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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

THURSDAY 24 MAY 2012, MORNING

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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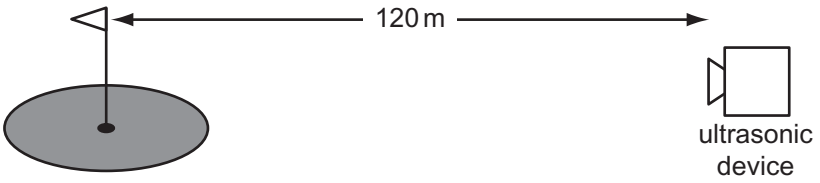
Marks	Remark

1 The diagram below shows how a golfer can use an ultrasonic (ultrasound) device to measure the distance to the flag.



(a) The device shows a distance of 120 m and the return time for the signal was 0.8 s.

Use the equation:

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

to calculate the speed of sound in air.

(Show your working out.)

Answer _____ m/s [3]

(b) (i) Explain fully what is meant by the term 'ultrasound'.

_____

_____

_____ [2]

(ii) Apart from measuring distance give another use of ultrasound.

_____ [1]

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(c) Ultrasound is a longitudinal wave and light is an example of the other type of wave.

(i) Name this other **type** of wave.

_____ [1]

(ii) State **one** feature both light and sound waves have in common.

_____ [1]

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2 The table below shows the cost per unit of generating electricity from some energy sources available in the UK.

Energy source	Building cost/p	Fuel cost/p	Running cost/p	Decommissioning cost/p	Total cost/p
Coal	1.1	1.5	0.3	0.1	3.0
Gas	0.4	2.5	0.5	0.1	3.5
Nuclear	1.5	0.5	0.5	2.5	5.0
Wind	4.2	none	0.9	0.2	5.3
Tidal	4.9	none	1.7	0.2	

(a) Calculate the total cost per unit of using **tidal** energy.

Answer _____ p [1]

(b) Use the information in the table to state two differences between the costs of using renewable sources compared to using non-renewable sources for electricity generation.

1. _____

_____

2. _____

_____ [2]

Nuclear power has the most expensive decommissioning cost.

(c) Describe fully what happens during decommissioning and suggest **one** reason why it is so expensive.

_____

_____

_____

_____

_____ [3]

(d) Apart from cost give **one** disadvantage of using tidal energy.

_____

_____ [1]

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(Questions continue overleaf)

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3 The picture below shows a dynamo connected to a bicycle wheel and lamp.

"Picture of a dynamo"

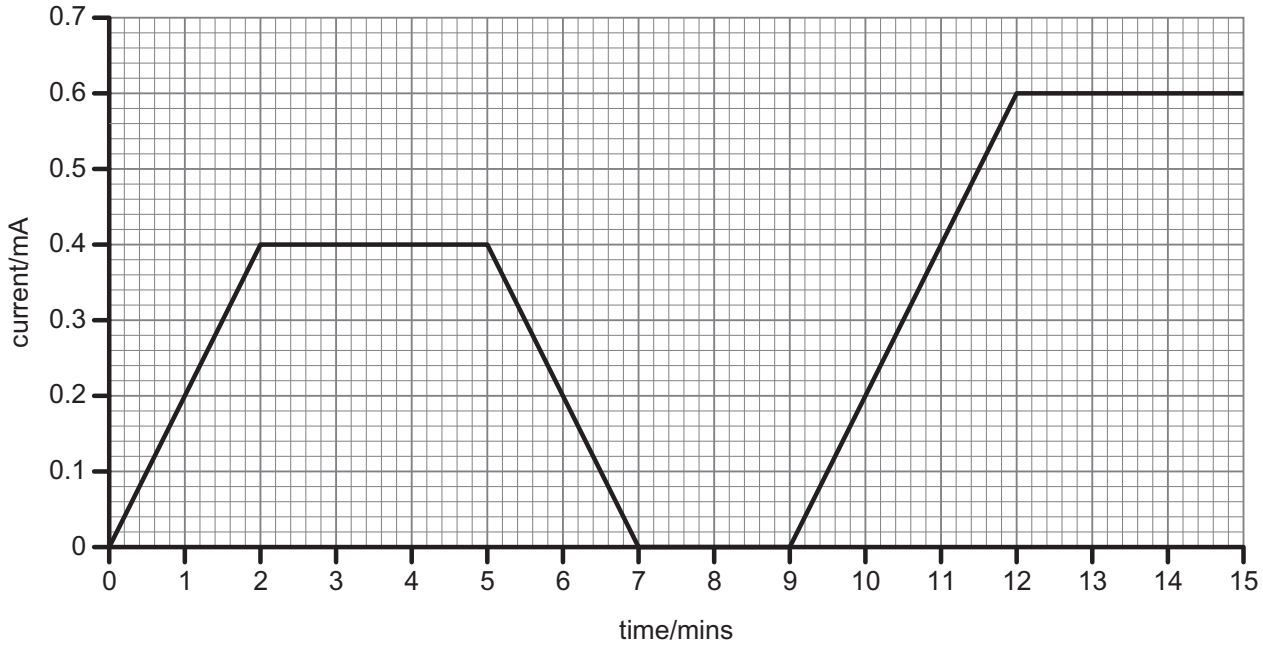
(a) A dynamo is a small generator. Describe fully what happens inside the dynamo to generate the electricity.

_____

_____

_____ [2]

(b) The graph below shows how much current is flowing from the dynamo to the lamp during a 15 minute cycle ride.



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(i) How much current is being produced at 6 minutes?

