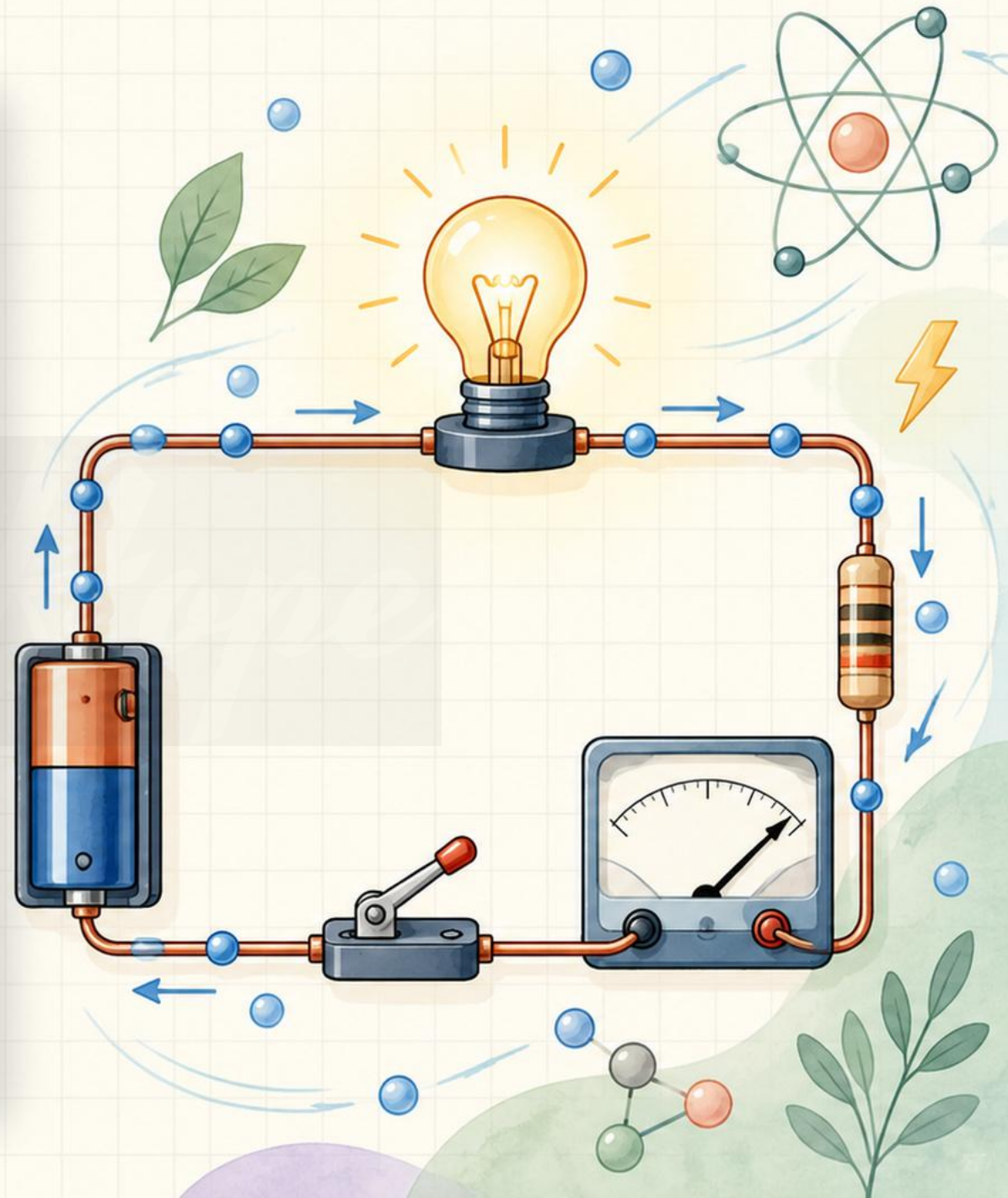


SCIENCE • CLASS 10

CHAPTER 11

# Electricity

CHAPTER NOTES



# ELECTRIC CURRENT AND CIRCUIT

## 1) ELECTRIC CURRENT

Electric current = rate of flow of charge

$$I = \frac{Q}{t}$$

$$1 \text{ A} = 1 \text{ C/s}$$

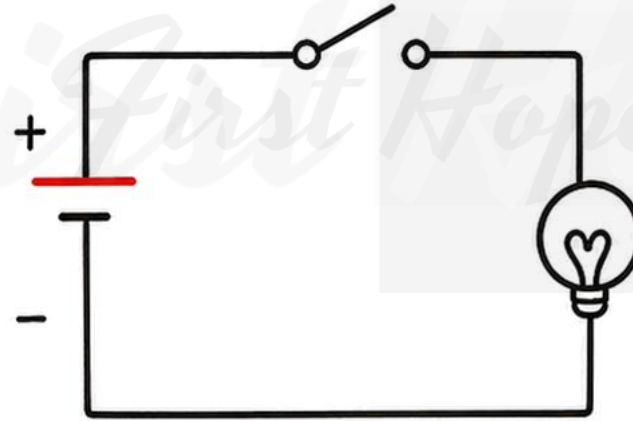
- $1 \text{ mA} = 10^{-3} \text{ A}$
- $1 \text{ microampere} = 10^{-6} \text{ A}$
- $1 \text{ C} = \text{charge magnitude of nearly } 6 \times 10^{18} \text{ electrons}$
- $\text{electron charge} = -1.6 \times 10^{-19} \text{ C}$

