

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

293/01

ELECTRONICS

MODULE TEST E1

FOUNDATION TIER

P.M. THURSDAY, 24 May 2007

(45 minutes)

For Examiner's use only	
Total Mark	

ADDITIONAL MATERIALS

In addition to this examination paper you may need a calculator.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

INFORMATION SHEET

This information may be of use in answering the questions.

1. Resistor Colour Codes

BLACK	0	GREEN	5
BROWN	1	BLUE	6
RED	2	VIOLET	7
ORANGE	3	GREY	8
YELLOW	4	WHITE	9

The fourth band colour gives the tolerance as follows:

GOLD $\pm 5\%$

SILVER $\pm 10\%$

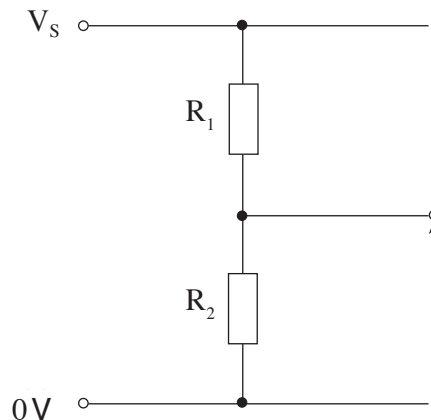
2. Preferred Values for Resistors

E 12 SERIES OF PREFERRED VALUES
10; 12; 15; 18; 22; 27; 33; 39; 47; 56; 68; 82 and multiples thereafter

3. **Resistance** = $\frac{\text{voltage}}{\text{current}}$; $R = \frac{V}{I}$.

4. **Effective resistance**, R , of two resistors R_1 and R_2 **in series** is given by $R = R_1 + R_2$.

5. Voltage Divider



$$V_{OUT} = \frac{R_2}{R_1 + R_2} \times V_s$$

6. **Power** = voltage \times current; $P = VI$

7. **LED** The forward voltage drop across a LED is 2V.

8. Transistors

The forward voltage drop across the base emitter junction is 0.7V.

Answer **all** questions in the spaces provided.

1. Here is a list of electronic components:

thermistor

LED

variable resistor

LDR

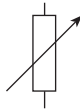
(a) Which component has this symbol?



Answer

[1]

(b) Which component has this symbol?



Answer

[1]

(c) Which component from the list would you use to sense changes in temperature?

Answer

[1]

2. Some electronic subsystems are listed below:

lamp

magnetic sensor

latch

AND gate

(a) Which **one** of these is an input subsystem?

.....

[1]

(b) Which **one** of these is an output subsystem?

.....

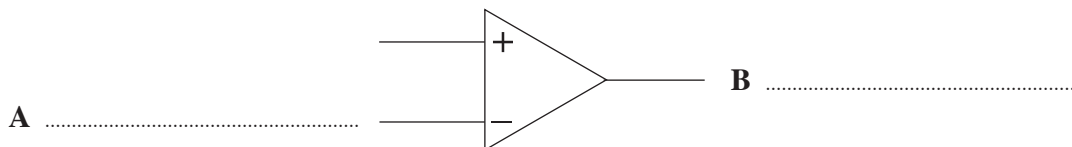
[1]

(c) Which subsystem will keep the output on until it is reset?

.....

[1]

3. This is the symbol for a comparator.



Choose the correct name for connections **A** and **B** from the following list.

[2]

Ground

Inverting input

Output

Non-inverting input

Positive supply

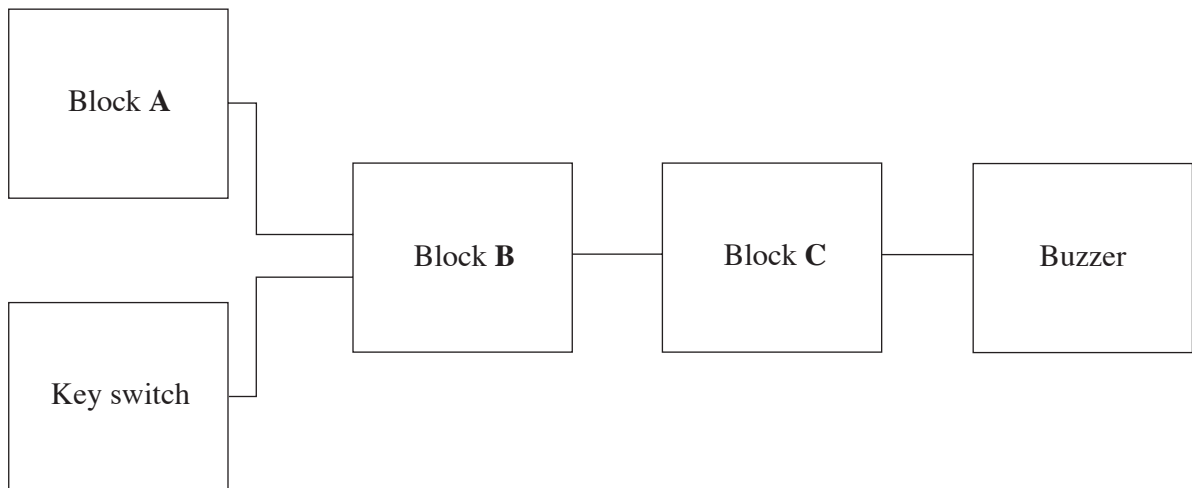
Write your answers in the spaces provided on the diagram.

