Standard circuit diagram symbols

4.2.1.1 · Electricity · revision notes

The circuit symbols you must recognise and draw, and how to read and draw circuit diagrams. Symbols come up in almost every electricity question: naming a component, completing a diagram, or drawing a circuit that could be used to take measurements.

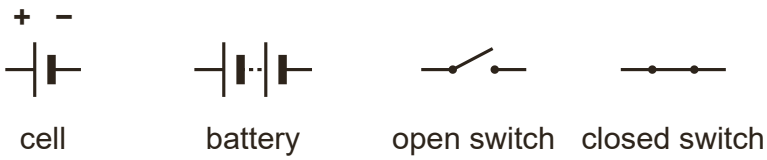
Key facts

- Cell: long thin line = positive terminal, short thick line = negative terminal
- Battery = two or more cells joined together
- Diode: triangle and bar; current flows only in the direction the triangle points
- LED: diode symbol + arrows pointing OUT (light comes out)
- LDR: resistor box in a circle + arrows pointing IN (light goes in)
- Thermistor: resistor box + diagonal line with a flat tail
- Variable resistor: resistor box + diagonal arrow
- Fuse: box with a line through it end to end
- Ammeter (A) in series; voltmeter (V) in parallel

Notes

Supplies and switches

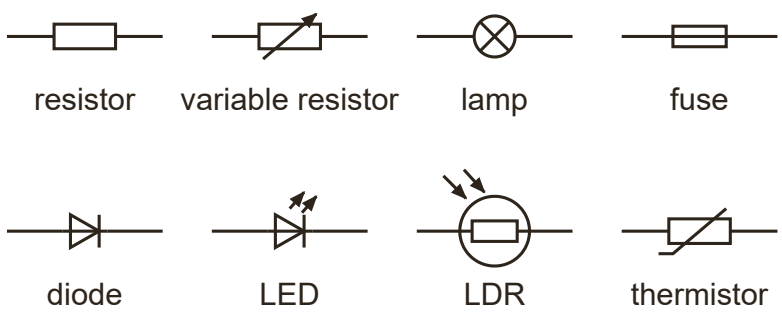
- A **cell** is drawn as two parallel lines. The longer, thinner line is the positive terminal and the shorter, thicker line is the negative terminal.
- A **battery** is two or more cells joined together. It is drawn as two or more cell symbols in a row (sometimes with a dashed line between them).
- An **open switch** has a gap, so no current flows. A **closed switch** has no gap, so current can flow.



Supplies and switches. The long thin line of a cell is +.

Components

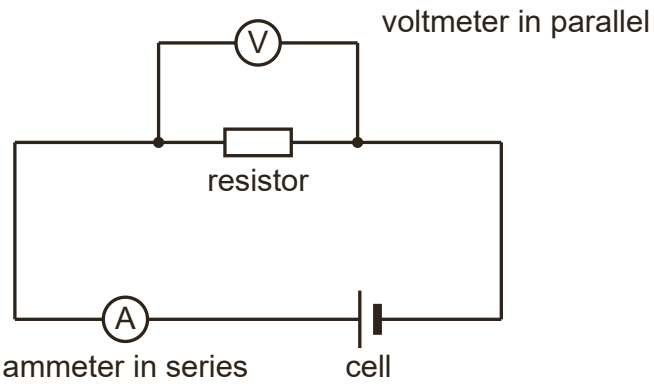
- **Resistor**: a plain rectangle (box). **Variable resistor**: the same box with a diagonal arrow through it, because its resistance can be changed.
- **Lamp**: a circle with a cross inside it. **Fuse**: a small box with a line running through it from end to end.
- **Diode**: a triangle pointing at a short bar. Current can only flow in the direction the triangle points.
- **LED** (light-emitting diode): the diode symbol with two small arrows pointing **away** from it, because it gives out light.
- **LDR** (light-dependent resistor): a resistor box inside a circle, with two arrows pointing **towards** it, because light falls on it.
- **Thermistor**: a resistor box with a diagonal line through it that has a short flat tail at the bottom end.



The component symbols you must know.

Meters

- **Ammeter**: a circle with A inside. It measures current and is always connected in **series** with the component.
- **Voltmeter**: a circle with V inside. It measures potential difference and is always connected in **parallel** with (across) the component.



Ammeter in the loop (series); voltmeter across the component (parallel).

Drawing circuit diagrams

- Use a ruler and a sharp pencil. Draw wires as straight lines with square corners.
- Make sure the circuit is a complete loop, with no gaps except in an open switch.
- Draw a dot at a junction, where wires join and the current splits or joins.
- Keep each symbol the right shape: a line drawn through a resistor box turns it into a fuse.

