2.2 Energy and Voltage in Circuits

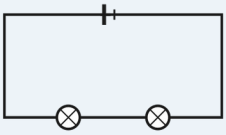
Mr Curran · practical-science.com

1. KEY VOCABULARY

TERM	MEANING
Current	The rate of flow of charge, measured in amperes (A).
Voltage (p.d.)	The energy given to each unit of charge, in volts (V).
Resistance	How much a component opposes the current, in ohms (Ω).
Series circuit	Components on one single loop.
Parallel circuit	Components on separate branches.

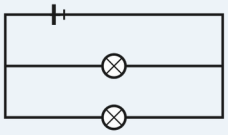
2. SERIES vs PARALLEL

SERIES CIRCUIT



- one path for the current
- current the SAME everywhere
- voltage SHARED between components
- add resistances: $R = R_1 + R_2$

PARALLEL CIRCUIT



- more than one path (branches)
- voltage the SAME across each branch
- current SPLITS between the branches
- one branch breaks — others still work

3. THE KEY EQUATIONS

voltage = current × resistance (V = I × R)
current = charge ÷ time (I = Q ÷ t)
energy = charge × voltage (E = Q × V)

4. RULES FOR SERIES CIRCUITS

- current is the SAME at every point
- voltage is SHARED between the components
- total resistance = $R_1 + R_2 + \ldots$
- if one component breaks, the whole circuit stops

5. RULES FOR PARALLEL CIRCUITS

- voltage is the SAME across every branch
- current SPLITS between the branches
- total resistance is LESS than the smallest branch
- if one branch breaks, the others still work

6. THE WHY

Why current is the same all the way round a series circuit: charge is not used up — the same charge flows through every component.
Why home wiring is parallel: each appliance gets the full voltage and can be switched on or off independently.

7. COMMON EXAM MISTAKES

✗ "Current is used up as it goes round."
✓ Current is the same all the way round a series circuit.
✗ "Voltage is the same everywhere in a series circuit."
✓ In series, voltage is SHARED; current is the same.
✗ "Adding a parallel branch increases total resistance."
✓ Extra parallel branches DECREASE total resistance.

8. SELF-CHECK · cover & quiz

Can you…

1. Define current, voltage and resistance with units?
2. Use V = I × R in a calculation?
3. State the rules for current and voltage in series?
4. State the rules for current and voltage in parallel?
5. Explain why current is the same all round a series circuit?
6. Explain why house circuits are wired in parallel?