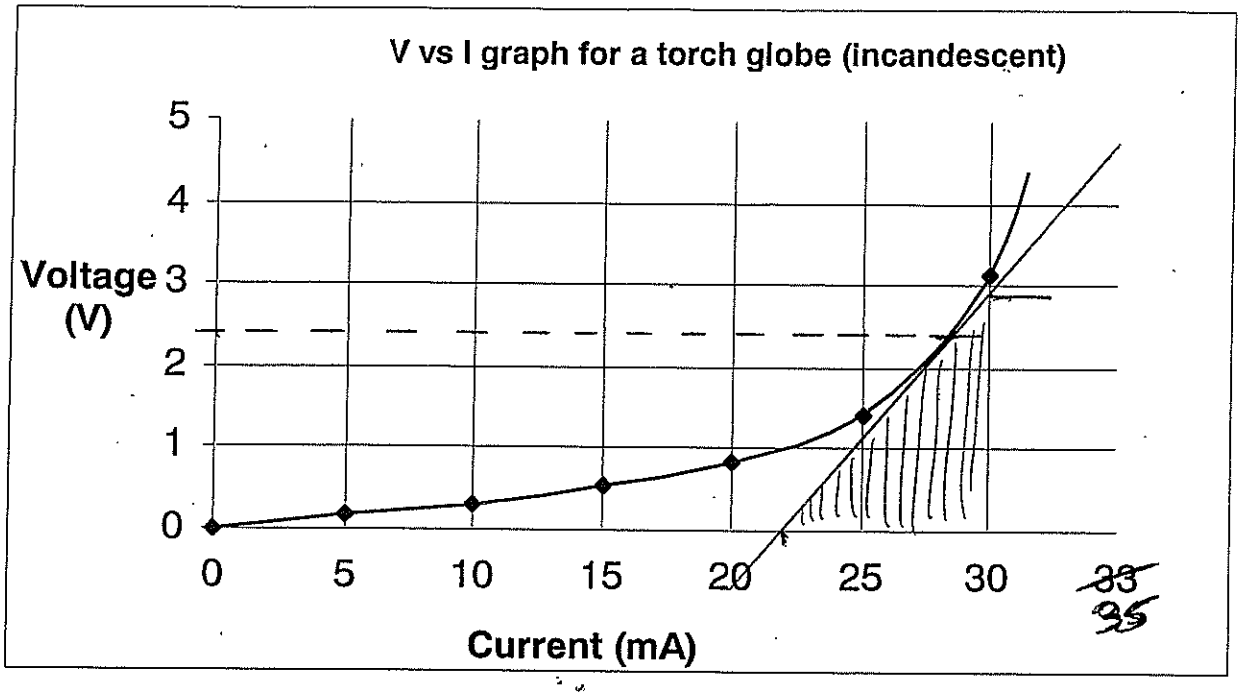
Year 11 Physics: Electricity
Ohm's Law: **Written** Assessment

Mark: (10)	

Name: Solutions Brett

Teacher: _____



1. From the above graph, determine the resistance of the globe when the torch holds two 1.2 V cells in series. NB: Show your working on the graph to show how you obtained your answer. (2)

$R = \frac{\Delta V}{\Delta I} = \frac{2.9}{(30-22)} = \frac{2.9}{8\times10^{-3}} \approx 362.5 \xrightarrow{400} 420\,\Omega$

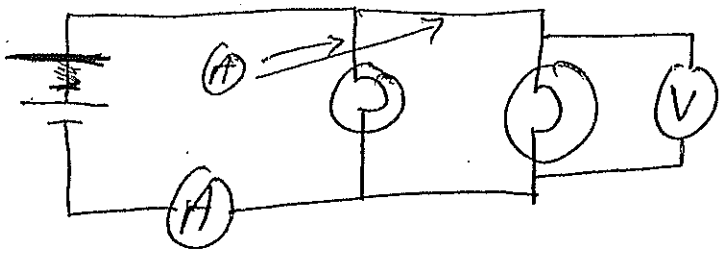
2. As the current increases what happens to the resistance of the globe? (1)

Increases (exponentially)

3. Explain why the graph does NOT behave like an ohmic resistor. (2)

- Filament is non-ohmic
- I & R increase disproportionately
- As I increase the atoms gain E_K, thus R continues to increase not in a linear fashion.

4. Draw a circuit diagram of two globes in parallel connected to a two cell battery. Include an ammeter and a voltmeter correctly in your circuit. (2)



½ each

½ for errors or additions.

