Oxford Cambridge and RSA

GCSE Physics A (Gateway)

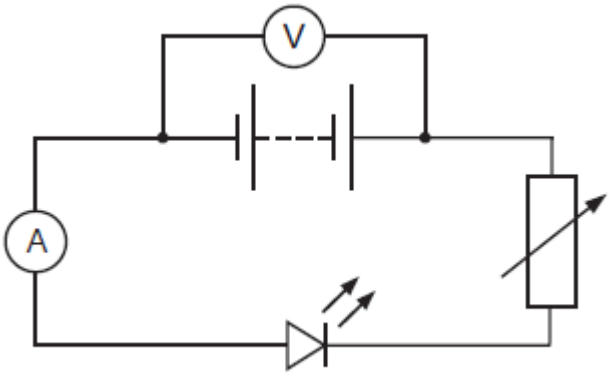
J249/03 Physics A P1-P4 and P9 (Higher Tier)

Question Set 12

1 A student investigates the electrical characteristics of a light emitting diode (LED).

The student builds a circuit to investigate how the current through an LED and the potential difference across it vary when the LED lights up.

Look at the circuit diagram.



(a) **(i)** The student has made **two** errors connecting the circuit.

Identify the errors.

1 The voltmeter should be in parallel to the LED

2 The ammeter and variable resistor should be swapped **[2]**

(ii)

What is the purpose of the component  in the circuit?

It is used to change the resistance in the circuit. **[1]**

(b) The student then connects the circuit correctly. He measures the current through the LED as 0.03A when the potential difference across it is 3.0V.

(i) Calculate the resistance of the LED.

Use the equation: potential difference = current × resistance

$3 = 0.03R$

$R = \frac{3}{0.03} = 100$

Resistance = 100 Ω

[3]

(ii) Calculate the charge which flows when this LED operates for 2.5 minutes..

$Q = It = 0.03 \ (2.5 \times 60)$

$= 4.5$

Charge = 4.5 C

[4]

(iii) Calculate the energy transferred when this LED operates for 2.5 minutes.

Use the equation: energy transferred = charge × potential difference

$E = 4.5 \times 3 = 13.5$

Energy transferred = 13.5 J

≈ 14 (2sf)

[2]

Total Marks for Question Set 12: 12