

Energy & Potential Difference in Circuits

Question Paper

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| Level | GCSE |
| Subject | Physics |
| Exam Board | Edexcel IGCSE |
| Module | Single Award (Paper 2P) |
| Topic | Electricity |
| Sub-Topic | Energy & Potential Difference in Circuits |
| Booklet | Question Paper |

Time Allowed: 37 minutes

Score: /31

Percentage: /100

Grade Boundaries:

| | | | | | | |
|------|-----|-----|-----|-----|-----|------|
| A* | A | B | C | D | E | U |
| >85% | 75% | 70% | 60% | 55% | 50% | <50% |

1 A washing machine has an electric motor and an electric heater.



The resistance of the heater is 22Ω .

The mains voltage is 230 V .

(a) (i) State the equation linking voltage, current and resistance.

(1)

(ii) Show that the current in the heater is about 10 A when it is working.

(2)

(b) The washing machine is fitted with a fuse rated at 13 A.

(i) Explain why the washing machine is fitted with a fuse.

(2)

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(ii) When the motor is working, the current in it is 1.74 A.

Explain why it would **not** be sensible to replace the 13 A fuse with a 2 A fuse.

(2)

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(Total for Question 1 = 7 marks)

2. A student has some LEDs connected in a circuit. They emit light of different colours.

(a) (i) The different colours of light are waves which must have

(1)

- A the same amplitude in free space
- B the same frequency in free space
- C the same speed in free space
- D the same wavelength in free space

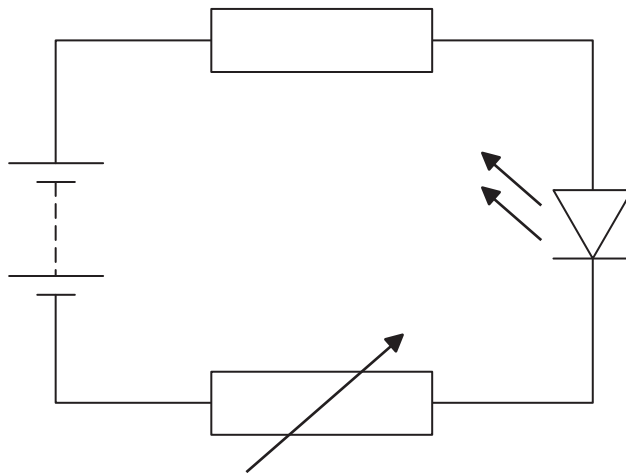
(ii) When an LED is on, it shows that

(1)

- A there must be alternating current in the circuit
- B there must be a current in the circuit
- C there is a fault in the LED
- D a fuse has blown

(b) An LED needs a minimum voltage to make it emit light.

The student investigates this minimum voltage using the circuit shown.



(i) The student uses a voltmeter to measure the voltage across the LED.

Add this voltmeter to the circuit diagram.

(2)

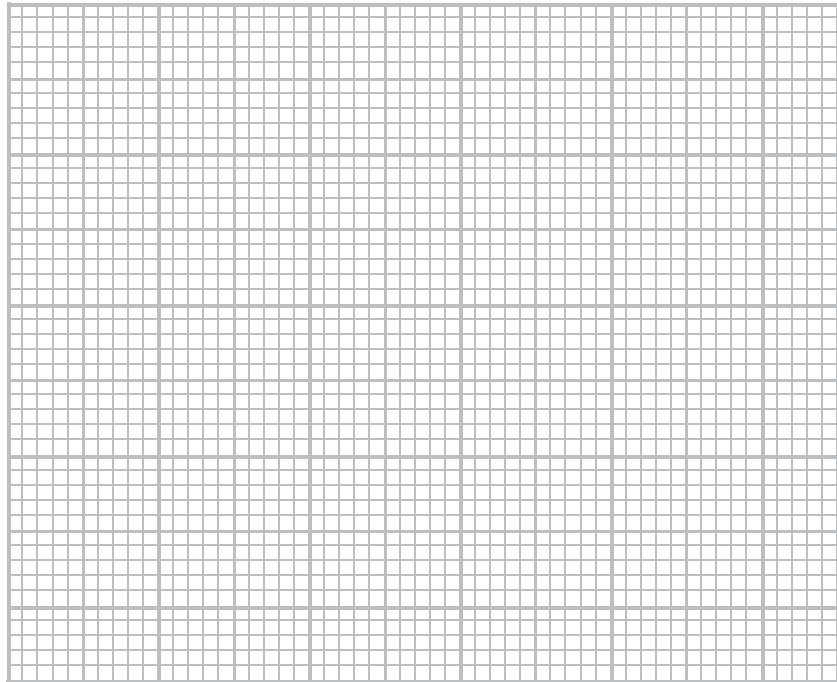
(ii) The student gradually increases the voltage across the LED and records the minimum voltage at which the LED emits light.

