Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

Leave blank

General Certificate of Secondary Education
June 2003

ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Tuesday 17 June 2003 9.00 am to 9.45 am

H

No additional materials are required.
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 (a) Some scientists are involved in the search for *extra-terrestrial* intelligence (SETI).

(i) What does *extra-terrestrial* mean?

.....

(1 mark)

(ii) What equipment is used to carry out this search?

.....

(1 mark)

(b) In 1967, radio pulses, one every 1.337 seconds, were discovered coming from a point in space. Some scientists thought the pulses were being produced by intelligent life elsewhere in the *Universe*. Later, it was discovered that the pulses were emitted by a *neutron star*.

(i) Complete this sentence.

The *Universe* is made up of at least a billion .....

(1 mark)

(ii) Suggest **one** reason why scientists might have thought that the pulses were produced by intelligent life.

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(1 mark)

(iii) What is the link between a *neutron star* and a *super nova*?

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(2 marks)

(c) In 2001, equipment was carried by balloons to a height of 41 km above the Earth's surface. The equipment detected the presence of bacteria.

(i) The natural movement of air in the Earth's atmosphere may have carried the bacteria up **or** the bacteria may have come from outer space.

Suggest **one** other explanation.

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(1 mark)

(ii) Suggest **one** way in which bacteria may have travelled through space to reach the edge of our atmosphere.

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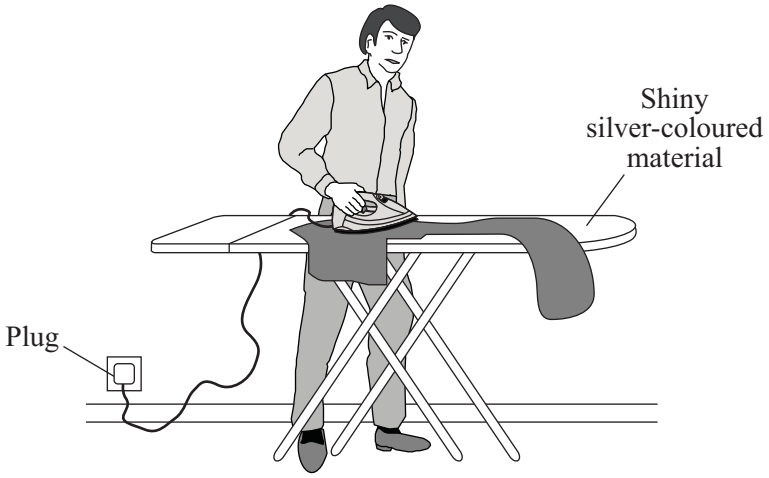
(1 mark)

8

TURN OVER FOR THE NEXT QUESTION

2 The drawing shows someone ironing a shirt. The top of the ironing board is covered in a shiny silver-coloured material.



(a) Explain why the shiny silver-coloured material helps to make ironing easier.

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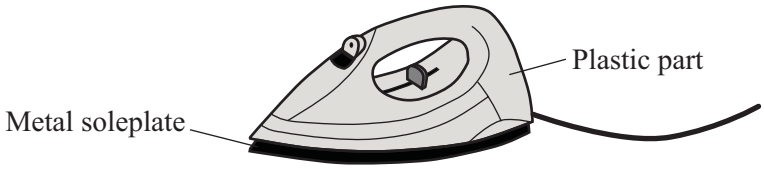
(2 marks)

(b) The iron must be earthed to make it safe. Which part of the iron is connected to the earth pin of the plug?



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(1 mark)

(c) Name a material that could be used to make the outside case of the plug.

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Give a reason for your choice.

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(2 marks)

(d) *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.*

Some electrical circuits are protected by a circuit breaker. These switch the circuit off if a fault causes a larger than normal current to flow. The diagram shows one type of circuit breaker. A normal current (15 A) is flowing.

Explain what happens when a current larger than 15 A flows. The answer has been started for you.

When the current goes above 15 A, the electromagnet becomes stronger and.....

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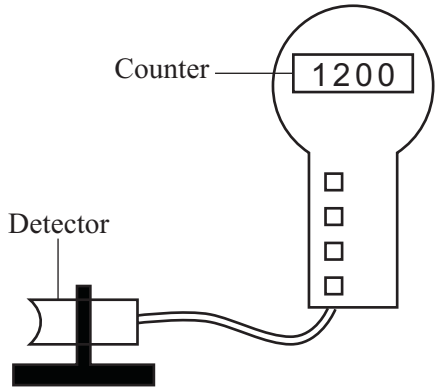
(3 marks)

8

3 (a) The diagram shows a radiation detector and counter being used to measure background radiation. The number shows the count ten minutes after the counter was reset to zero.



(i) Name **one** source of background radiation.

.....

(1 mark)

(ii) Calculate the average background radiation level, in counts per second. Show clearly how you work out your answer.

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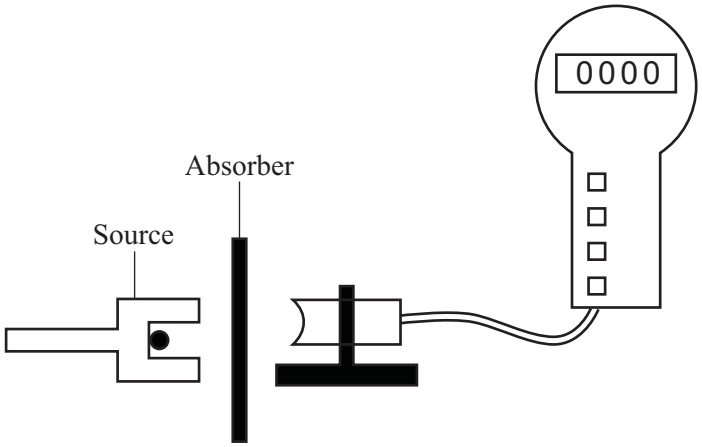
.....

