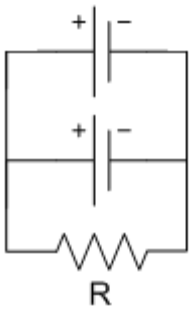
Example 2

Two cells with e.m.f 1.5 V for each cell and internal resistance 0.2Ω are joined in parallel and connected to an external resistor of 4Ω. What is current will flow.

Solution:



Total e.m.f , E = 1.5V
Total internal resistance = r/m = 0.2/2 = 0.1Ω
Total resistance, R_T = r/m + R
= 0.1 + 4
= 4.1Ω

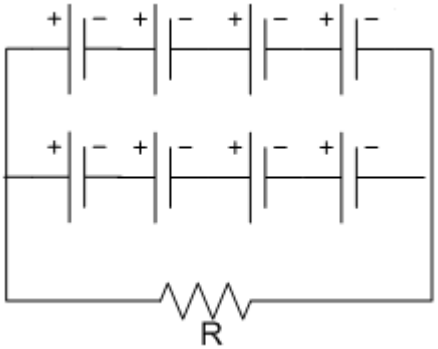
$$\text{Current, I} = \frac{\text{total emf}}{\text{total resistance}}$$
$$= \frac{\text{E}}{\text{r/m} + \text{R}}$$
$$= \frac{1.5}{4.1}$$
$$= 0.366\text{A}$$

Example 3

Eight cells are divided in two groups. Four cells for each group and the group are joined in parallel. Emf for each cell is 1.5V and internal resistance is 0.6Ω. One external resistor 5Ω connected in parallel to the group. Calculate:

a) Current flow
b) Voltage drop for internal resistor
c) The potential difference at the battery terminals

Solution:



a) $\text{I} = \frac{\text{nE (V)}}{\frac{\text{nr}}{\text{m}} + \text{R}(\Omega)}\ (\text{A}) = \frac{4(1.5)}{\frac{4(0.6)}{2} + 5} = 0.968A$

b) $V_r = I \times \frac{nr}{m} = 0.968 \times \frac{4(0.6)}{2} = 1.16V$

c) Voltage source, V_S = nE - V_r
= 4(1.5) – 1.16V
= 4.84V

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$V_S = IR_L = 0.968 \text{ X } 5 = 4.84\text{V}$