Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2010 – 2011

Science: Single Award (Modular)

Electricity, Waves and Communication

Module 5

Higher Tier

[GSC52]

GSC52

THURSDAY 11 NOVEMBER 2010, AFTERNOON

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 In an experiment on hearing, different frequencies were played to 20 teenagers and 20 pensioners. The number who could hear each frequency was recorded.
The results are shown in the table below.

Frequency (kHz)	Number who could hear each frequency	
	Teenagers	Pensioners
12	20	20
14	20	18
16	20	15
18	20	12
20	20	0
22	0	0

(a) (i) Describe fully what the information in the table tells us about hearing in teenagers.

_____

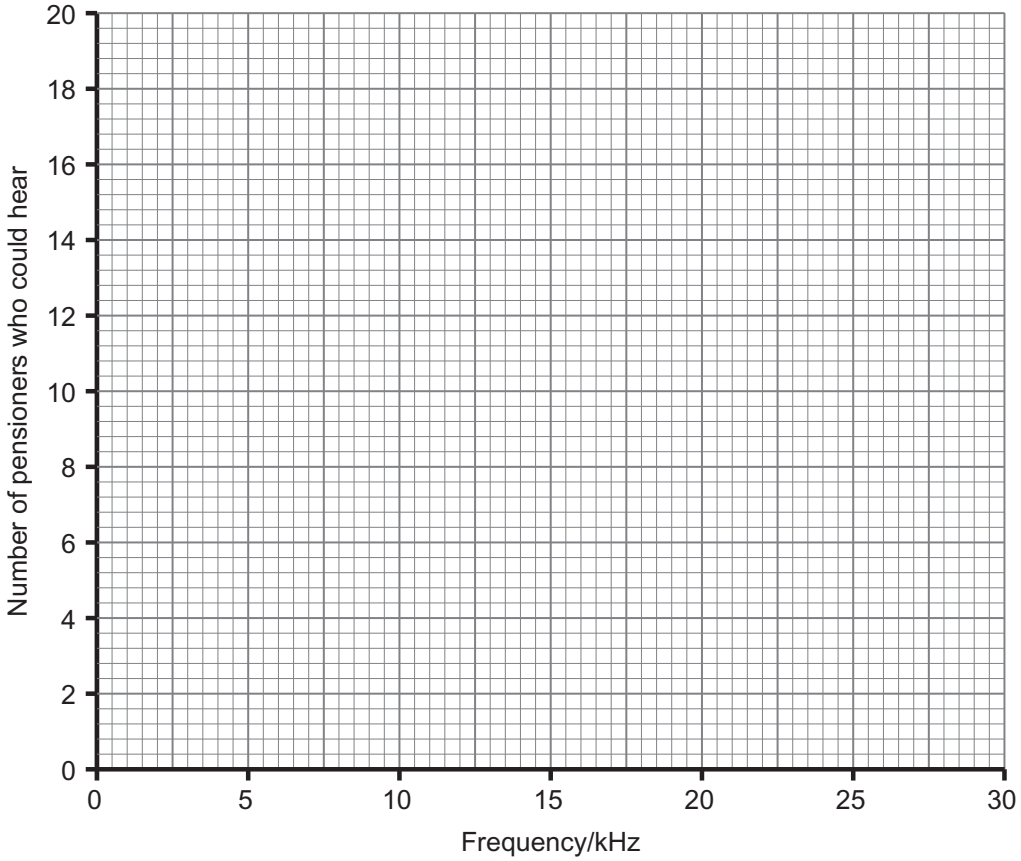
_____

_____ [2]

(ii) What name is given to sounds above 20 kHz?

_____ [1]

(b) Plot a line graph below for the **pensioners'** results.



[3]

(c) **(i)** Describe fully a conclusion that can be drawn about our ability to hear different frequencies as we get older.

_____

_____

_____ [2]

(ii) How could the accuracy of these results be improved?

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** A charity wanted to build a water pump in a remote desert area of Africa. They had the choice of a petrol generated or solar powered pump. Explain fully why they considered the solar powered pump the better choice.

_____

_____

_____

_____

_____ [3]

(b) The water pump has a power rating of 1 kW and a voltage of 250 V. Calculate the current flowing in the lead connecting the water pump to the generator.

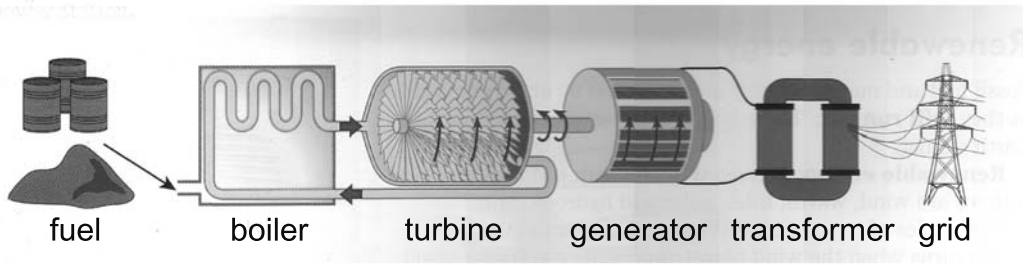
Use the equation:

$$\text{Current} = \frac{\text{Power}}{\text{Voltage}}$$

Answer _____ A [3]

Examiner Only	
Marks	Remark

3 **(a)** The diagram below outlines the component parts of a fossil fuel power station.



