



F

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

Duration: 45 minutes

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, 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.

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.

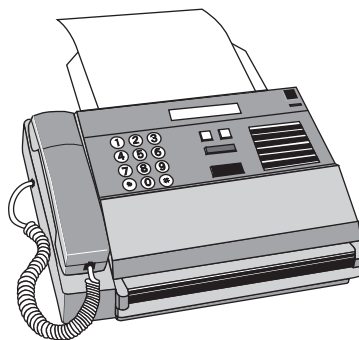
A lot of the information is lost when it is stored.

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

[2]

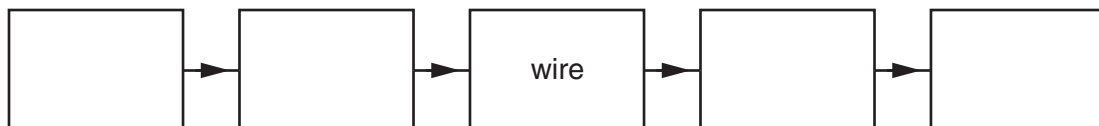
[Total : 7]

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]

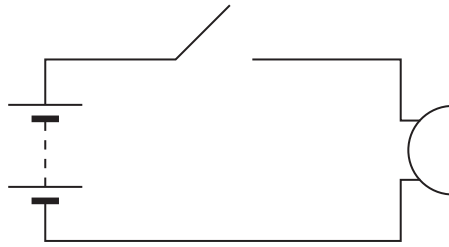
(b) The invention of email and the internet has increased the quantity of communication between people.

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

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

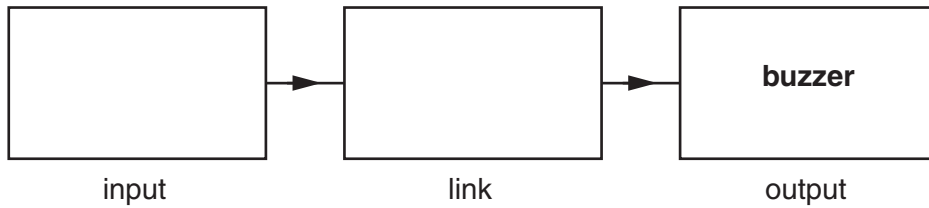
[Total: 4]

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]

Turn over

6 Sally works in the communications industry.

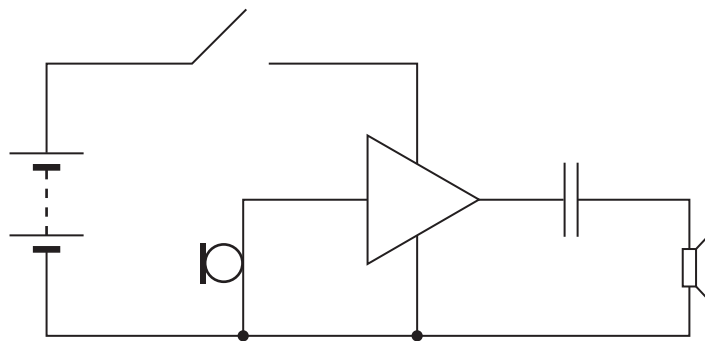
She repairs broken electronic equipment, such as this loud hailer.



(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) 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 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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