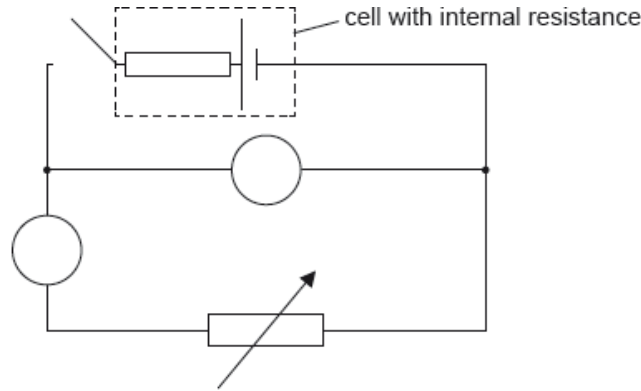# SL Paper 3

The circuit shown may be used to measure the internal resistance of a cell.

The ammeter used in the experiment in (b) is an analogue meter. The student takes measurements without checking for a "zero error" on the ammeter.

a. An ammeter and a voltmeter are connected in the circuit. Label the ammeter with the letter A and the voltmeter with the letter V. [1]

b. In one experiment a student obtains the following graph showing the variation with current I of the potential difference V across the cell. [3]
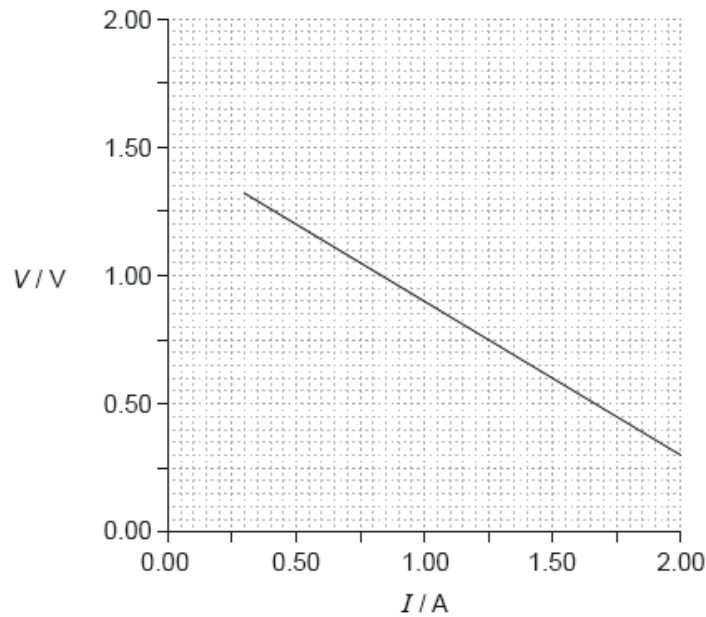

Using the graph, determine the best estimate of the internal resistance of the cell.

c.i. State what is meant by a zero error. [1]

c.ii. After taking measurements the student observes that the ammeter has a positive zero error. Explain what effect, if any, this zero error will have [2]

on the calculated value of the internal resistance in (b).

An electrical circuit is used during an experiment to measure the current I in a variable resistor of resistance R. The emf of the cell is e and the cell has an internal resistance r.
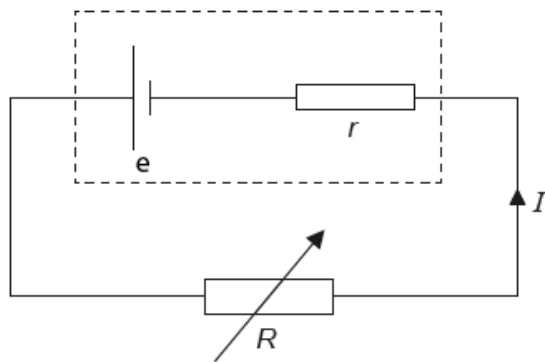
A graph shows the variation of $\frac{1}{I}$ with R.
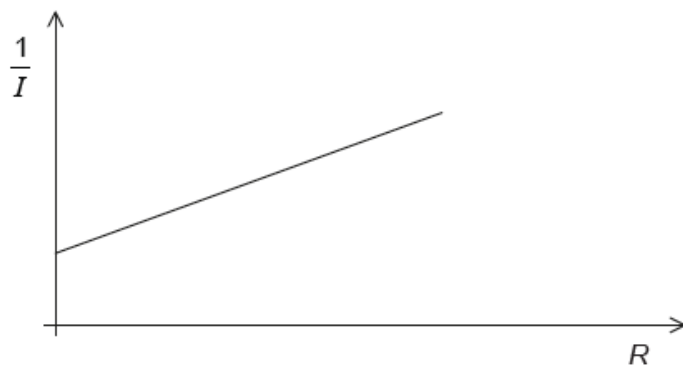
a. Show that the gradient of the graph is equal to $\frac{1}{e}$. [2]

b. State the value of the intercept on the R axis. [1]