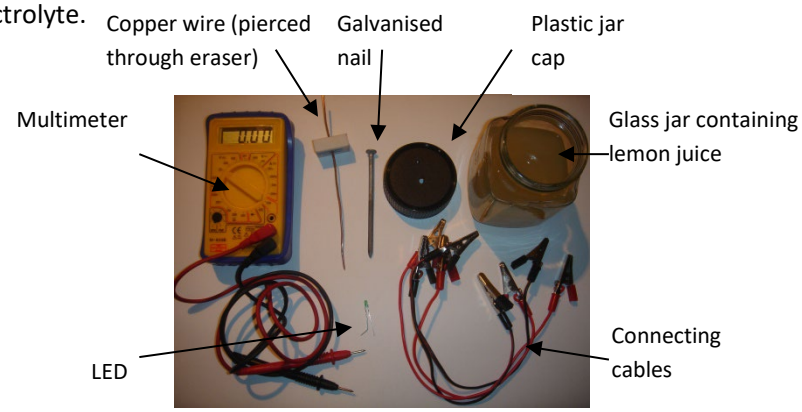
Exercise to Build a Simple Battery

Stage 1 – Identify the Key Components and Construct Simple Cells

You will have been provided with two sets of parts: 'Kit 1' and Kit 2.' Within each set, identify which parts could be used as the key components of a simple, primary, discharging battery cell, i.e., the anode (negative electrode), cathode (positive electrode) and the electrolyte.

Kit 1	Which Part?
Anode (-)	
Cathode (+)	
Electrolyte	



Kit 2	Which Part?
Anode (-)	
Cathode (+)	
Electrolyte	

Kit 1

1. Insert the galavanised nail and the copper wire (pierced through a pencil eraser) through the holes in the plastic jar cap.
2. Carefully screw the plastic cap onto the jar so that the nail and copper wire are immersed into the lemon juice contained in the jar.

Quality points! The eraser should be resting on the top of the cap. Ensure that the nail and copper wire are not touching each other at any point.

Kit 2

Take the copper tube and carefully place it upright on its base within the can filled with vinegar.

Quality point! Ensure that the copper tube is not touching the can at any point (it is okay for the black plastic base to do so).

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Stage 2 – Establish the Voltage Produced from Each Individual Cell

For Cell 1 (made from the Kit 1 components), attach a lead between the cathode on the cell and the red lead on the multimeter using the alligator clips. Attach another lead between the anode on the cell and the black lead on the multimeter (as shown in Figure 2.1). Note the voltage recorded on the multimeter.

Repeat for Cell 2.

Quality point! Ensure there is a good connection made with the alligator clips to achieve an output reading. You may have to fiddle with the clips a little.

Cell #	Voltage
Cell 1	
Cell 2	

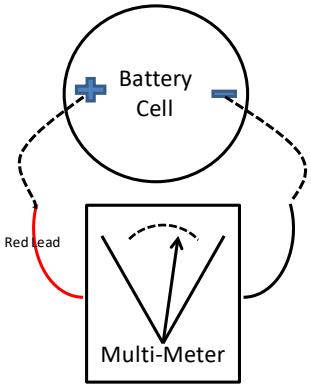

Figure 2.1 Connecting up a Single Cell

Stage 3 – Establish the Voltage Produced from the Two Cells Connected in Series

Connect the two cells in series, using the provided leads with alligator clips, by connecting the anode on Cell 1 to the cathode on Cell 2. This should leave the cathode on Cell 1 and the anode on Cell 2 free to connect to the multimeter as before (as shown in Figure 3.1). Note the voltage recorded on the multimeter.