Background radiation level = ...counts per second

(2 marks)

(b) The detector and counter are used in an experiment to show that a radioactive source gives out alpha and beta radiation only.



Two different types of absorber are placed one at a time between the detector and the source. For each absorber, a count is taken over ten minutes and the average number of counts per second worked out. The results are shown in the table.

Absorber used	**Average counts per second**
No absorber	33
Card 1 mm thick	20
Metal 3 mm thick	2

Explain how these results show that alpha and beta radiation is being given out, but gamma radiation is **not** being given out.

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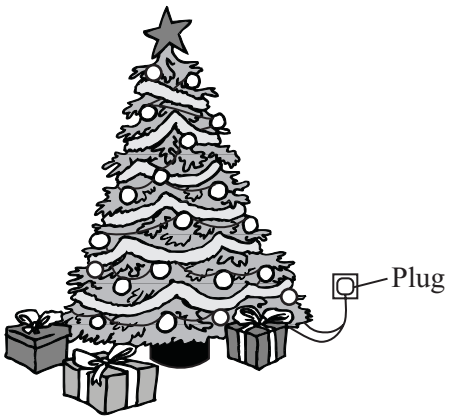
(3 marks)

6

Turn over ▶

4 A set of Christmas tree lights is made from twenty identical lamps connected in series.



(a) Each lamp is designed to take a current of 0.25 A. The set plugs directly into the 230 V mains electricity supply.

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

.....

(1 mark)

(ii) Calculate the resistance of **one** of the lamps. Show clearly how you work out your final answer and give the unit.

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Resistance = ...

(4 marks)

(iii) What is the total resistance of the set of lights?

.....

Total resistance = ...

(1 mark)

(b) How does the resistance of a filament lamp change as the temperature of the filament changes?

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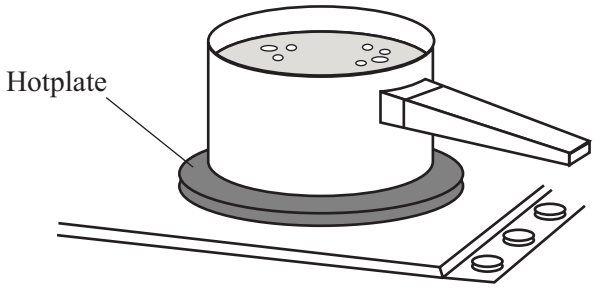
(1 mark)

7

5 The drawing shows water being heated in a metal saucepan.



(a) Explain, in terms of the particles in the metal, how heat energy is transferred through the base of the saucepan.

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(2 marks)

(b) Energy is transferred through the water by convection currents. Explain what happens to cause a convection current in the water. The answer has been started for you.

As heat energy is transferred through the saucepan, the water particles at the bottom .....

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(3 marks)

(c) Some energy is transferred from the hotplate to the air by *thermal radiation*. What is meant by *thermal radiation*?

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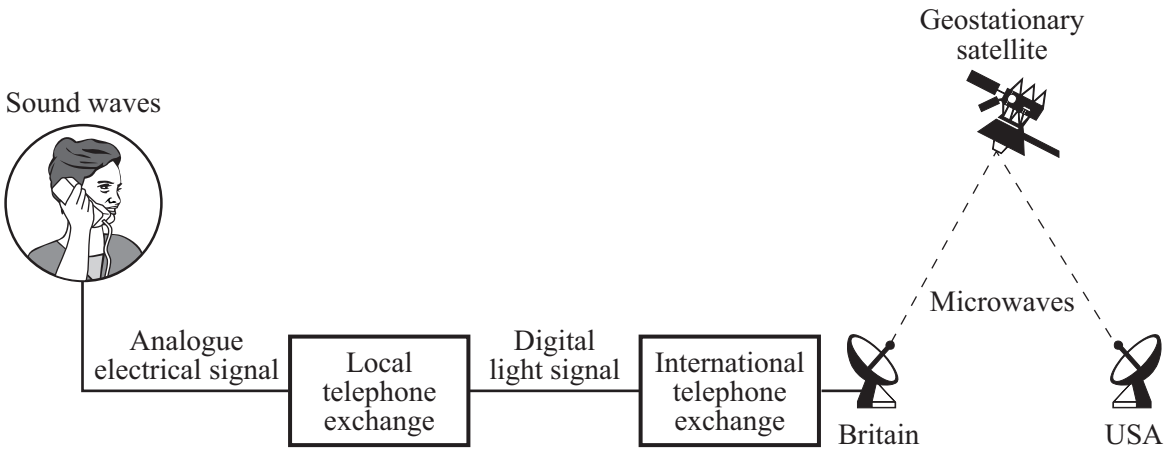
(1 mark)

6

6 (a) The diagram shows, in a simplified form, how a telephone call can be transmitted from Britain to the USA.



(i) What is the difference between an analogue and a digital signal? You may wish to draw a diagram to help your answer.

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(2 marks)

(ii) Explain why the quality of an analogue signal transmitted over a long distance decreases, but the quality of a digital signal transmitted over the same distance does not change.

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(3 marks)

(iii) Explain why the satellite used to receive and transmit the microwave signals is placed in a geostationary orbit.

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(2 marks)

(b) The picture shows a pre-natal scan obtained using ultrasonic waves.

(i) Explain how ultrasonic waves are used to produce the image of an unborn baby.

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(2 marks)

(ii) Give another use for ultrasonic waves.

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(1 mark)

10

END OF QUESTIONS