

# Physics Term3 Week 10

Power

# Recall That

- An electrical circuit is simply an energy transformation tool.
- Energy is provided to the circuit
- The rate at which this energy transformation occurs
- **Power** is the rate at which electrical energy is supplied to a circuit or consumed by a load.

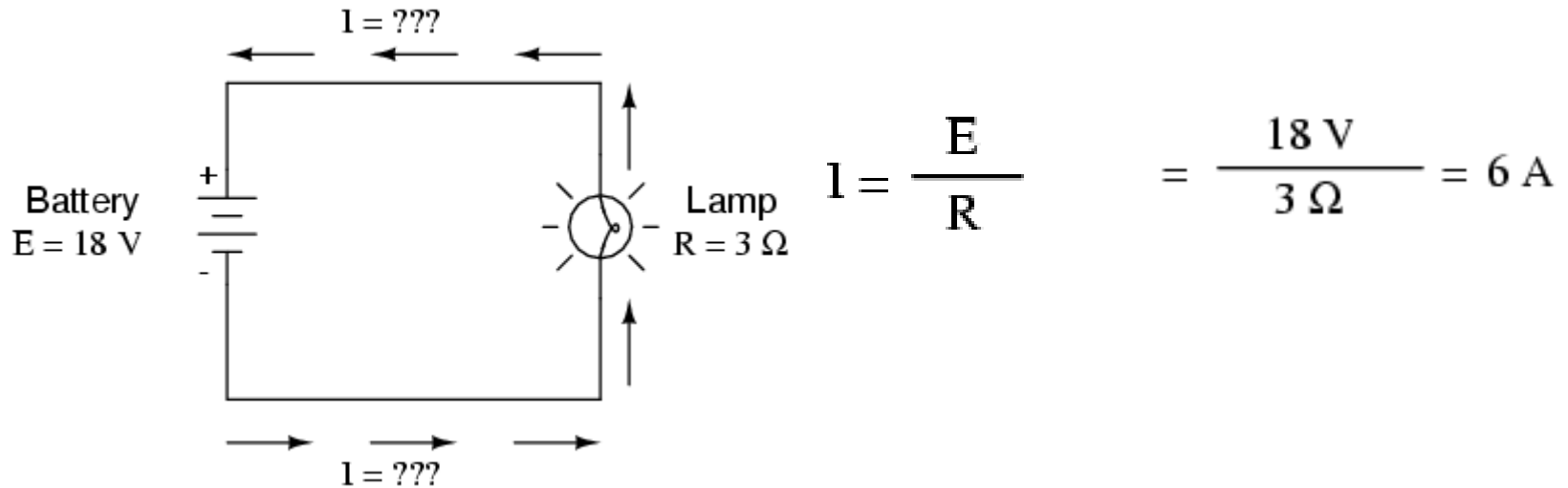
$$\text{Power} = \frac{\text{Work Done on Charge}}{\text{Time}} = \frac{\text{Energy Consumed by Load}}{\text{Time}}$$

# Watt

**1 watt = 1 joule / second**

- 120-watt light bulbs draws 120 joules of energy every second
- Electrical power refers to the rate at which the charge changes its energy

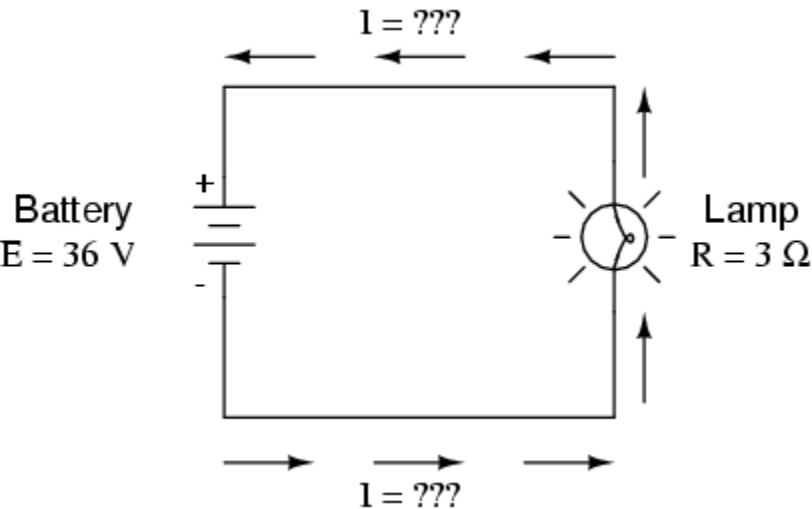
# Calculating Power



- Now that we know the current -take that value and multiply it by the voltage to determine power:

$$P = I E = (6 \text{ A})(18 \text{ V}) = 108 \text{ W}$$

# Same Circuit but Double PD



$$I = \frac{E}{R} = \frac{36 \text{ V}}{3 \Omega} = 12 \text{ A}$$

- This stands to reason: if  $I = E/R$ , and we double  $E$  while  $R$  stays the same, the current should double.
- 12 amps of current instead of 6

$$P = I E = (12 \text{ A})(36 \text{ V}) = 432 \text{ W}$$

- Power is a function of voltage multiplied by current, and *both* voltage and current doubled from their previous values
- Power will increase by a factor of  $2 \times 2$ , or 4.

# Don't Knows and the Power Formula

- Only know voltage (E) and resistance (R):

$$\textit{If, } I = \frac{E}{R} \quad \textit{and} \quad P = I E$$

$$\textit{Then, } P = \frac{E}{R} E \quad \textit{or} \quad P = \frac{E^2}{R}$$

# More Don't Knows

- If you only know current (I) and resistance (R):

*If,*     $E = I R$             *and*             $P = I E$

*Then,*     $P = I(I R)$             *or*     $P = I^2 R$

# Power Equations

$$P = IE \qquad P = \frac{E^2}{R} \qquad P = I^2R$$