A special report is one that is written up outside the first year laboratory. The following was written as a typical special report; we have included some of the errors that might be found in a laboratory report. This report would get about 55% provided we were certain that the student actually attended the laboratory and undertook the work.

THE MEASUREMENT OF RESISTANCE USING VOLTMETER & AMMETER

INTRODUCTION

In electrical circuits, we are concerned with the flow of electrical current around closed loops made up of wires, meters and other components. For this unit we measured and calculated electrical quantities such as direct current, voltage and resistance.

Current

Electrical current is the rate at which electrical charge flows around a circuit. It is measured in units of amperes (A) by ammeters.

Potential Difference (voltage)

Electrical charge tends to move from points of high potential to points of low potential. The difference in potential between two points is called the potential difference or voltage and is measured in units of volts (V).

Resistance

For many devices, it is found that the potential difference appearing across a device is proportional to the current flowing through it. The connecting relationships is known as Ohm's law and is written:

$$V = IR$$

where R is the resistance and is measured in ohms (Ω).

EQUIPMENT AND METHODS

For this experiment we were given:

- some ammeters
- a voltmeter
- a power supply
- some batteries
- a multimeter
- some wires
- some resistors on a board.

The following two circuits were set up.

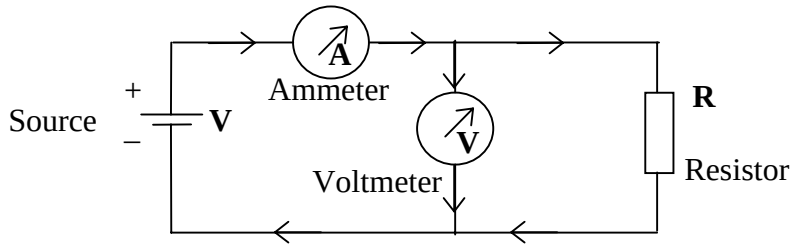

Figure U4.1

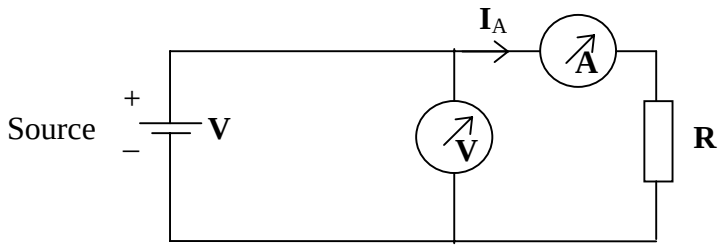

Figure U4.3

To calculate R the resistance of the device use Ohm's law.

$$R = \frac{V}{I}$$

Use the 1.5V torch cell to, measure the values of at least four resistors and compare the results with the colour codes on the resistors.

RESULTS AND UNCERTAINTIES

We followed the instructions in the manual and set up the first circuit was used to get the best results. We checked the range of the ammeter in the circuit.

	V (volt)	I (mA)	V/I (Ω)	Colour code value
A	1.5	87	17.24	15 Ω
B	1.5	40	37.5	33 Ω
C	1.5	2.2	681	680 Ω
D	1.5	154 μA	9740	8200 Ω
E	1.5	38 μA	39473	39 kΩ

The above results have errors

A (17.24-15)/15 = 0.149
B (37.5-33)/33 = 0.136
C (681-680)/680 = 0.00147
D (9740-8200)/8200 = 0.187
E (39473-39000)/39000 = 0.0121

The average value is 0.0971 Ω.

DISCUSSION

The results show that Ohm's law is true but this isn't always true. The resistances were accurate to 10% and our average error is 9.7% which is right. These uncertainties were caused by inaccurate readings of the meters, wrong colour codes and human error. Also the battery seemed to be flat and sometimes it read as low as

1.45 V. It would be better if we could use new batterys. It would be better if we could use up to date electronic voltmeters and ammeters.

CONCLUSION

We were able to prove Ohm's law for resistances $V = IR$. We checked our results against the proper values from the colour codes and they agreed to with in experimental error. In future experiments it would be best to use better equipment, that is more up date meters.