 **Mandurah Catholic College**

**Physics - Unit 1**

**Electricity Validation Test**

**Name: Total Marks /40**

You have taken a part time job in a local electronics store and on your first morning at work you manage to tip over a large box of resistors (that are all mysteriously missing the markings that indicate their resistance values). Ever the enthusiastic Physics student you volunteer to sort out all of the mixed up resistors and determine their Resistance values.

You quickly locate the following list of electronic components:

* 12 V power supply
* switch
* six electrical leads
* voltmeter
* ammeter

1. Using a circuit diagram, briefly outline the method you will use to determine the Resistance value of one of the unlabelled resistors. (4)

2. An apprentice electrician at the company takes pity on you and decides to help you out. She sets up an identical circuit to yours and records the following information for one of the unlabelled resistors:

|  |  |
| --- | --- |
| **Potential Difference across resistor (V)** | **Current through resistor (mA)** |
| 2 | 36.4 |
| 4 | 72.7 |
| 6 | 109 |
| 8 | 145 |
| 10 | 182 |
| 12 | 218 |

\* Note the units for each.

On the graph paper supplied plot a graph of Current vs Potential Difference for the above Resistor and use it to determine its Resistance. (6)

3. Is this resistor ‘Ohmic’? Explain your answer with reference to your graph.

(2)

4. What is the difference between an Ohmic and a non-Ohmic circuit component in terms of their Resistance to Current flow? Sketch I-V graphs to illustrate your answer. (4)

5. Would an old style Incandescent Light Bulb be an Ohmic or non-Ohmic device? Explain your reasoning. (3)

6. You take 3 of the Resistors, whose resistances you have experimentally determined to be 20 Ohms, 25 Ohms and 30 Ohms and connect them in series with a power supply (set to 12V).

a) Calculate the total Resistance of the 3 resistors in series. (2)

b) Calculate the Current that would flow through each resistor (assume power supply set to 12V). (2)

c) Calculate the Potential Difference across each of the resistors.

(3)

7. You reconnect the 3 resistors so that they are now connected in parallel with the power supply.

1. Calculate the total Resistance of the 3 resistors connected in parallel.

(2)

1. Calculate the Current that would flow through each resistor (assume power supply set to 12V). (3)
2. What is the Potential Difference across each of the resistors?

(1)

8. If you replace each of the resistors with a globe (assume they each have the same resistance as the resistor they replace), will they glow more brightly when connected in series or parallel (assume 12V)? Explain your answer.

(4)

9. The helpful apprentice is designing a set of decorative backyard fairy lights for her mum (for Mothers Day). Explain the advantages and disadvantages of connecting the lights in Series compared with connecting them in Parallel. (4)

Hi Jemma,  
  
I think the test is very good. Students often get confused with ohmic/non-ohmic and particularly also with parallel/series. Those that have a good understanding will do very well and that will be demonstrated by their work in Q6 & 7.  Q8 is very good, especially with the explain bit, as that shows a really good understanding of electricity, if answered correctly.   
  
If you had time you could have changed Q7 to a diagram of the parallel and have them solve it, without indicating parallel or series. So say the helpful apprentice draws a diagram and says this will work better, so you decide to calculate a), b), c). Then have a d) section where it asks what conclusion did you draw about the amount of voltage, current and total resistance between Q6 and Q7 - that way you are testing their ability to interpret the results between parallel and series circuits, explaining which has more current, etc. That way you are testing the word calculations in Q6 and the visual in Q7 (or you could change it, so the visual is in Q6 and the word explanation is Q7) - Hope that made sense.  
  
With Q8, possibly rewrite:  
  
If you replace each of the resistors with a globe (assume each globe has the same resistance as the resistor they replace), will they glow more brightly when connected in series or parallel (assume 12V)? Explain your answer.  
  
As is though it is a very good test. However, I believe you have a few high fliers and so changing the approach to the way the question is asked (Q6 versus Q7), that could test them.  
  
Thankyou  
Kim