Cell #	Voltage
Cell 1 and Cell 2	

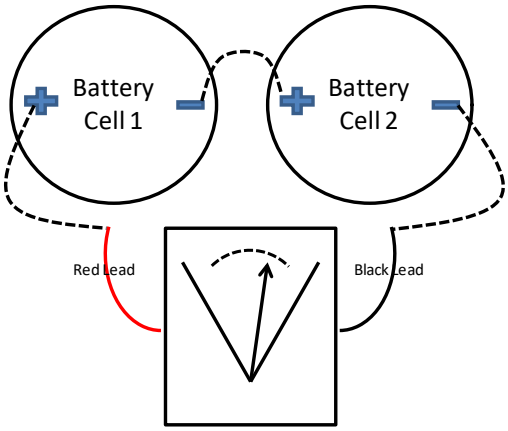

Figure 3.1 Connecting 2 Cells in Series

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Stage 4 – Establish the Voltage Produced from Three Cells Connected in Series

In the same way that you have connected two cells, now connect three cells by combining Cell 1 from Stage 3 with two additional Cell 1s, which will be provided to you (as shown in Figure 4.1). Again, note the voltage recorded on the multimeter. On this occasion, also try to connect one of the LEDs (Light Emitting Diodes) in place of the multimeter. Note that the positive pole (as per the red lead on the multimeter) is longer than the negative pole, and the LED must be connected the correct way round to work. Note whether the LED does light and how bright.

4 Cells in Series	Result
Voltage	
LED Light Y/N	

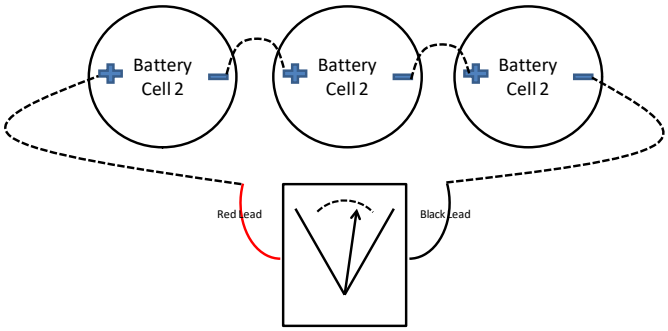

Figure 4.1 3 Cells Connected in Series

Stage 5 – Establish the Voltage Produced from a Pair of 3 Cells Each Connected in Series, Then the Pairs Connected in Parallel

Start by taking the set of 3 cells from each team in Stage 4 and connect them in parallel. Do this by connecting the cathodes of the first cell in each set and then the anodes of the third cell in each set. Finally, connect the cathode of the first cell (either pair will do) to the red lead of the multimeter and connect an anode from one of the third cells to the black lead on the multimeter. Note the recorded voltage. Try connecting the LED in place of the multimeter, as in Stage 4, and note the effect. Is there any difference in the voltage or bulb brightness between Stage 4 and Stage 5?

Pair of 3 Cells Connected in Series Connected in Parallel	Result
Voltage	
LED Light Y/N	

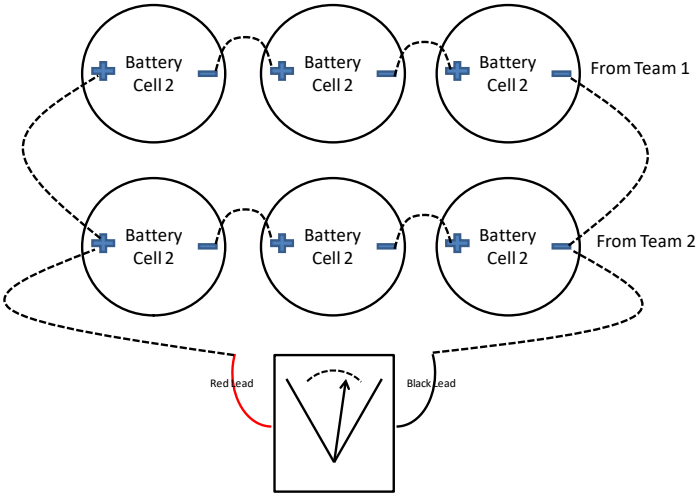

Figure 5.1 Pair of 3 Cells Connected in Series, Then Connected in Parallel

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