The results for some different LEDs are shown in the table.

| Colour of light from LED | Minimum voltage in V |
|--------------------------|----------------------|
| Red | 1.7 |
| Blue | 3.6 |
| Yellow | 2.1 |
| Orange | 2.0 |
| Green | 3.0 |

Display the results of the student's investigation on the grid.

(4)



(iii) The student concludes:



The minimum voltage depends on the wavelength of the light emitted.

Evaluate the student's conclusion.

(2)

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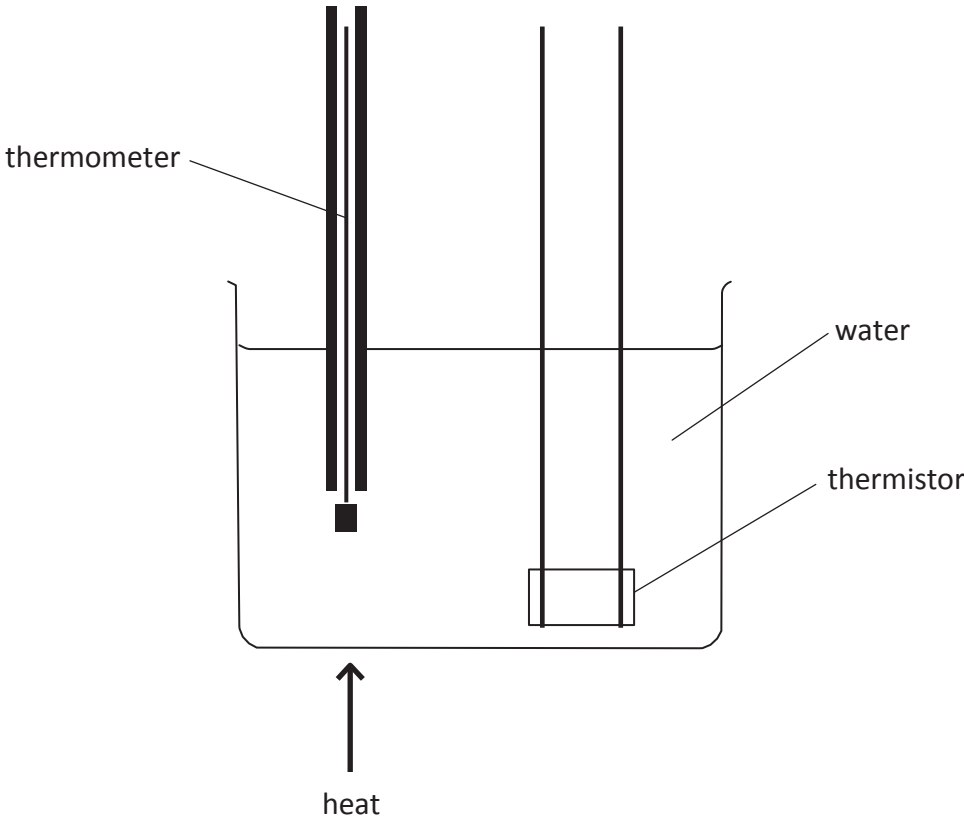
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(Total for Question 2 = 10 marks)

3. A student investigates how the voltage across a thermistor varies with temperature.

The student keeps the current in the thermistor constant, but varies the temperatures between 20 °C and 100 °C.

(a) The diagram shows how the student sets up his apparatus.



