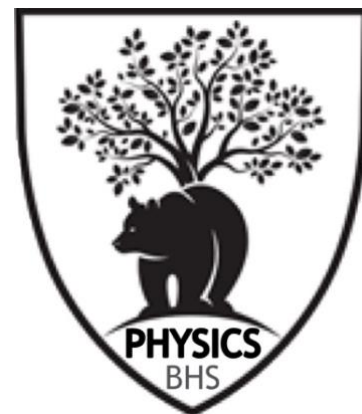


Name:

Teacher:



N5 Physics and Electronics

Electricity 1 - Circuits

	Success Criteria	Test	Prelim	Exam
L1	I can draw the circuit symbol for: cell, battery, lamp, switch, voltmeter, ammeter, motor, microphone, loudspeaker, photovoltaic cell,			
L2	I can define potential difference (voltage)			
	I can define current			
	I can describe practical applications of series and parallel circuits.			
	I can make measurements of current and voltage using appropriate meters in simple and complex circuits.			
	I can apply the current and voltage relationships in a series circuit.			
L3	I can describe the symbol, function and application of: resistor, variable resistor			
	I can use an ohmmeter to measure resistance			
	I can use resistor colour coding			
L4	I can make measurements of IR using appropriate meters in simple and complex circuits.			
	I can make use of a V-I graph to determine resistance.			
	I can make use of an appropriate relationship to calculate potential difference (voltage), current and resistance			
	I can describe the relationship between temperature and resistance of a conductor.			
	I can describe the relationship between temperature and resistance of a resistor.			
L5	I can describe an experiment to prove Ohm's Law.			
	I know what happens in a circuit when I increase the resistance in both series and parallel circuits.			
	I can predict the total resistance in a series circuit			
	I can measure the total resistance in a series circuit			
	I can predict the total resistance in a parallel circuit with resistors of the same value			
L6	I can measure the total resistance in a parallel circuit with resistors of the same value			
	I know what happens in a circuit when I increase the resistance in both series and parallel circuits.			
	I can predict the total resistance in a series circuit			
	I can measure the total resistance in a series circuit			
	I can predict the total resistance in a parallel circuit with resistors of the same value			
L6	I can measure the total resistance in a parallel circuit with resistors of the same value			
	I can measure the total resistance in a parallel circuit with resistors of the same value			

L1 - Circuit Symbols

- I can draw the circuit symbol for: cell, battery, lamp, switch, voltmeter, ammeter, motor, microphone, loudspeaker, photovoltaic cell,

Task 1: Complete the table with the SQA accepted definitions and symbols

Component	Symbol	Function
Cell		
Battery		
		Converts electrical energy to light energy
		Opens and closes the circuit
		Measures the voltage across a component
Ammeter		
Motor		
Microphone		
Loudspeaker		
Photovoltaic Cell		Converts light energy to electrical energy (Solar Panel)

