

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



SCIENCE SINGLE AWARD (CO-ORDINATED) 3463/3F
FOUNDATION TIER
Paper 3

Tuesday 22 June 2004 9.00 am to 9.45 am

F

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

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

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.

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

- 1 (a) Complete the sentences by choosing the correct word or phrase from the box.

Each word or phrase may be used once or not at all.

circular	comet	elliptical	Milky Way
Moon	solar system	Universe	

A planet and a both move in orbits around the Sun.

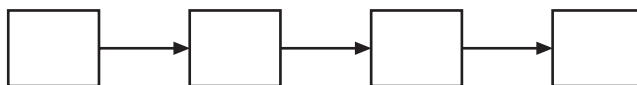
The Sun is part of the galaxy.

The contains at least a billion galaxies. (4 marks)

- (b) The following sentences describe the stages that a star such as the Sun goes through during its life.

- A** The star is stable.
- B** The star contracts to a white dwarf.
- C** The star expands into a red giant.
- D** The star is formed when the force of gravity pulls dust and gases together.

- (i) Arrange the sentences in the order in which the stages happen.



(3 marks)

- (ii) The Sun is at which stage in its life, **A**, **B**, **C** or **D**?

.....
(1 mark)

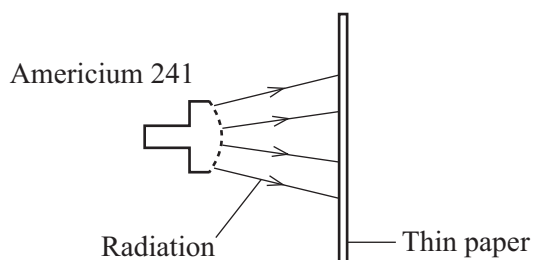
2 A smoke detector fitted inside a house contains a radioactive source, americium 241.

(a) Complete the following table of information for an atom of americium 241.

Number of neutrons	146
Number of protons	95
Number of electrons	

(1 mark)

(b) The diagram shows that the radiation given out by americium 241 does not go through paper.



Which type of radiation, alpha (α), beta (β), or gamma (γ) is given out by americium 241?

.....
(1 mark)

(c) Explain why the radiation given out by the americium 241 is unlikely to do any harm to people living in the house.

.....

 (2 marks)

(d) Complete the sentence by choosing an answer from the box.

less than more than the same as

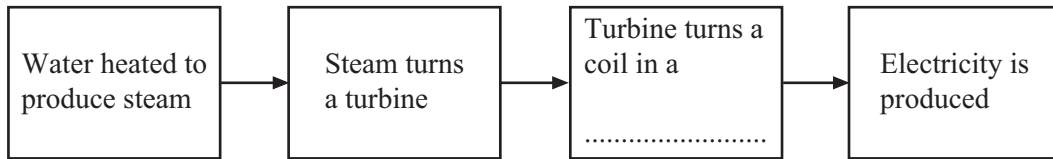
After many years the radiation emitted by americium 241 will be when the smoke detector was new.

(1 mark)

5

Turn over ►

- 3 (a) In Britain most power stations burn fuel to produce heat. The diagram shows the stages by which the heat is transferred into electrical energy. Complete the diagram by filling in the missing word.



(1 mark)

- (b) A fuel burning power station uses 2000 joules of fuel energy to generate 600 joules of electrical energy. The rest of the fuel energy is wasted as heat.
- (i) For every 600 joules of electrical energy generated, how much fuel energy is wasted as heat?

