

Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.**Table 1** shows information about different light bulbs.

The bulbs all have the same brightness.

Table 1

Type of bulb	Input power in watts	Efficiency
Halogen	40	0.15
Compact fluorescent (CFL)	14	0.42
LED	7	0.85

- (a) (i) Calculate the useful power output of the CFL bulb.

Useful power output = _____ watts

(2)

- (ii) Use your answer to part (i) to calculate the waste energy produced each second by a CFL bulb.

Waste energy per second = _____ joules

(1)

- (b) (i) A growth cabinet is used to investigate the effect of light on the rate of growth of plants.

The figure below shows a growth cabinet.



In the cabinet the factors that affect growth can be controlled.

A cooler unit is used to keep the temperature in the cabinet constant. The cooler unit is programmed to operate when the temperature rises above 20 °C.

The growth cabinet is lit using 50 halogen bulbs.

Changing from using halogen bulbs to LED bulbs would reduce the cost of running the growth cabinet.

Explain why.

(4)

- (ii) A scientist measured the rate of growth of plants for different intensities of light.

What type of graph should be drawn to present the results?

Give a reason for your answer.

(1)

- (c) **Table 2** gives further information about both a halogen bulb and a LED bulb.

Table 2

Type of bulb	Cost to buy	Lifetime in hours	Operating cost over the lifetime of one bulb
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Halogen	£1.50	2 000	£16.00
LED	£30.00	48 000	£67.20

A householder needs to replace a broken halogen light bulb.

Compare the cost efficiency of buying and using halogen bulbs rather than a LED bulb over a time span of 48 000 hours of use.

Your comparison must include calculations.

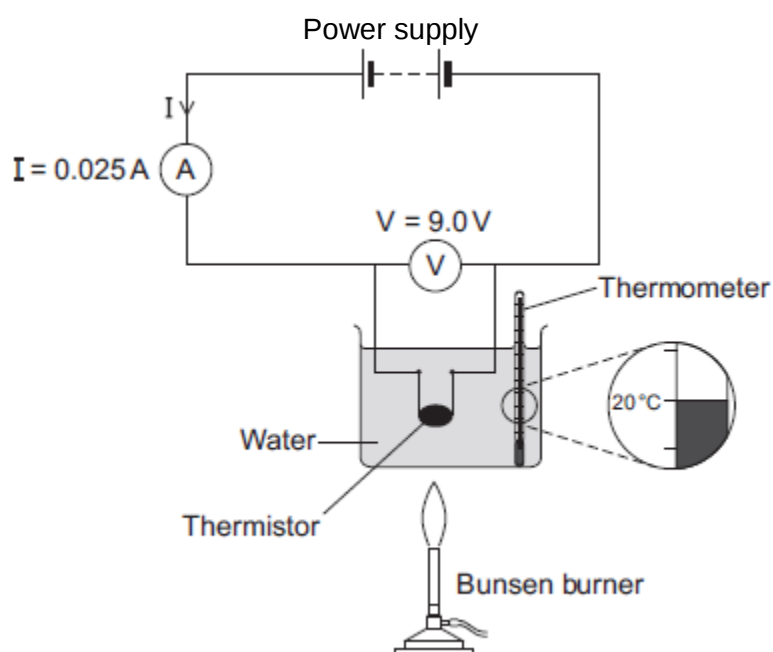
(4)

(Total 12 marks)

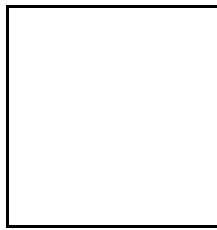
Q2.

- (a) **Figure 1** shows the apparatus used to obtain the data needed to calculate the resistance of a thermistor at different temperatures.

Figure 1



- (i) In the box below, draw the circuit symbol for a thermistor.



(1)

- (ii) Use the data given in **Figure 1** to calculate the resistance of the thermistor at 20 °C.

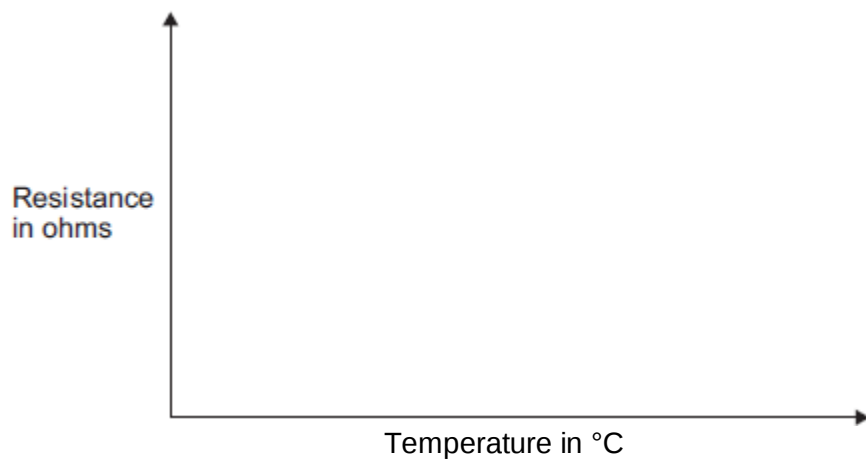
Resistance = _____ ohms

(2)

- (iii) **Figure 2** shows the axes for a sketch graph.

Complete **Figure 2** to show how the resistance of the thermistor will change as the temperature of the thermistor increases from 20 °C to 100 °C.

Figure 2



(1)

- (iv) Which **one** of the following is most likely to include a thermistor?

Tick (✓) **one** box.

An automatic circuit to switch a plant watering system on and off.

☐

An automatic circuit to switch an outside light on when it gets dark.

☐

An automatic circuit to switch a heating system on and off.

☐

(1)

- (b) The ammeter used in the circuit has a very low resistance.

Why is it important that ammeters have a very low resistance?

(1)

- (c) The table below gives the temperature of boiling water using three different temperature scales.

Temperature	Scale
100	Celsius ($^{\circ}\text{C}$)
212	Fahrenheit ($^{\circ}\text{F}$)
80	Réaumur ($^{\circ}\text{Re}$)

Scientists in different countries use the same temperature scale to measure temperature.

Suggest **one** advantage of doing this.

(1)

- (d) A student plans to investigate how the resistance of a light-dependent resistor (LDR) changes with light intensity.

The student starts with the apparatus shown in **Figure 2** but makes three changes to the apparatus.

One of the changes the student makes is to replace the thermistor with an LDR.

Describe what other changes the student should make to the apparatus.

(2)

(Total 9 marks)