EXAMPLE:  $0.5 \text{ A for } 600 \text{ s} \rightarrow Q = It = 300 \text{ C}$

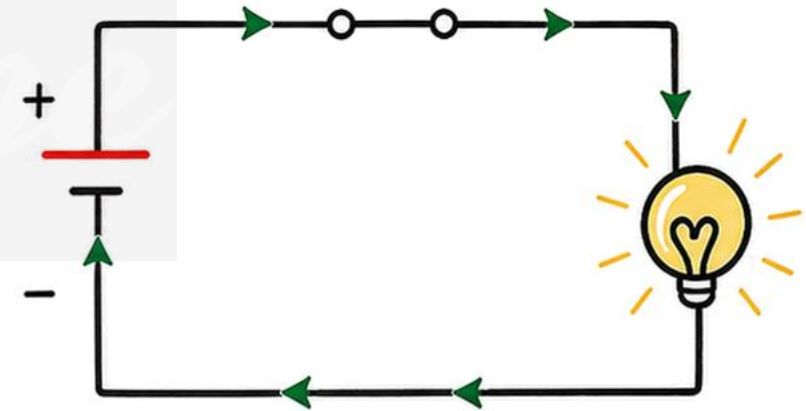
## 2) ELECTRIC CIRCUIT

A continuous closed path is an electric circuit.

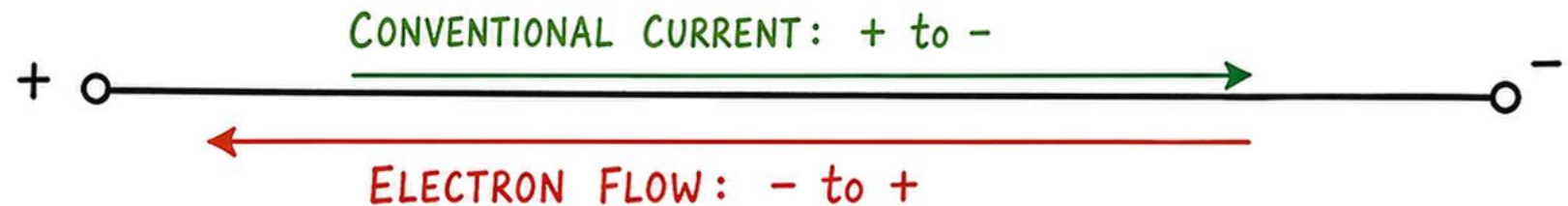
Open path  $\rightarrow$  no current  $\rightarrow$  bulb OFF



Closed path  $\rightarrow$  current flows  $\rightarrow$  bulb ON



## 3) DIRECTION OF CURRENT AND ELECTRON FLOW



# ELECTRIC POTENTIAL DIFFERENCE

Potential difference provides the electrical push that sets charges in motion.

A cell or battery maintains potential difference using chemical energy.

