Candidate Forename		Candidate Surname	

Centre Number					Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A326/02

TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

Communications (Higher Tier)

WEDNESDAY 27 JANUARY 2010: 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 clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**

- **Use 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 <u>ALL</u> the questions.**

- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

INFORMATION FOR CANDIDATES

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

- **The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.**

- **The total number of marks for this paper is <u>36</u>.**

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Answer <u>ALL</u> the questions.

1 An office uses copper wire to link its fax machines to each other.

   This is because copper wire is cheap and easy to use. Other communication systems use radio waves.

   (a) Describe your own example of a different communication system that uses <u>RADIO WAVES</u> as the link.

   _____

   _____ [1]

   (b) Explain why radio waves are the best link for your example.

   _____

   _____

   _____ [2]

   (c) Communication systems use different radio frequencies.
   Put a (ring) around the frequency that best matches your example.

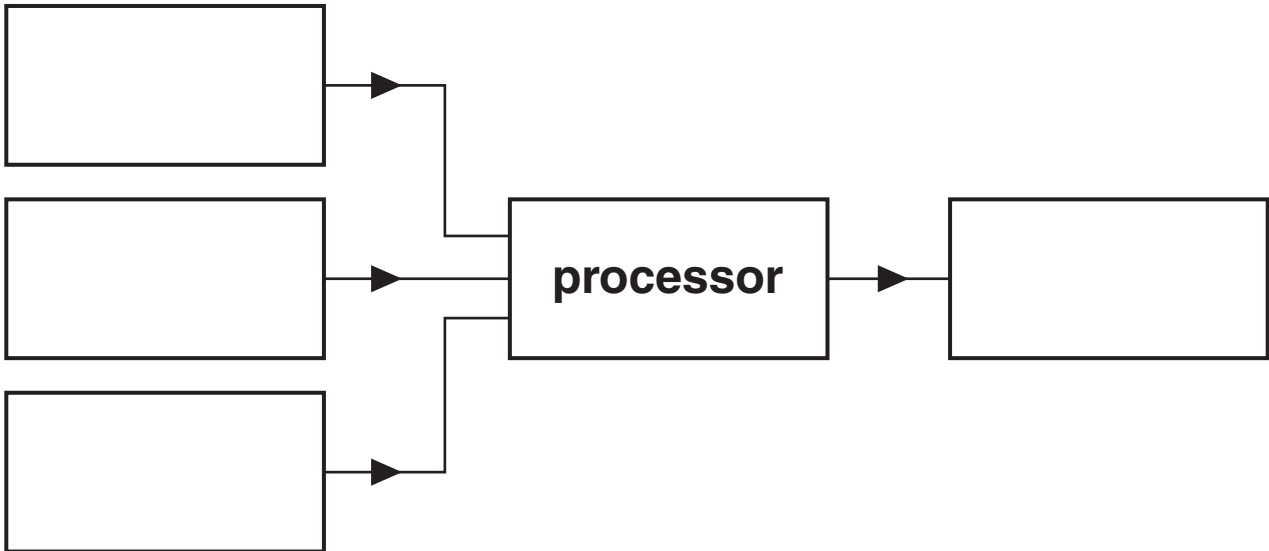   100 MHz   600 MHz

   2 GHz   10 GHz

   [1]

(d) Using radio waves as the link for a communication system is quite expensive.
Explain **<u>ANOTHER</u>** disadvantage of using radio waves as the link.

_____

_____

_____

_____ **[2]**

[Total: 6]

2 Anita worries about burglars.
She uses a video screen to view pictures from <u>THREE</u> cameras placed around her house.

(a) Complete this block diagram for the system.

```
┌──────────┐
│          │──────┐
└──────────┘      │
                  ▼
┌──────────┐   ┌──────────┐   ┌──────────┐
│          │──▶│processor │──▶│          │
└──────────┘   └──────────┘   └──────────┘
                  ▲
┌──────────┐      │
│          │──────┘
└──────────┘
```

[1]

(b) Complete the sentence.

Choose a word from this list.

