

Name \_\_\_\_\_

Class \_\_\_\_\_

Date \_\_\_\_\_

## By the end of this worksheet I can...

- ☐ recognise and draw the main components
- ☐ sort components into input and output transducers
- ☐ recall the formulae for series, parallel and voltage divider circuits
- ☐ describe how a transistor and relay work

## I DO

## Key facts From the revision mind map

### V = IR

Voltage = current × resistance (Ohm's law)

- V in volts, I in amps, R in ohms ( $\Omega$ )
- Convert first: 4.7 k $\Omega$  = 4700  $\Omega$ , 30 mA = 0.03 A

|            | Series                            | Parallel                                                           |
|------------|-----------------------------------|--------------------------------------------------------------------|
| Resistance | $R_T = R_1 + R_2 + \dots$         | $1/R_T = 1/R_1 + 1/R_2 + \dots$ (two: $R_1 R_2 \div (R_1 + R_2)$ ) |
| Current    | The same everywhere               | Splits: $I_T = I_1 + I_2 + \dots$                                  |
| Voltage    | Shared: $V_S = V_1 + V_2 + \dots$ | The same across every branch                                       |

### V<sub>out</sub> = R<sub>2</sub> ÷ (R<sub>1</sub> + R<sub>2</sub>) × V<sub>supply</sub>

Voltage divider; also  $V_1 \div V_2 = R_1 \div R_2$

- **Electrical energy**  $E_e = VIt$ ; **electrical power**  $P = VI$ .
- **LDR**: light up, resistance down (LURD). **Thermistor**: temperature up, resistance down (TURD).
- **NPN transistor** (base, collector, emitter) switches on when about 0.7 V is applied to the base.
- A **relay** lets a small current in its coil switch a separate circuit through its contacts.

## Remember

Check the data booklet for every formula.

## YOU DO

## Revision tasks Use your notes if you get stuck.

**1 Name the three connections of an NPN transistor, and state the voltage needed at the base to switch it on.**

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**2 Explain why a relay is used in a control circuit.**

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**3 State what happens to the resistance of an LDR as it gets darker, and of a thermistor as it gets hotter.**

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**4 A 4 k $\Omega$  resistor and a 6 k $\Omega$  resistor form a divider on a 10 V supply. Calculate  $V_{\text{out}}$  across the 6 k $\Omega$  resistor.**

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**5 Complete the table: draw each symbol, say whether it is an input or output transducer (or neither), and what it does.**

| Component         | Draw the symbol | Input or output? | What it does |
|-------------------|-----------------|------------------|--------------|
| Battery           |                 |                  |              |
| Switch (SPST)     |                 |                  |              |
| Resistor          |                 |                  |              |
| Variable resistor |                 |                  |              |
| LDR               |                 |                  |              |
| Thermistor        |                 |                  |              |
| Diode             |                 |                  |              |
| LED               |                 |                  |              |
| Lamp              |                 |                  |              |
| Buzzer            |                 |                  |              |
| Motor             |                 |                  |              |

## Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.

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