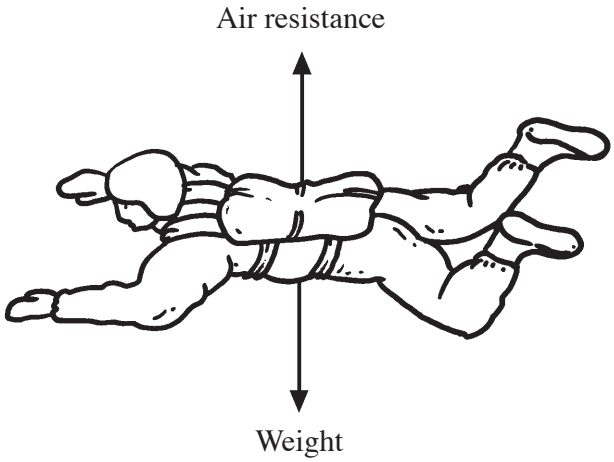
12. A skydiver jumps from an aeroplane and free falls. The skydiver is acted on by the two forces shown.



(a) State what happens to **each of the forces** as the speed of the skydiver increases. [2]

.....

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.....

(b) Explain why the skydiver eventually moves at a steady speed. [2]

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4