Task 2: Create flashcards for the symbols

Task 3: In pairs, or small groups, quiz each other on the symbols

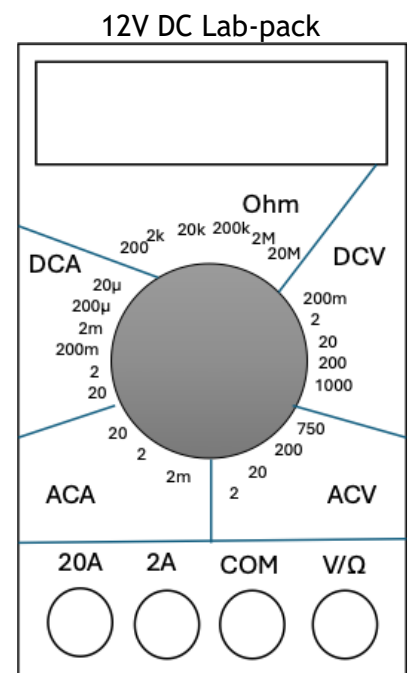
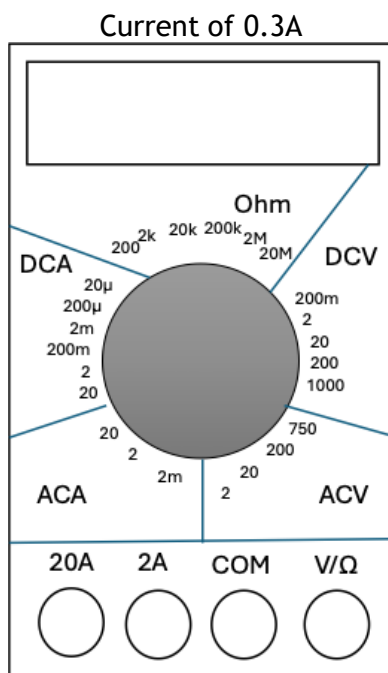
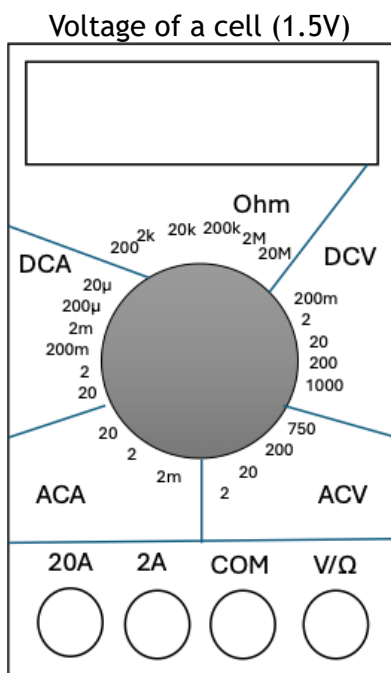
L2 - Current and Voltage

- I can define potential difference (voltage)
- I can define current
- I can describe practical applications of series and parallel circuits.
- I can make measurements of current and voltage using appropriate meters
- I can apply the current and voltage relationships in a series circuit.
- I can apply the current and voltage relationships in a parallel circuit.

Task 1: Complete the table with the SQA accepted definitions

Term	Definition	Symbol	Units
Potential Difference (Voltage)	Energy supplied to each coulomb of _____ passing through the supply		
Current	The amount of _____ passing a point every second		

Task 2: On the multimeters below, label the correct ports and position to measure: (Colour)



Task 2: Complete the table with the circuit rules.

	Series	Parallel
Current		
Voltage		

L3 - Measuring Resistance

- I can describe the symbol, function and application of: resistor, variable resistor
- I can use an ohmmeter to measure resistance
- I can use resistor colour coding

Task 1: Complete the table with the SQA accepted definitions and symbols

Component	Symbol	Function
Resistor		
Variable Resistor		

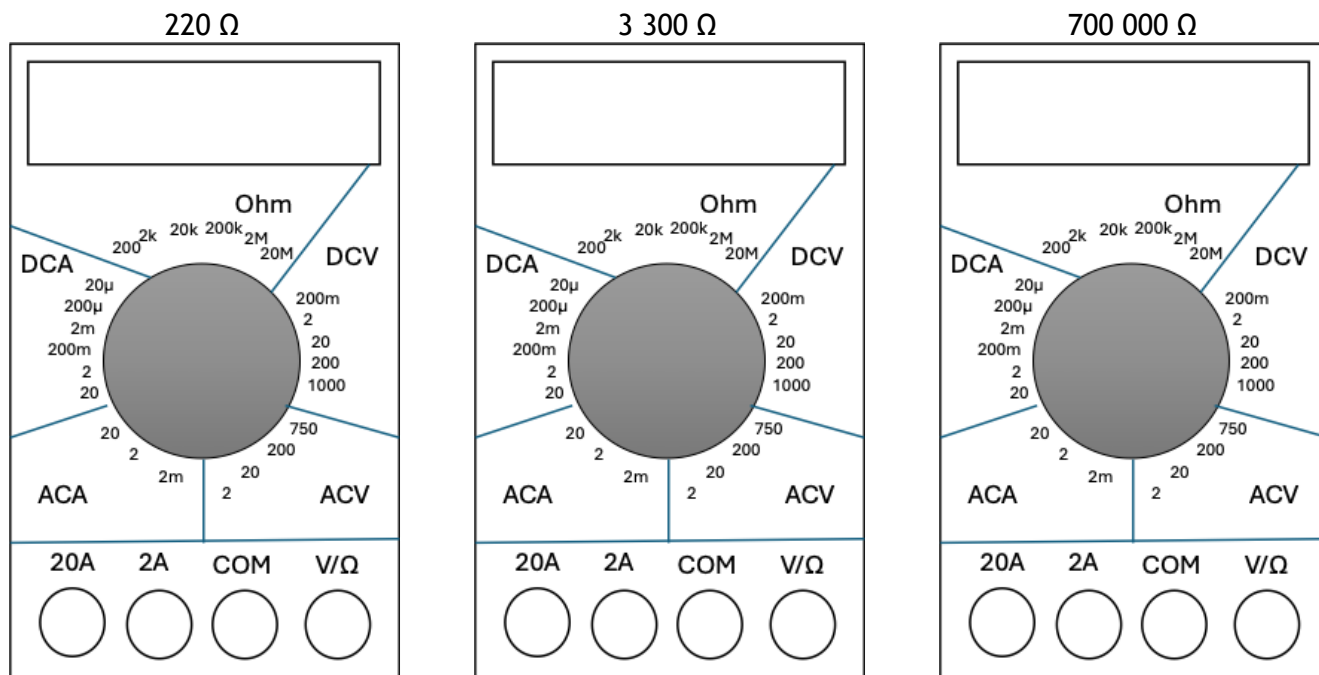
Task 2: Complete the table with the SQA accepted definitions

