## Series Circuits

## Electric Circuits <br> 0

- A circuit is a closed loop in which electric current can flow.
- For a continuous flow of electrons, there must be a complete circuit with no gaps
- A gap is usually provided by an electric switch that can be opened or closed to either cut off or allow electron flow
- The simplest circuit requires a minimum of three things:
- A source of electrical potential energy or voltage
- Battery
- A conductive path which would allow for the movement of charge
- Wires
- An electrical resistance (something that uses electricity to do work)
- Light bulbs (brightness of the bulb depends on the amount of electrical power the bulb dissipates)


## Diagramming Electric Circuits



Battery
в


## Resistors In Series (Series Circuits)



## In Series



- Equivalent resistance in the series circuit is the sum of the individual resistances along the circuit path.

$$
R_{e q}=R_{1}+R_{2}+R_{3}+\cdots
$$

Ex: Find the total resistance of the three resistors connected in series.

## In Series

- Current passing through each electric device is the same

$$
I_{1}=I_{2}=I_{3}
$$

- Ohm's Law applies across each individual device


$$
V_{1}=I_{1} R_{1} \quad V_{2}=I_{2} R_{2} \quad V_{3}=I_{3} R_{3}
$$

- Sum of the voltage drops across the individual devices is equal to the total voltage supplied by the source

$$
V_{t o t a l}=V_{1}+V_{2}+V_{3}
$$

- For the entire circuit: $\quad V_{t o t a l}=I R_{e q}$


## Example 1: Series

- What is the current through the battery?



## Example 2: Series

- Find the resistance of the unknown resistor, R.



## Example 3: Series

- Two $4 \Omega$ resistors and two $3 \Omega$ resistors are connected in series to a 28 V battery.
- What is the equivalent resistance?
- What is the current in the circuit?
- What is the voltage drop across each resistor?

