| Candidate forename | | Candidate surname | |
|---|---|---|---|

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

# OXFORD CAMBRIDGE AND RSA EXAMINATIONS

## GCSE

# A326/02

# TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

## Communications (Higher 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**

DC (LEO/SW) 12MEP01225 57711/1

## 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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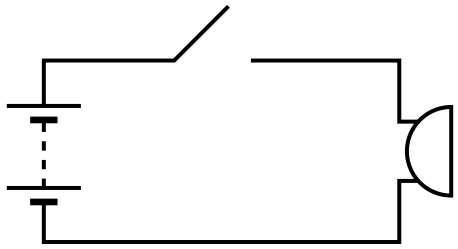
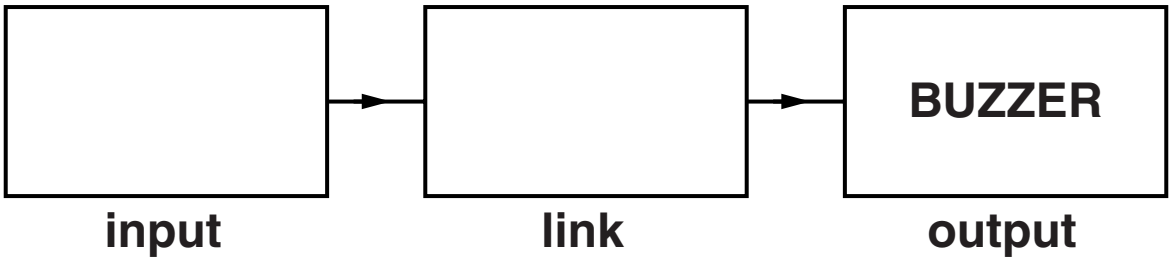
**Answer ALL the questions.**

**1 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. One day she has a loud hailer to repair.**

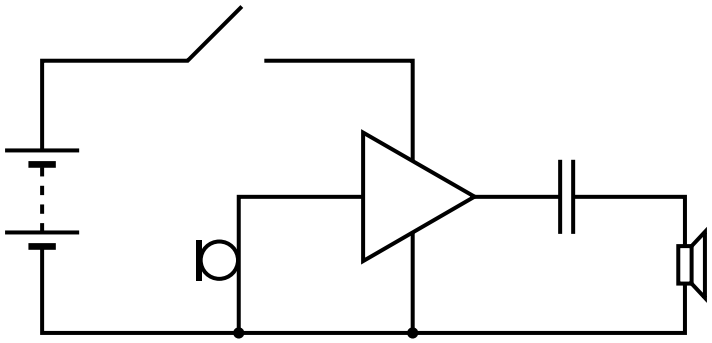
**(a) Give ANOTHER example of a job in the communications industry which needs technical expertise.**

_____

_____

_____ **[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 3 V.**

**What is the maximum power for the new loudspeaker?**

**Put a (ring) around the answer.**

**Use the rule $P = VI$.**

**0.5 W  1.5 W  3.0 W  6.0 W**

**[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 | TYPE OF RECEIVER |
|---|---|
| ferrite rod | phone mast |
| dish receiver | mobile phone |
| simple dipole | 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 3 600 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]**

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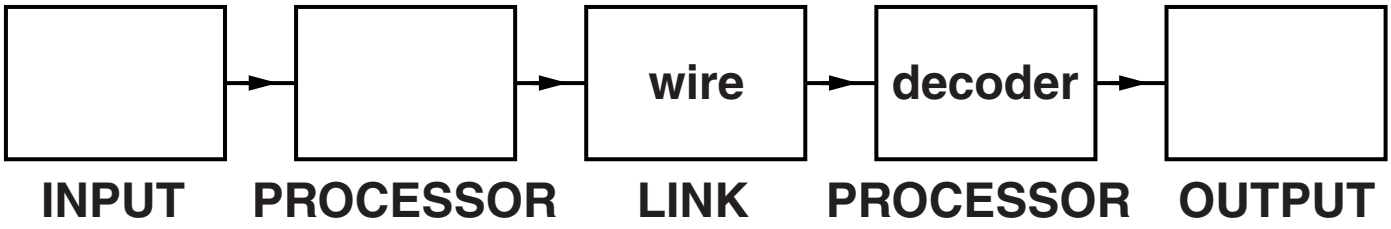
**5 A fax system transmits images of printed sheets from one place to another.**

**(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**