Term	Definition	Symbol	Units
Resistance	A measure of how _____ it is for charge to flow through a material		

Task 3: Complete the following table:

Resistor Bands				Quoted Resistance	Tolerance	Maximum Value	Minimum Value
1	2	3	4				
Orange	Orange	Brown	Silver				
Green	Blue	Red	Silver				
Brown	Green	Orange	Gold				
Red	Black	Orange	Gold				
				470 Ω	$\pm 5\%$		
				820 Ω	$\pm 10\%$		
				390 k Ω	$\pm 5\%$		

Task 4: On the multimeters below, label the correct ports and position to measure: (Colour)



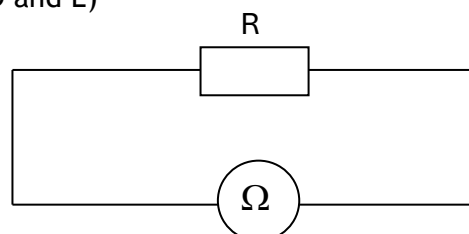
Task 5: Experiment - Measuring resistance using an ohmmeter

AIM To determine the resistance of a resistor using an ohmmeter.

APPARATUS a digital multimeter
a set of unknown resistors (label them A, B, C, D and E)

METHOD

- Connect the ohmmeter directly across resistor A.
- Repeat for resistors B, C, D and E.



RESULTS

Resistor	Quoted Resistance value / Ω	Tolerance	Measured Resistance value / Ω	Within tolerance? (Y/N)
A				
B				
C				
D				
E				

L4 - Ohms Law

- I can make measurements of IR using appropriate meters in simple and complex circuits.
- I can make use of a V-I graph to determine resistance.
- I can make use of an appropriate relationship to calculate potential difference (voltage), current and resistance
- I can describe the relationship between temperature and resistance of a conductor.
- I can describe the relationship between temperature and resistance of a resistor.
- I can describe an experiment to prove Ohm's Law.

Task 1: Label the equation

$$V = IR$$

Task 2: Try the example questions and get your teacher to check

1. A current of 0.2 A is passing through a 33 Ω resistor. **Calculate** the voltage across the resistor

2. A component has a resistance of 5 Ω and a voltage across it of 230 V. **Calculate** the current through the component

3. A resistor is required to have a current of 2 mA When a voltage of 8V is applied to it. **Calculate** the required resistance

Task 3: Yellow Books page 45-49

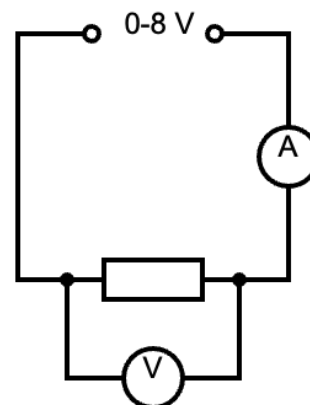
Task 4: Ohms Law Practical 1

Aim

To Prove that current and potential difference are directly proportional for a fixed resistor.

