



NANYANG GIRLS' HIGH SCHOOL
2021 Sec 4 Physics Practical 04:
Potential Difference and Current in a Resistor & a Filament Lamp

Suggested Markscheme (Total = 15 marks)

Record of measurements [3]

- Table with wide vertical columns (*to record readings in table immediately*)
- Headings with units **I** / A, **V** / V, and $\frac{\mathbf{V}}{\mathbf{I}}$ / VA⁻¹ or Ω (*last column for filament lamp only*)
- Acceptable values and correct d.p. for **I** and **V** (precisions: 0.01 A and 0.05 V)
- correctly calculated ratio and s.f. of $\frac{\mathbf{V}}{\mathbf{I}}$ (least s.f. of **V** and **I**, **2s.f.**) (*for resistor only*)
- Wide range (at least 0.3 A) and fairly well spread out values of **I**

Acronym to help students remember: SPLACT

Graph of V against I [4]

- **S**cales are suitable, spaced out points
- **P**oints are correctly plotted: *plot different points if lines intersect*, e.g. “x” and “⊙”
- **L**ines are sharp/of uniform thickness
 - **Resistor: best fit line:** about equal no. of points on each side & points on each side are spaced out), not force line through origin
 - **Filament lamp:** smooth curve with about equal no. of points on each side, passing through origin
- **A**xes **V** against **I**, correct labelling, intersection labelled

Gradient G

- **C**oordinates for the 2 points selected for gradient
Large **T**riangle on graph for gradient ($\geq \frac{1}{2}$ length of line) } [1]
- gradient of graph = $(y_2 - y_1) / (x_2 - x_1) \approx 2.2 \pm 0.2$ or $5.0 \pm 0.5 \Omega$ [1]

Conclusion [1]

Fig.1: V is directly proportional to I (if graph passes through or close to origin)
OR *V increases linearly as I increases* (*if graph does not pass through origin*)

Questions

1. To ensure that the current is a minimum at the beginning. This will prevent a sudden surge of a large current flowing through the circuit which may damage circuit components, when the circuit is closed. [1]
2. To prevent the heating effect of the current which would cause the resistance of circuit components to change and affect the V and I readings. [1]
3. This may cause the voltmeter and the ammeter readings to fluctuate.
OR
This may increase the effective resistance of the circuit and hence affect the V and I readings. [1]
4. (Given by gradient) gradient of graph = $(y_2 - y_1) / (x_2 - x_1) \approx 2.2 \pm 0.2$ or $5.0 \pm 0.5 \Omega$ [1]
5. The V-I graph for the resistor is a straight line passing through (or close to) the origin, indicating that it has a constant resistance.
The V-I graph for the filament lamp is a curve with increasing gradient, indicating that its resistance increases with increasing current (or p.d.). [1]

Discussion

This statement is true only if the resistor is an ohmic conductor, as in this experiment

By definition, the resistance is the ratio of V to I.