.....
(1 mark)

- (ii) Use the following equation to calculate the efficiency of the power station. Show clearly how you work out your answer.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

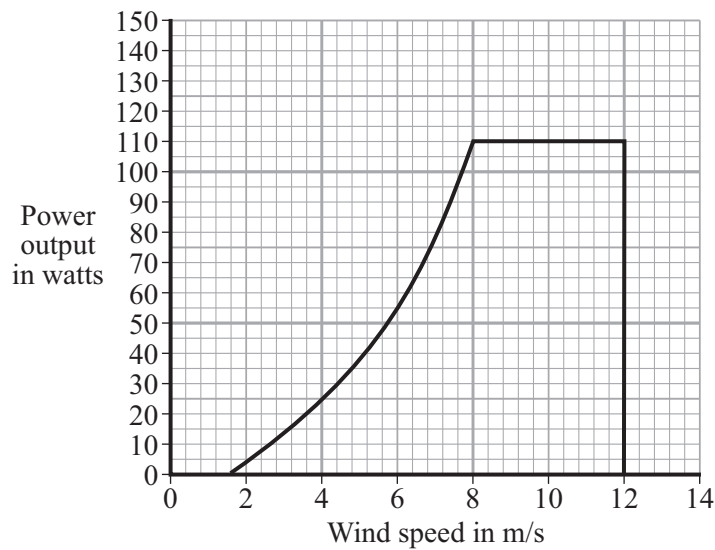
.....
.....
efficiency =
(2 marks)

- (c) List **A** gives three energy resources used to generate electricity. List **B** gives environmental problems that may be caused by using different energy resources. Draw a straight line from each energy resource in List **A** to the environmental problem it may cause in List **B**. Draw **three** lines only.

List A Energy resource	List B Environmental problem that may be caused
Wind	Destroys the habitat of wading birds in river estuaries
Tides	Produces a lot of noise
Falling water (hydroelectricity)	Produces the gas sulphur dioxide
	Floods land used for farming or forestry

(3 marks)

- (d) A small wind generator is used to charge a battery. The graph shows the power output of the generator at different wind speeds.



- (i) What is the maximum power produced by the generator?

..... watts
(1 mark)

- (ii) The generator is designed to stop if the wind speed is too high.

At what wind speed does the generator stop working?

..... m/s
(1 mark)

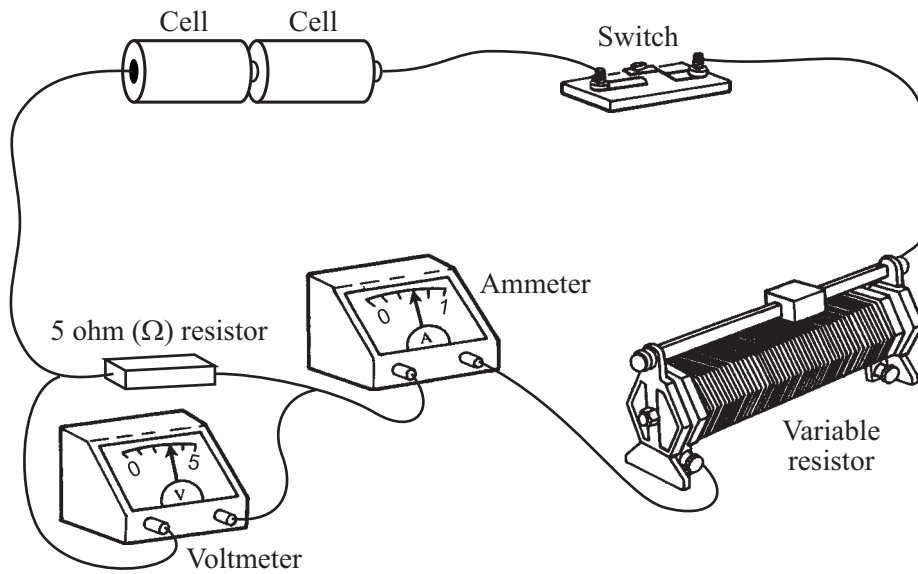
- (iii) Give **one** disadvantage of using a wind generator to charge a battery.

.....
.....
(1 mark)

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 4 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.