Method

1. Adjust supply 1- 5 V
 2. Measure V and I each time
 3. Plot a graph of V against I
 4. Gradient = R
- Complete the experiments in groups.
 - Write up your finding Individually.



Task 5: Ohms Law Practical 2

Aim

To discover the link between voltage and current of a nonohmic conductor

Method

1. Adjust supply 1- 5 V
2. Measure V and I each time
3. Plot a graph of V against I

Task 6: Answer the flowing Questions

1. How do the graphs from practical 1 and 2 compare?

2. Describe the relationship between temperature and resistance for a fixed resistor.

3. Describe the relationship between temperature and resistance for a non-ohmic conductor

L5 - Combining Resistors 1 (Basic)

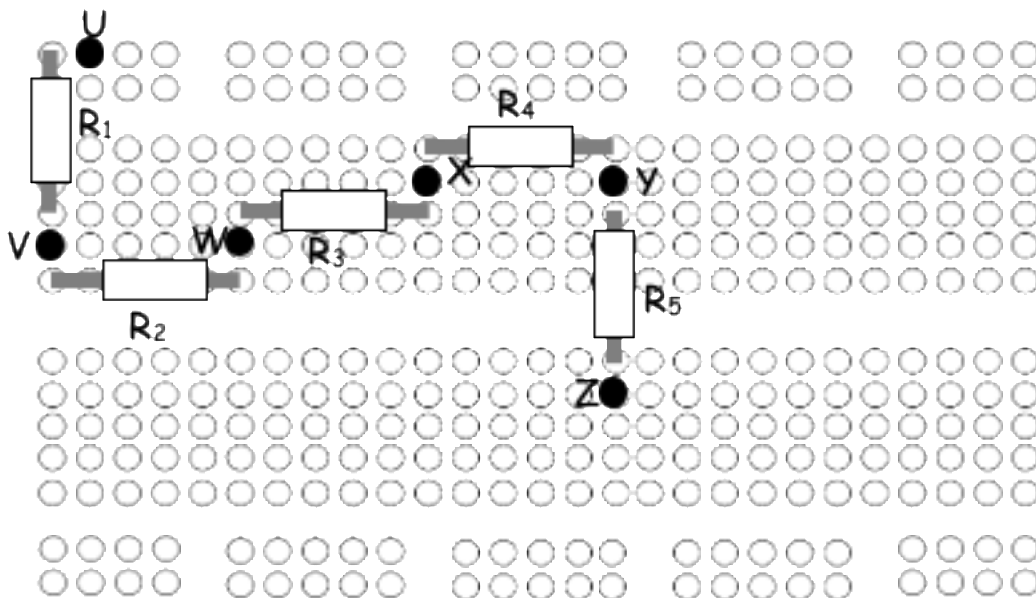
- I know what happens in a circuit when I increase the resistance in both series and parallel circuits.
- I can predict the total resistance in a series circuit
- I can measure the total resistance in a series circuit
- I can predict the total resistance in a parallel circuit with resistors of the same value
- I can measure the total resistance in a parallel circuit with resistors of the same value

Practical 1: Combining Resistors in Series

AIM To measure the total resistance of several resistors in series

APPARATUS a digital multimeter
the set of resistors labelled A, B, C, D and E
prototype board

Connect the 5 resistors as shown below on prototype board:



