

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

A326/01

Communications
(Foundation 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	10	
2	6	
3	5	
4	4	
5	5	
6	6	
TOTAL	36	

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Answer **all** the questions.

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



(a) The invention of the mobile phone has increased the **quantity** of human communications.

(i) State **another** example of an electronic system which has increased the quantity of communications between people.

..... [1]

(ii) How does your example allow people to communicate?

You may use a labelled diagram.

.....
.....
.....
..... [2]

(b) Mobile phone systems use microwaves to transfer information about sound waves. They use amplitude modulation.

Draw straight lines to link each **feature of the system** with its correct **technical term**.

feature of the system	technical term
mobile phone	signal
microwave	carrier
sound wave	modulator

- (c) Julie often finds that her mobile phone doesn't work well in large buildings.



Here are some ideas why phone reception is poor in a large building.

Underline the correct reason.

- a different sort of aerial is needed inside a building**
the microwaves are absorbed by the walls of the building
other people in the building use a different microwave frequency

[1]

- (d) Julie's mobile phone provider has a licence to use a range of microwave frequencies.

- (i) Complete the sentences. Choose words from the list.

broadcast government interfere phone manufacturer
radio shop power receive price size

The provider buys the licence from the

The licence allows the provider to a spread of microwave frequencies.

The range of a mobile phone is kept low by limiting its

[3]

- (ii) What is a typical microwave frequency used for mobile phones?

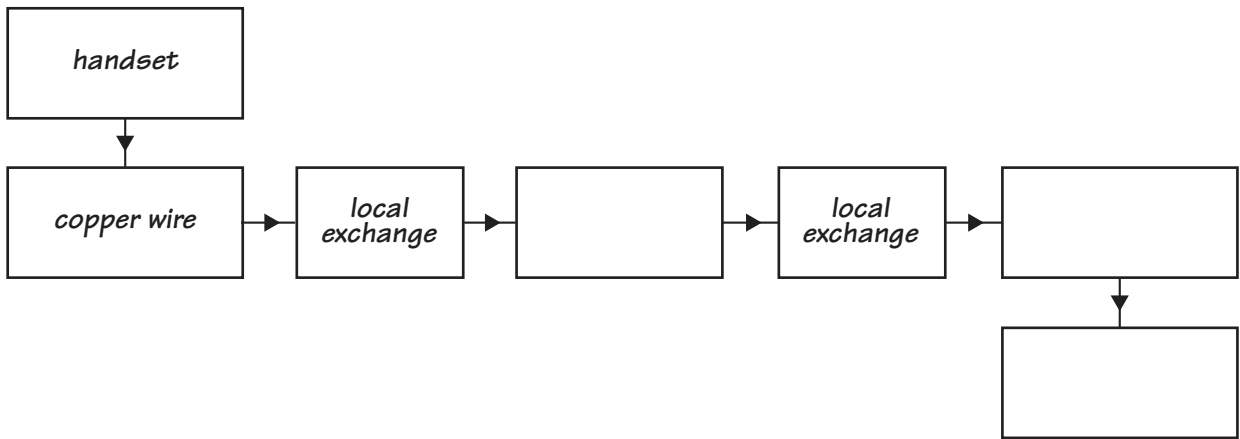
Put a ring around the answer.

100 MHz 600 MHz 2 GHz 10 GHz

[1]

[Total: 10]

2 Here is an incomplete block diagram for a telephone network.



The network uses optical fibres to carry signals between places that are far apart.

(a) Complete the block diagram. Choose words from the list.

- copper wire handset optical fibre power supply**

[3]

(b) Human voices are **analogue** signals.
Optical fibres carry digital signals.

Here are some ideas about communications signals.

Put ticks (✓) in the boxes next to the **two** correct ideas.

Digital signals can have any value.

Analogue signals are easy to encrypt.

Digital signals travel faster than analogue signals.

Analogue signals need much simpler circuits than digital signals.

Digital signals can transfer information without being affected by noise.

[2]

(c) How do signals travel through optical fibres?

Put a **ring** around the **correct** answer.

as electric current

as infrared pulses

as radio waves

[1]

[Total: 6]

3 Andy goes shopping for an MP3 player.



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(a) He writes a list of key factors for the MP3 player.

memory capacity must be at least 1 Gbyte
it mustn't cost more than £50

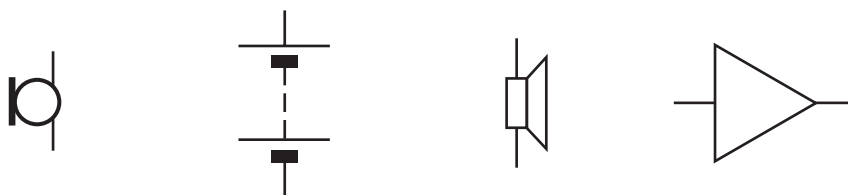
Add three more key factors for Andy to consider.

[3]

(b) Andy's new MP3 player is powered by batteries.

(i) Here are some electrical symbols.

Put a **ring** around the battery symbol.



[1]

(ii) Batteries have to be replaced when they run out of energy.
What is the advantage of using batteries to power communication systems?