<u>CURRENT</u>   <u>INFORMATION</u>

<u>LIGHT</u>   <u>MICROWAVES</u>

The arrows in the diagram show the flow of

_____ from one block to another.

[1]

(c) How is a circuit diagram different from a block diagram?

_____

_____ [1]

(d) Here is some technical data for the video screen.

bits for each pixel	4
pixels per frame	65 536
frame refresh rate	32 per second

(i) Use the data to calculate the video bit rate for the cable leading to the screen.

video bit rate = _____ bits per second [1]

(ii) Each row of the screen has 256 pixels.
How many bits of information are needed for each row of the screen?

information = _____ bits [1]

[Total: 5]

3 Joe opens up a computer to inspect it.
He sees two hazard symbols on the cover.
This one tells him that there is a laser hazard.
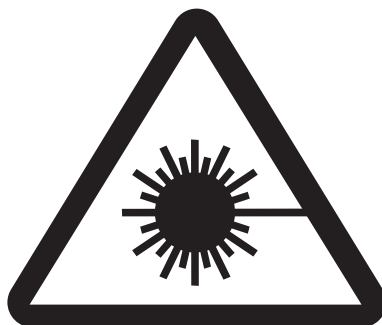
The other tells him of a high voltage hazard.

(a) Draw the high voltage hazard symbol below or describe clearly this symbol.

[1]

(b) He decides to use an <u>EARTH LEAKAGE DEVICE</u> to increase his safety.
Explain how this makes him safer as he services the computer.

_____

_____

_____ [2]

(c) Before he inspects the computer, he makes copies of the digital files on its hard disc.

    (i) Give <u>TWO</u> examples of other devices which he could use to store the files.

        1 _____

        2 _____ **[1]**

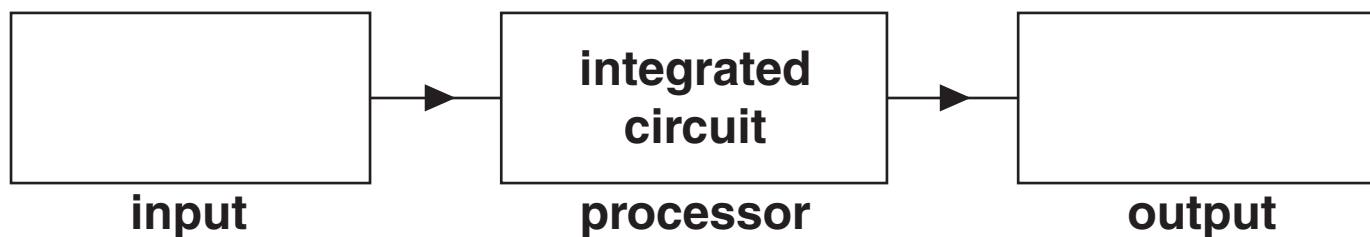   **(ii)** He <u>COMPRESSES</u> the files before storing them. Explain why he does this.

        _____

        _____

        _____ **[2]**

[Total: 6]

4 Here is the circuit diagram for a simple signalling system.
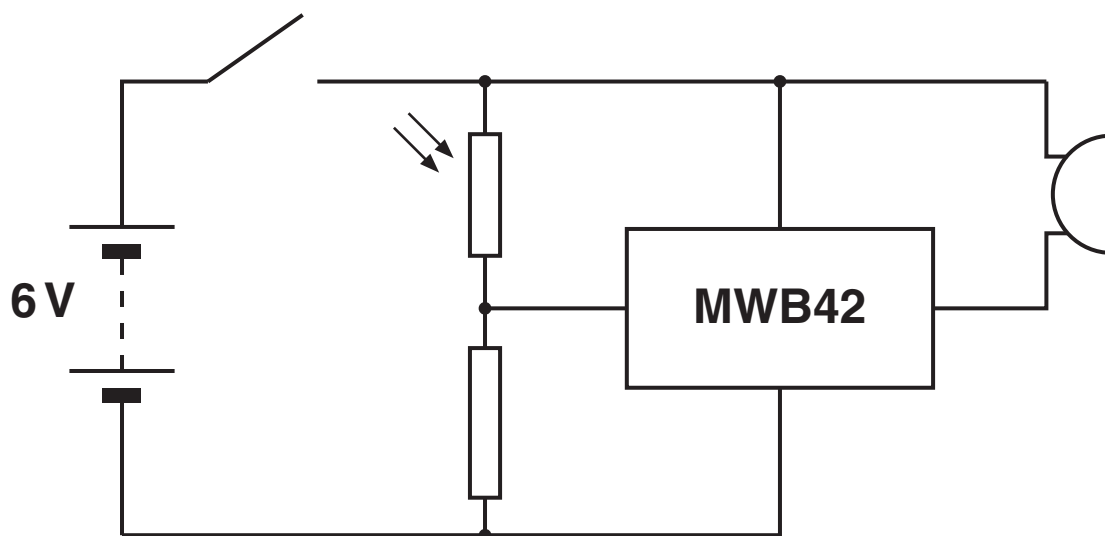
(a) Use the circuit diagram to complete this block diagram.

