



ANSWER BOOK

Potential dividers

Electricity · Year 12

AQA 3.5.1.5 · CIE 10.3 · OCR A 4.3.3

9 questions · 26 marks

NAVY EDITION

SECTION A · Warm-up

A1 The same current flows through both, and the pd across each is IR . The larger the resistance, the larger its share of the pd, so the supply voltage is divided between them in the ratio of their resistances. [2]

A2 $V_{\text{out}} = V_{\text{in}} \times R_2 / (R_1 + R_2) = 12 \times 8.0 / (4.0 + 8.0) = 8.0 \text{ V}$. [2]

A3 $V_{\text{out}} = V_{\text{in}} \times R_2 / (R_1 + R_2)$. [2]

SECTION B · Standard

B1 $V_{\text{out}} = 10 \times 3.0 / (2.0 + 3.0) = 6.0 \text{ V}$. [3]

B2 $3.0 = 9.0 \times R_2 / (4.0 + R_2)$. Solving: $3.0(4.0 + R_2) = 9.0R_2$, so $R_2 = 2.0 \text{ k}\Omega$. [3]

B3 $V_{\text{out}} = 6.0 \times 4.0 / (2.0 + 4.0) = 4.0 \text{ V}$. As it cools the thermistor's resistance rises, taking a larger share of the pd, so the output across the fixed resistor falls. [4]

B4 A single resistive track is connected across the supply, and a sliding wiper taps off the output between one end and the wiper. Moving the wiper changes the proportion of the track (and so the resistance) in the output section, varying the output smoothly from zero up to the full supply voltage. [3]

SECTION C · Stretch

C1 Dark: $V_{\text{out}} = 6.0 \times 2.0 / (10 + 2.0) = 1.0 \text{ V}$. Light: $V_{\text{out}} = 6.0 \times 2.0 / (1.0 + 2.0) = 4.0 \text{ V}$. The output rises as the light gets brighter. [4]

C2 A potential divider can deliver any output from zero up to the full supply voltage, whereas a series rheostat can only reduce the voltage and never bring it down to zero. The divider therefore gives full, controllable range. [3]