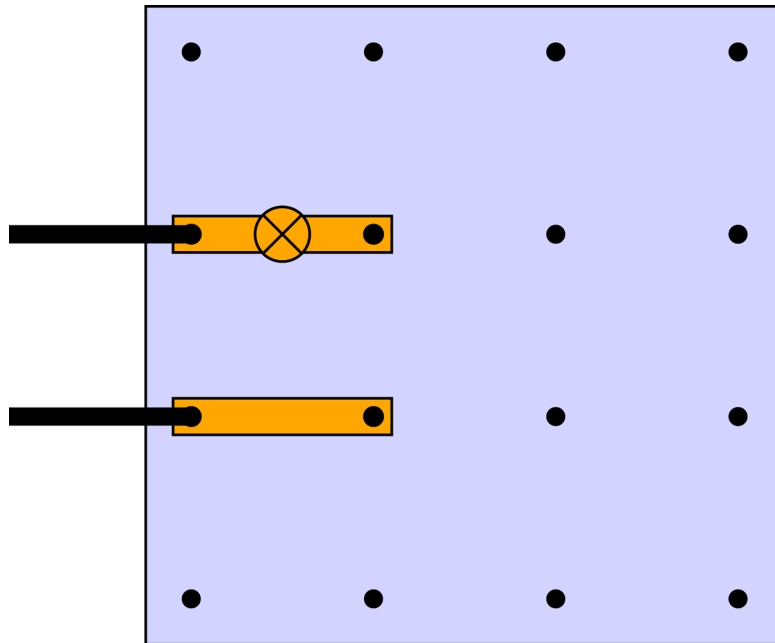


1. Conductors & insulators

Set up the circuit as shown below. Use each of the materials to bridge the gap and complete the circuit.

Materials to test:

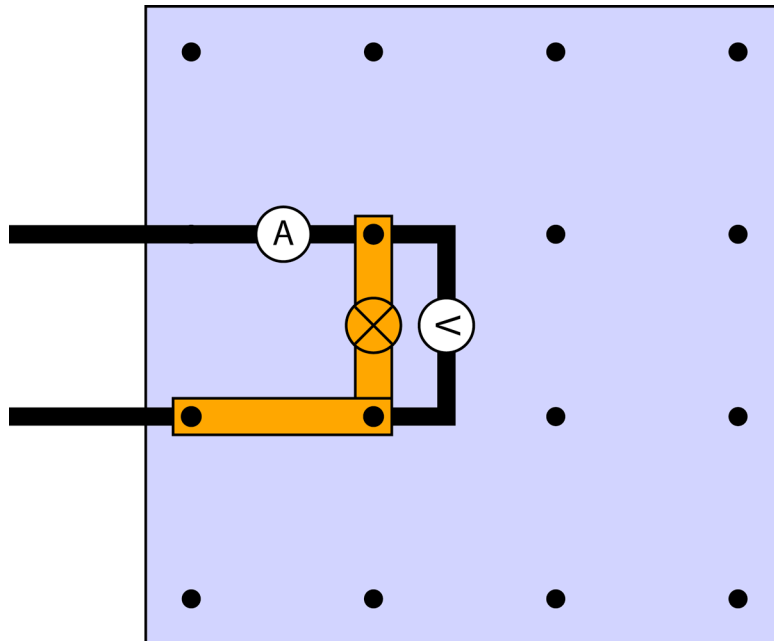
- Iron nail
- Carbon
- Plastic
- Wood
- Glass
- Aluminium foil
- String



- Draw up a table in your book and classify the materials as good or bad conductors of electricity.
- What types of materials make the best conductors of electricity?

2. Voltage & current - Ohms law.

The circuit below shows how to measure the current through and voltage across a light globe. The ammeter is in series and the voltmeter is in parallel. If these are not arranged correctly, the readings will be incorrect and you risk damage to equipment through a short-circuit.



- a) Start with the power supply on 2V and ensure that the globe glows. Record the current and voltage from the meters. Increase the voltage on the power supply and record again. Record the voltage and current up to 12V.

