OCR (B) Physics A-level

PAG 03.3 - Determining Internal Resistance and Maximum Power of a Cell

Practical Flashcards

What is a source's internal resistance?

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A source's internal resistance is the resistance of the materials inside the source. It is equal to the lost volts per unit current in the source.

What is the emf of a power source?

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A power supply's emf is the work done by the source per unit charge. It is equal to the potential difference across the source when no current flows.

State the equation used to calculate a battery's emf from its current, load resistance and internal resistance.

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$$\varepsilon = I (R + r)$$

R: Load Resistance

r: Internal Resistance

What is meant by the phrase ‘lost volts’?

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The lost volts of a battery is the difference between the battery’s emf and its terminal potential difference.

How do you calculate a battery's emf from its terminal potential difference, current and internal resistance?

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$$\varepsilon = V + Ir$$

Demonstrate how the equation of a V-I graph, for a source with internal resistance ‘r’ can be obtained.

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$$\varepsilon = I(R + r) \qquad V = IR$$

$$\varepsilon = V + Ir$$

$$V = \varepsilon - Ir$$

$$V = -rI + \varepsilon$$

Which is in the form y = mx + c

How can you find the internal resistance of a battery from a graph of V against I?

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$$V = - rI + \varepsilon$$

$$y = mx + c$$

The internal resistance is the gradient of the graph.

How can you find the emf of a battery from a graph of V against I?

How can you find the emf of a battery from a graph of V against I?

$$V = -rI + \varepsilon$$

$$y = mx + c$$

The emf is the y-intercept of the graph.

Why should the battery be disconnected between readings?

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The temperature of the circuit should remain constant throughout this experiment, so as not to affect the resistance. Disconnecting the battery when not needed will reduce heating.

Why should you avoid using a rechargeable battery/cell when carrying out this experiment?

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Rechargeable power sources have a very low internal resistance which would be hard to measure with this experiment.

Why should a new cell/battery be used when carrying out this experiment?

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Run-down cells and batteries have internal resistances that may fluctuate throughout the experiment. Using a new source will result in a more constant value.

What safety precautions should be taken when carrying out this experiment?

What safety precautions should be taken when carrying out this experiment?

If connected for long periods of time, the battery and circuitry can become hot. Avoid touching bare metal contacts and disconnect the battery when not taking readings.

What device could be used to check your value for the cell's internal resistance?

What device could be used to check your value for the cell's internal resistance?

An Ohmmeter

Suggest why your value for the cell's emf may be slightly different to the true value.

Suggest why your value for the cell's emf may be slightly different to the true value.

Ideal voltmeters are assumed to have an infinite resistance. In reality, a small current may still flow through the voltmeter, resulting in there being a pd across the internal resistance.