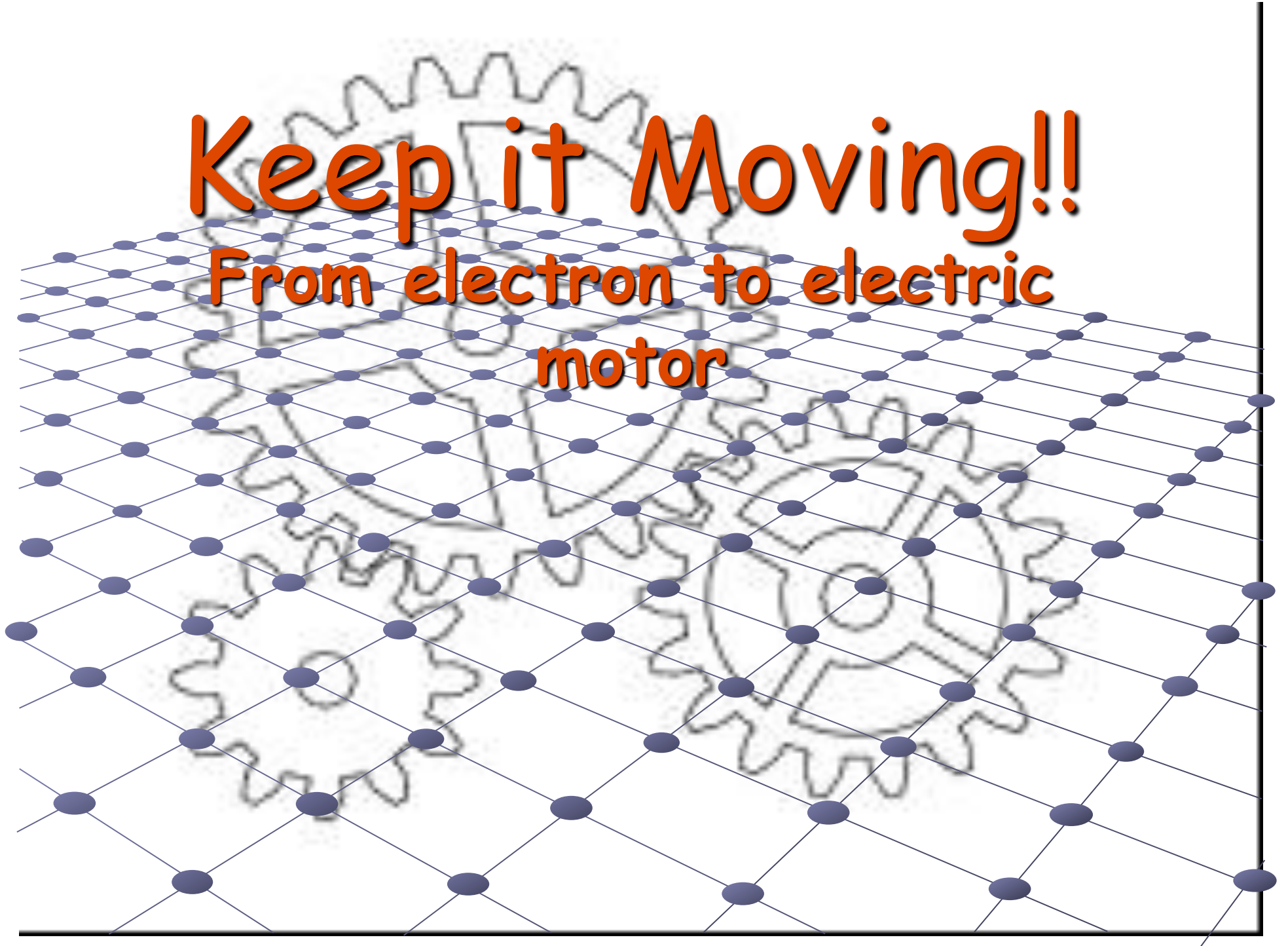
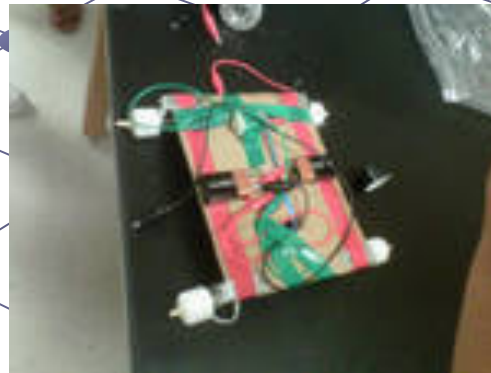
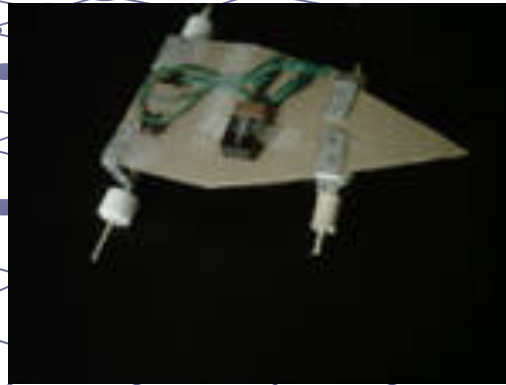
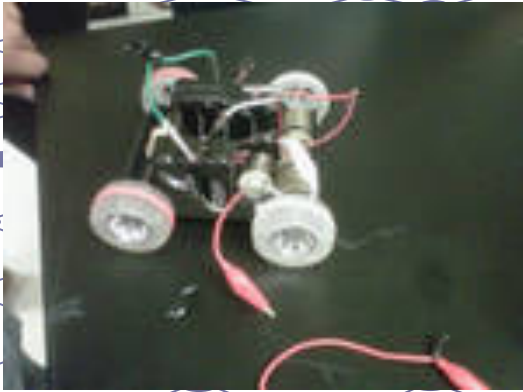


