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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

A326/01

**TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A**

Communications (Foundation Tier)

WEDNESDAY 1 FEBRUARY 2012: Afternoon

DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The total number of marks for this paper is 36.**

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Answer ALL the questions.

1 Ali is going to buy a new mobile phone.

(a) Ali writes down KEY FACTORS for his phone and the REASONS for them.

| KEY FACTOR | REASON |
|-------------------|---|
| cost | I can only afford up to £20 a month. |
| fashion | I want to be up to date. |
| signal | I must have good signal in the places where I go. |
| | |
| | |

Write down TWO more key factors in the table. Include reasons for them.

[2]

(b) Ali finds out that microwaves behave like radio waves.

This explains why the mobile phone signal is better in some places than others.

Draw straight lines to join each PROPERTY of microwaves to HOW IT AFFECTS THE SIGNAL.

| PROPERTY | HOW IT AFFECTS THE SIGNAL |
|---------------------|---|
| absorption | Microwaves which arrive by different paths can cancel. |
| reflection | Microwaves bounce off buildings instead of passing through them. |
| interference | The strength of microwaves goes down as they pass through walls. |

[2]

(c) What type of aerial should Ali's phone have? Put a ring around the answer.

DISH RECEIVER

FERRITE ROD

SIMPLE DIPOLE

[1]

[Total: 5]

2 Jill is a reporter for the local newspaper.

She uses her phone to record interviews with people.

(a) Complete the sentences to explain how the phone converts sound into a digital signal.

Choose words from this list.

ANALOGUE

BINARY

FRAME

LONG

PHOTO

SAMPLE

The microphone makes a signal which is

_____ .

The phone takes a _____ of

the signal many times each second, creating a

series of _____ words. [3]

(b) The phone records information and stores it in its memory.

Each second of recording makes 5 kilobytes of information.

The memory is full when it holds 20 000 kilobytes of information.

(i) Calculate how long it takes to fill the memory.

time = _____ s [1]

(ii) When Jill gets back to the office she stores her recordings onto the hard disk of her computer.

State ANOTHER device she could use to store the recordings from her phone.

_____ [1]

(c) Jill's father used to work for the same newspaper.

He had to use magnetic tape to record interviews.

Magnetic tape stores information in analogue form.

Here is a list of possible disadvantages of storing information in analogue form.

Put ticks (✓) in the boxes next to the TWO correct disadvantages.

The circuits are very expensive.

The circuits are very complicated.

The information can't be encrypted.

A lot of the information is lost when it is stored.

Some of the information is lost each time it is copied.

[2]

[Total : 7]

3 A fax system transmits images of printed pages from one place to another.

(a) Complete this block diagram for a fax system. Choose words from this list.

DECODER ENCODER PRINTER SCANNER



[3]

(b) These sentences explain how a colour picture is sent by fax.

Complete each sentence by putting a ring around the correct word in BOLD.

The picture is broken into dots called

FRAMES LINES PIXELS.

The colour of each dot is coded as a binary

NOTE SHEET WORD.

[2]

- (c) The two halves of the fax system are linked by copper wire.

Describe ANOTHER communication system which uses copper wire as the link.

Give a reason why copper wire is the link.

[2]

- (d) Here is some data for a colour fax.

| | |
|-------------------------------|---------|
| word size for each pixel | 8 bits |
| number of pixels in a picture | 100 000 |

- (i) Calculate the number of bits needed to make a whole picture.

answer = _____ bits [1]

- (ii) The speed of the wire link is 160 000 bits per second.

Calculate how long it takes to transmit a picture from one place to another.

answer = _____ seconds [1]

[Total: 9]

4 Sam uses the internet at work to send emails.

(a) She makes sure that the emails are ENCRYPTED before they are sent.

(i) Suggest why she does this.

[1]

(ii) State ANOTHER example of communication where encryption is important.

What could happen if encryption was not used?

