

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
 TWENTY FIRST CENTURY SCIENCE  
 ADDITIONAL APPLIED SCIENCE A**

Communications (Foundation Tier)

**FRIDAY 20 JUNE 2008**

Morning  
 Time: 45 minutes

Candidates answer on the question paper.

**Additional materials (enclosed):**

None

Calculators may be used.

**Additional materials:** Pencil  
 Ruler (cm/mm)



Candidate  
 Forename

Candidate  
 Surname

Centre  
 Number

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Candidate  
 Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.

**FOR EXAMINER'S USE**

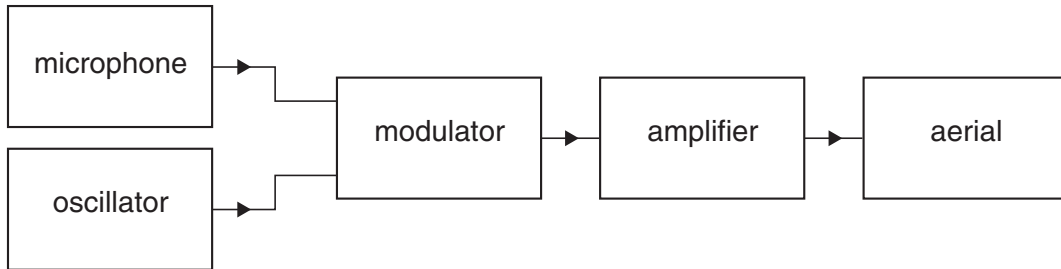
Qu.	Max	Mark
1	10	
2	6	
3	6	
4	3	
5	6	
6	5	
<b>TOTAL</b>	<b>36</b>	

This document consists of **12** printed pages.

Answer **all** the questions.

1 Sue has been given a radio **transmitter** to repair.

(a) Here is a block diagram for the radio transmitter.



Draw straight lines to connect each **block** with its **function**.

block	function
The aerial ...	... generates modulated radio waves.
The amplifier ...	... provides a signal for the modulator.
The oscillator ...	... provides a carrier for the modulator.
The modulator ...	... increases the power of the modulated carrier.
The microphone ...	... puts information from the signal onto the carrier.

[4]

(b) The transmitter operates in the medium wave band.

Sue checks the frequency of radio waves from the transmitter.

Which **one** of these frequencies is in the medium wave band?

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

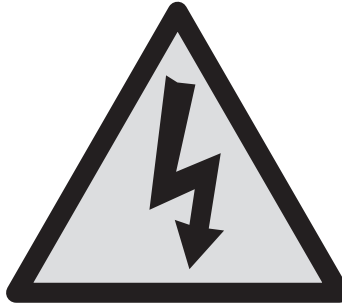
**800 kHz**

**100 MHz**

**3 GHz**

[1]

- (c) For some of the tests, Sue has to open up the transmitter. She notices this hazard symbol on the cover.



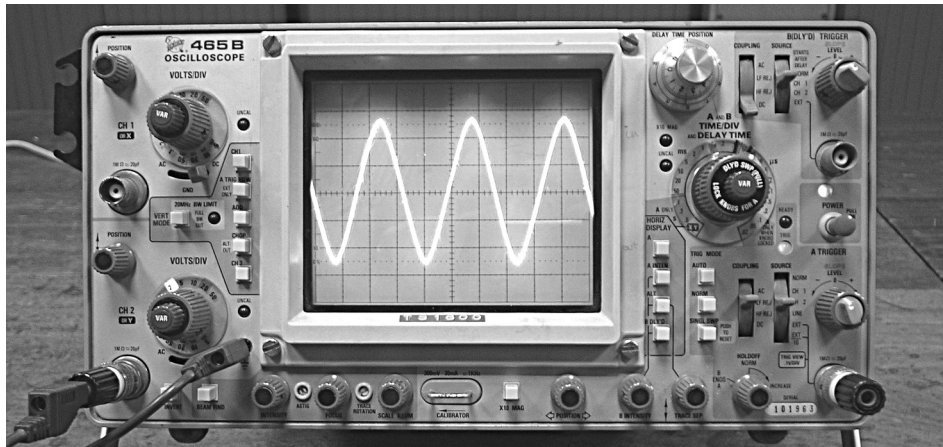
- (i) What type of danger does the symbol warn about?

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

- (ii) Suggest what Sue could do to reduce her risk from this hazard.

