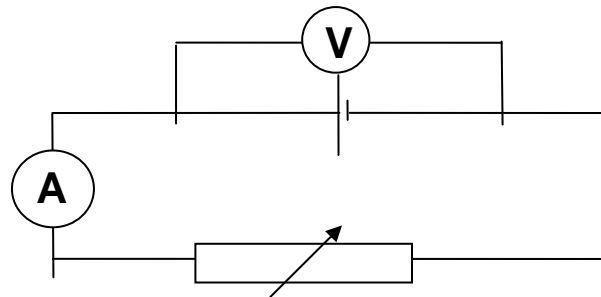


TAP 121-3: Internal resistance of a C cell

Apparatus required:

- ✓ C cell (possibly modified by the addition of a series resistor)
- ✓ Two multimeters (or an ammeter and voltmeter)
- ✓ Rheostat (approx. $10\ \Omega$)
- ✓ Leads

Circuit:



Procedure

Start with the rheostat on its maximum resistance. Record V and I . Gradually reduce the rheostat to its lowest resistance (zero) measuring V and I a minimum of 7 times over the range. Don't leave the circuit connected for long when the resistance is low (current high) because this will run the cell down quickly.

Plot a graph of V against I . E is the intercept on the V axis. The gradient is $-r$.

Another alternative approach is to interface the experiment to a computer using a suitable package. If you do this you can collect current and voltage readings immediately as you sweep the rheostat across its range of values. Most packages allow you to plot the graph as you collect data so the students will see this plotted in real time.

Practical Advice

The experiment is easier for students to perform with an extra resistance added in series with the cell. 1 or 2 Ω is suitable, though 10 Ω could be used.

DO NOT use alkaline cells as the internal resistance is too low unless an extra resistor is used.

Make it clear that the 'cell' is the power source plus the resistor.

A zinc carbon cell will give around 5 A if shorted out (dependent on size). That from an alkaline cell is much larger, it is best to protect the cells with an external resistance. If nothing else the cell will last longer as it could be left shorted out by the student.