Using an ohmmeter, complete the table below

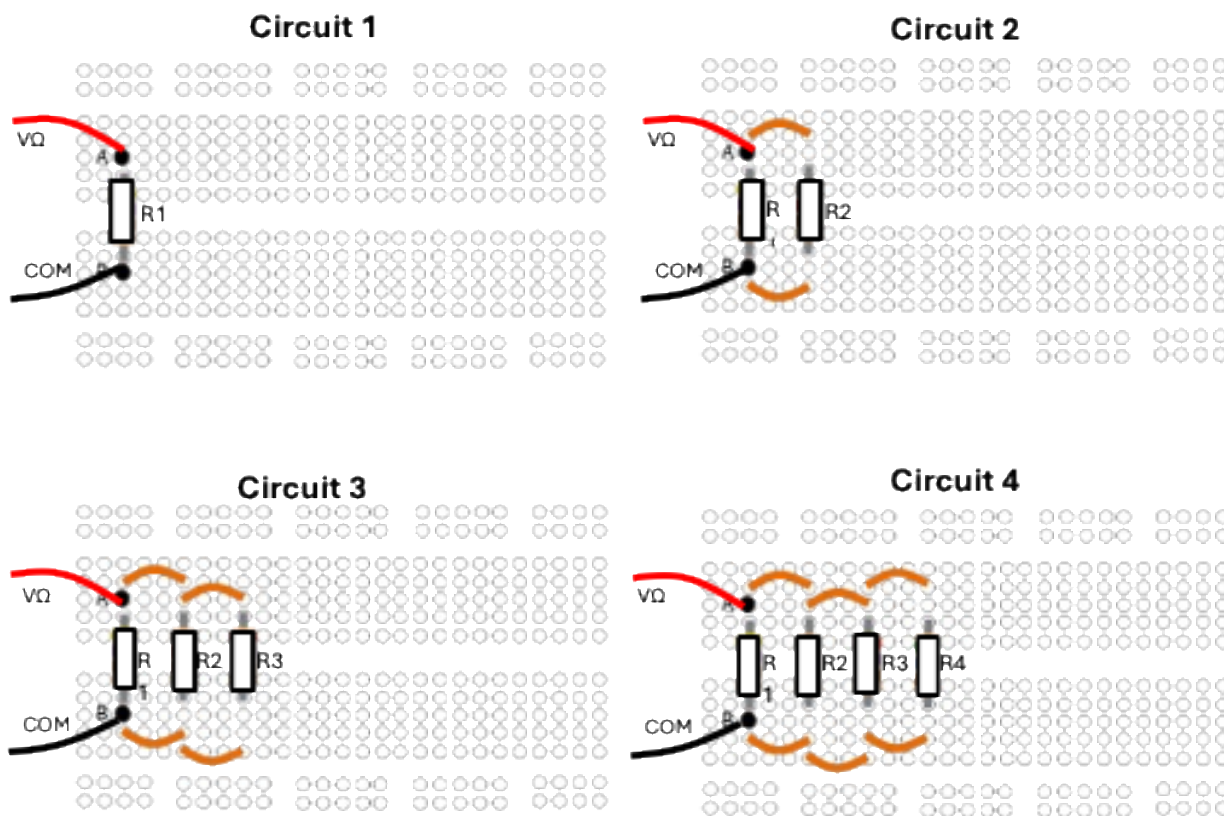
Meter position	Prediction (Ω)	Ohmmeter reading (Ω)
U and W		
U and X		
U and Y		
U and Z		
V and X		
W and Y		
X and Z		

Practical 2: Resistors in Parallel

AIM To measure the total resistance of several resistors in parallel

APPARATUS a digital multimeter
the set of 4 resistors of the same value
prototype board

Connect each circuit 1 at a time:



Complete the table:

Circuit	Prediction (Ω)	Ohmmeter reading (Ω)
1		
2		
3		
4		

Task 1: Write a rule for resistance in series and parallel below

L6 - Combining Resistors 2 (Tricky)

- I can solve problems involving total resistance in a parallel circuit
- I can solve problems involving total resistance in a combination circuit
- I can predict the total resistance in a parallel circuit with resistors of the different values
- I can measure the total resistance in a parallel circuit with resistors of the different values

