Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

Leave blank

General Certificate of Secondary Education
June 2004

ASSESSMENT and QUALIFICATIONS ALLIANCE

SCIENCE SINGLE AWARD (CO-ORDINATED) 3463/3H
HIGHER TIER
Paper 3

Tuesday 22 June 2004 9.00 am to 9.45 am

H

In addition to this paper you will require:
a ruler.
You may use a calculator.

Time allowed: 45 minutes

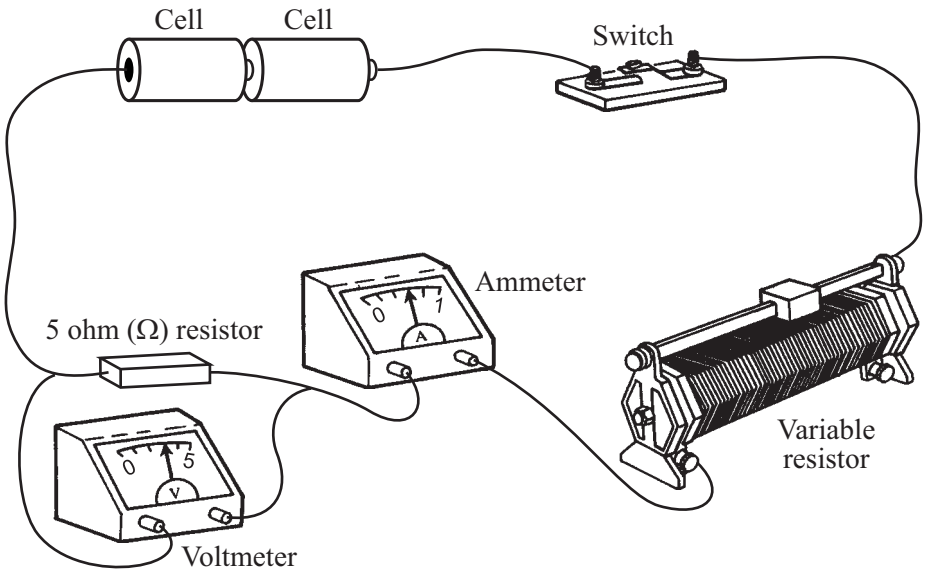
Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 45.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Number	Mark	Number	Mark
1		4	
2		5	
3		6	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 The drawing shows the circuit used to investigate how the current through a 5 ohm (Ω) resistor changes as the potential difference (voltage) across the resistor changes.



(a) Draw, in the space below, a circuit diagram of this circuit. Use the correct symbols for each part of the circuit.

(2 marks)

(b) (i) Write down the equation that links current, potential difference and resistance.

.....

(1 mark)

(ii) Calculate the potential difference across the 5 ohm (Ω) resistor when the current through the resistor equals 0.4 A. Show clearly how you work out your final answer.

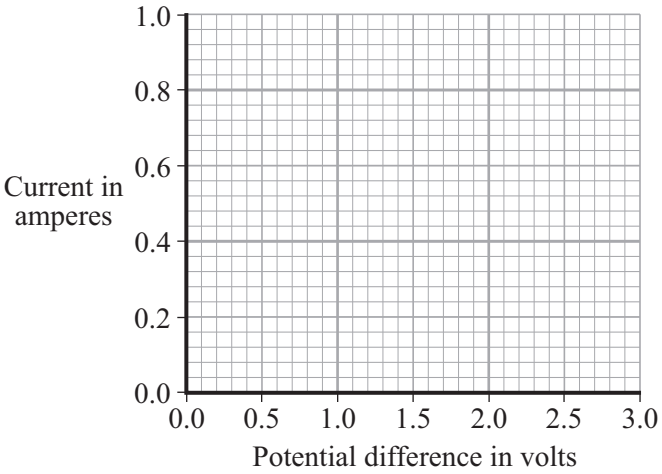
.....

.....

potential difference =.....volts

(2 marks)

(iii) Complete the graph to show how the current through the resistor changes as the potential difference across the resistor increases from 0 V to 3 V. Assume the resistor stays at a constant temperature.



(2 marks)

(c) The resistor is replaced by a 3 V filament lamp. The resistance of the lamp increases as the potential difference across it increases. Why?

.....

.....

(1 mark)

8

2 The diagram represents the electromagnetic spectrum.

Gamma rays	X-rays	Ultraviolet	Visible light	Infra red	Microwaves	Radio waves

(a) Name the type of electromagnetic radiation that is used:

(i) to sterilise surgical instruments;

.....

