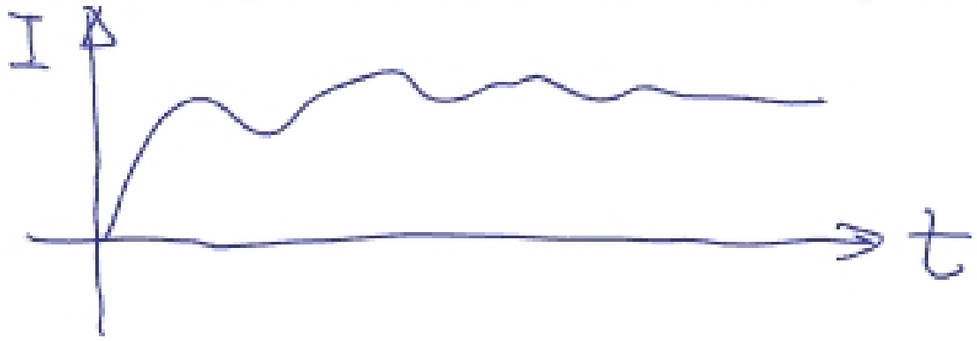
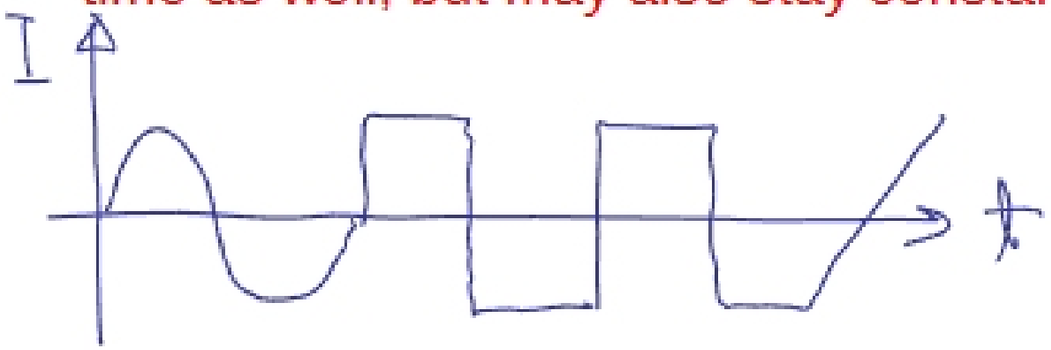
- Direct Current (DC) and circuits:
  - Direct Current: the DIRECTION of the current in a circuit does not change with time. The amplitude of the current may or may not change with time.

