



General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Electricity, Waves and Communication
Module 5

Higher Tier

[GSC52]

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.15 am



Centre Number

71

Candidate Number

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 45.

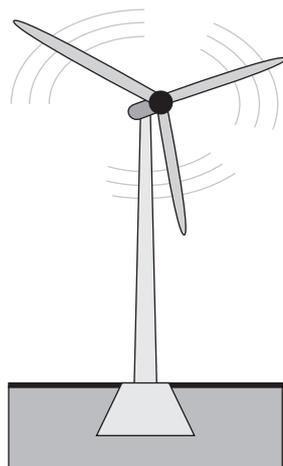
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	

Total Marks	
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1 Below is a diagram of a wind turbine.



The following investigation was carried out to find out how much electricity it produced.

- The wind turbine was used to charge a battery overnight.
- The next morning the battery was used to light a bulb and the time it stayed lit until it was completely out was timed.
- This was repeated every night for a week.
- The results are recorded below.

Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Time bulb stayed lit /mins.	45	50	2	25	60	35	42

(a) (i) What is measured in this investigation to show the amount of electricity produced by the wind turbine?

_____ [1]

(ii) Explain how timing the bulb until it is completely out ensures that the investigation is a fair test (valid).

 _____ [1]

Examiner Only

Marks Remark

2 The picture below shows a race being started using a starting pistol.

There is a large brick wall at the side of the running track.

“Image of runners starting a race with a brick wall in the background”.

Each time the pistol is fired an echo is heard a short time later.

(a) Suggest why the runners will see the smoke from the pistol before they hear the sound.

_____ [1]

(b) Explain fully why the runners will hear an echo.

_____ [2]

Examiner Only	
Marks	Remark

- (c) The wall is 50 m behind the starter and the echo is heard 0.3 s after the pistol is fired.

Use the equation:

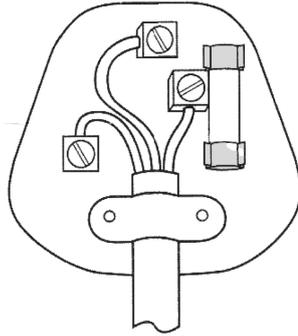
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

to calculate the speed of sound in air.
Show your working out.

Answer _____ m/s [3]

Examiner Only	
Marks	Remark

3 (a) The diagram below shows a 3-pin plug.



(i) Explain fully how the fuse protects any appliance attached to the plug.

[2]

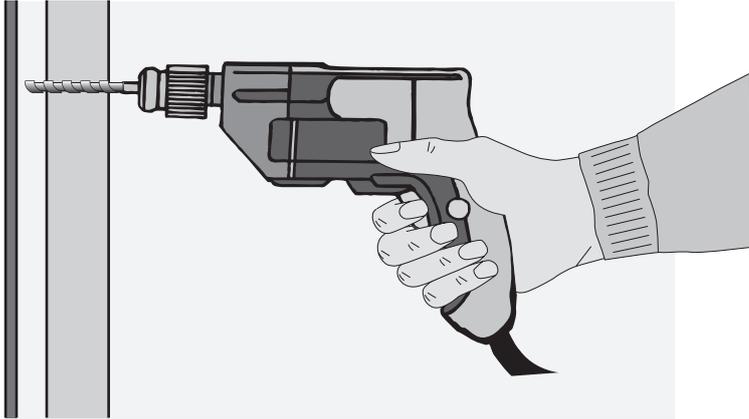
(ii) Give one other safety feature of the 3-pin plug and explain how it protects the user from electric shock.

[2]

Examiner Only

Marks Remark

(b) The picture below shows a double insulated drill.



© GCSE Single Award Science for CCEA by T Lavery, J Napier & R White, page 199, published by Hodder Murray, 2006. ISBN 978 0340926000. 'Reproduced by permission of Hodder Education'.

(i) Name the wire that is not required in the plug for this drill.

_____ [1]

(ii) Explain fully how double insulation protects the user from electric shock.