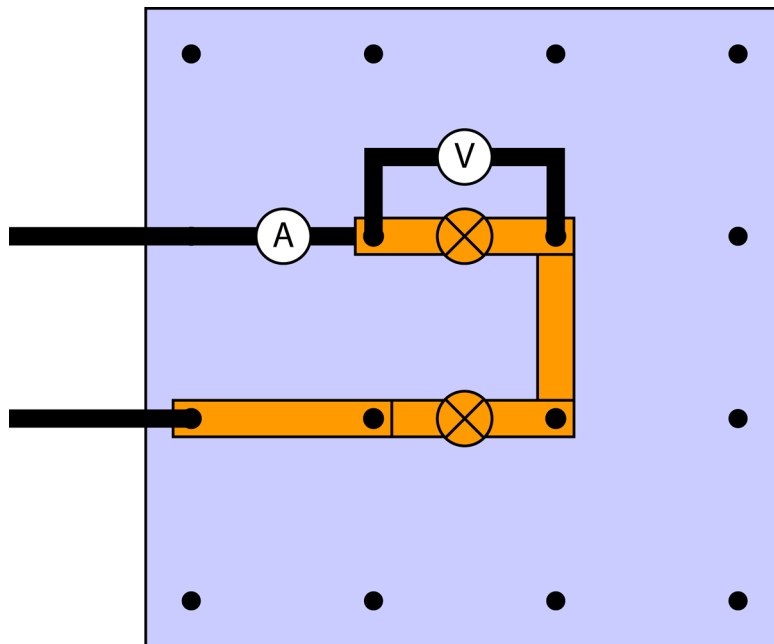
Power supply setting	Measured voltage across globe	Measured current through globe
2V		
4V		
6V		
8V		
10V		
12V		

The current that flows with 12V will be used as a reference for all other measurements in these activities.

- b) What relationship do you notice between increases in voltage and current?
 c) What is the relationship between current and brightness of a globe?
 d) What current do you think would flow if the voltage was increased to 24V?

3. Series circuits

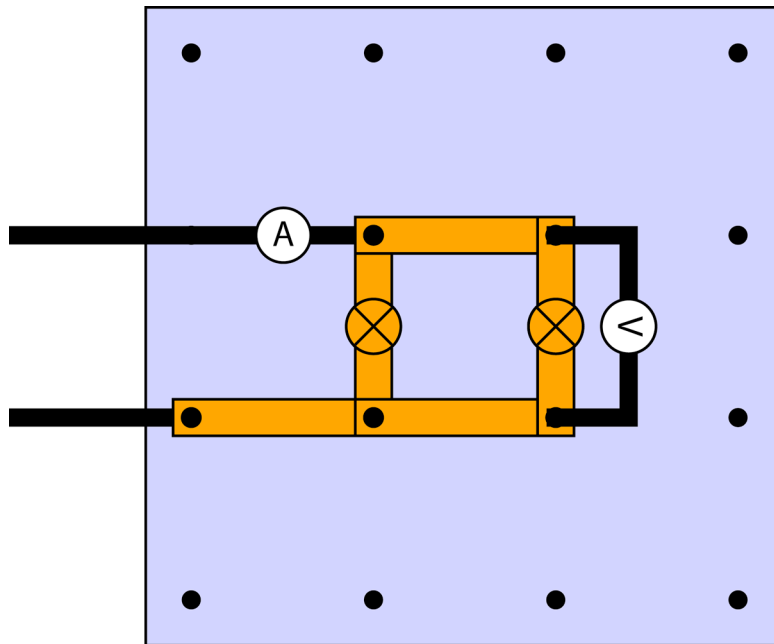
Set the power supply to 12V. Connect two globes in **series** as shown below. Components are in series if there is only one path that current can take.



- Measure and record the current that runs through the circuit.
- How does the current through two globes compare to the current through one globe with 12V? (This was measured in question 1.)
- What do you notice about the brightness of the two globes in series compared to just one?
- Measure and record the voltage across each globe.
- What do you notice about the two voltages across the globes in series?
- Predict and then measure what you think that the current would be if three globes were placed in series. Draw a diagram of this circuit.
- Does it matter where the ammeter is placed in series in the circuit? Explain why.
- Explain what a negative reading on the ammeter means. Is this a problem?