Task 1: Annotate the relationships below

1. Combining resistors in _____

$$R_t = R_1 + R_2 + \dots$$

2. Combining resistors of the same value in _____

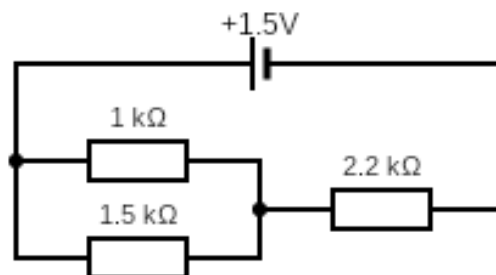
$$R_t = \frac{R_1}{\text{no. branches}}$$

3. Combining resistors of the different values in _____

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

Worked Example - Tricky

Calculate the total effective resistance of the combination circuit below:



Step 1: Parallel

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_p} = \frac{1}{1000} + \frac{1}{1500}$$

$$\frac{1}{R_p} = 0.00166 \dots$$

$$R_p = 600 \, \Omega$$

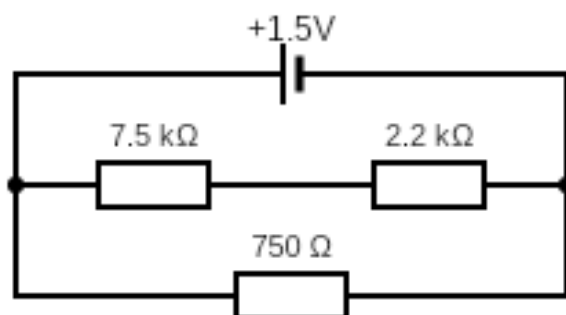
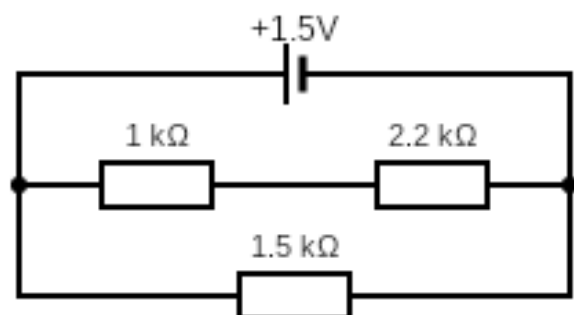
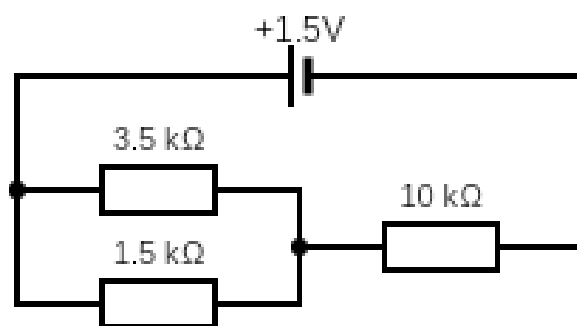
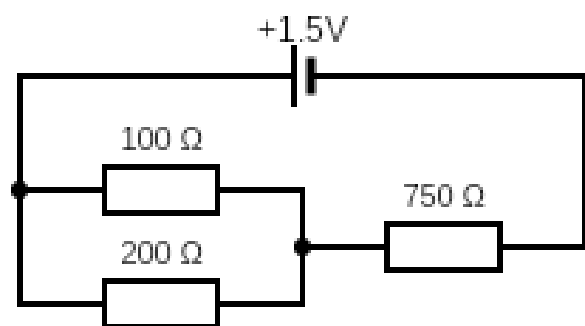
Step 2: Series

$$R_t = R_p + R_3$$

$$R_t = 600 + 2200$$

$$\underline{R_t = 2.8 \, k\Omega}$$

Task 2: Calculate the total effective resistance for the circuits bellow



Task 3: Yellow books

Practical: Resistors in Parallel

AIM To measure the total resistance of several resistors in parallel

APPARATUS a digital multimeter
the set of 4 resistors of different values
prototype board
wires

Method Connect resistors of different values in parallel on a prototype board
Use the table below to record your predictions and results
The diagrams on page 9 may help with designing your circuits

Complete the table:

Resistors (Ω)	Prediction (Ω)	Ohmmeter reading (Ω)

Review: Check your booklet is up to date
Test yourself on the definitions
Complete Electricity practice test 1
Self-Mark Electricity practice test 1
Fill in your learning Log

