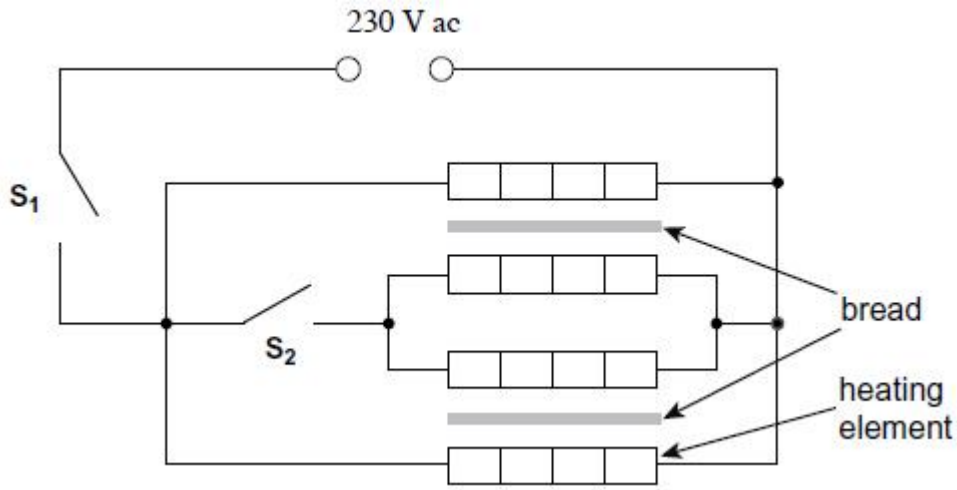
Name of the Student:_____
Max. Marks : 19 Marks **Time :** 19 **Minutes**

Q1.

The diagram shows the circuit diagram for a two-slice electric toaster that is operated at a mains voltage of 230 V.



The toaster has four identical heating elements and has two settings: normal and low. On the normal setting both sides of the bread are toasted. On the low setting, only one side of the bread is toasted. The setting is controlled by switches **S_1** and **S_2**.

The table shows the position of each switch and the power for each setting.

Setting	**S_1**	**S_2**	**Power / W**
Low	closed	open	400
Normal	closed	closed	800

(a) Calculate the current in **S_2** when the normal setting is selected.

current _____ A

(2)

(b) (i) Show that the resistance of **one** heating element is approximately 260 Ω when the toaster is operating at its working temperature.

(2)

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(ii) Calculate the total resistance when the normal setting is selected.

resistance _____ Ω

(2)

(iii) Each heating element is made of nichrome wire of diameter 0.15 mm.
The nichrome wire is wrapped around an insulating board.

Determine the length of nichrome wire needed to provide a resistance of 260 Ω.

resistivity of nichrome at the working temperature = 1.1×10^{-6} Ω m

length of wire _____ m

(3)

(c) Explain why the resistivity of the nichrome wire changes with temperature.

_____

_____

_____

_____

_____

(3)

(d) The nichrome wire has an equilibrium temperature of 174°C when the toaster is operating.

Calculate the peak wavelength of the electromagnetic radiation emitted by the wire.

Give your answer to an appropriate number of significant figures.

peak wavelength _____ m

(3)

(Total 15 marks)

Q2.

The diagram shows an electrical circuit in a car. A voltmeter of very high resistance is used to measure the potential difference across the terminals of the battery.

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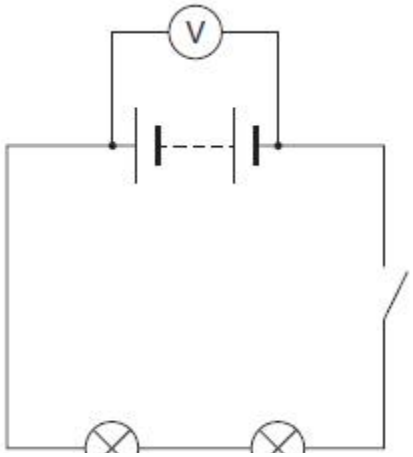

(a) Define potential difference.

_____

_____

(1)

(b) Explain how and why the voltmeter reading changes when the switch is closed.

_____

_____

_____

_____

_____

_____

(3)

(Total 4 marks)

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