ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 13

Subject : PHYSICS

CLASS : XII

Date : 11.6.20

Chapter : Current Electricity

Topic : Combination of cells, condition for maximum current in mixed combination of cells.

Multiple Choice Question : **1 x 15 = 15**

1. When cells are connected in series
   a) the EMF increases.
   b) the potential difference decreases.
   c) the current capacity increases.
   d) the current capacity decreases.

   Ans : (a) the EMF increases.

2. To draw maximum current from a combination of cells, how should the cells be grouped?
   (a) parallel (b) series (c) mixed grouping
   (d) depends upon the relative values of internal and external resistances.

   Ans. : (d) Depends upon the relative values of internal and external resistances.

3. To get a maximum current through a resistance of $2.5\,\Omega$, one can use m rows of cells each row having n cells. The internal resistance of each cell is $0.5\,\Omega$. What are the values of m and n, if the total number of cells are 20?

   (a) $m = 2, n = 10$ (b) $m = 4, n = 5$ (c) $m = 5, n = 4$ (d) $n = 2, m = 10$

   Ans. : (a) $m = 2, n = 10$

4. Three similar cells, each of emf $2V$ and internal resistance $r\,\Omega$ send the same current through an external resistance of $2\,\Omega$ when connected in series or in parallel. The strength of the current flowing through the external resistance is
   (a) $1A$ (b) $1.5A$ (c) $2A$ (d) 0.75A

   Ans. : (d) 0.75A

5. There are 24 cells. They are to be grouped in m rows, each containing n cells in series. The values of m and n for maximum current in a resistor of $4\,\Omega$ (internal resistance of each cell = $1.5\,\Omega$) is
   (a) $m = 4, n = 6$ (b) $m = 3, n = 8$ (c) $m = 2, n = 12$ (d) $m = 1, n = 24$

   Ans. : (b) $m = 3, n = 8$

6. Equal number of identical cells (each of emf e and internal resistance r) are first connected in series and then in parallel to an external resistance R. Under what condition current through R will be same?

   (a) $r = R$ (b) $r = R/2$ (c) $Rr = 1$ (d) $r = R/3$

   Ans. : (a) $r = R$

7. In a mixed combination of cells, there are 'm' rows and each row contains 'n' cells in series. Each cell has emf e and internal resistance r. The combination is connected to external resistance R. Now the condition of maximum current in R is —

   (a) $mR = nr$ (b) $mr = nR$ (c) $mn = rR$ (d) $\frac{m}{R} = \frac{n^2}{r}$ Ans. : (a) $mR = nr$

8. From Q. 7, find the main current flowing through R is

(a) $I = \frac{mne}{mR+nr}$ (b) $I = \frac{mne}{mr+nR}$ (c) $I = \frac{mnrR}{e}$ (d) $\frac{mR+nr}{mne}$

Ans. : (a) $I = \frac{mne}{mR+nr}$

9. Two electric cells each of emf $1.5V$ and internal resistance $2\,\Omega$ are connected in parallel and this combination of cells is connected with an external resistance of $2\,\Omega$. What will be the current in the external circuit?

(a) $\frac{1}{4}A$ (b) $\frac{1}{3}A$ (c) $\frac{1}{2}A$ (d) $1A$

Ans. : (c) $\frac{1}{2}A$

10. n identical cells, each of emf e and internal resistance r, are first connected in series and then in parallel. What will be the ratio of the emfs and of the internal resistances of these two cell combinations?

(a) n, n (b) n, n^2 (c) n^2, n (d) $\frac{1}{n}, n$

Ans. : (b) n, n^2

11. A galvanometer connected with an unknown resistor and two identical cells in series each of emf $2V$, shows a current of $1A$. If the cells are connected in parallel, it shows $0.8A$. Then the internal resistance of the cell is

(a) $1\,\Omega$ (b) $2.8\,\Omega$ (c) $0.7\,\Omega$ (d) $1.4\,\Omega$

Ans. : (a) $1\,\Omega$

12. The n rows each containing m cells in series are joined in parallel. Maximum current is taken from this combination across an external resistance of $3\,\Omega$ resistance. If the total number of cells used are 24 and internal resistance of each cell is $0.5\,\Omega$ then

(a) $m = 8, n = 3$ (b) $m = 6, n = 4$ (c) $m = 12, n = 2$ (d) $m = 2, n = 12$

Ans. : (c) $m = 12, n = 2$

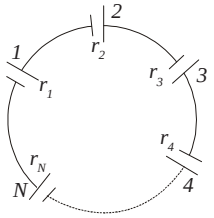
13. In a mixed grouping of identical cells 5 rows are connected in parallel by each row containing 10 cells. This combination sends a current i through an external resistance of $20\,\Omega$. If the emf and internal resistance of each cell is 1.5 *volt* and $1\,\Omega$ respectively then the value of i is

(a) 0.14 (b) 0.25 (c) 0.75 (d) 0.68 Ans. : (d) 0.68

14. A group of N cells whose emf varies directly with the internal resistance as per the equation $E_N = 1.5r_N$ are connected as shown in the following figure. The current i in the circuit is

(a) 0.51 *amp*
(b) 5.1 *amp*
(c) 0.15 *amp*
(d) 1.5 *amp*

Ans. : (d) 1.5 *amp*



15. 100 cells each of emf $5V$ and internal resistance $1\,\Omega$ are to be arranged so as to produce maximum current in a $25\,\Omega$ resistance. Each row contains equal number of cells. The number of rows should be

(a) 2 (b) 4 (c) 5 (d) 100 Ans. : (a) 2

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