

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**A326/02**

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

**Communications  
(Higher Tier)**

**FRIDAY 17 JUNE 2011: 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. Pencil may be used for graphs and diagrams only.**
- **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).**
- **Answer ALL the questions.**

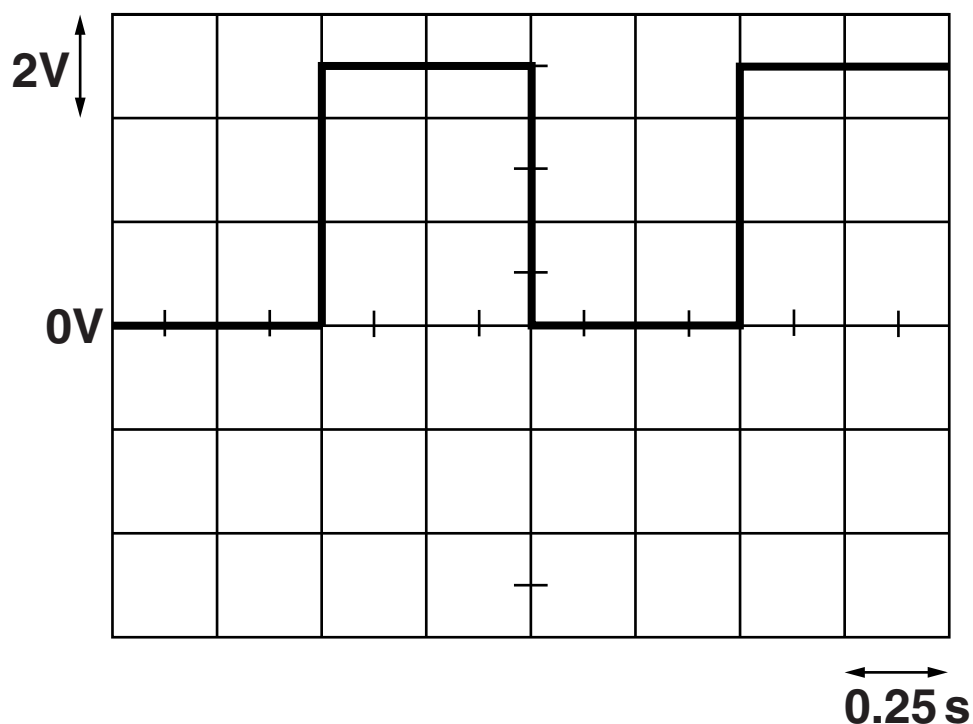
## **INFORMATION FOR CANDIDATES**

- **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.**

**BLANK PAGE**

Answer ALL the questions.

1 Here is an oscilloscope trace of a digital signal.



(a) How can you tell that the signal is a DIGITAL one?

\_\_\_\_\_ [1]

(b) The oscilloscope is set up with 0V at the centre of the screen.

Calculate the maximum voltage of the signal.

maximum voltage = \_\_\_\_\_ V [1]

**(c) Calculate the time for one cycle (period) of the signal on the screen.**

**Then draw one straight line to link your value of the PERIOD to its FREQUENCY.**

<b>PERIOD</b>	<b>FREQUENCY</b>
<b>0.25 s</b>	<b>0.5 Hz</b>
<b>0.50 s</b>	<b>1.0 Hz</b>
<b>1.00 s</b>	<b>2.0 Hz</b>
<b>2.00 s</b>	<b>4.0 Hz</b>

**[2]**

**(d) Digital signals are used a lot in communications.**

**This is because they do not lose their quality as they travel.**

**State TWO other advantages of using digital signals for communication.**

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**[2]**

**[Total: 6]**

**2 Jim plans to buy a new radio receiver.**

**(a) He finds these details in a catalogue.**

<b>receiver name</b>	<b>AW36</b>	<b>LH56</b>	<b>ZB02</b>	<b>SD99</b>
<b>cost</b>	<b>£42</b>	<b>£32</b>	<b>£36</b>	<b>£27</b>
<b>size</b>	<b>stand alone</b>	<b>table top</b>	<b>table top</b>	<b>pocket</b>
<b>weight</b>	<b>75 N</b>	<b>20 N</b>	<b>15 N</b>	<b>2 N</b>
<b>channels</b>	<b>DAB only</b>	<b>LW, MW and FM</b>	<b>FM only</b>	<b>MW and FM</b>
<b>power source</b>	<b>mains</b>	<b>mains or battery</b>	<b>battery</b>	<b>battery</b>
<b>sound power</b>	<b>42W</b>	<b>10W</b>	<b>1.5W</b>	<b>0.1W</b>

**(i) Jim wants a radio that he can easily carry around with him.**

**Which one should he choose? Give TWO reasons for your answer.**

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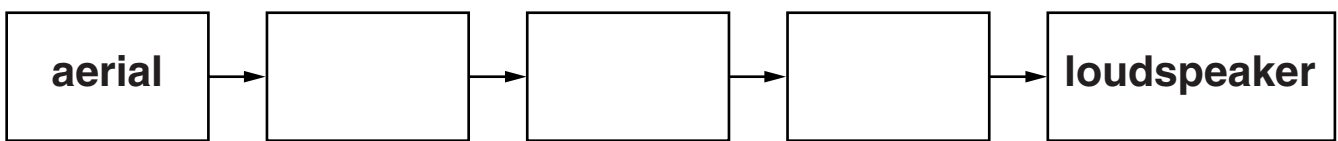
**[1]**

- (ii) Jim wants a receiver which is cheap to run and picks up FM channels.