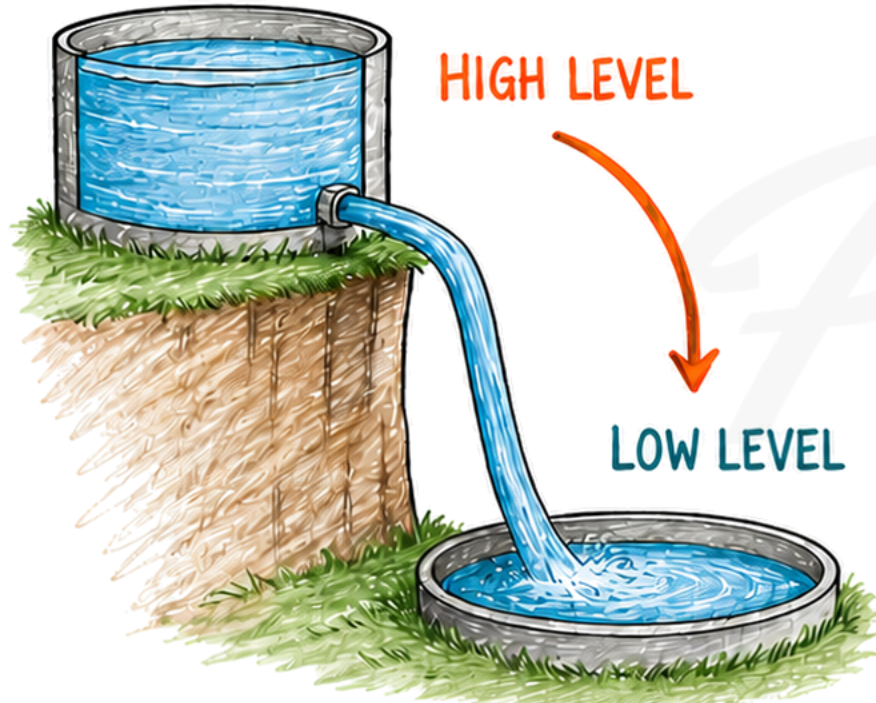
Potential difference = work done per unit charge

$$V = \frac{W}{Q}$$

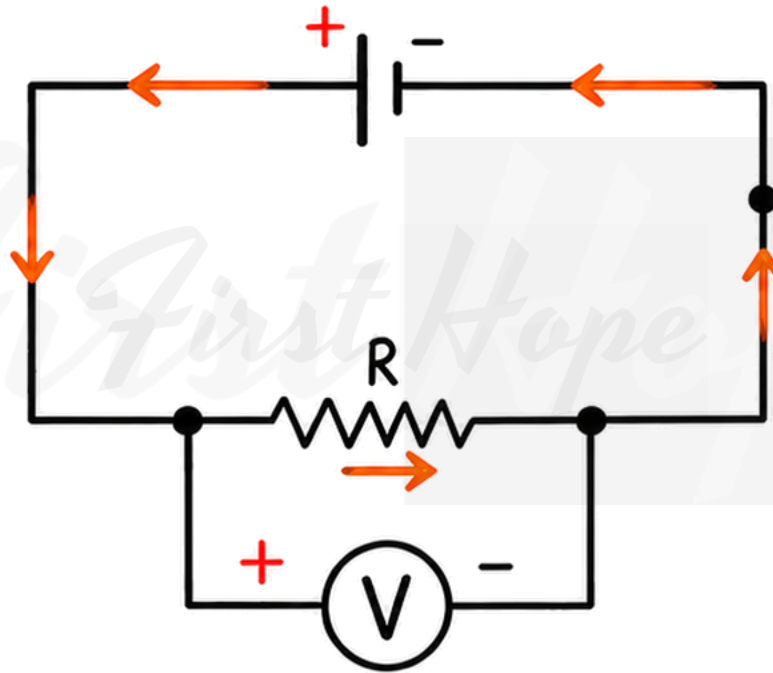
$$1\text{ V} = 1\text{ J/C} = 1\text{ J C}^{-1}$$

EXAMPLE:

$$V = 12\text{ V}, Q = 2\text{ C} \rightarrow W = VQ = 24\text{ J}$$



ANALOGY: a difference drives flow



VOLTMETER: connected in PARALLEL across the two points



chemical energy in cell

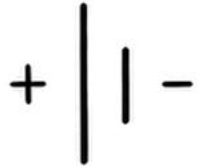
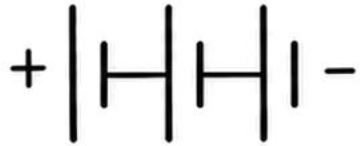