[2]

(b) The invention of email and the internet has increased the quantity of communication between people.

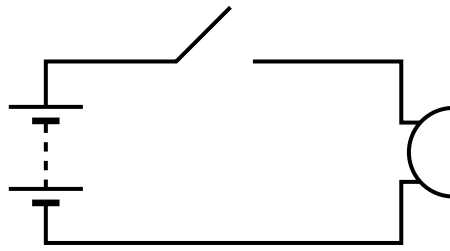
Suggest another electronic invention which has increased the QUANTITY of communication.

[1]

[Total: 4]

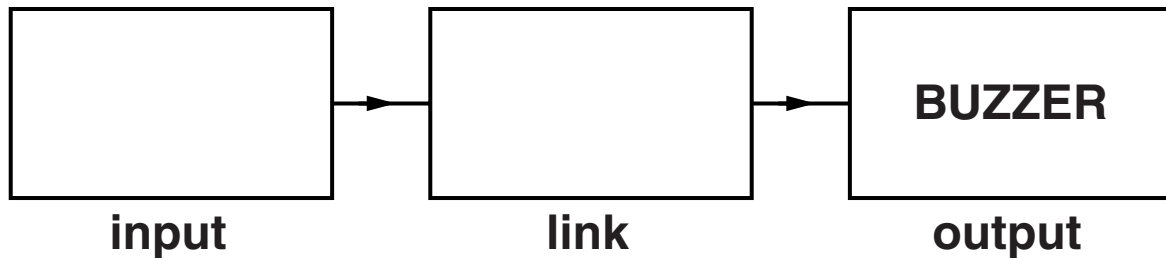
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5 Dan uses this circuit to send messages in Morse code.



Each time that he presses the switch, the buzzer makes a sound.

(a) Complete this block diagram for the circuit.



[2]

(b) The BLOCK diagram shows the flow of information through the communication system.

What does the CIRCUIT diagram show?

[1]

(c) Morse code uses long and short bursts of sound to represent letters of the alphabet.

For example, the letter G is represented by two long bursts followed by a short one.

(i) Explain how this shows that Morse code is digital and not analogue.

[1]

(ii) Give TWO advantages of sending messages with a digital code.

[2]

[Total: 6]

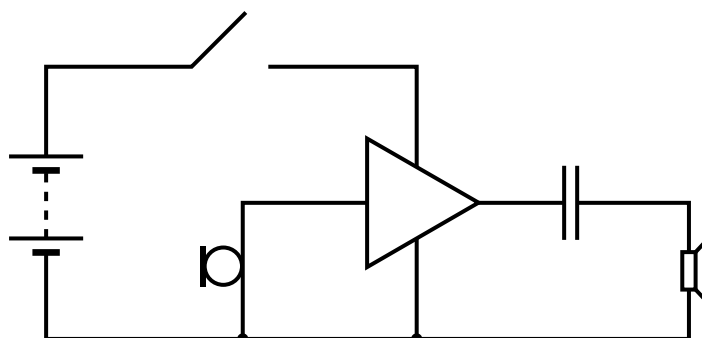
6 Sally works in the communications industry.

She repairs broken electronic equipment. One day she has a loud hailer to repair.

(a) Give ANOTHER example of a job in the communications industry which needs technical expertise.

[1]

(b) Sally finds this circuit diagram for the broken loud hailer.



(i) She starts off by testing the capacitor. Put a ring around the capacitor in the circuit diagram.

[1]

- (ii) Sally then tests the amplifier. What does the amplifier do in this circuit?

[2]

- (iii) Eventually, Sally finds that the loudspeaker in the circuit needs replacing.

The amplifier can deliver a maximum current of 0.5 A at a voltage of 3V.

What is the maximum power for the new loudspeaker?

Put a **ring** around the answer.

Use the rule $P = VI$.

0.5W

1.5W

3.0W

6.0W

[1]

[Total: 5]

END OF QUESTION PAPER

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