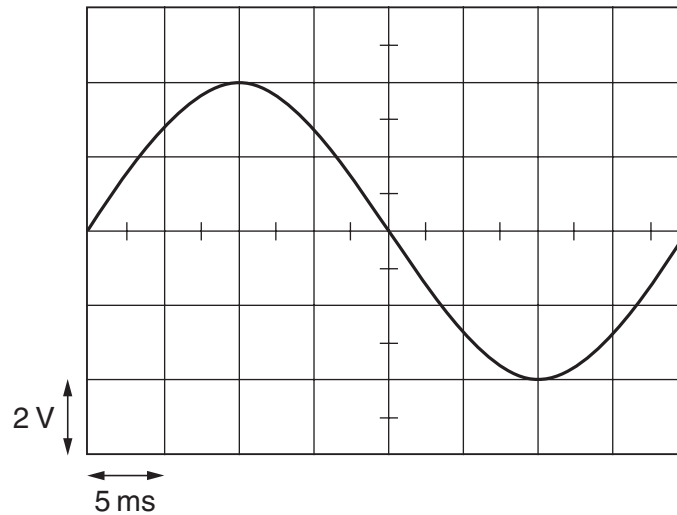
.....  
.....  
..... [1]

(d) Sue uses an oscilloscope to test the radio transmitter.



© OCR

Here is one of the signals that she observes.



(i) What is the **amplitude** of this signal?

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

**2 V**

**4 V**

**8 V**

[1]

(ii) Here are the steps that Sue follows to calculate the **frequency** of the signal.

They are in the wrong order.

**A** Multiply by the time for one square.

**B** Divide one by the answer.

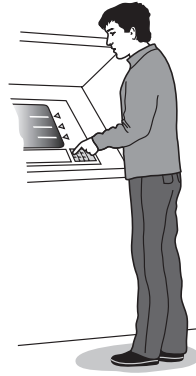
**C** Count the number of squares for one cycle.

Put the letters **A**, **B** and **C** in the boxes to show the correct order.

--	--	--

[2]

2 Matt gets some money from a cash machine.



(a) He presses buttons on a keyboard to enter his security code. The code is sent across the internet to his bank. The internet uses optical fibre.

(i) How is the code carried through optical fibre?

Put a ring around the correct answer.

**electric current**

**infrared light**

**radio wave**

[1]

(ii) The internet uses optical fibre because it provides a high level of security. Suggest **two** other reasons why the internet uses optical fibre.

1 .....  
.....  
2 .....  
..... [2]

(b) Some communication systems use copper wire as the link.

(i) Describe an example of communication system which has a copper wire link.

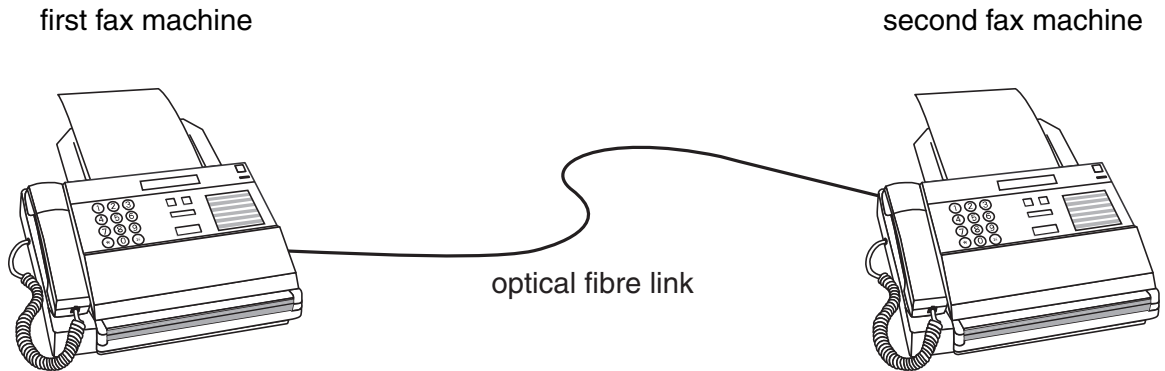
.....  
..... [1]

(ii) Give reasons why your example uses copper wire.

.....  
.....  
.....  
..... [2]

[Total: 6]

- 3 One fax machine sends a copy of a document to another fax machine. An optical fibre links the two machines.



- (a) Here is an incomplete block diagram for the system.



Complete the block diagram. Use words from this list.

**decoder**

**encoder**

**printer**

**scanner**

[3]

- (b) The information is sent down the optical fibre link in digital form. This allows it to be **encrypted**.

- (i) Give another example of a communication system which uses encryption.

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

- (ii) Why is encryption needed in your example?

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

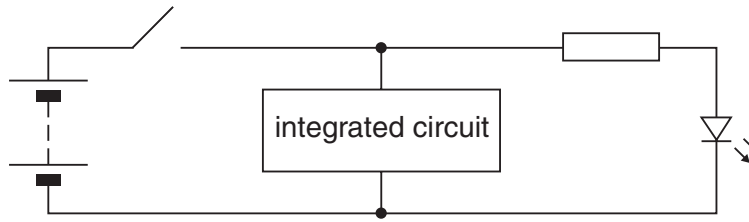
- (c) Digital information is **stored** in a computer. Some of it is stored on the **hard disc**.