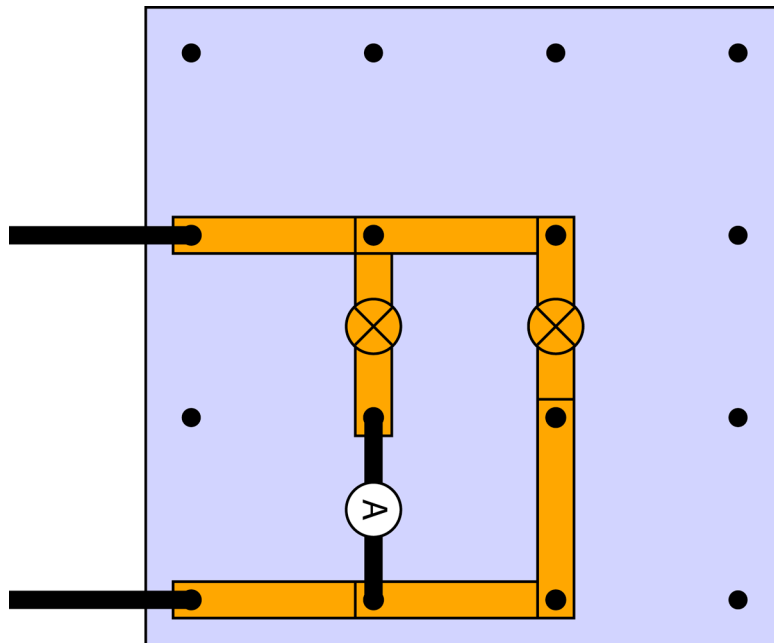
4. Parallel circuits

Set the power supply to 12V. Connect two globes in **parallel** as shown below. Components are in parallel if there is more than one path that current can take.



- Measure and record the total current that runs through the circuit.
- How does the current through two globes in parallel compare to the current through one globe with 12V? (This was measured in question 1.)
- What do you notice about the brightness of the two globes in series compared to just one?
- Measure and record the voltage across each globe individually.
- What do you notice about the two voltages across the globes in parallel?

Extend the circuit to allow the current through each globe to be measured. (Remember that the ammeter must be placed in series by breaking the circuit!)



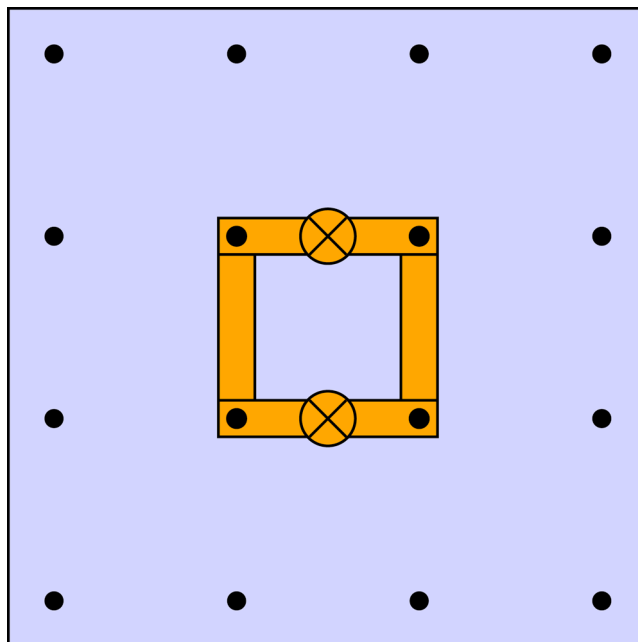
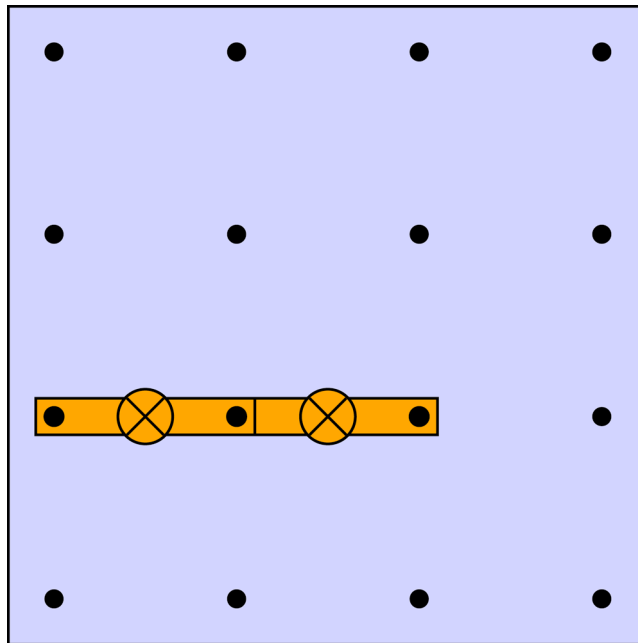
- f) Measure and record the current through each globe.
- g) What do you notice about the current through each globe, in comparison to the original reference (12V, one globe)?
- h) Predict and then measure what you think that the total current would be if three globes were placed in parallel. Draw a diagram of this circuit.