Which receiver should he choose? Give a reason for your answer.

\_\_\_\_\_ [1]  
\_\_\_\_\_

- (b) Here is a block diagram for a radio receiver.



- (i) Complete the diagram. Choose from these words.

**AMPLIFIER**

**DEMODULATOR**

**MICROPHONE**

**MODULATOR**

**TUNER**

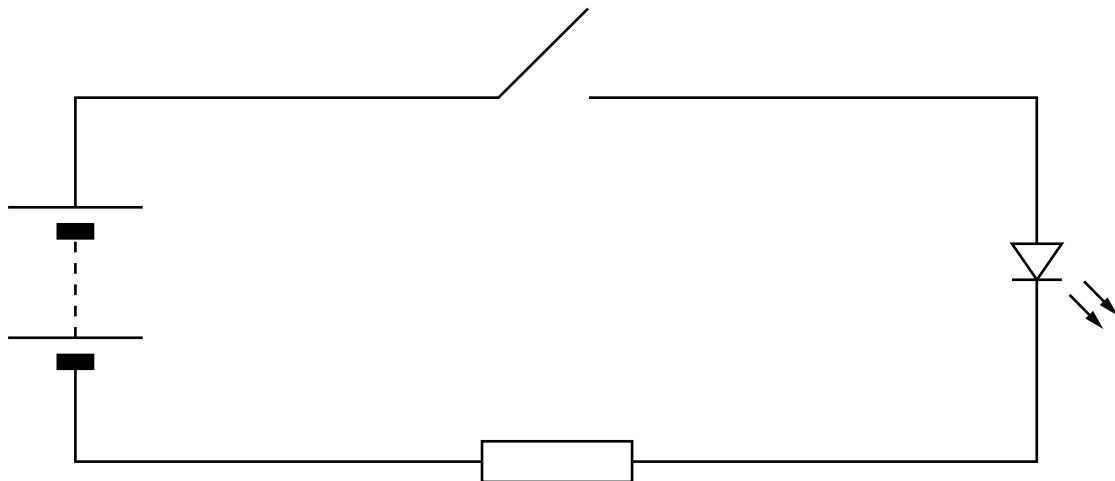
[2]

- (ii) What do the arrows in the diagram represent?

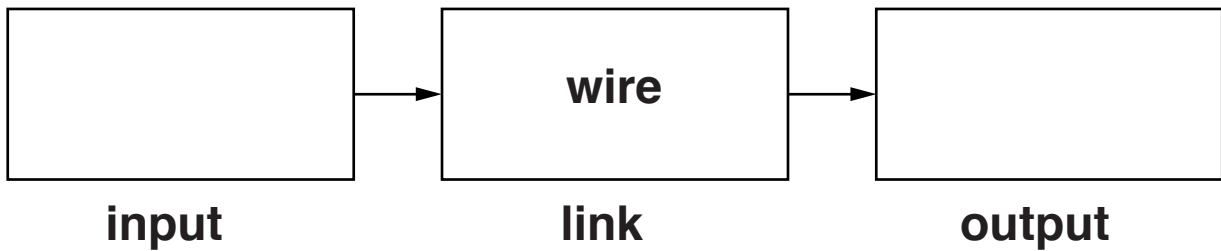
\_\_\_\_\_ [1]  
\_\_\_\_\_

[Total: 5]

**3 Bob builds this simple signalling circuit. It uses flashes of light to carry Morse code.**



**(a) Complete this block diagram for the signalling circuit.**



**[2]**

**(b) Bob uses the circuit to communicate with Sally in another room, using Morse code.**

**Explain how he could measure the ERROR RATE for the system.**

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**[2]**



**(c) Morse code is an example of a DIGITAL code.**

**Give another example of a DIGITAL code.**

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**[1]**

**[Total: 5]**

**4 Saleem has a wireless printer for his computer system.**

**Radio waves pass information from the computer to the printer.**

**(a) Describe how information about a document is passed from the computer to the printer. Use these words in your answer.**

**CARRIER WAVE  
DEMODULATE  
MODULATE**

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[3]

