Your notes

GCSE Engineering: revision notes

Electrical and electronic systems

Contents

1. The systems approach
2. Electrical calculations
3. Circuits and construction
4. Key terms
5. Quick questions
6. What to do next

The systems approach

- An electronic system has an **input**, a **process** and an **output**. A closed-loop system uses feedback to check the output, such as a thermostat.
- **Inputs** (sensors): switches (push, micro, reed and tilt), light-dependent resistors (LDRs: resistance falls as light increases), **thermistors** (resistance usually falls as temperature rises) and potentiometers.
- **Processes**: **transistors** (electronic switches), logic gates (AND, OR, NOT), timers and programmable **microcontrollers**.
- **Outputs**: LEDs, lamps, buzzers, motors, solenoids and relays (a relay lets a small current switch a larger one).

Electrical calculations

- **Ohm's law**: voltage = current × resistance (V = IR). 0.5 A through 24 Ω needs 12 V.
- Power = voltage × current (P = VI). A 12 V motor drawing 2 A uses 24 W.
- Resistors in series add up: 220 Ω + 330 Ω = 550 Ω.
- An LED needs a series resistor to limit current. Resistor = (supply voltage – LED voltage) ÷ current. With 9 V, a 2 V LED and 0.02 A: (9 – 2) ÷ 0.02 = 350 Ω.

Circuits and construction

- A potential divider uses two resistors (such as an LDR and a fixed resistor) to produce a voltage that changes with conditions.
- Circuits are built on breadboards for testing, then on printed circuit boards (PCBs). Components are soldered in place.
- **Microcontrollers** can be reprogrammed, reducing the number of components needed.

Key terms

Input	A component that senses a change, such as a switch or sensor.
Process	The part of a system that decides what to do.
Output	A component that produces a result, such as light or movement.
LDR	A light-dependent resistor, whose resistance falls as light increases.
Thermistor	A resistor whose resistance changes with temperature.
Transistor	A component that acts as an electronic switch.
Microcontroller	A programmable chip that controls a system.
Ohm's law	Voltage equals current multiplied by resistance.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What happens to an LDR's resistance as light increases?
2. Which is an output component?
3. What does a transistor do in a circuit?
4. A current of 0.5 A flows through 24 Ω. What is the voltage?
5. A 12 V motor draws 2 A. What is its power?
6. What is the total resistance of 220 Ω and 330 Ω in series?
7. Why does an LED need a series resistor?
8. What is a closed-loop system?

Answers

1. It falls
2. A buzzer
3. Acts as an electronic switch
4. 12 V
5. 24 W
6. 550 Ω
7. To limit the current
8. A system that uses feedback

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

Your notes