 _____ [2]

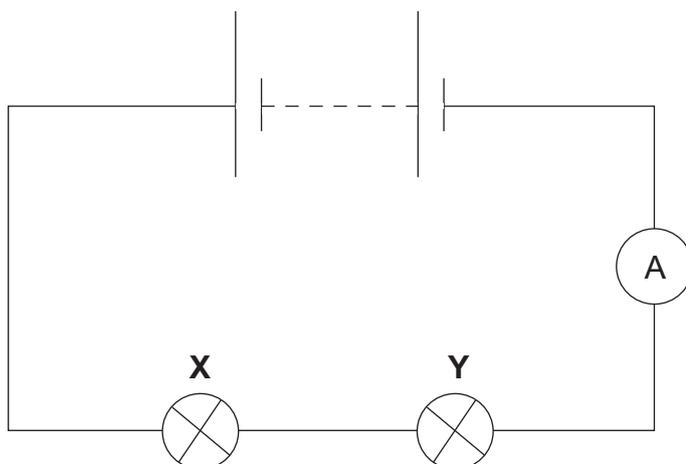
(c) In modern houses the fuses have been replaced with RCCB's (residual current circuit breakers).

State one reason why RCCB's are considered to be better than fuses.

_____ [1]

Examiner Only	
Marks	Remark

- 4 (a) The circuit diagram below shows two identical bulbs each with a resistance of $4\ \Omega$.



- (i) The ammeter reading is 2 A .

Use the equation:

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

to calculate the voltage across bulb X.

Answer _____ V [2]

- (ii) What is the total voltage supplied by the power supply?

Answer _____ V [1]

- (iii) If bulbs X and Y are now connected in parallel with the same power supply, what will be the voltage across each bulb?

Answer _____ V [1]

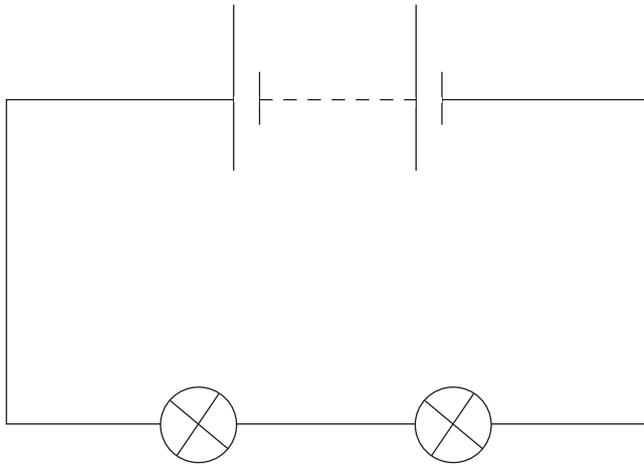
Examiner Only

Marks Remark

- (b) Suggest and explain why it is safer to have car headlights connected in parallel.

 [2]

- (c) (i) Show, using an arrow, the direction of conventional current flow on the circuit diagram below.



[1]

- (ii) Explain fully why the current actually flows in the opposite direction.

 [2]

Examiner Only	
Marks	Remark

- 5 (a) The following article about wireless networking fears appeared in a newspaper.

Wireless networking (Wi-fi) fears are “unproven”

Wi-fi technology uses electromagnetic radiation to communicate between routers and laptops.

More and more schools are now installing wireless networks but some people have reported suffering from ill-health as a result.

The BBC’s Panorama programme employed a scientist to measure electromagnetic radiation levels. He measured radiation levels, once, 100m from a mobile phone mast and 1 m from a school laptop computer.

The scientist reported that measurements of radiation levels near the laptop were three times higher than those 100m from the phone mast, although they were still 600 times less than the government’s safety limits.

Other scientists have criticised the findings, saying they are ‘unscientific’.

Adapted from: “Wi-fi health fears are ‘unproven’”, 21 May 2007 © BBC News @bbc.co.uk 2012

- (i) Give two reasons why these results are described as ‘unscientific’.

[2]

- (ii) The report states that “some people have reported suffering from ill-health as a result.”

Name a health risk associated with the radiation from mobile phones.

[1]

Examiner Only	
Marks	Remark

(b) The electromagnetic spectrum of waves is shown in the table below.

Gamma rays	X-rays	Ultraviolet light	Visible light	Infra red	Micro waves	Radio waves
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(i) State one feature all electromagnetic waves have in common.

_____ [1]

(ii) Explain fully why gamma rays are much more dangerous than ultraviolet.

_____ [2]

Examiner Only	
Marks	Remark

- 6 The picture below shows a combined microwave oven and traditional grill.



© Argos UK Plc

- (a) (i) Explain fully the microwave heating effect in terms of energy absorption and molecular behaviour.

[3]

- (ii) Suggest why food is more likely to be burnt when using a traditional grill.

[1]

- (b) This combined microwave oven and grill has a power rating of 900W.

Use the equation:

$$\text{cost} = \text{power} \times \text{time} \times \text{cost per unit}$$

to calculate the cost of using this appliance 30 mins per day for a week given that the cost of each unit of electricity is 21p.

Cost _____ p [3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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