Suggest three changes to this set up that would improve the accuracy of the measurement of the thermistor temperature.

(3)

1

2

3

(b) What instrument should the student use to measure the current in the thermistor?

(1)

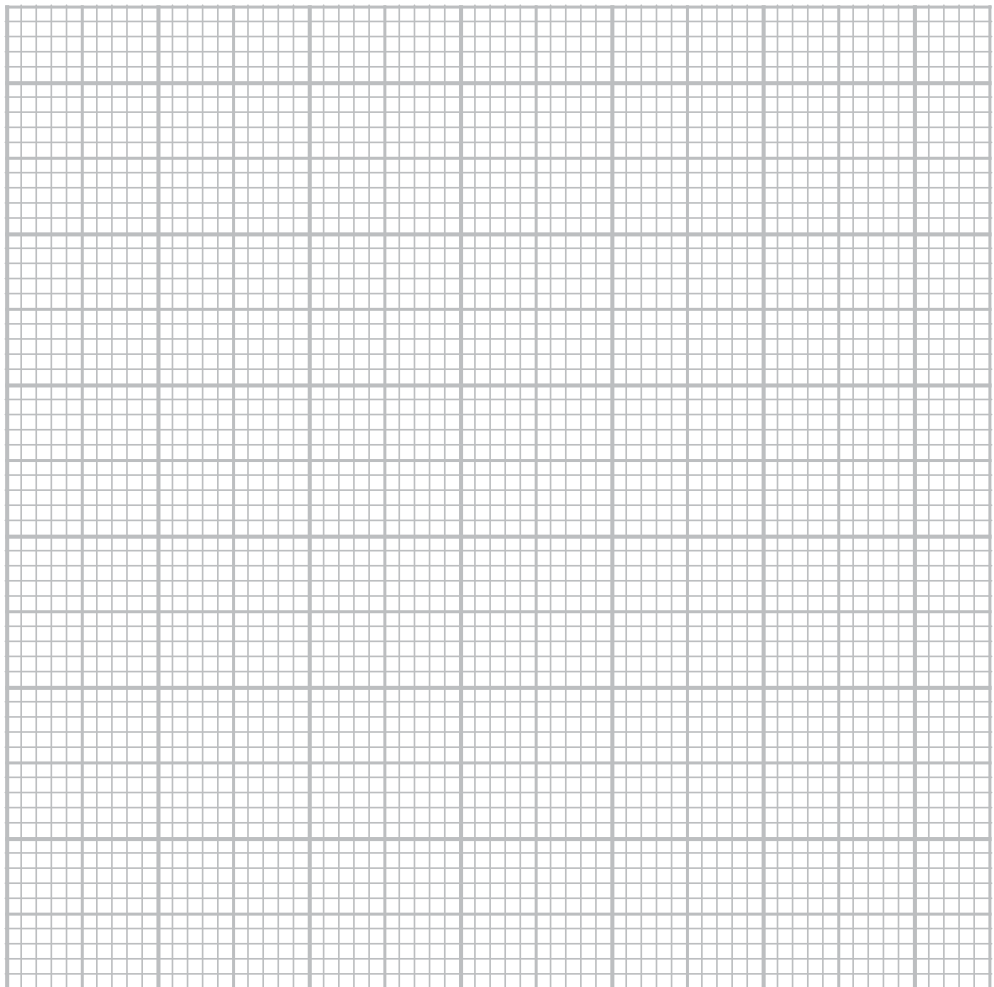
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(c) The table shows the student's results.

| Temperature in °C | Voltage in V |
|----------------------|-----------------|
| 20 | 6.0 |
| 40 | 2.2 |
| 60 | 1.1 |
| 80 | 0.2 |
| 100 | 0.4 |

(i) Plot a graph of voltage against temperature and draw the line of best fit.

(5)



(ii) Circle the anomalous point on your graph.

(1)

(d) (i) State the equation linking voltage, current and resistance.

(1)

(ii) At room temperature the thermistor has a resistance of 680Ω .

The voltage across it is 5.9 V .

Show that the current in the thermistor is about 8.5 mA .

(3)

(Total for Question 3 = 14 marks)