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| Analysis | EMF and Internal Resistance |
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*A battery was connected to a resistor, the current was measured through the circuit and the potential difference was measured at the terminals of the battery. By varying the resistor value it is possible to find the EMF and internal resistance of the battery.*

**Experimental Data**

Here is the experimental data collected from using different external resistors.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resistance,**  *R*  **(Ω)** | **Terminal p.d.,**  *V*  **(V)** | | | **Current**  *I*  **(A)** | | | **Mean p.d.,**  *V*  **(V)** | **Mean Current,**  *I*  **(A)** |
| 1 | 1.23 | 1.18 | 1.22 | 1.07 | 1.14 | 1.09 |  |  |
| 1.5 | 1.26 | 1.35 | 1.26 | 0.84 | 0.76 | 0.84 |  |  |
| 2.2 | 1.33 | 1.34 | 1.31 | 0.57 | 0.55 | 0.59 |  |  |
| 3.3 | 1.38 | 1.37 | 1.38 | 0.39 | 0.43 | 0.41 |  |  |
| 4.7 | 1.39 | 1.40 | 1.40 | 0.32 | 0.29 | 0.29 |  |  |
| 6.8 | 1.42 | 1.42 | 1.41 | 0.21 | 0.21 | 0.22 |  |  |
| 10 | 1.43 | 1.45 | 1.44 | 0.14 | 0.14 | 0.14 |  |  |
| 22 | 1.46 | 1.45 | 1.46 | 0.07 | 0.08 | 0.07 |  |  |

**Analysis**

Draw the circuit used in this investigation.

Calculate the mean p.d. and current for each of the resistance values.

What is the precision of the voltmeter and ammeter?

What is the independent variable in this investigation?

What is the dependent variable in this investigation?

Calculate the uncertainty in the largest mean value of p.d.

What is this as a percentage of the mean?

Calculate the uncertainty in the p.d. when the resistance was 3.3Ω

What is this as a percentage of the mean?

Calculate the uncertainty in the smallest mean value of current.

What is this as a percentage of the mean?

Calculate the uncertainty in the current when the resistance was 6.8Ω

What is this as a percentage of the mean?

Plot a graph of *V* against *I* (on the x axis) and draw a line of best fit.

If *V* and *I* are connected by the equation, what does the gradient of the line represent?

Calculate the gradient of your line of best fit.

What does the y-intercept of your line represent?

Write down the value of the y-intercept from your graph.

If the internal resistance was increased what effect would this have one your graph?