

Internal Resistance

Name & Set

- 1 A battery of e.m.f. 2 V and an internal resistance of 0.5 Ω is connected across a 9.5 Ω resistor. Calculate (a) the current and (b) the terminal potential difference.

(a) _____
_____ [3]

(b) _____
_____ [3]

- 2 A battery of e.m.f. 4.5 V is connected across a 12 Ω resistor. If the pd. across the resistor is 3 V calculate (a) the current in the circuit and (b) the internal resistance of the battery.

(a) _____
_____ [3]

(b) _____
_____ [3]

- 3 A battery of e.m.f. 12 V and internal resistance 8 Ω is connected first across (a) a 1.5 Ω wire and then (b) a parallel arrangement of 5 Ω & 10 Ω . Calculate the current through the battery and the terminal pd. in each case.

(a) _____

_____ [3]

(b) _____

_____ [3]

- 4 The terminals of a cell, of e.m.f. 1.1 V, are connected to a resistance of 2 Ω and the pd. across them falls to 0.9 V. Calculate the internal resistance of the cell.

_____ [3]

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5 When a resistance of 8.5Ω is connected across the terminals of a cell of e.m.f. 1.44 V a current of 0.12 A flows through the wire. Calculate

(a) the internal resistance of the cell and

[3]

(b) the pd. across the external resistor.

[3]

6 Calculate the combined resistance of 7Ω and 3Ω in parallel. This combination is connected in series with a resistance of 7.5Ω and a cell of e.m.f. 1.5 V and an internal resistance of 0.4Ω .

(a) Draw a circuit diagram.

(b) Calculate the current in each of the resistances.

[3]

7 A cell is connected in series with an 8.0Ω resistor and a switch. A high resistance voltmeter is connected across the terminals of the cell and reads 3.6 V when the switch is open and 3.2 V when the switch is closed. Calculate (a) the e.m.f. of the cell and (b) its internal resistance.

(a) _____

[3]

(b) _____

[3]

8 A battery drives a current of 3.0 A round a circuit consisting of two 2.0Ω resistors in parallel. When these resistors are connected in series the current changes to 1.2 A. Calculate

(a) the e.m.f. of the battery

_____ [2]

(b) the internal resistance of the battery.

_____ [2]

9 A battery consisting of 6 cells in series each of e.m.f. 1.5 V and internal resistance 0.5Ω is joined to two resistors, of 5Ω and 20Ω which are in parallel to one another. An ammeter of resistance 0.5Ω is included in the circuit to measure the current through the battery.

(a) draw a circuit diagram

(b) calculate the current through the ammeter

_____ [3]

(c) calculate the reading of a high resistance voltmeter attached across the battery.

_____ [3]

10 A cell has an e.m.f. of 1.45 V and an internal resistance of 4.5Ω . Calculate the approximate percentage error of taking the reading of the voltmeter, having a resistance of 100Ω , as the e.m.f. of the cell when the voltmeter is connected directly across its terminals (assume that the voltmeter is correctly calibrated.)

_____ [3]

11 A cell is connected in circuit with a variable resistance while, at the same time, a high resistance voltmeter is connected across the terminals of the cell. The voltmeter reads 1.3 V when the variable resistance is fixed at 13Ω , and again 1.2 V when the variable resistance is fixed at 8Ω . Calculate the e.m.f. and the internal resistance of the cell.

_____ [3]

12 Thirty cells, each of e.m.f. 2 V and internal resistance 0.5Ω are used to send a current through an external resistor of 5Ω . . What is this current if the cells are grouped in and

(a) series

[3]

(b) parallel

[3]

13 Three resistors, having resistances of 2Ω , 5Ω and 10Ω respectively are joined in parallel and connected across a 12 V battery.

(a) Draw the circuit diagram.

(b) If the current through the 5Ω wire is found to be 1.5 A, calculate the internal resistance of the battery.

[3]