Answer on Question #46031 – Physics – Electromagnetism

## Question.

A battery has emf 13.2V and internal resistance  $24m\Omega$ . If the load current is 20.0A, find the terminal voltage of the battery

Given:

$$\varepsilon = 13.2 V$$
  
 $r = 24 m\Omega = 0.024 \Omega$   
 $I = 20 A$   
Find:  
 $U = ?$ 

## Solution.

Let use the Ohm's law for closed circuit with electromotive force:

$$\frac{\varepsilon}{R+r} = I, where$$

 $\varepsilon$  is the electromotive force;

*I* is the electric current;

*R* is the external resistance;

r is the internal resistance.

$$\varepsilon = IR + Ir = U + Ir$$
, where

 $\boldsymbol{U}$  is the terminal voltage in circuit.

So,

$$U = \varepsilon - Ir$$

Calculate:

$$U = 13.2 - 20 \cdot 0.024 = 13.2 - 0.48 = 12.72 V$$

## Answer.

 $U = \varepsilon - Ir = 12.72 V$