

Mon Warm Up 6 (D2L)

Tues: Discussion / quiz

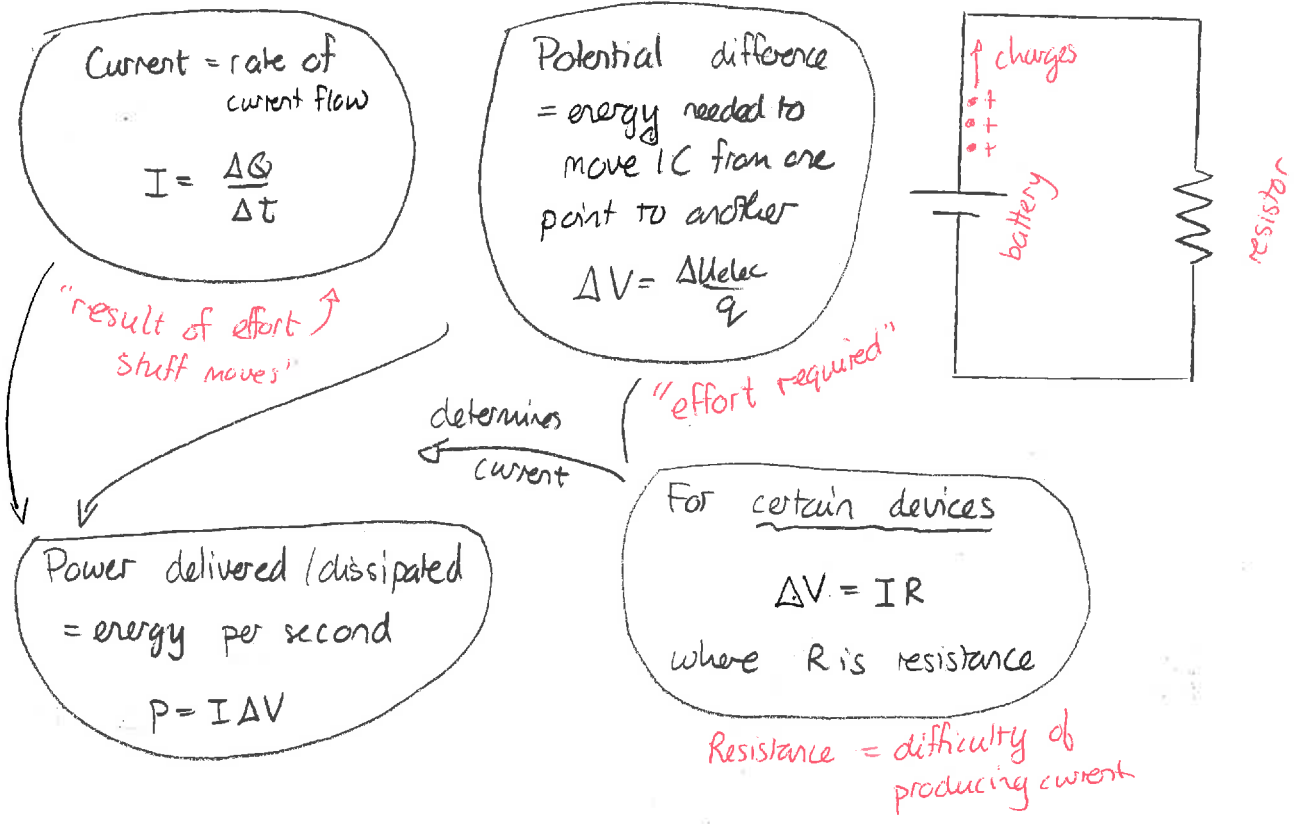
Supp Ex 49, 50, 52

Ch 23 Questions 9

Problems 5, 6a

Circuit operation

We know that a circuit operates by having charges flow through its constituent parts. The ingredients are:



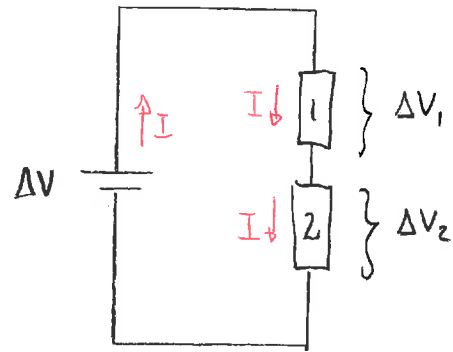
Quiz 1 30% → 70%

Resistors in series

Most circuits consist of multiple devices connected in various ways

One simpler example is a pair of devices in series. The key rules are

- 1) the current is the same everywhere
- 2) the voltages across the devices combined to give the voltages across the battery



$$\Delta V = \Delta V_1 + \Delta V_2$$

This rule emerges by considering energy conservation for a charge that traverses the circuit.

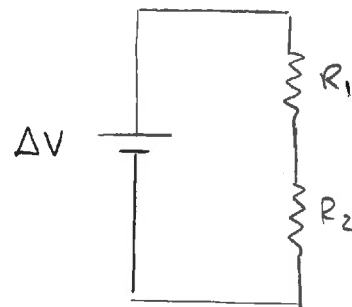
A special example of such a circuit has two resistors in series.

Then analysis shows that the current in the circuit is

$$\Delta V = I R_{eq}$$

where the equivalent resistance is

$$R_{eq} = R_1 + R_2$$



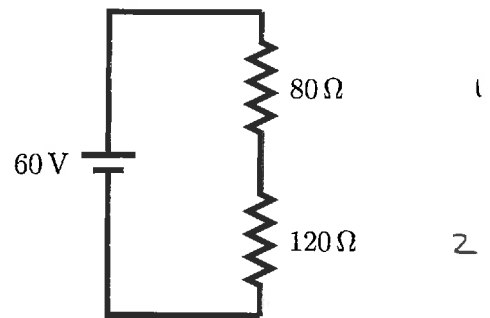
Note that then $\Delta V_1 = IR_1$

$\Delta V_2 = IR_2$

48 Resistors in series

Determine the currents through, voltages across and the power dissipated by each resistor in the illustrated circuit.

- Determine the current in the circuit.
- Determine the potential difference across each resistor.
- Determine the power delivered to each resistor.



Answer: a) $\Delta V = I R_{eq}$

$$R_{eq} = R_1 + R_2 = 80\Omega + 120\Omega = 200\Omega$$

$$\Rightarrow 60V = I 200\Omega$$

$$\Rightarrow I = \frac{60V}{200\Omega} = 0.30A$$

b) For 80Ω $\Delta V_1 = IR_1 = 0.30A \times 80\Omega$

$$\Rightarrow \Delta V_1 = 24V$$

For 120Ω $\Delta V_2 = IR_2 = 0.30A \times 120\Omega$

$$\Rightarrow \Delta V_2 = 36V$$

note $\Delta V_1 + \Delta V_2 = \Delta V_{battery}$

c) For 80Ω $P = I_1 \Delta V_1 = 0.30A \times 24V = 7.2W$

For 120Ω $P = I_2 \Delta V_2 = 0.30A \times 36V = 10.8W$

We can use this when assessing more complicated circuits.

Quiz 2 100%

Quiz 3 100%

Quiz 4 50% - 70%