5. Measuring resistance – Series and parallel

When measuring resistance, the power supply must not be connected. Damage can occur to the meter if this is not done correctly.

Use the multimeter on the resistance scale to record the resistance of:

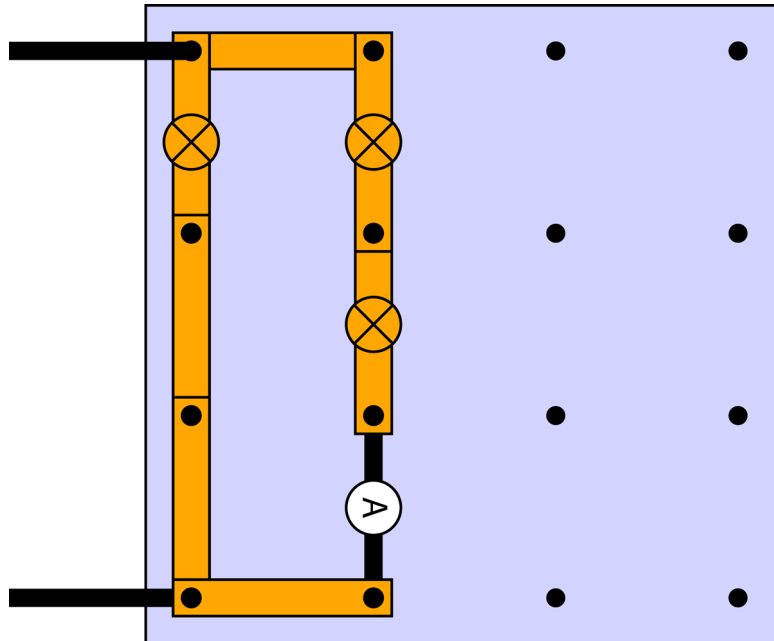
- one globe
- two globes in series
- two globes in parallel



- Predict and then measure the resistance of three globes in series and three globes in parallel.
- There are two other ways in which the three globes can be arranged to give different overall resistances. Build and draw the circuits and record the measurements.

6. Extension circuits

Construct the circuit has shown below.



- Measure and record the current through the two connected globes.
- Predict and then measure the current through the single globe.
- Explain the result of part b. (Hint: What are the resistances of the single and two globes?)
- Which globe(s) is brightest? Why?

7. Summary

Write down at least five things that you have learnt from doing this activity.

VELS – Science knowledge & understanding

4.00 4.25 4.50 4.75 5.00 5.25 5.50



7 8 9 10

To meet level 4.75:

- Most questions have been addressed correctly.
- A correct understanding of the difference between voltage & current is apparent.

VELS – Science at work

4.00 4.25 4.50 4.75 5.00 5.25 5.50



7 8 9 10

To meet level 4.75:

- Measurements were completed correctly & safely with instructions followed on the correct use of the equipment.