(i) Describe fully how electricity is made inside the generator.

_____

_____

_____ [2]

(ii) Suggest how the amount of electricity produced by the generator can be increased.

_____

_____ [1]

(iii) State the energy changes that occur in the:

Boiler _____ → _____ [1]

Turbine _____ → _____ [1]

(b) Nuclear power can also be used to generate electricity. A major disadvantage is the eventual cost of decommissioning (shutting down and making the plant safe).
Explain fully why decommissioning is so expensive.

_____

_____

_____

_____

_____ [3]

4 Mobile phones send digital signals using electromagnetic waves.

Examiner Only	
Marks	Remark

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(a) (i) Describe the main features of analogue and digital signals.

Analogue _____ [1]

Digital _____ [1]

(ii) Name a type of electromagnetic wave used in mobile phone communications.

_____ [1]

(b) The table below gives the SAR rating (Specific Absorption Rate) of 5 popular mobile phones.

Model	SAR (W/kg)
A	0.94
B	0.53
C	1.18
D	0.52
E	1

SAR (specific absorption rate) is a measurement of how much electromagnetic radiation is absorbed by body tissue whilst using a mobile phone. The higher the SAR the more radiation is absorbed. The maximum recommended level in the UK is 2 W/kg but experts warn that children are twice as sensitive to radiation as adults.

Use the information given to answer the following questions.

Examiner Only	
Marks	Remark

(i) Which phone (A, B, C, D or E) would be the safest purchase? Explain your choice.

Choice _____

Explanation _____

_____ [1]

(ii) Explain fully why model C should not be used by children.

_____

_____

_____ [2]

(c) Apart from considering SAR values suggest two other ways that mobile phone users can reduce their exposure to electromagnetic radiation.

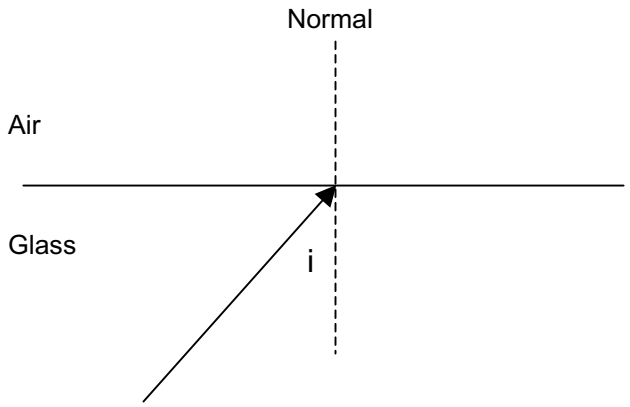
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

5 During an experiment rays of light were incident onto a glass-air boundary as shown in the diagram below.



(a) Describe fully what happens to a ray of light at the following angles of incidence (i):

(i) 40° (less than the critical angle)

_____

_____ [2]

(ii) 42° (critical angle)

_____

_____ [2]

(iii) 44° (greater than the critical angle)

_____

_____ [2]

(b) Optical fibres have replaced copper as communication cables because they can carry more information.
Explain fully the reason for this choice.

_____

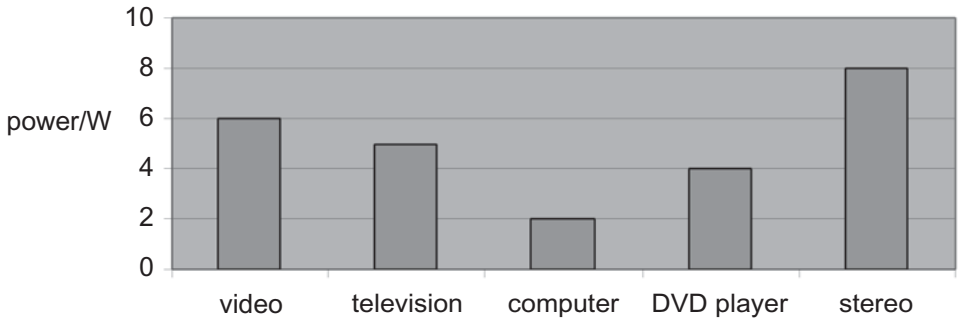
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

6 The bar chart below shows how much electrical power appliances use when left on Standby.



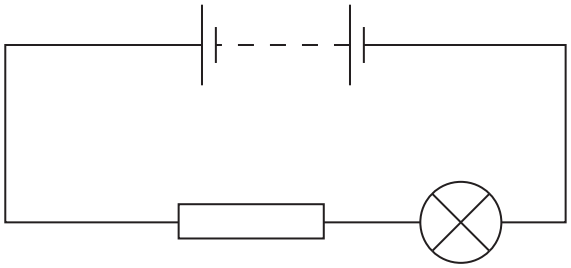
(a) Calculate the cost of leaving the video and DVD player on Standby for 1 month (300 hours).
Each unit of electricity costs 18p per kWhr.

Use the equation:

Total cost = power × time × cost per unit

Answer _____ p [3]

(b) Explain the difference between actual and conventional current flow. You may use the diagram to help your answer.



_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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