Power (reminder)

- **Power** is the rate of doing work.
- The SI **unit of power** is the watt (W), which is equal to one joule per second 1W=1J/sec.
- Power is a **scalar** quantity (number). It does not have a direction.
- Work may be mechanical work, or **work done by a battery** driving an electric current.
- **Work** can be replaced by **Heat**. That will be **thermal power** rather than mechanical or electric one.

$$P = \frac{W}{t}$$

$$power = \frac{work}{time}$$

Example:

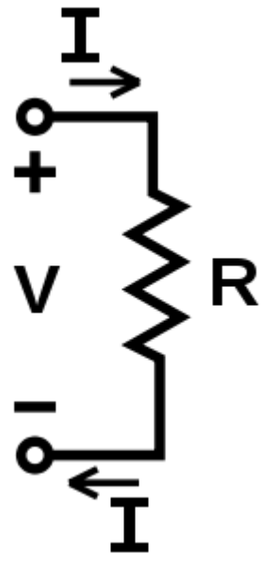
The power 100 W approximately corresponds to:

- lifting 10 kg to the height of 1 meter in 1 second
- the power required to operate a 100 W bulb
- heating 1 L of water by 15 degree Celsius in 10 minutes

Power in electric circuits

Ohm's Law

$$V = I \cdot R$$



V is **Voltage Drop**, the **Potential Difference** between two ends of a wire (or resistor, light bulb etc). **V** is the difference of electric potential energies of a unit charge between two points.

- Assume that a battery pushes the charge Q through the potential difference V in time t.
- This means that the work done by battery is W=QV
- The power required for this is P=W/t =QV/t=V(Q/t)
- Q/t can be recognized as the current I
- We have the formula for the electric power P=V I
- Other forms can be obtained using Ohm's law

$$P = I \cdot V$$

$$Power = Current \times Voltage$$

$$P = I \cdot V = I^2 R = \frac{V^2}{R}$$

04/29/2018
Physics 0

Homework

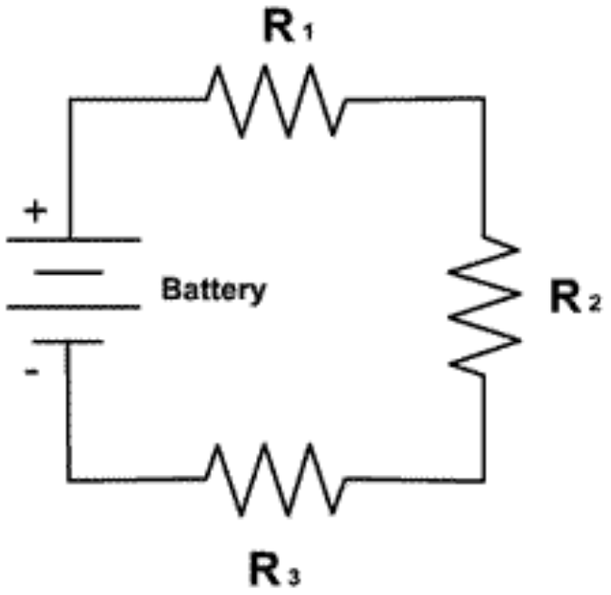
Problem 1

An electric motor is used to lift a mass m=50 kg to height h=10m, over time t=10s. Find the power of the motor and current that runs through it, if the voltage on the motor is V=110V.

Problem 2

Find the total power supplied by the battery in circuits shown in the Figure. In both cases the values of all resistances are 100 Ω and the voltage produced by battery is V_{batt}=15 V.

a)



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