5. A small lighting circuit contains 2 lamps (rated at 12V, 10W) in parallel. The energy is supplied by a multi-cell battery rated at 12V, 5A-hr. How long will the battery last? (3)

Method 1

$P = 10W$

$V = 12V$

$I = ?$

$I = \frac{P}{V} = \frac{10}{12} = 0.83\dot{3}\ A$

$t = \frac{5\ Ahr}{0.83\dot{3}\ A} = 6\ hr.$ (1 lamp)

OR $\frac{6}{2} = 3$ hours

OR $t = \frac{5\ Ah.}{2 \times 0.83\dot{3}} = 3$ hour.

Method 2.

$P_{Batt} = 12 \times 5 = 60$ Wh

$load_{max} = 2 \times 10 = 20W$

OR $\frac{60}{20} = 3$ hr

End of written assessment.

Year 11 Physics: Electricity
Ohm's Law: **Practical** Assessment

Mark: (15)	

Power supply number	

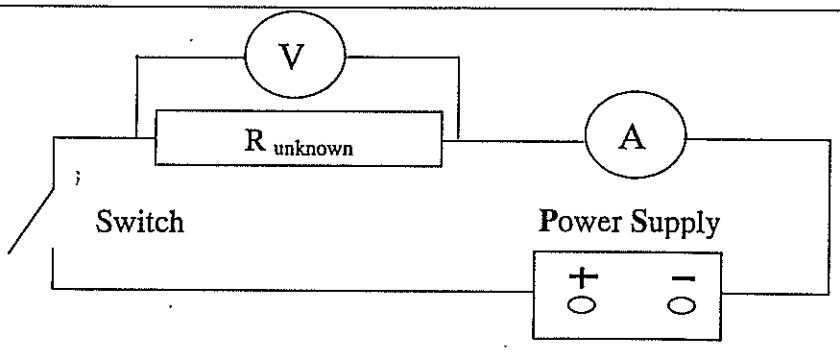
Name: Solutions
Teacher: _____

Determining the relationship between potential difference and current in a resistor.

The amount of current flowing in a metallic conductor depends on the amount of charge flowing past a point per unit time. If you apply a potential difference, V, across the ends of a conductor it will cause a current, I, to flow. You can use a voltmeter to measure the electrical potential difference, V, between the ends of a metal wire resistor and you can measure the current, I, in that resistor with an ammeter. In this experiment you will determine the resistance of an electrical component by measuring the current flowing through the component and the potential difference across the component.

Equipment needed:		
Power supply (0-12 V DC) Electrical leads (6 of) Single globe (12 V)	Voltmeter (0-12V) Ammeter (0-5A)	Switch Unknown resistor (1 only)

Procedure:

1	Before building the circuit, use the voltmeter to measure the terminal voltage of the power supply (no load condition). Write your Terminal Voltage in the **bold column** in the table at the bottom of the page.
2	Connect the equipment as shown in the circuit diagram below. 
3	Set the power supply to the minimum output with the unknown resistor connected to your circuit. Set both meters to the maximum reading before turning on the power supply and ensure correct polarity. With the meters working correctly, continue with the lab test.
4	Adjust the power supply (**PS**) output to obtain **five different readings** of potential difference and current. Do **NOT** run the circuit for more than 15-20 seconds. If the current is too high it may overheat the resistor and damage it.
5	Repeat steps 3 and 4, replacing the unknown resistor with the 12V globe. **(Check that the globe is 12 V)**

Processing results:

1. Record your results for the **unknown resistor.** Calculate & record the values for **V / I.** (2)

Reading	**PS dial voltage**	Current (~~A~~ or mA) through the resistor	Potential difference (V) **across** the resistor.	**V / I**
1	2	22	2.5	
2	4	38	4	
3	6	60	6	
4	8	80	7.8	
5	10	100	10	
			Average	

±10% ≈110 ≈220

If error in I, allow error in following ones!

$\pm 10^{-3}$ only once!

$-\frac{1}{2}$ No Average

2. Record your results for the 12V **globe**. Calculate & record the values for **V / I**. (3)

Reading	**PS dial voltage**	Current (A or ~~mA~~)	Potential difference (V)	**V / I**
1	2	0.06	1.5	2x5
2	4	0.1	3	30
3	6	0.13	5	38.46
4	8	0.17	6.5	38.2
5	10	0.2	8.5	42.5
				(-½ Average)

I increase

V/I increase

Non-linear some may be only just.