		integrated circuit		
input	→	**processor**	→	**output**

[2]

(b) The current in the integrated circuit is 0.20 A. Explain why the current through the closed switch is <u>MORE</u> than 0.20 A.

_____

_____

_____ [1]

(c) The maximum power rating of the integrated circuit is 1.8W.

    (i) Calculate the maximum safe voltage of power supply for the integrated circuit.
Use *P = IV*. Assume the current is 0.20 A.

supply voltage = _____ V [1]

    (ii) Draw a voltmeter on the circuit diagram opposite to show how it should be connected to measure the voltage across the integrated circuit. [2]

[Total: 6]

5 **This question is about the radio <u>TRANSMITTER</u> in a mobile phone.**
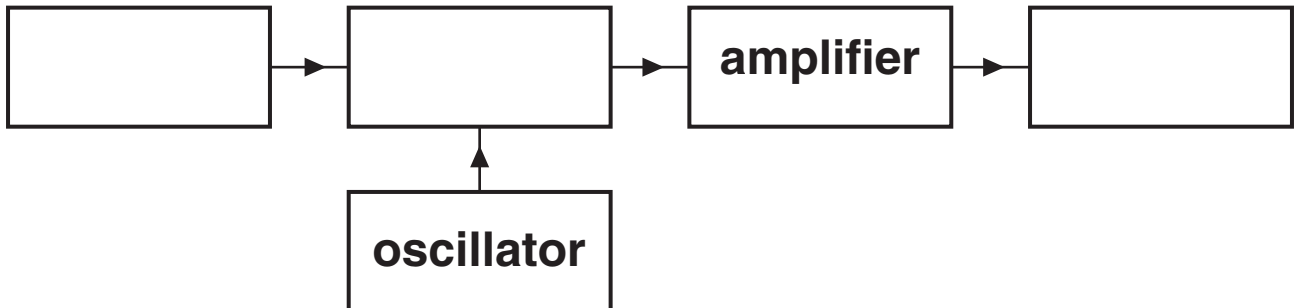
(a) Complete the block diagram for this radio <u>TRANSMITTER</u>. **[3]**

(b) Describe the function of the amplifier.

_____

_____

_____ **[2]**

(c) Mobile phone transmissions use a digital format. This allows analogue voice signals to be encrypted.

  (i) Suggest why voice signals are **<u>ENCRYPTED</u>**.

_____

_____ [1]

  (ii) The sentences describe how the analogue voice signal is converted into a digital format. Complete the sentences. Choose the correct words from this list.

<u>SAMPLED</u>   **<u>ENCODED</u>**

<u>DECODED</u>   **<u>COMPRESSED</u>**

The analogue voice signal is _____ many times each second.

The voltage of the signal is _____ as a binary word.   [2]

[Total: 8]

6 Sue uses her computer to communicate over large distances through the internet.

(a) (i) Name the __INPUT DEVICE__ for a computer.

_____ [1]

(ii) State what the input device does to information before transferring it onto the computer.

_____

_____ [1]

(b) Explain the meaning of these terms as they apply to the internet.

(i) data transmission rate

_____

_____

_____ [1]

(ii) error rate

_____

_____

_____ [1]

(iii) range

_____

_____

_____ **[1]**

[Total: 5]

END OF QUESTION PAPER