

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A**

A326/02

Communications
(Higher Tier)

**Friday 23 January 2009
Morning**

Duration: 45 minutes

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.
- The total number of marks for this paper is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	5	
2	6	
3	9	
4	5	
5	5	
6	6	
TOTAL	36	

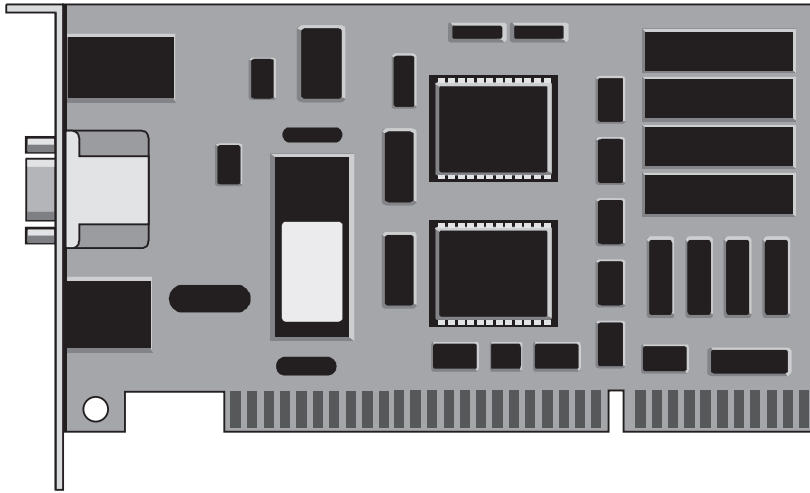
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Answer **all** the questions.

- 1 Joe is a computer technician. He repairs a circuit board.



He decides to replace a burnt out resistor.

The value needs to be $200\ \Omega$. The largest voltage across the resistor will be 5V.

Joe does calculations to make sure that the new resistor will not burn out.

- (a) Show that the maximum current in the resistor is about 0.03 A.

Use the equation $I = \frac{V}{R}$.

current = A [2]

- (b) Calculate the maximum heating power of the resistor.

Use the equation $P = VI$.

power = W [2]

- (c) Joe chooses the maximum heating power of the resistor so that it doesn't burn out.

Which value should he choose?

Put a **ring** around the answer.

0.01W

0.05W

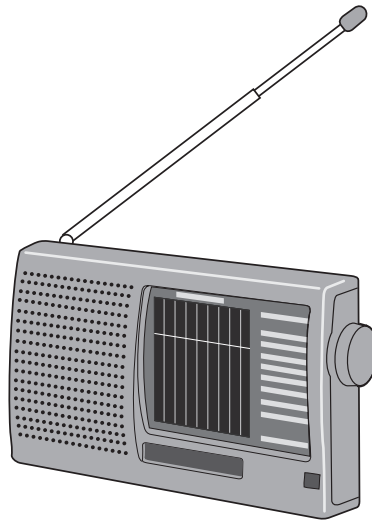
0.1W

0.2W

[1]

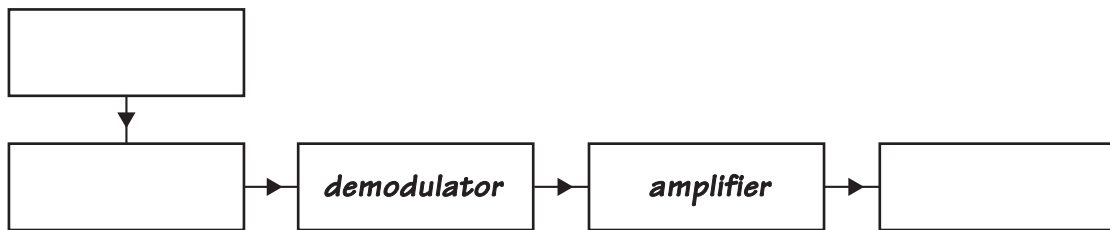
[Total: 5]

2 Sam has a portable radio receiver.



She tunes the radio to receive Radio CA, so that she can listen to her favourite music.

Here is an incomplete block diagram for the radio receiver.



- (a) Complete the block diagram. [3]
- (b) Draw diagrams of the signals entering and leaving the amplifier to show what the amplifier does.

input signal

output signal



(c) Why does Sam have to tune the radio before she can listen to Radio CA?

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..... [1]

[Total: 6]

3 Julie uses a mobile phone a lot. It helps her to keep in touch with her friends.

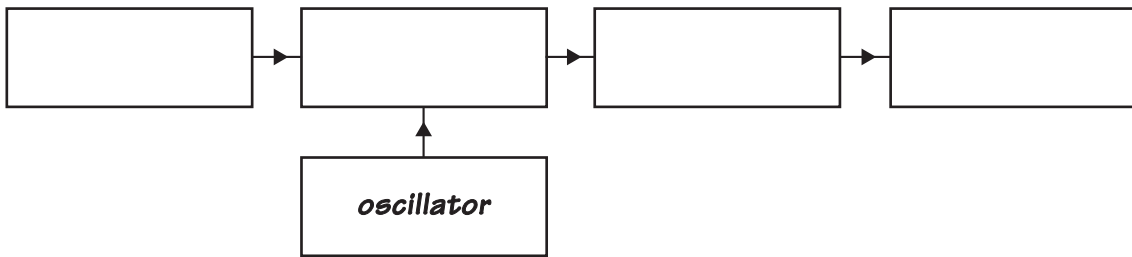


(a) Julie's phone uses amplitude modulation of microwaves to transfer information.