Keep it Moving!!

From electron to electric
motor



So you made yourself a model of a vehicle...



But how does it work?

Review: Periodic Table of Elements

How can you determine the # of electrons this element has?

19

atomic #

K

element symbol

39.098

atomic mass

Potassium

element name

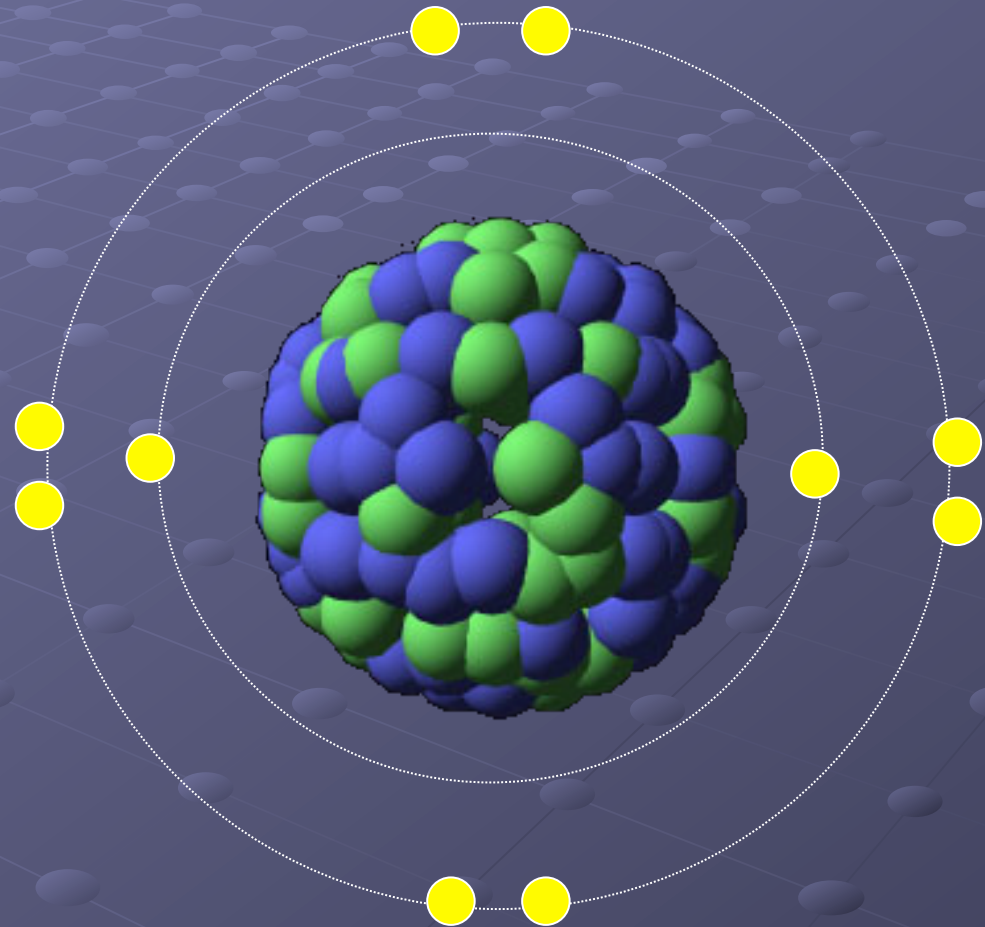
Review: The Atom

- The three particles every atom consists of are:

