Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Electricity, Waves and Communication
Module 5

Higher Tier

[GSC52]

GSC52

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.15 am

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.

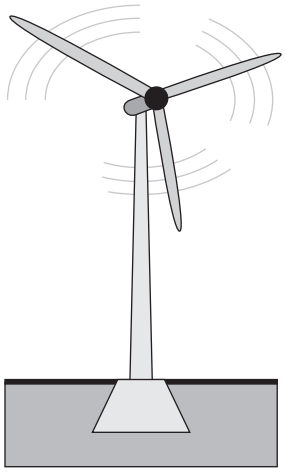
INFORMATION FOR CANDIDATES

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	

Examiner Only	
Marks	Remark

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]

(iii) Apart from timing the bulb until it is completely out, state **two** other things that need to be done to ensure that the results are valid.

_____

_____

_____ [2]

(iv) It is difficult to know exactly when the bulb is completely out.

Suggest how this will affect the results.

_____

_____ [1]

(b) Wind is classified as a renewable energy source.

(i) Name another renewable energy source.

_____ [1]

(ii) Explain fully why developing alternative renewable energy sources is becoming more important for the environment.

_____

_____

_____

_____

_____ [3]

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:

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

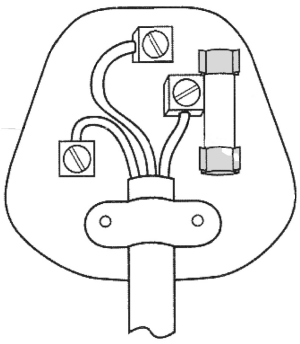
to calculate the speed of sound in air.
Show your working out.

Answer _____ m/s [3]

Examiner Only	
Marks	Remark

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]

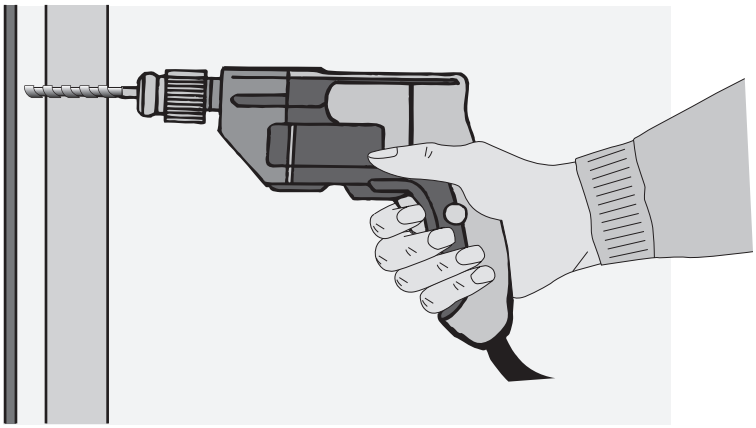
(ii) Give one other safety feature of the 3-pin plug and explain how it protects the user from electric shock.

_____

_____

_____ [2]

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



(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).

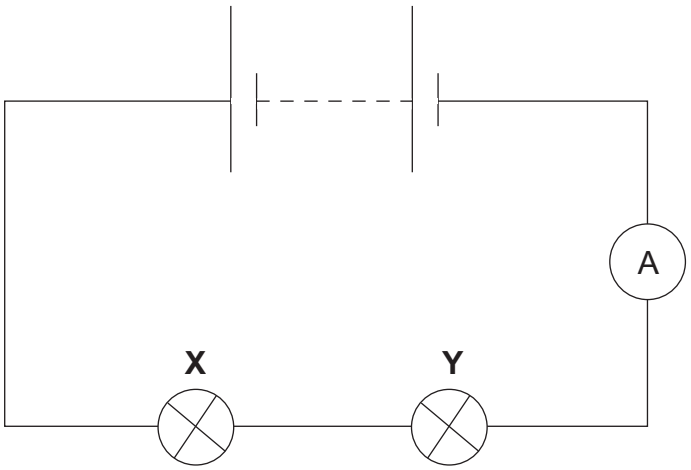
State one reason why RCCB's are considered to be better than fuses.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The circuit diagram below shows two identical bulbs each with a resistance of 4 Ω.



(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]

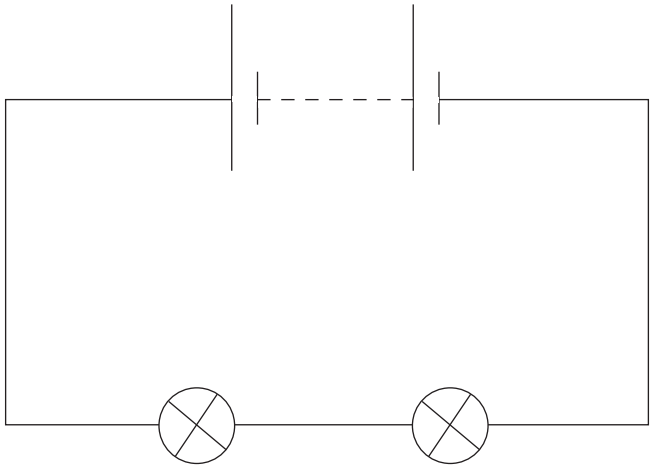
(b) Suggest and explain why it is safer to have car headlights connected in parallel.

_____

_____

_____ [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

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, 100 m 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 100 m 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]

(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

(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

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 900 W.

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]

THIS IS THE END OF THE QUESTION PAPER

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