(i) Complete this block diagram for the radio transmitter in her mobile phone.

Choose words from this list.

aerial amplifier loudspeaker microphone modulator



[3]

(ii) A microwave carrier transfers information from a voice signal.

It uses amplitude modulation.

Explain how amplitude modulation allows voice information to be coded onto a microwave.
You may draw labelled diagrams to help your answer.

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[3]

(b) Julie often finds that her mobile phone doesn't work well in and around large buildings.



Explain why mobile phone reception can be poor in and around large buildings.

Use ideas of reflection, absorption and interference of microwaves.

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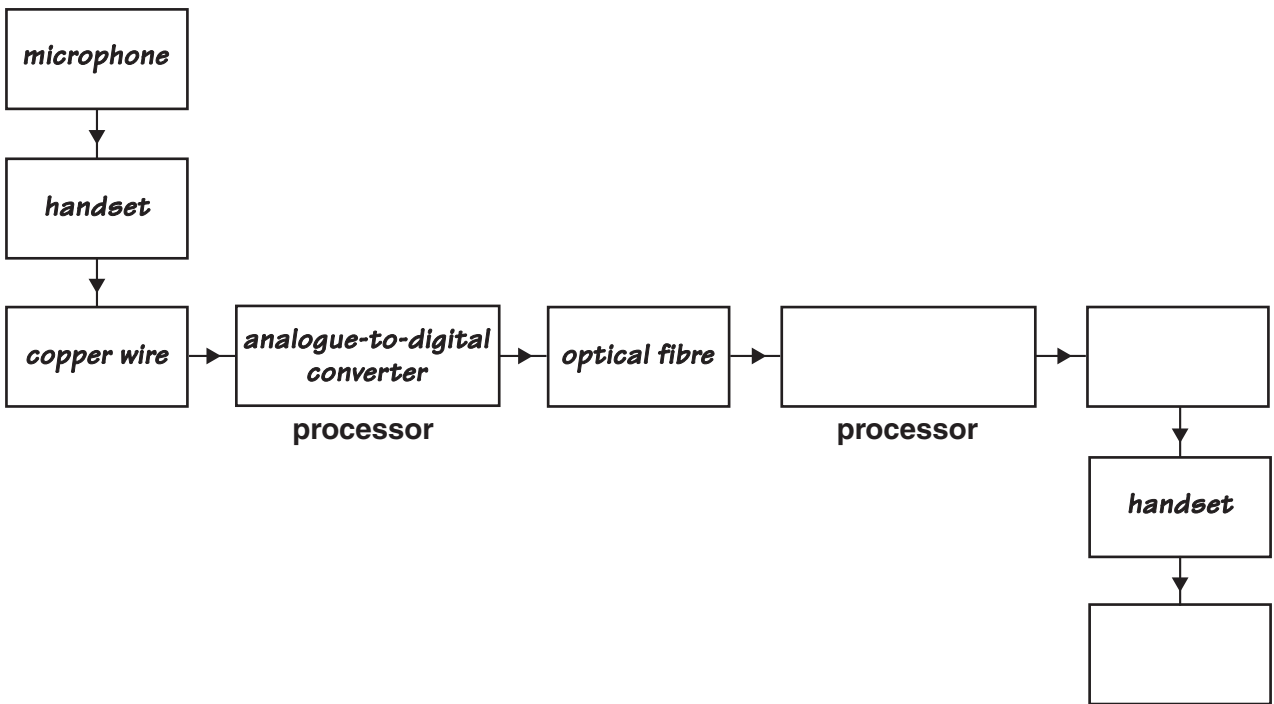
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..... [3]

[Total: 9]

4 Here is an incomplete block diagram showing a connected call through a telephone network.



(a) Complete the diagram by filling in the boxes. [3]

(b) The sentences explain how the analogue-to-digital converter works.

They are not in the correct order.

- A The whole process is repeated.
- B The voltage of the signal is sampled.
- C The voice signal enters the converter.
- D A binary word representing a sample is created.
- E Each bit of the word is sent out of the converter one after the other.

Complete the boxes to show the correct order.

The last one has been done for you.

				A
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[2]

[Total: 5]

5 Andy goes shopping for an MP3 player.



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(a) The MP3 player is powered by rechargeable batteries.

Give **two** advantages and **two** disadvantages of operating electronic technology from batteries.

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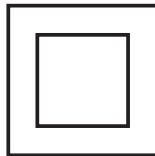
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..... [2]

(b) Andy is anxious for his safety.

He looks for this symbol on the mains recharging unit.



What does the symbol mean? Explain how its presence increases Andy's safety.

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..... [3]

[Total: 5]

Turn over

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