Mathematical Relationships in Circuits

Read from **Lessons 2 and 3** of the **Current Electricity** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/circuits/u9l2c.html
http://www.physicsclassroom.com/Class/circuits/u9l2d.html
http://www.physicsclassroom.com/Class/circuits/u9l3c.html
http://www.physicsclassroom.com/Class/circuits/u9l3d.html

MOP Connection: Electric Circuits: sublevels 5 and 6

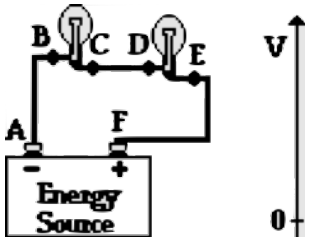
1. **Matching**: Identify the units on the following electrical quantities by placing a letter in the blank.

The unit of charge is the ____.
The unit of electric potential is the ____.
The unit of power is the ____.
The unit of potential energy is the ____.
The unit of current is the ____.
The unit of resistance is the ____.

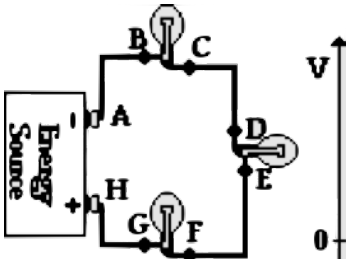
Choices: A. Coulombs
B. Amperes
C. Volts
D. Ohms
E. Joules
F. Watts

2. An **electric potential diagram** is a useful means of representing the potential of a positive charge as it moves around a circuit. The electric potential of a charge at strategic locations in a circuit is represented on a chart. Points on the circuit where the charge has the highest potential are located highest on the chart; points of lowest potential are located lowest on the charts. At some points on the circuit, charges have approximately the same amount of potential. Construct electric potential diagrams for the following circuits. Label the points.

a.



b.

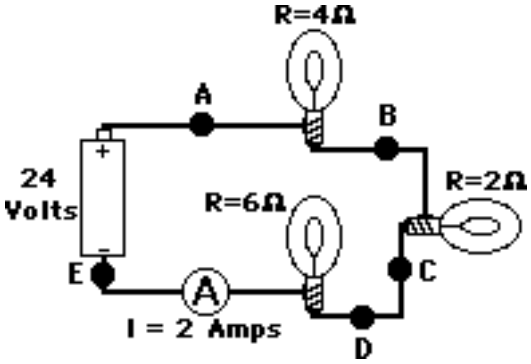


3. Given the circuit at the right with the listed current and resistance values, determine the electric potential at the indicated positions. Note that you are to find the electric potential (or voltage) and **NOT** the electric potential difference (or voltage drop).

V_A = _____V V_B = _____V

V_C = _____V V_D = _____V

V_E = _____V



4. Determine the following quantities for the circuit in question #3 above. **PSYW**

a. The overall power.

b. The power of the 6-ohm light bulb.

c. The overall resistance.

d. The energy used by the circuit in 10 minutes.

Show your work for the following problems.

5. a. Determine the amount of energy used when listening to your 5.0-Watt IPod Nano for 10 hours.

   b. Determine the resistance of the IPod if it uses a 5.2 Volt battery.

   c. What quantity of charge passes through the IPod battery during this 10-hr time period?

6. a. Calculate the energy used and current drawn by a 200-W window fan when plugged into a 110-V outlet and left on for an 8-hr time period.

   b. Calculate the energy used and the current drawn by a 3400-W air conditioner that is wired to a 220-V circuit and left on for an 8-hr time period.

7. A 2000-W hand dryer in a public bathroom at a zoo runs for 30 seconds per cycle. At a cost of 13 cents per kW•hr, determine the cost of running the dryer 200 times in a day.

   What is the annual cost of the hand dryer assuming it is used on average 200 times per day?

   Calculate the resistance and the current for the hand dryer if it is connected to a 220-V circuit.