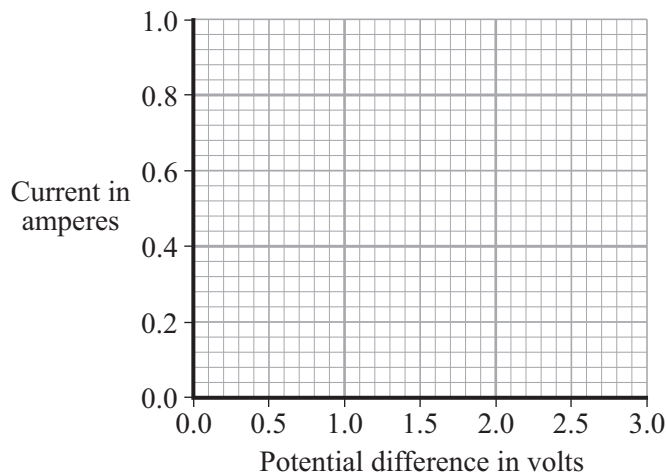
.....
(1 mark)

- (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)

5 The diagram represents the electromagnetic spectrum.

Gamma rays	X-rays	Ultraviolet	Visible light	Infra red	Microwaves	Radio waves
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(a) Name the type of electromagnetic radiation that is used:

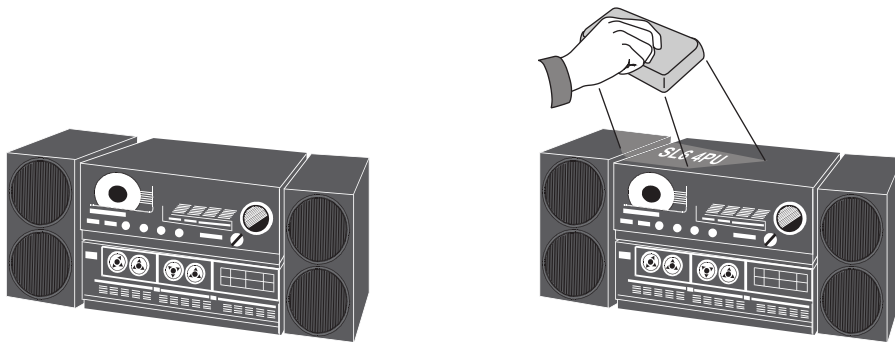
(i) to sterilise surgical instruments;

.....
(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

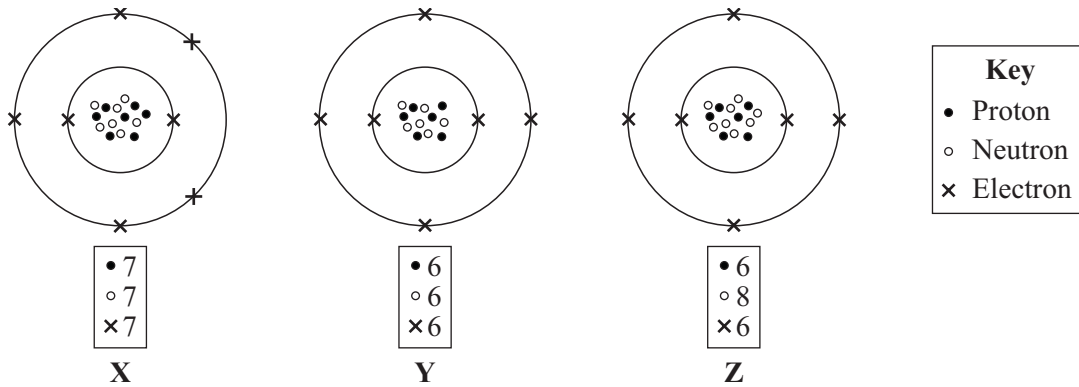
.....
.....
.....

energy transferred =kWh
(2 marks)



Turn over ►

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



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

.....

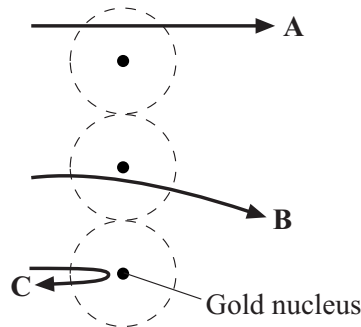
Give a reason for your answer.

.....

.....

(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)

END OF QUESTIONS

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