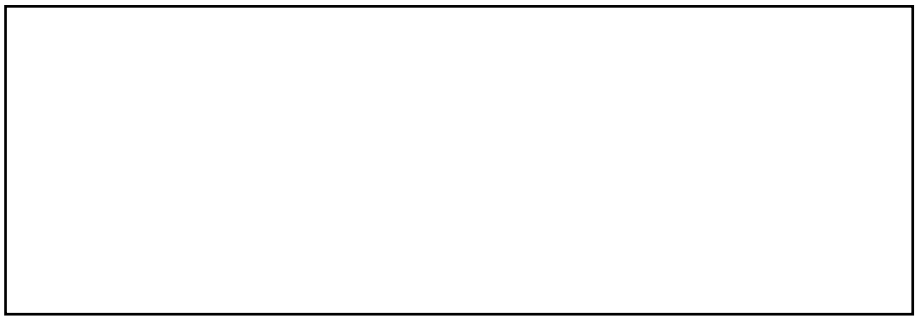
PHYSICS 11

Electromotive Force = emf = ε

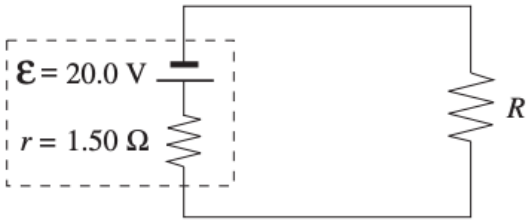
- Electromotive force is the amount of energy per unit of electric charge [J/C = Volt]. Thus, emf is not a force.
- Energy is transformed from one form to another in an electric generator, a battery or a single cell as the device does work on the electric charge that moves within the device. One terminal becomes positively charged and one terminal is then negatively charged.
- Emf can be thought of as work done on one unit of electric charge OR as the amount of energy gained by a unit of electric charge.
- Some of the emf is lost within the battery due to internal resistance in the battery ("r").
- Voltage measured across the terminals of a battery is then given by:



Examples:

1.

In the circuit shown below the voltage loss due to the battery's internal resistance is 2.0 V.

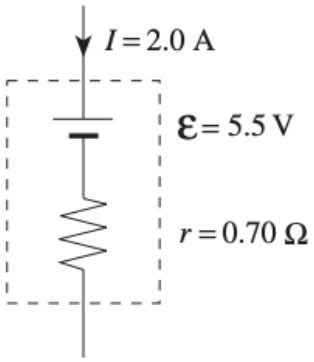


Determine the value of the load resistance R.

A. 12.0 Ω
B. 13.3 Ω
C. 13.5 Ω
D. 15.0 Ω

2.

A battery is being charged by a 2.0 A current as shown in the diagram below.

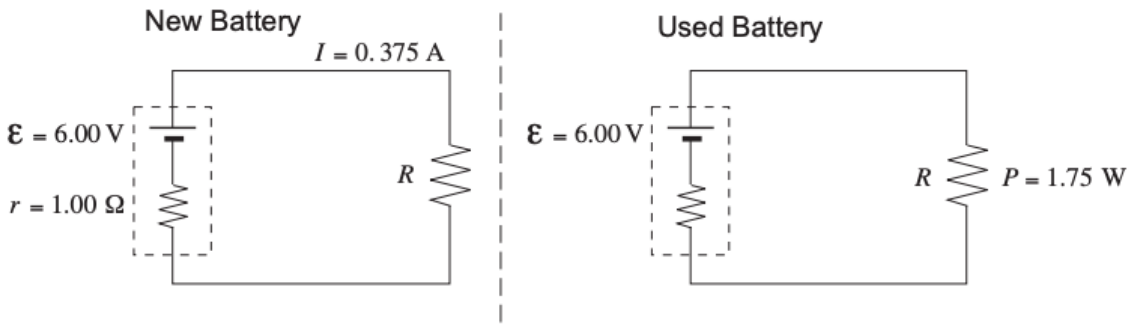


What is the terminal voltage of this battery?

A. 1.4 V
B. 4.1 V
C. 5.5 V
D. 6.9 V

3.

A circuit using a new battery which has an emf of 6.00 V and an internal resistance of 1.00 Ω is shown on the left. The battery is then replaced with a used one that has the same emf of 6.00 V but a different internal resistance.



If resistor R now dissipates 1.75 W, what is the internal resistance of the used battery?

A. 1.00 Ω
B. 2.57 Ω
C. 3.55 Ω
D. 5.60 Ω