A Level · OCR · Physics

7 mins 7 questions

Multiple Choice Questions

E.m.f & Internal Resistance

E.m.f & Internal Resistance / Calculating E.m.f / Determining Internal Resistance / E.m.f & Potential Difference / Energy Transfer

Medium (5 questions)	/5
Hard (2 questions)	/2
Total Marks	**/7**

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Medium Questions

1 The potential difference across a lamp is 2.5 V. The current in the lamp is 20 mA.

What is the energy dissipated in the lamp in 3.0 hours?

A. 0.050 J

B. 0.15 J

C. 9.0 J

D. 540 J

(1 mark)

2 One million electrons travel between two points in a circuit.

The **total** energy gained by the electrons is 1.6×10^{-10} J.

What is the potential difference between the two points?

A. 1.6×10^{-16} V

B. 1.6×10^{-4} V

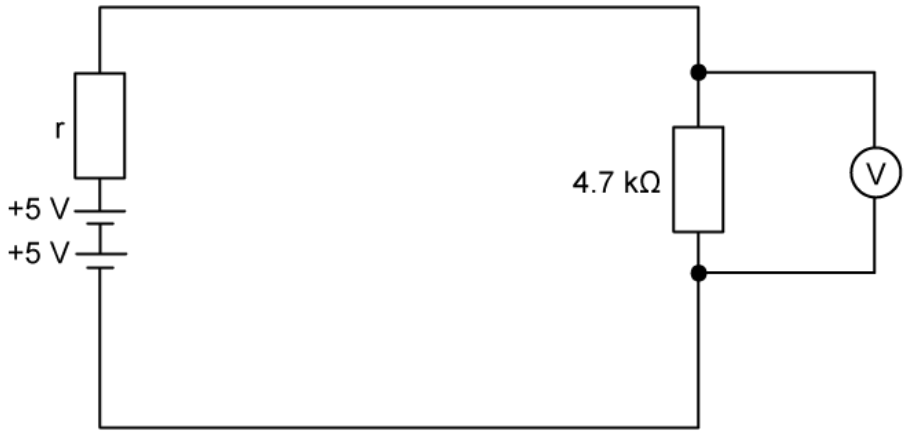
C. 1.0×10^{3} V

D. 1.0×10^{9} V

(1 mark)

3 The diagram below represents a battery composed of two cells, each with an emf of 5 V each connected in series with an external resistor with a resistance of 4.7 kΩ. A voltmeter placed in parallel with the external resistor records a measurement of 9.4 V.

The resistor labeled *r* represents the combined internal resistance of the two cells.



Calculate the internal resistance of the battery.

A. 3 Ω

B. 35 Ω

C. 120 Ω

D. 300 Ω

(1 mark)

4 Consider the following statements about the electromotive force and internal resistance:

1. Because of internal resistance, the electromotive force is always greater than the terminal potential difference

2. The lost volts are found by adding together the terminal potential difference and the electromotive force

3. The electromotive force is not actually a force and has units of J C^{-1}

Which of the statements is correct?

A. 1 and 2

B. 1 and 3

C. Only 1

D. 2 and 3

(1 mark)

5 A 5 Ω resistor receives 10 J of energy when 2.5 C of charge flows through it. What is the potential difference across the resistor?

A. 2 V

B. 4 V

C. 25 V

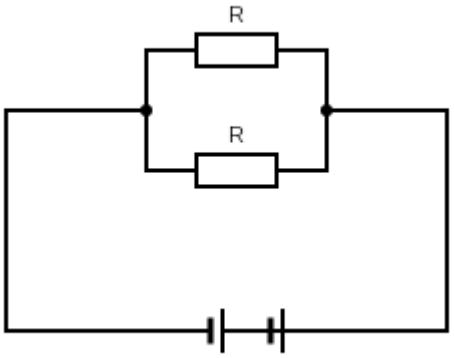
D. 50 V

(1 mark)

Hard Questions

1 Two cells, each of e.m.f Ɛ and internal resistance *r* are placed in series with two parallel resistors of resistance *R* as shown in the diagram below.

Which of the following expressions is equal to the current drawn from these cells?



A. $I = \frac{\mathcal{E}}{(2r + \frac{R}{2})}$

B. $I = \frac{2\mathcal{E}}{(2r + \frac{R}{2})}$

C. $I = \frac{\mathcal{E}}{(r + R)}$

D. $I = \frac{4\mathcal{E}}{R}$

(1 mark)

2 Consider a resistor with length *L*, cross-sectional area *A*, and resistivity ? joined in series with a cell of electromotive force Ɛ and internal resistance *r*. For this particular power supply, the mean drift velocity of electrons *v* passing through the resistor and the number density of conduction electrons *n* within the resistor are known.

Which of the following expressions are equal to the internal resistance of the cell?

A. $r = \frac{1}{A}\left(\frac{\mathcal{E}}{nev} - \rho L\right)$

B. $r = \frac{1}{A}\left(\frac{\mathcal{E}}{nev} + \rho L\right)$

C. $r = \left(\frac{\mathcal{E}}{Anev} - \rho L\right)$

D. $r = \frac{\rho L}{A}$

(1 mark)