**(b) The computer compresses the data before transmitting it to the printer.**

**What does compression do to the data? Suggest why it is done.**

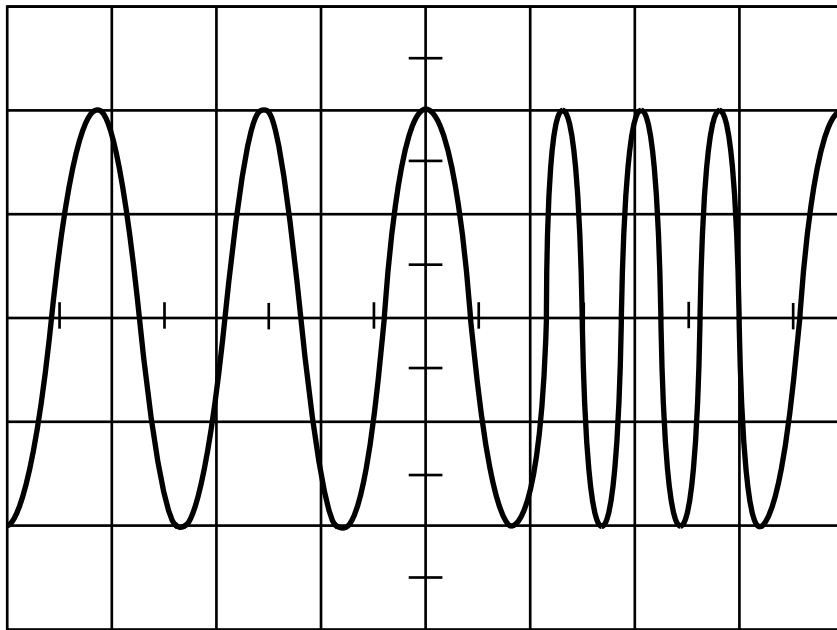
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[2]

**(c) Here is an oscilloscope trace of the signal as it arrives at the printer.**



**Name the type of modulation used in the system.**

\_\_\_\_\_ [1]

**[Total: 6]**

**5 Pete is a policeman. He uses the radio in his car to communicate with other police.**

**(a) The radio set encrypts Pete's messages before sending them out.**

**Suggest why police messages are ENCRYPTED.**

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\_\_\_\_\_ [1]

**(b) Pete's radio can receive video signals and display pictures on a screen.**

**The video signal bit rate is 2400 bits per second.**

**Each picture has 60 rows, with 100 pixels in each row.**

**Each pixel requires 2 bits of information.**

**Do calculations to explain why it takes 5 seconds to receive one picture.**

**Show your working clearly.**

[2]

- (c) The video signal bit rate is low because Pete's radio channel has a small bandwidth.

Explain what is meant by **BANDWIDTH**.

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[2]

- (d) Pete's radio channel uses a frequency similar to that of television broadcasts.

- (i) Here are some radio frequencies.

Put a **ring** around the one which could be used for Pete's radio.

5 kHz

500 MHz

5 GHz

500 GHz

[1]

- (ii) Explain why the police and other radio broadcasters need to be licensed.

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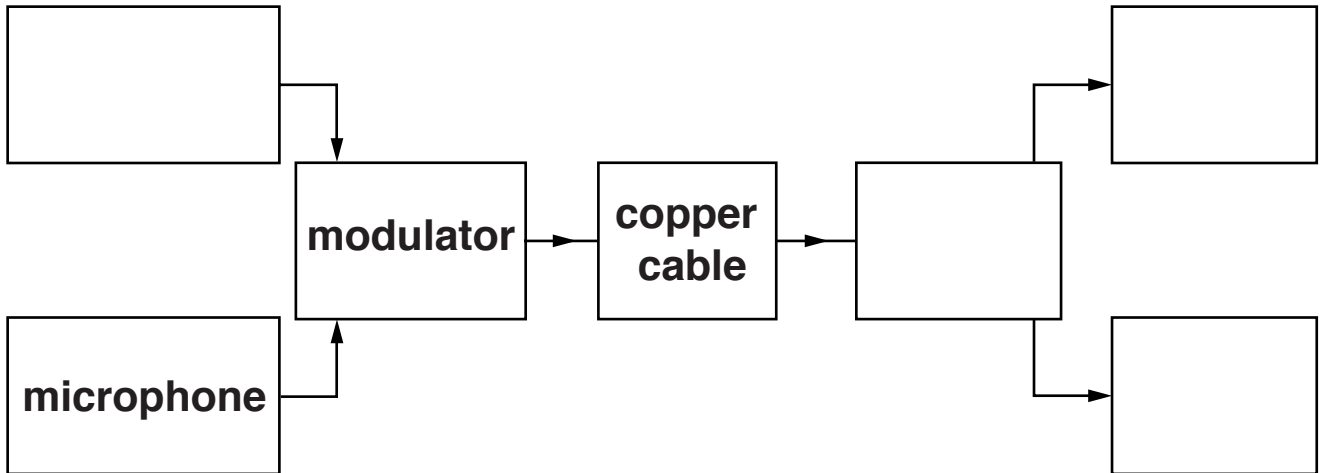
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[2]

[Total: 8]

6 Here is the block diagram for a simple television security system.

It carries signals from one room to another in the same building.



(a) Complete the block diagram for this television system. [3]

(b) An ANALOGUE signal is transmitted along the copper cable.

Give TWO advantages of using an analogue signal instead of a digital one.

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[2]

**(c) A modern TV security system uses optical fibre instead of copper cable.**

**Give another example of a communication system which uses optical fibre as the link.**

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[1]

**[Total: 6]**

**END OF QUESTION PAPER**



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