How to answer each type of question

Name the component from its symbol 1 mark each **Grade 3**

1. Start with the basic shape: box (resistor family), circle (lamp or meter) or triangle and bar (diode family).
2. Look for the extra detail: an arrow through it, arrows in or out, a cross, a letter or a tailed line.
3. Give the full name, e.g. 'light-dependent resistor' or 'LDR', not just 'resistor'.

Example. A student describes three circuit symbols.
(a) A circle with a cross inside it.
(b) A rectangle with a diagonal arrow through it.
(c) A triangle pointing at a short bar, with two small arrows pointing away from it.
Name the component that each symbol represents.

Model answer.

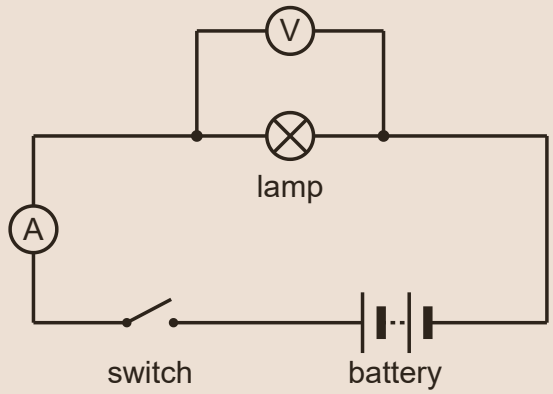
(a) Lamp (1)
(b) Variable resistor (1)
(c) LED / light-emitting diode (1)

Draw a circuit diagram that could be used to take measurements 2 to 3 marks **Grade 4**

1. Put the supply, switch, component and ammeter in one series loop.
2. Connect the voltmeter in parallel across the component only, not across the supply.
3. Use correct symbols, a ruler and no gaps in the circuit.

Example. A student wants to measure the current through a lamp and the potential difference across the lamp. She has a battery, a lamp, a switch, an ammeter and a voltmeter.
Draw a circuit diagram she could use.

Model answer.



Battery, switch, lamp and ammeter all connected in one series loop (1). Voltmeter connected in parallel across the lamp only (1). All symbols correct (1).

Identify and correct a mistake in a circuit 2 marks **Grade 5**

1. Check that each meter is in the right place: ammeter in series, voltmeter in parallel.
2. Check for gaps, open switches and components drawn the wrong way round (e.g. a diode pointing against the current).
3. Say what is wrong AND how to put it right.

Example. A student wants to measure the potential difference across a resistor. He connects the cell, the resistor and the voltmeter one after another in a single loop.
Explain what is wrong with his circuit and how he should correct it.

Model answer. The voltmeter is connected in series with the resistor, but it must be connected in parallel with (across) the resistor (1). He should connect the resistor directly to the cell in a loop and connect the voltmeter's two leads to the two ends of the resistor (1).

Don't lose marks

- Mixing up the LED and the LDR: check which way the arrows point.
- Drawing the voltmeter in series or the ammeter in parallel.

- Leaving gaps in the circuit, or drawing wires freehand so they run through symbols.
- Drawing a diode the wrong way round, so it blocks the current.
- Confusing the fuse (line through the box) with the resistor (empty box).

More tips

Memory tricks

- Arrows OUT = light OUT (LED). Arrows IN = light IN (LDR).
- Ammeters go IN the loop (series); voltmeters go AROUND the component (parallel).
- Long line = plus: you need the longer line to make a + sign.
- The resistor family all start with the same box: add an arrow for variable, a tailed line for thermistor, a circle and arrows in for LDR, a line through it for fuse.

Exam technique

- Use a ruler and a sharp pencil for circuit diagrams, and check every symbol before moving on.
- If a question says 'draw a circuit that could be used to...', include every meter it mentions and put each one in the right place.
- The mark is for the correct symbol. A label does not rescue a wrong symbol, so draw it carefully.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **Name common components from their symbols**
Recognise the cell, battery, switch, lamp, resistor, ammeter and voltmeter symbols.

Grade 4 — **Draw a simple series circuit correctly**
Use a ruler, straight wires and the correct symbols, with no gaps in the loop.

Grade 4 — **Recognise diode, LED, fuse and variable resistor**
Tell apart symbols that look alike, such as the diode and the LED, or the resistor and the fuse.

Grade 5 — **Recognise thermistor and LDR symbols**
Both start from the resistor box: the thermistor has a line with a flat tail through it, the LDR has two arrows pointing in.

Grade 5 — **Place ammeters and voltmeters correctly**
Draw an ammeter in series with a component and a voltmeter in parallel across it.

Grade 6 — **Interpret circuit diagrams with junctions**
Work out which components are in series and which are on parallel branches.

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