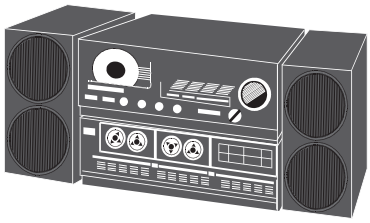
(1 mark)

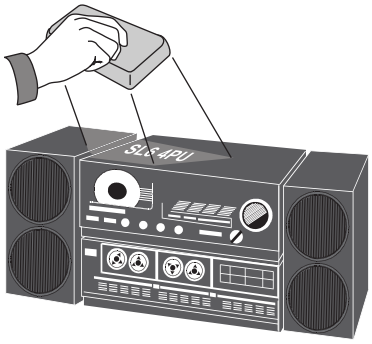
(ii) to send a signal to a TV from a remote control.

.....

(1 mark)

(b) Valuable items can be security marked using special ink. The ink can only be seen in ultraviolet radiation.





Explain what happens to make the ink visible.

.....

.....

.....

.....

(2 marks)

(c) Explain why skin cells need to be protected from ultraviolet radiation.

.....

.....

.....

.....

(2 marks)

(d) The following information is from an oven that combines a microwave and a grill.

Voltage	230 V
Microwave power	0.65 kW
Grill power	1.15 kW

(i) Name the **two** types of electromagnetic radiation that the oven can use to cook food.

..... and .....

(1 mark)

(ii) A joint of meat is cooked using both the microwave and the grill. Both are switched on at full power for half an hour.

Use the following equation to calculate the energy transferred, in kilowatt-hours, by the oven. Show clearly how you obtain your answer.

energy transferred = power × time

.....

.....

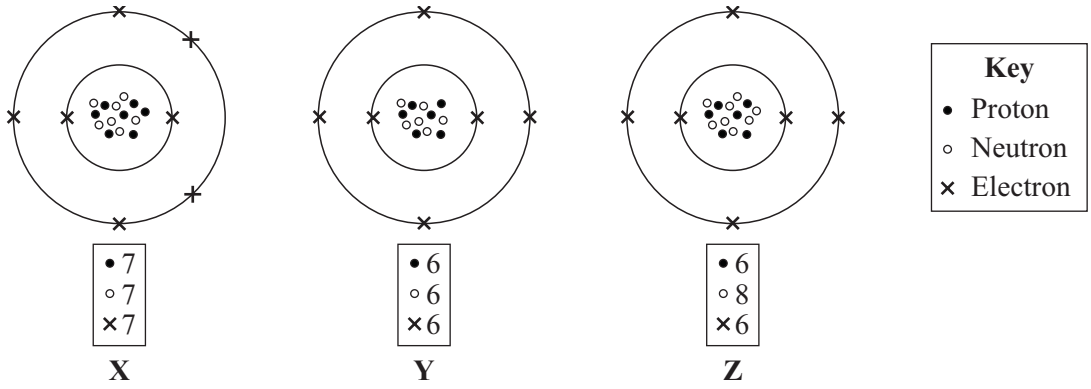
.....

energy transferred = ...kWh

(2 marks)

9

3 (a) The diagrams represent three atoms **X**, **Y** and **Z**.



Which **two** of the atoms are from the same element?

.....

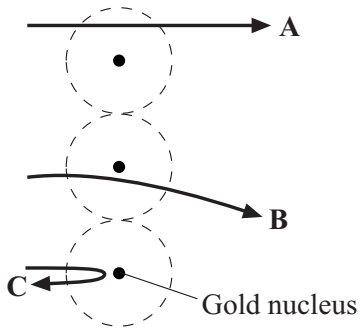
Give a reason for your answer.

.....

.....

(2 marks)

(b) In the early part of the 20th century some scientists investigated the paths taken by positively charged alpha particles into and out of a very thin piece of gold foil. The diagram shows the paths of three alpha particles.



Explain the different paths **A**, **B** and **C** of the alpha particles.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

(3 marks)

4 (a) A beta particle is a high-energy electron.

(i) Which part of an atom emits a beta particle?

.....

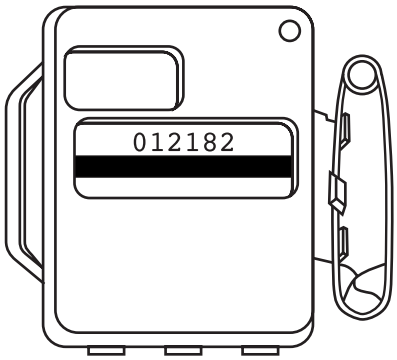
(1 mark)

(ii) How does the composition of an atom change when it emits a beta particle?

.....

(1 mark)

(b) The diagram shows a badge used to monitor radiation. It measures the amount of radiation a worker has been exposed to in one month.



(i) What is used inside the badge to detect radiation?

.....

(1 mark)

(ii) What would indicate that the worker has been exposed to a high level of radiation as opposed to a low level of radiation?

.....

.....

(1 mark)

(iii) Why is it important to monitor the amount of radiation the worker has been exposed to?