Give an example of **another** device which stores digital information.

..... [1]

[Total: 6]

4 The circuit diagram shows an integrated circuit powered by a battery.



(a) The circuit includes an LED to show when the switch is closed.

Put a ring around the LED.

[1]

(b) The battery could be replaced with a power supply connected to the mains.

Suggest **two** advantages of powering a circuit with a mains power supply instead of a battery.

1 .....

.....

2 .....

..... [2]

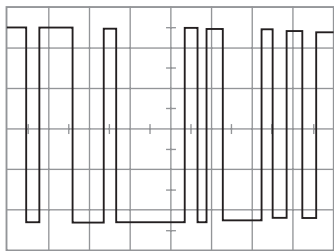
[Total: 3]

5 John is a disc jockey.

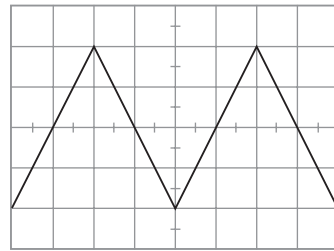


(a) He likes to play old music recorded on vinyl discs. The old music is recorded on the disc as an **analogue** signal. He knows that music sometimes sounds better when it is recorded as a **digital** signal.

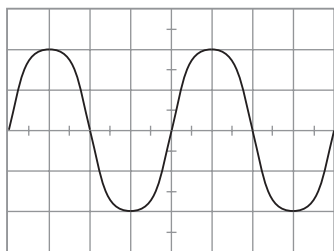
(i) Here are four oscilloscope traces of signals.



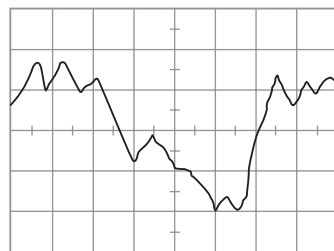
A



B



C



D

Which one is a **digital** signal?

answer ..... [1]

(ii) Why might music sound better when it is recorded as a digital signal?

.....  
 .....

[1]



(iii) Suggest another advantage of recording music as a digital signal.

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

(b) John decides to transfer part of his favourite vinyl recording to the hard disc of his computer.



The analogue recording is converted into a digital signal.  
 This is stored as a file in the computer.

Here is some information about the conversion process.

digital sample	12 bits
sample rate	42 000 samples per second
length of recording	15 seconds

(i) Show that 504 000 bits are needed to store each second of the recording.

[1]

(ii) How many bits are needed to store 15 seconds of the recording?

answer ..... bits [1]

(iii) How would you convert this file size from bits into **bytes**?

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

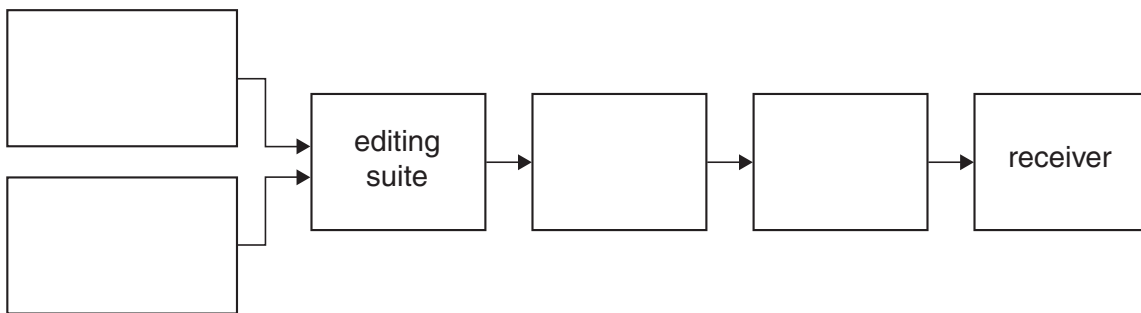
[Total: 6]

[Turn over

6 Live outside broadcasts allow people all over the world to watch a sporting event.



(a) Here is an incomplete block diagram for a live outside TV broadcast system.



Complete the block diagram. Use words from this list.

- cameras**      **microphones**      **transmitter**      **satellite**

[2]

(b) The system is managed by the people in the editing suite.

Describe what these people do to produce the broadcast.

.....

.....

.....

.....

.....

.....

[2]

(c) The receiver contains an aerial.

What is the best type of aerial for the receiver?

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

**dish**

**dipole**

**rod**

**wireless**

[1]

[Total: 5]

**END OF QUESTION PAPER**

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