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OCR
RECOGNISING ACHIEVEMENT

Wednesday 1 February 2012 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A

A326/01 Communications (Foundation Tier)

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)

Duration: 45 minutes

Candidate forename		Candidate surname	

Centre number					Candidate number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

* Write your name, centre number and candidate number in the boxes above. 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).
* Do **not** write in the bar codes.

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**.
* This document consists of **12** pages. Any blank pages are indicated.

OCR is an exempt Charity

Turn over

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 a 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) Jill 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 worked for a newspaper.

He used 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. ☐

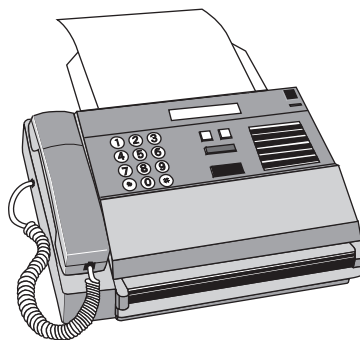A lot of the information is lost when it is stored. ☐

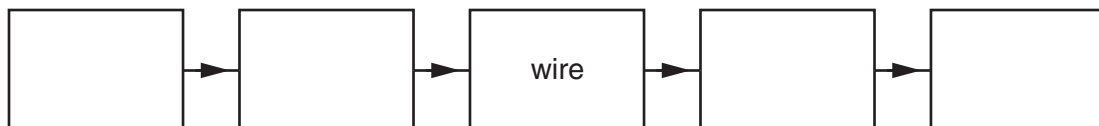Some of the information is lost each time it is copied. ☐

[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

		wire		

[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]

Turn over

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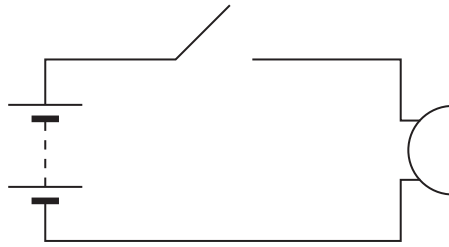
(b) The invention of email and the internet has increased the quantity of communication between people.

  Suggest another electronic invention which has increased the **quantity** of communication.

  ....

  .... **[1]**
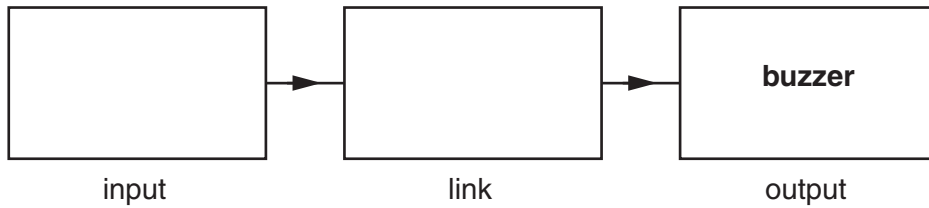
[Total: 4]

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.

		buzzer
input	link	output

[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, such as this loud hailer.

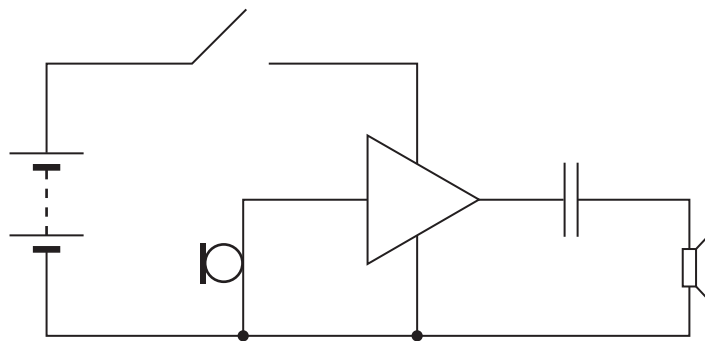**(a)** Give **another** example of a job in the communications industry which needs technical expertise.

....

....

.... **[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) 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 3 V.

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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