4. Put the three measures of resistance in order of size, starting with the **biggest**, and ending with the **smallest**.

kilohm (kΩ)
ohm (Ω)
megohm (MΩ)

..... → → [2]

5. The block diagram shows a design for a bedroom alarm.
The alarm is set by turning a key-operated switch.
If someone opens the door, a micro switch operates and the buzzer sounds.



- (a) You can choose any of the following subsystems to use for blocks **A**, **B** and **C**:

<i>temperature sensing unit</i>	<i>comparator</i>
<i>AND gate</i>	<i>transistor switch / transducer driver</i>
<i>pulse unit</i>	<i>micro switch</i>

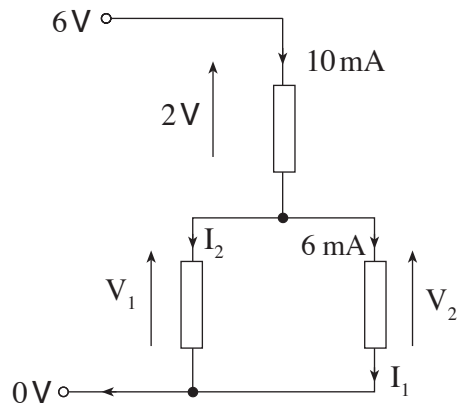
Which subsystem is:

- (i) a suitable unit for block **A**?
- (ii) a suitable unit for block **B**?
- (iii) a suitable unit for block **C**?

[3]

- (b) Name a subsystem that could be added to this circuit so that the buzzer stays on if the door is shut again after triggering the alarm. [1]

6. Look at the following diagram.



Write down the values of the following:

[4]

(a) I_1 mA

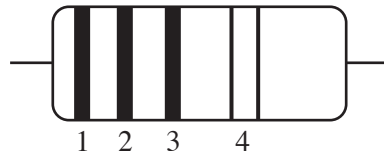
(b) I_2 mA

(c) V_1 V

(d) V_2 V

7. The resistor colour code is given in the information sheet on page 2.

Here is a diagram of a $560\ \Omega$ resistor with a 5% tolerance.



Complete the following table.

[4]

Resistor value	Colour of Band 1	Colour of Band 2	Colour of Band 3	Colour of Band 4
$560\ \Omega \pm 5\%$				

8. The current and voltage ratings for four bulbs **A**, **B**, **C** and **D** are listed in the following table.

Bulb	Voltage (V)	Current (A)
A	9	0.1
B	12	0.2
C	9	0.2
D	6	0.2

(a) Which bulb will use the **least** power?

[1]

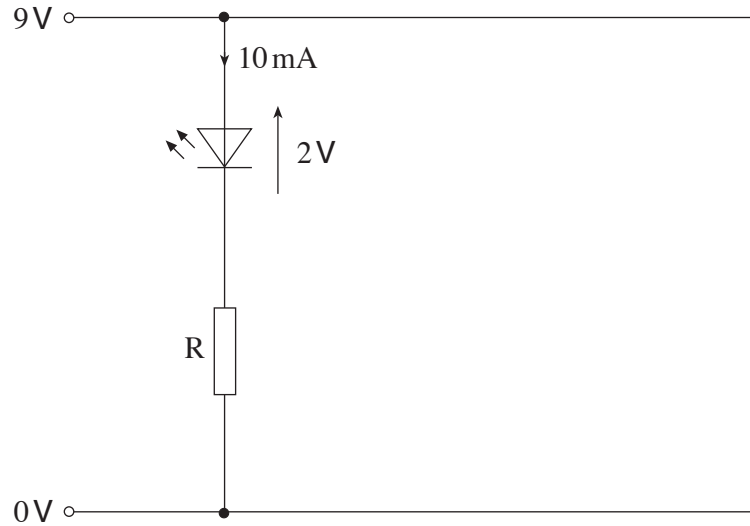
(b) Use the formula in the information sheet on page 2 to calculate the power used by bulb **C**.