_____ mA [1]

(ii) Between which times would you suggest the bicycle is moving fastest?
Explain your answer.

Times _____ and _____

Explanation _____

_____ [2]

(iii) Suggest a reason why dynamo powered lamps are considered less safe than battery powered lamps.

_____

_____ [1]

(c) A 6 V battery is used to supply a 2.4 W bulb.

Use the equation:

$$\textbf{current} = \frac{\textbf{power}}{\textbf{voltage}}$$

to calculate the current flowing from the battery to the bulb.

(Show your working out.)

Answer _____ A [2]

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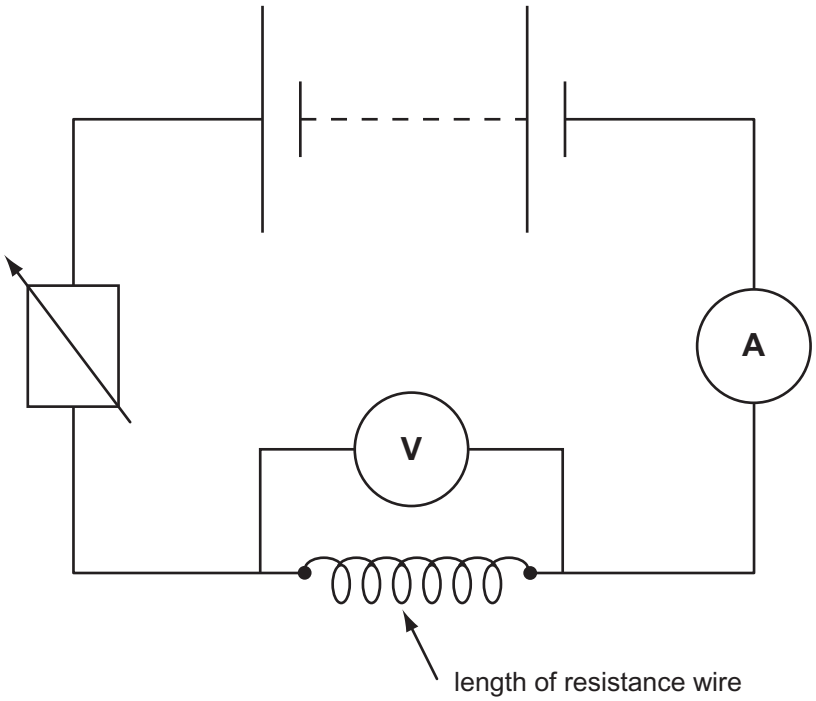
4 The circuit below was set up to measure the resistance of a length of wire.



(a) How can the current through the resistance wire be changed without changing the batteries?

_____

_____ [1]

(b) **(i)** Draw an arrow on the diagram to show the direction of conventional current flow. [1]

(ii) Explain fully the difference between conventional current flow and how the current actually flows around the circuit.

_____

_____

_____ [2]

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(c) When different lengths of wire were put into the circuit the following results were found.

Length/cm	Current/A	Resistance/ohms
25	2.00	1.5
50	1.58	1.9
75	1.25	2.4
100	1.03	2.9
125	0.91	3.3

(i) State **two** trends shown by the results in the table.

_____

_____

_____

_____ [2]

(ii) Apart from length, name another property of a wire which affects resistance.

_____ [1]

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Marks	Remark

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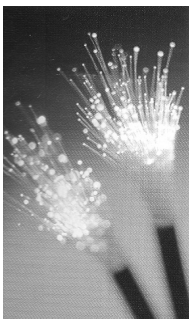
5 The picture below shows two bundles of optical fibres.



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(a) Total internal reflection allows light to pass along optical fibres. Explain fully how total internal reflection is achieved inside optical fibres.

_____

_____

_____ [2]

(b) **(i)** Suggest two reasons why optical fibres are replacing copper wire in telephone communications.

1. _____

_____ [1]

2. _____

_____ [1]

(ii) Apart from communications give another use for optical fibres.

_____ [1]

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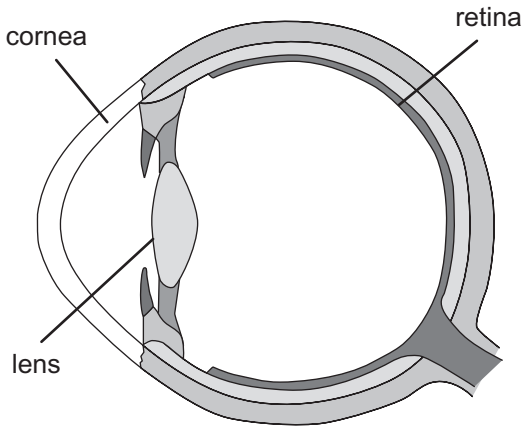
6 The diagram below shows the human eye.



© CCEA GCSE Single Award in Science Foundation Tier byA G McFarland, C Murphy & J Napier, page 114, published by Hodder Education, 2009. ISBN 978 0340 974728. 'Reproduced by permission of Hodder Education'.

(a) Use the diagram and your knowledge to explain fully what happens to parallel rays of light as they pass through the eye.

_____

_____

_____

_____

_____ [3]

(b) Short sight and astigmatism are two common eyesight problems.

(i) Describe fully the cause and effect of short sight.

_____

_____

_____

_____

_____ [3]

(ii) Name the type of lens required to correct short sight.

_____ [1]

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(iii) What is the cause of astigmatism?

_____

_____ [1]

(iv) Suggest how an optician could test for astigmatism.

_____

_____

_____

_____ [2]

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THIS IS THE END OF THE QUESTION PAPER

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