



H

**Wednesday 1 February 2012 – Afternoon**

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

**A326/02** Communications (Higher 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	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

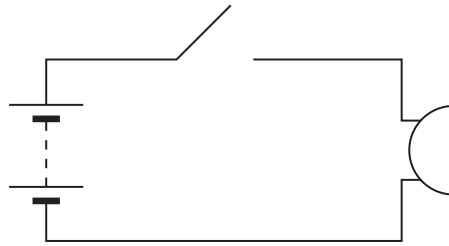
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting 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 **8** pages. Any blank pages are indicated.

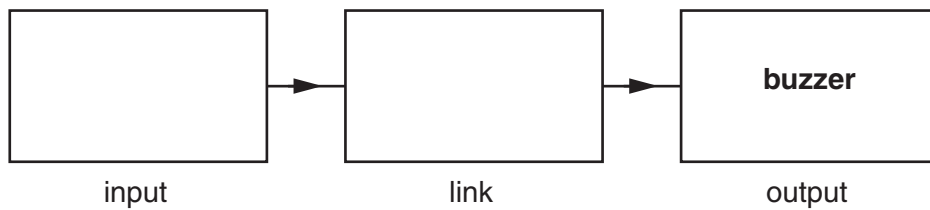
Answer **all** the questions.

1 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]

2 Sally works in the communications industry.

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



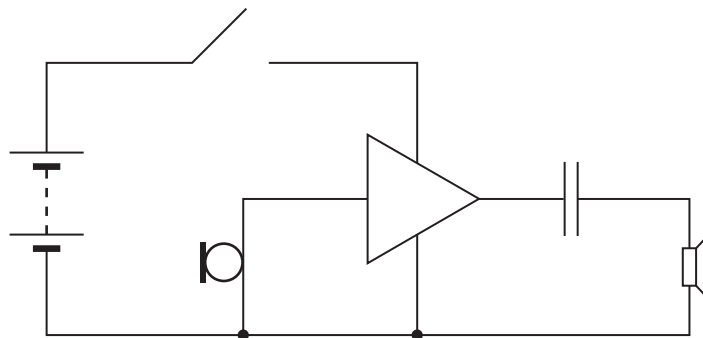
(a) Give **another** example of a job in the communications industry which needs technical expertise.

.....

.....

..... [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]

3 Ali buys a new mobile phone.



He knows that it uses microwaves to communicate with the local phone mast.

(a) What frequency will the microwaves have?

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

**10 MHz**

**100 MHz**

**1 GHz**

**10 GHz**

[1]

(b) Draw straight lines to link the **type of aerial** to the **type of receiver** for mobile phone communications.

**type of aerial**

ferrite rod

dish receiver

simple dipole

**type of receiver**

phone mast

mobile phone

satellite in orbit

[2]

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

This explains why the phone can lose signal strength.

Use properties of radio waves to explain **three** reasons why the phone can lose signal strength.

property 1 .....

.....

property 2 .....

.....

property 3 .....

..... [3]

[Total: 6]

4 Jill is a reporter for the local newspaper.



She uses her phone to record interviews with people.

(a) The phone converts sound into a digital signal so that it can be stored in the memory.

Describe how the phone receives the sound and converts it into a digital signal.

Use these words in your answer.

analogue      binary      sample

.....  
.....  
.....  
.....  
..... [3]

(b) The phone’s memory holds 14 400 kilobytes of digital information.

It takes one hour of recording to fill the memory.

Calculate the number of kilobytes of information recorded in each second.

1 hour is 3600 seconds

answer = ..... kilobytes per second [1]

(c) The digital sound information is compressed before it is stored in the memory.

(i) What is meant by **compression of information**?

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

(ii) Why is the information compressed?

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

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

He had to use magnetic tape to record interviews.



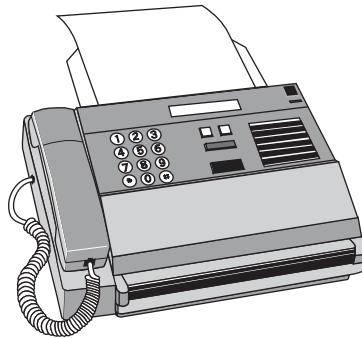
Magnetic tape stores information in analogue form.

Give **three** reasons why it is better to store information in digital form.

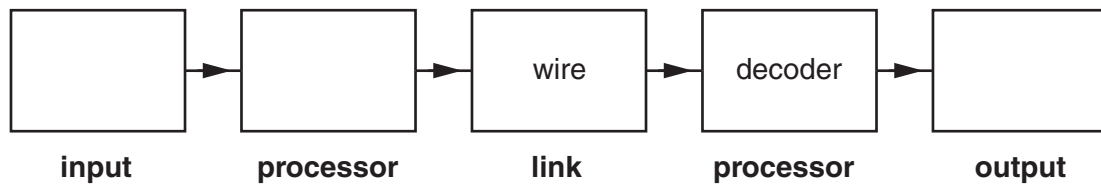
- 1 .....
  - 2 .....
  - 3 .....
- ..... [3]

[Total: 9]

5 A fax system transmits images of printed sheets from one place to another.



(a) Complete this block diagram for a fax system.



[3]

(b) The transmitter sends information along the link.

The receiver uses this to make an image of the printed sheet.

Complete the sentences using the correct technical terms.

Each complete image of the printed sheet is one ..... which is made from many lines of small ..... [2]

(c) The link in the fax system is copper wire.

Some fax systems use optical fibre instead of copper wire.

Suggest **three** advantages of using optical fibre.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- ..... [3]

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

word size for each pixel	8 bits
number of pixels in an image	100 000
speed of wire link	160 000 bits per second

Calculate how long it takes to copy an image from the transmitter to the receiver.

answer = ..... s [2]

[Total: 10]

**END OF QUESTION PAPER**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.