.....

.....

[2]

9. The LED in the following circuit has a current of **10 mA** and forward voltage drop of **2 V** across it.



- (a) (i) What is the current through resistor R?

.....

- (ii) What is the voltage across resistor R?

.....

[2]

- (b) Use the formula in the information sheet on page 2 to calculate a suitable resistance for resistor R.

.....

.....

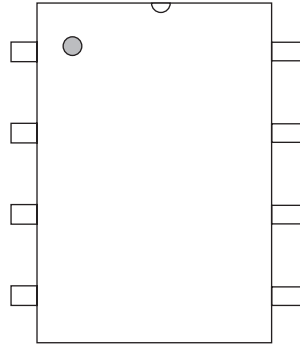
[2]

- (c) Choose a suitable preferred value for resistor R from the E12 series in the information sheet on page 2 so that the LED has about 10 mA going through it.

.....

[1]

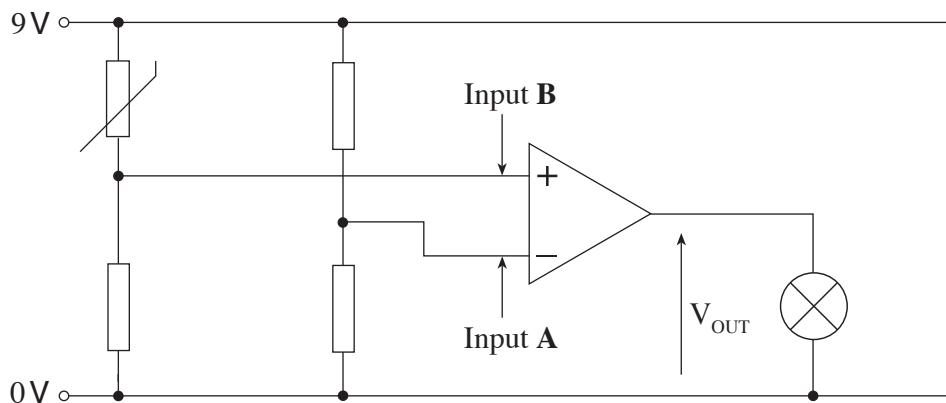
10. (a) The diagram shows a comparator IC seen from above.



- (i) **Label** pin 1 with the number 1.
(ii) **Label** pin 5 with the number 5.

[2]

- (b) The following diagram shows a circuit which indicates when the temperature in a greenhouse is too high.



- (i) The output V_{OUT} of the comparator saturates at 9V and 0V.

Complete the table for the given values of the input voltages.

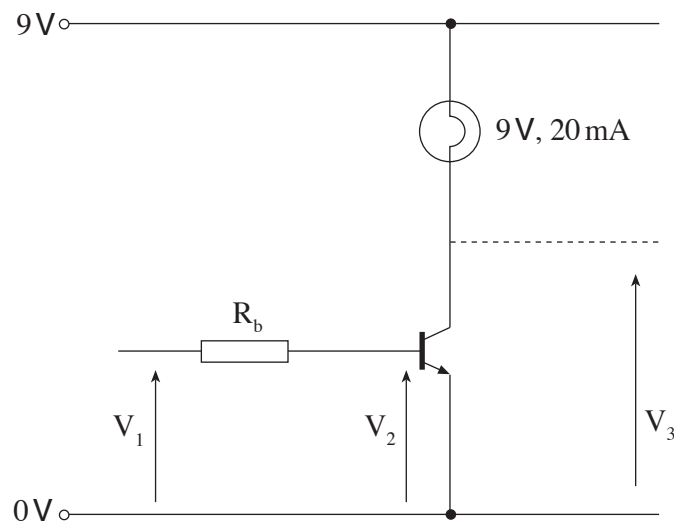
[2]

Input A (V)	Input B (V)	Output V_{OUT} (V)
4.5	2.3	
4.5	4.8	

- (ii) The temperature at which the bulb comes on needs to be adjustable. Modify the circuit diagram above to allow this.

[1]

11. The following circuit diagram shows part of a system used to switch on a lamp.



The transistor is **just** saturated when the input voltage V_1 is 2.7V .

Complete the following table to show:

- the voltage V_2 and V_3 for the input voltages V_1 given,
- whether the bulb will be **On** or **Off**.

[5]

V_1	V_2	V_3	Bulb On/Off?
0.4V			
3.0V			