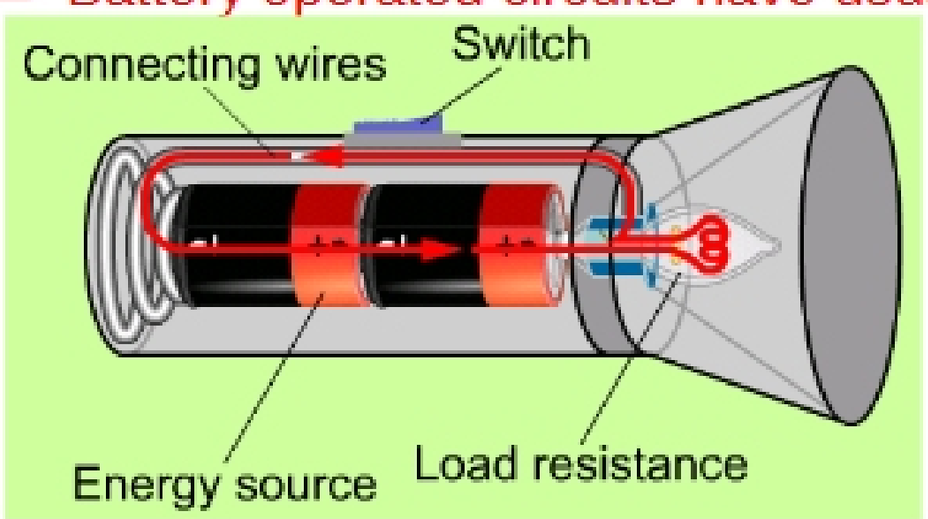


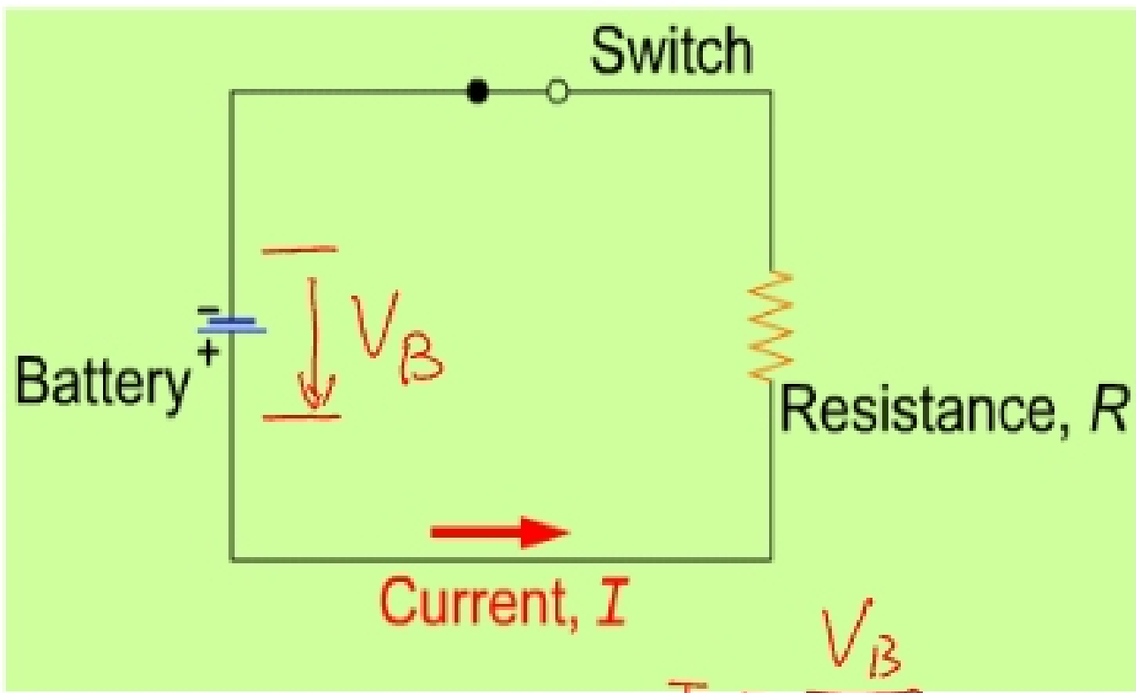
Current I will never be negative.

  - The opposite, the Alternating Current (AC): the DIRECTION of the current in a circuit changes with time. The amplitude of the current usually changes with time as well, but may also stay constant.

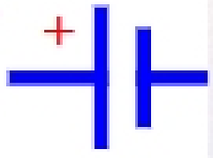


  - Battery operated circuits have usually DC.