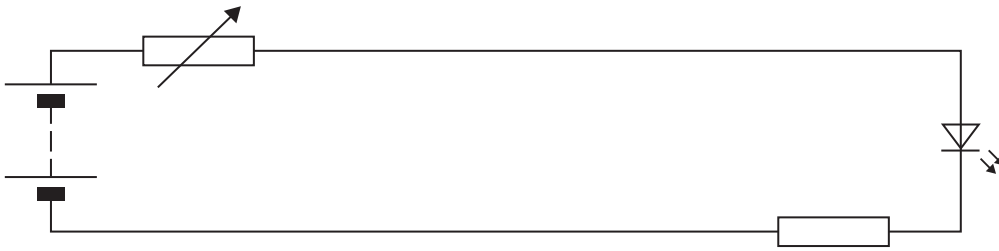
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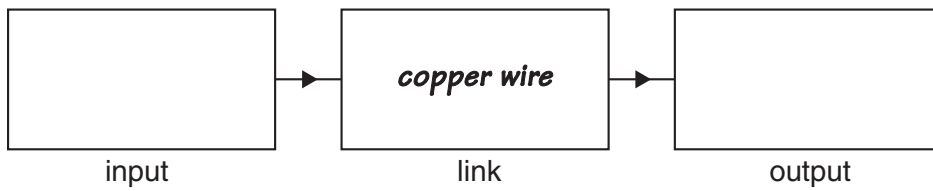
..... [1]

[Total: 5]

4 Here is a circuit diagram of a simple signalling system.



Here is a block diagram for the same system.



(a) Look at the circuit diagram. Use it to complete the block diagram.

Choose words from the list.

- LED variable resistor LDR**

[1]

(b) The signalling system uses copper wire as the link.

(i) Give another example of a communication system which uses copper wire as the link.

..... [1]

(ii) State the input and output devices for your example.

input

.....

output

..... [1]

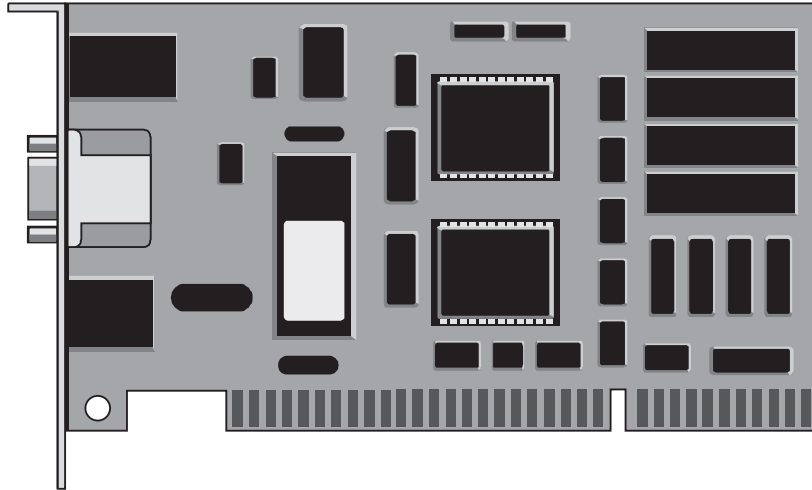
(iii) Why is copper wire the best type of link for your example?

.....

..... [1]

[Total: 4]

- 5 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 0.03A .

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

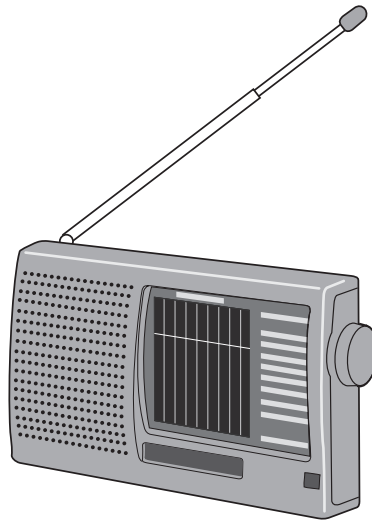
0.1W

0.2W

[1]

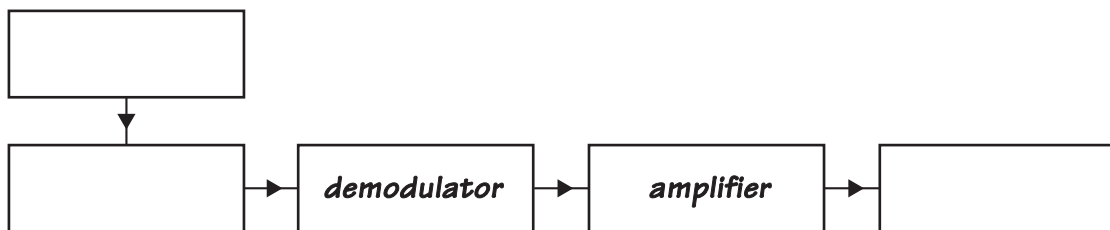
[Total: 5]

6 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?

.....
.....
..... [1]

[Total: 6]

END OF QUESTION PAPER

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