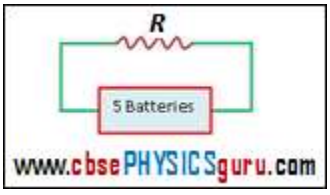
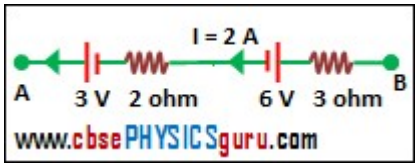
EMF AND COMBINATION OF CELLS

1. The emf of a cell is e and its internal resistance r. Its terminals are connected to a resistance R. The potential difference between the terminals is 1.6 V for R = 4 Ω and 1.8 V for R = 9 Ω. Then:
   (a) e = 1 V, r= 1 Ω **(b)** e = 2 V, r= 1 Ω (c) e = 1 V, r = 2 Ω (d) e = 1 V, r = 1.5 Ω
2. When a current of 2 A flows in a battery from negative to positive terminal, the potential difference across it is12 V. If a current of 3 A flowing in the opposite produces a potential difference of 15 V, the emf battery is:
   (a) 10.6 V **(b)** 13.2 V (c) 15.5 V (d) 16.0
3. A battery of emf e has an internal resistance r. A resistance R is connected to the terminals of the battery. A current I is drawn from the battery. V is the terminal potential difference. If R alone is gradually reduced to zero, which of the following best describes I and V?
   (a) I approaches zero, V approaches e **(b)** I approaches e/r, V approaches zero (c) I approaches e/r, V approaches e (d) I approaches infinity, V approaches e
4. A battery of emf e produces currents I_1 and I_2 when connected to external resistances R_1 and R_2 respectively. The internal resistance of the battery is:
   (a) $\frac{I_1R_2 - I_2R_1}{I_2 - I_1}$ (b) $\frac{I_1R_2 - I_2R_1}{I_2 + I_1}$ **(c)** $\frac{I_1R_1 - I_2R_2}{I_2 - I_1}$ (d) $\frac{I_1R_1 + I_2R_2}{I_2 + I_1}$
5. A battery of emf 8 V with internal resistance 0.5 Ω is being charged by a 120 V dc supply using a series resistance of 15.5 Ω. The terminal voltage of the battery is:
   (a) 9.5 V (b) 10.5 V **(c)** 11.5 V (d) 5.5 V
6. The box shown in diagram has five batteries, each of emf *e* and internal resistance *r*, connected randomly in series. This setup is connected across a resistor *R*. The maximum and minimum possible values of currents in the resistor *R* respectively are:
   (a) $\frac{e}{R+5r}, \frac{5e}{R+5r}$ **(b)** $\frac{5e}{R+5r}, \frac{e}{R+5r}$ (c) $\frac{5e}{5R+r}, \frac{5e}{R+5r}$ (d) $\frac{5e}{R+r}, \frac{5e}{R+5r}$



7. The number of cells, each of emf 1.5 volt and internal resistance 0.5 ohm that must be joined in series with a resistance of 20 ohm so as to send a current of 0.6 ampere through the circuit is:
   (a) 2 (b) 8 **(c)** 10 (d) 12
8. 32 cells each of emf 3 V are connected in series and kept in a box. Externally, the combination shows an emf of 84 V. The number of cells reversed in the connection is:
   (a) 0 **(b)** 2 (c) 4 (d) 8
9. N identical cells, each of emf e and internal resistance r, are joined to form a closed circuit. One cell X is joined with reverse polarity. The potential difference across each except X is:
   (a) $\frac{2e}{N}$ (b) $\frac{(N-1)e}{N}$ (c) $\frac{(N-2)e}{N}$ (d) $\frac{Ne}{N-1}$
10. Three similar cells, each of emf 2 V and internal resistance r Ω send the same current through an external resistance of 2 Ω, when connected in series or in parallel. The current flowing through the external resistance is:
    (a) 1 A (b) 1.5 A (c) 2 A **(d)** 0.75 A
11. The potential difference ($V_A - V_B$) between the points A and B in the given figure is:
    (a) -13 V (b) +13 V (c) +16 V (d) -19 V



12. Two batteries of emfs 2 V and 1 V of internal resistances 1 Ω and 2 Ω respectively are connected in parallel. The effective emf of the combination is:
    (a) 4/3 V **(b)** 5/3 V (c) 2 V (d) 5/2 V
13. n cells each of emf e and internal resistance r send the same current through an external resistance R whether the cells are connected in series or in parallel. Then:
    (a) R= r (b) R= r/n (c) r = R/n (d) $R = n^2r$
14. 3 cells each of emf 4 V and internal resistance of 1 Ω are connected in parallel to a load resistor of 1.75 Ω. Then the current through the load resistor is:
    (a) 2 A (b) 2.5 A (c) 1 A (d) 1.5 A
15. The plot of the variation of potential difference across a combination of three identical cells in series, versus current is shown in figure. The emf and internal resistance of each cell used are respectively:
    (a) 1.5 V, 1.5 Ω (b) 6 V, 2 Ω **(c)** 2 V, 2 Ω (d) 1 V, 1 Ω