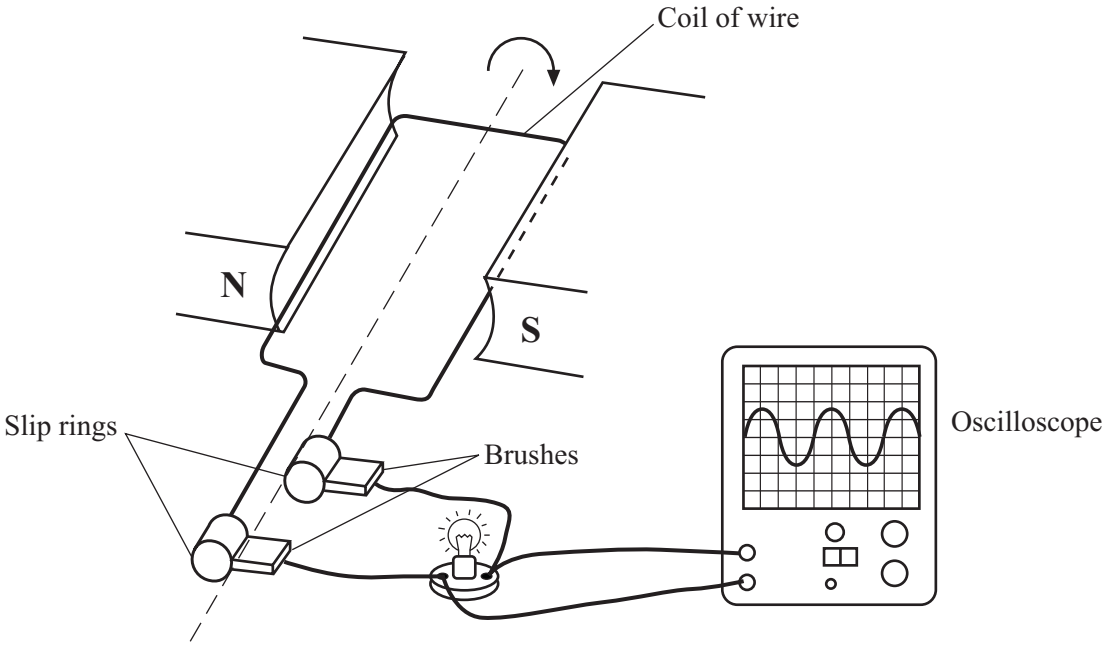
.....

.....

(1 mark)

5

5 (a) The diagram shows a simple generator. The trace on the oscilloscope shows that the generator produces an alternating current.



(i) Explain how the generator works. Include in your answer the reasons why the slip rings and brushes are needed.

.....

.....

.....

.....

.....

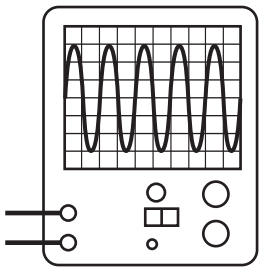
.....

.....

.....

(4 marks)

(ii) What should be done to make the generator give the oscilloscope trace drawn below? Assume the controls on the oscilloscope are unchanged.



.....

.....

.....

.....

(2 marks)

(b) Explain why electricity is transmitted through the National Grid as alternating current (a.c.) rather than direct current (d.c.).

.....

.....

.....

.....

.....

.....

(3 marks)

9

TURN OVER FOR THE NEXT QUESTION

6 (a) Explain how stars produce energy.

.....

.....

.....

.....

(2 marks)

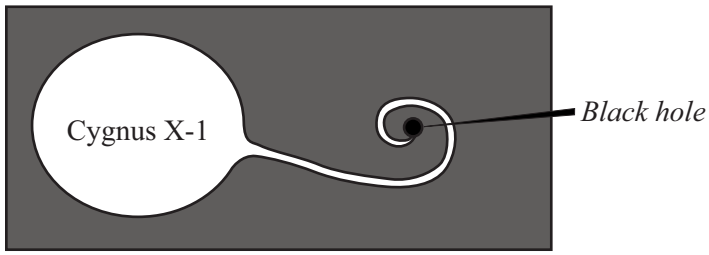
(b) What evidence is there to suggest that the Sun was formed from the material produced when an earlier star exploded?

.....

.....

(1 mark)

(c) It is thought that gases from the massive star Cygnus X-1 are spiralling into a black hole.



(i) Explain what is meant by the term *black hole*.

.....

.....

(2 marks)

(ii) What is produced as the gases from a star spiral into a black hole?

.....

(1 mark)

(d) The light spectrum from a distant galaxy shows a red shift.

What is meant by *red shift* and what does it tell us about distant galaxies?

.....

.....

.....

.....

(2 marks)

(e) What name is given to the theory that the Universe started with a massive explosion?

.....

(1 mark)

9

END OF QUESTIONS