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]

5 When a resistance of 8.5 Ω 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 7 Ω and 3 Ω in parallel. This combination is connected in series with a resistance of 7.5 Ω and a cell of e.m.f. 1.5 V and an internal resistance of 0.4 Ω.

(a) Draw a circuit diagram.

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

_____

_____

_____ [3]

7 A cell is connected in series with an 8.0 Ω 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 2.0 Ω 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 0.5 Ω is joined to two resistors, of 5 Ω and 20 Ω which are in parallel to one another. An ammeter of resistance 0.5 Ω is included in the circuit to measure the current through the battery.

(a) draw a circuit diagram

(b) calculate the current though 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 4.5 Ω. Calculate the approximate percentage error of taking the reading of the voltmeter, having a resistance of 100 Ω, 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 13 Ω, and again 1.2 V when the variable resistance is fixed at 8 Ω. 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 0.5 Ω are used to send a current through an external resistor of 5 Ω. . What is this current if the cells are grouped in and

(a) series

_____

_____ [3]

(b) parallel

_____

_____ [3]

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

(a) Draw the circuit diagram.

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

_____

_____

_____ [3]