3. Plot a graph of potential difference, V, against current, I, for the resistor and the 12 V globe. Put current on the "x" axis and put values for both the unknown resistor and the 12V globe on the same graph. Use graph paper supplied. **Write your full name on the top right hand side of the graph paper.** (4)

QUESTIONS:

1. State which component, if any, was ohmic or non-ohmic

   Resistor (unknown) = ohmic (1)

   12 V Globe = non-ohmic (1)

2. (i) **On** your unknown resistor **graph** (V vs I) **show** the points on the graph used to determine the slope (actual rise and run used) (1)

   (ii) Show your working on your graph used to calculate the slope of your unknown resistor curve. (1)

   must use graph

3. State the value of unknown resistor according to **your graph**. (1)

   Unknown resistor = 110/220 ± 10% or table error

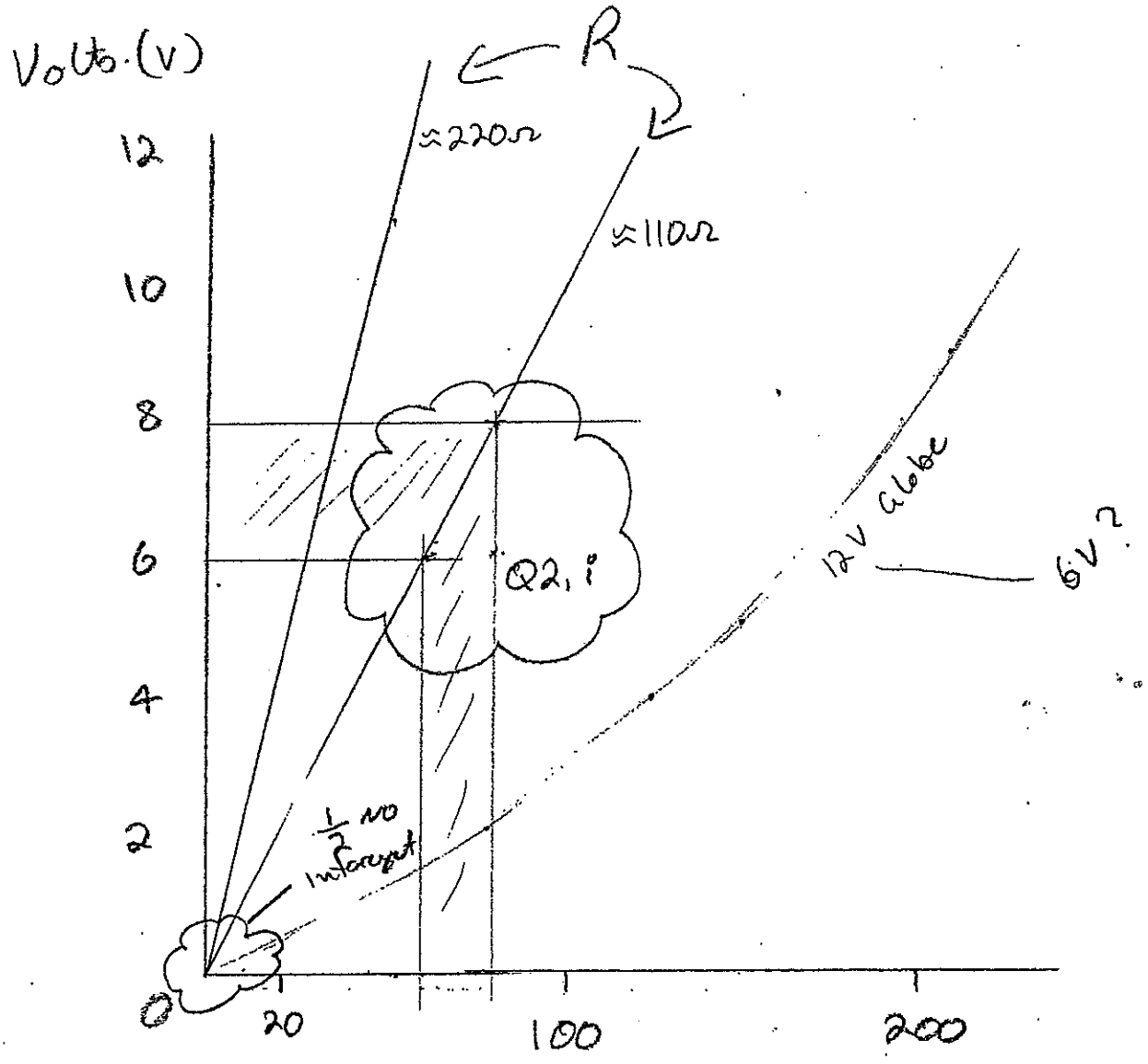
4. Briefly state the relationship between slope and resistance exhibited on your graph. (1)

   (1) Unknown – V I graph is proportional
   – R ∝ slope of V I graph
   –

   (2) Bulb –

End of practical assessment.

V I graph for unknown R + Globe



Q2 i)

for $R = \frac{\text{rise}}{\text{run}} = \frac{2}{20\times10^{-3}} \approx 100\Omega$

Marks – title $-\frac{1}{2}$

axis $-\frac{1}{2}$

curve R $-1\frac{1}{2}$ — Ruler $-\frac{1}{2}$ if natured. straight line (LBF) labelled points correct

" Globe $-1\frac{1}{2}$ — curved line exp labelled points correct.