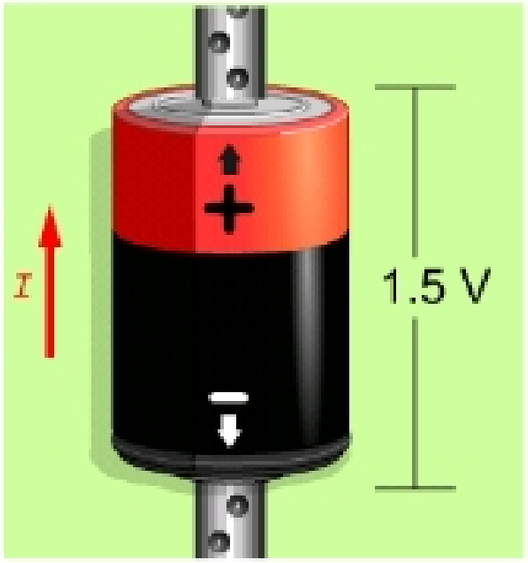




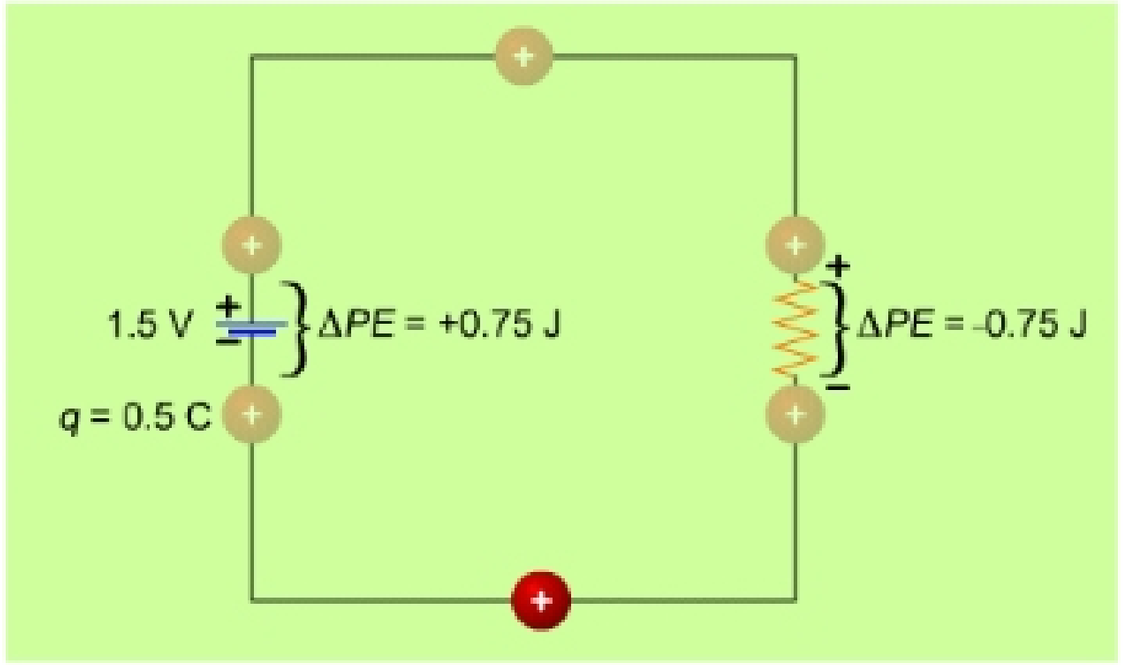
$$I = \frac{V_B}{R}$$

- Basic components and their symbols:
  - Wire: connects other components in the circuit, without any resistance. Symbol: 
  - Switch: when it is closed, a circuit (a loop for the current) is formed. Symbol: 
  - Resistor: the component that follows the Ohm's Law $R = \frac{V}{I}$. Symbol:  or 
  - Capacitor: the component that is defined through $C = \frac{Q}{V}$. Symbol: 
  - Battery: the device that provides the electric potential difference in a circuit, that converts other type of energy into electric. Symbol: 
  - Inductor: will be discussed later part of this semester.
  - Transistor: not in the scope of this course.
  - … …

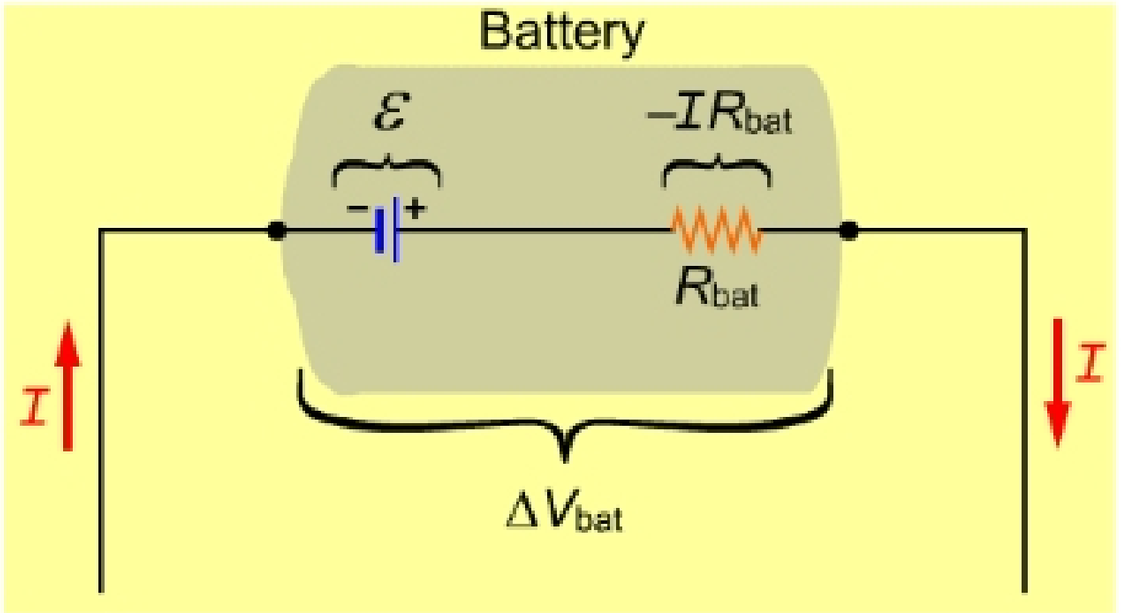
- The electromotive force (emf, E) of a battery:



The external force (mechanical or chemical) that provides the potential difference is called the electromotive force. For a battery, this emf comes from chemical reactions.



- The capacitance of a battery:
  This is often specified as Amp•hour or a variation of this unit (like mA•h)
- The internal resistance and the terminal voltage:



$$\Delta V_{bat} = \mathcal{E} - \Delta V_R = \mathcal{E} - IR_{bat}$$

ΔV_{bat} = potential difference across battery
$\mathcal{E}$ = emf, I = current
ΔV_R = resistive potential difference
R_{bat} = internal resistance of battery