potential difference

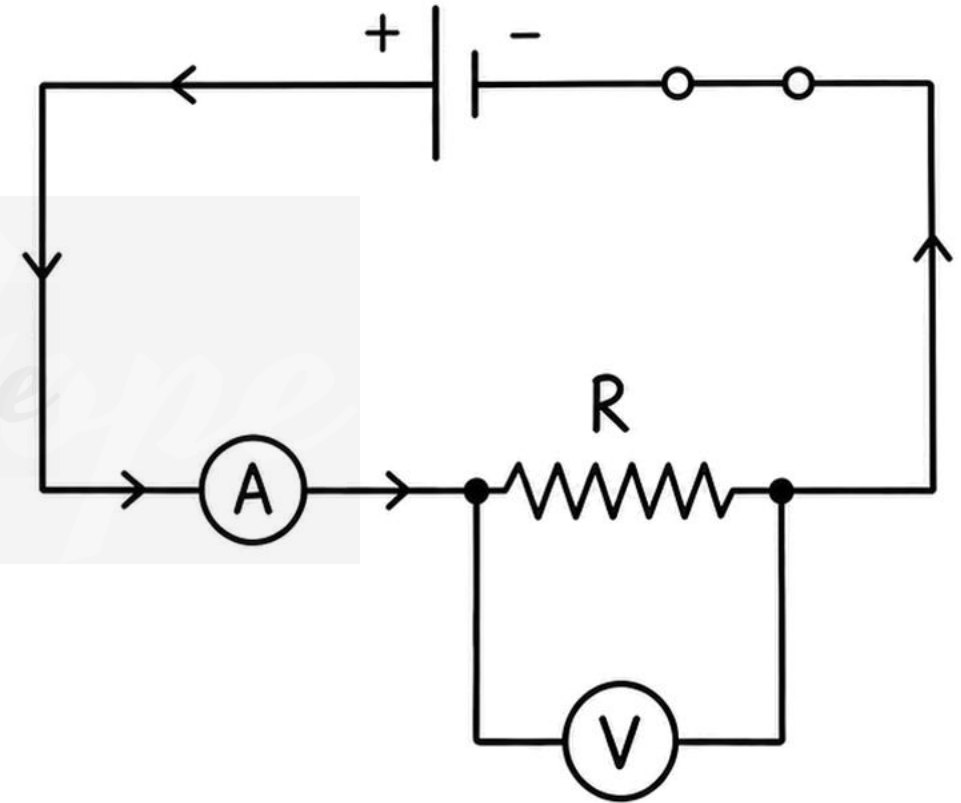


current in closed circuit

# CIRCUIT SYMBOLS AND METER CONNECTIONS

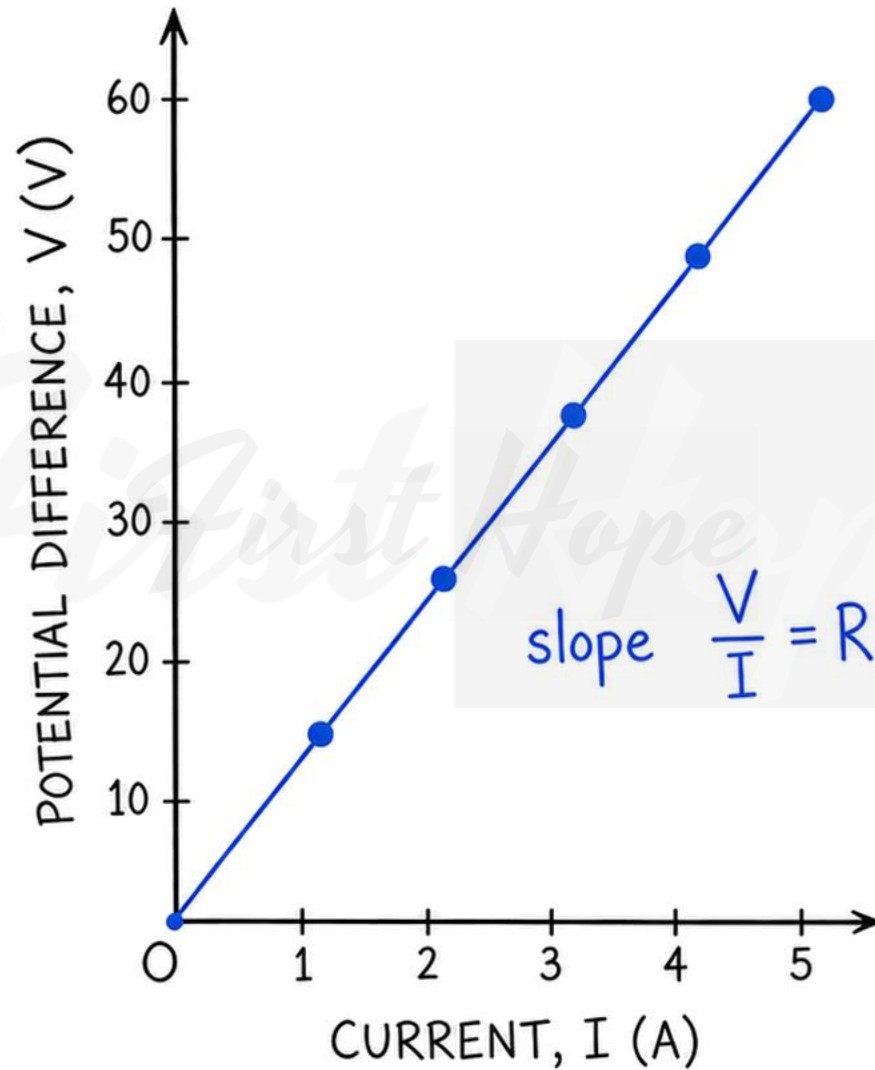
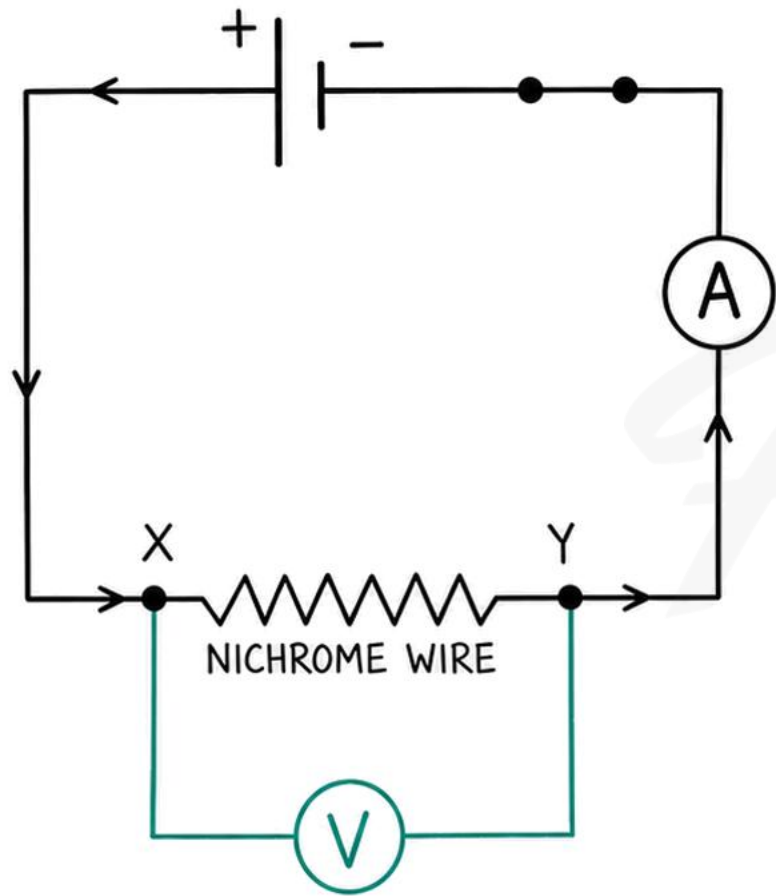
|                                                                                                         |                                                                                                         |                                                                                                                  |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1<br><br>ELECTRIC CELL | 2<br><br>BATTERY       | 3<br><br>OPEN SWITCH          |
| 4<br><br>CLOSED SWITCH | 5<br><br>WIRE JUNCTION | 6<br><br>CROSSING, NOT JOINED |
| 7<br><br>ELECTRIC BULB | 8<br><br>RESISTOR R    | 9<br><br>RHEOSTAT             |
| 10<br><br>AMMETER    | 11<br><br>VOLTMETER  | 12<br><br>CONNECTING WIRE   |

AMMETER → SERIES



VOLTMETER → PARALLEL

# OHM'S LAW AND THE V-I GRAPH



For a given metallic conductor at **CONSTANT TEMPERATURE**:

$V$  is directly proportional to  $I$

$$\frac{V}{I} = \text{constant} = R$$

$$V = IR$$

$$R = \frac{V}{I} \quad I = \frac{V}{R}$$

$$1 \text{ ohm} = 1 \text{ V/A}$$

At fixed  $R$ : double  $V \rightarrow$  double  $I$

60 V/4 A = 15 ohm; at 120 V,  $I = 8$  A

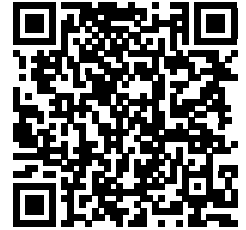


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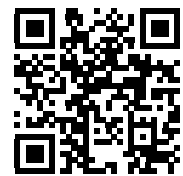


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