Name: _____

Class: _____

Due Date: _____

Physics Topic 50 – Internal Resistance

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: Define *internal resistance r*. Units?

2. C: Define the following variables for the equation $\varepsilon = I(R + r)$. Draw an image to describe this equation.

3. E: A dry cell has an emf of 3.04 V. Its terminal potential drops to zero when a current of 50.0 A passes through it. What is its internal resistance?

4. E: A cell has an emf of 145 V. This means that its terminal voltage is 145 V when no current flows through it. When the terminal potential is 120. V the current through the circuit is 25.0 A.

   a. What is the internal resistance of the cell?

   b. What will be the terminal potential when the current is 12.0 A?

5. E: A cell with internal resistance is connected to a 3.00 Ω resistor. Determine the internal resistance r of the cell if the current going through it is 2.00 Amps when its ε is 12.0 V.

6. E: A battery with internal resistance is connected to a variable resistor. When the resistor has a resistance R of 12.0 Ω the current is 2.00 Amps. When the resistor has a resistance R of 6.00 Ω the current is 3.00 Amps. Determine the emf ε and internal resistance r of the battery.

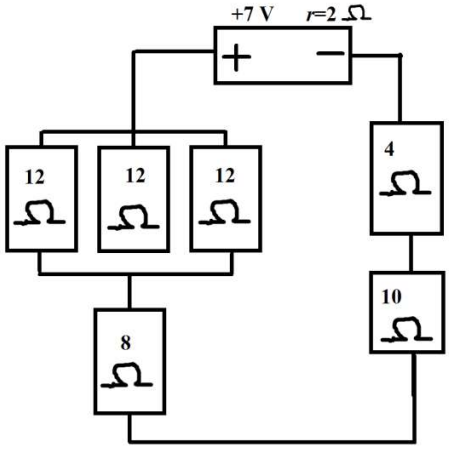
7. E: While attached to a 2.00 Ω resistance the terminal voltage of a battery is measured to be 5.20 V. The open circuit voltage of this same battery is measured to be 6.70 V.

   a. What is the internal resistance of the battery?

   b. What will be the maximum current that can be delivered by the battery?

8. E: A battery is known to have an emf of 4.60 Volts and an internal resistance of 2.20 Ω. What will be the terminal voltage of this battery while connected to a load of 7.80 Ω?

9. E: Consider the circuit below:



a. What is the total resistance of this circuit?

b. What will be the total current flowing through this circuit?

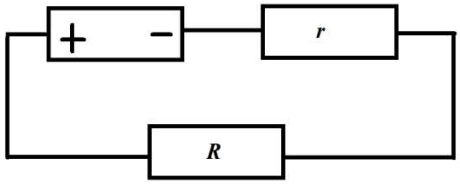
c. What will be the current flowing through each 12.0 Ω resistor?

d. What will be the voltage drop across each of the 12.0 Ω resistors?

e. What will be the terminal voltage of the battery?

f. What will be the voltage drop across the 10.0 Ω resistor?

10. E: A battery, which has an emf of 6.00 V and an internal resistance $r = 0.500\ \Omega$, is connected to a load which has a resistance of $R = 3.50\ \Omega$.



a. What will be the current flowing in this circuit?

b. What will be the voltage drop across the load?

c. How much power is being supplied by the battery?

d. How much power is being consumed by the load?

e. How much power is being consumed by the internal resistance of the battery?

f. With what efficiency is power being delivered to the load in this circuit?