● Protons = "+"

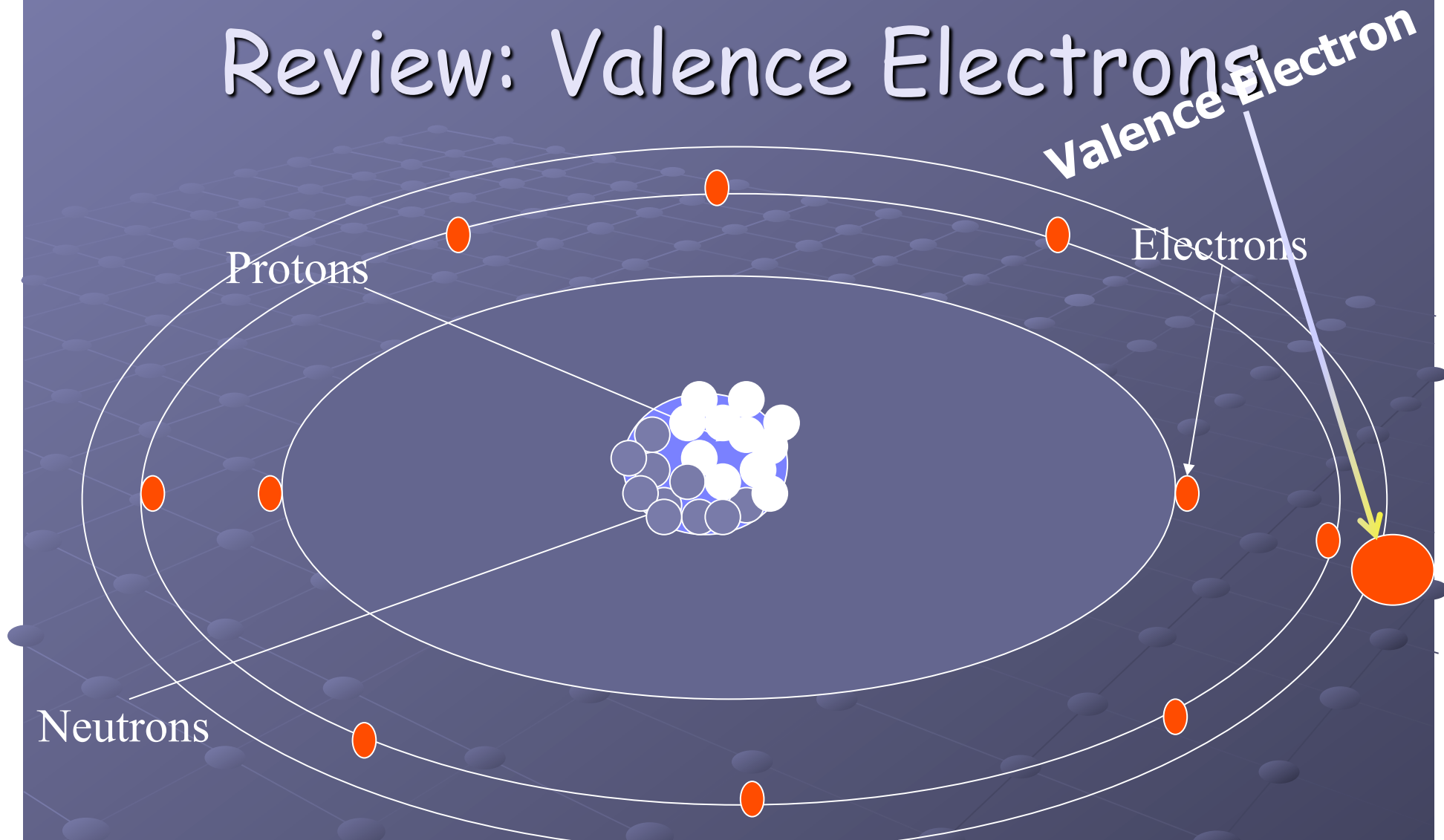
● Neutrons = "0"

● Electrons = "-"



Uranium atom

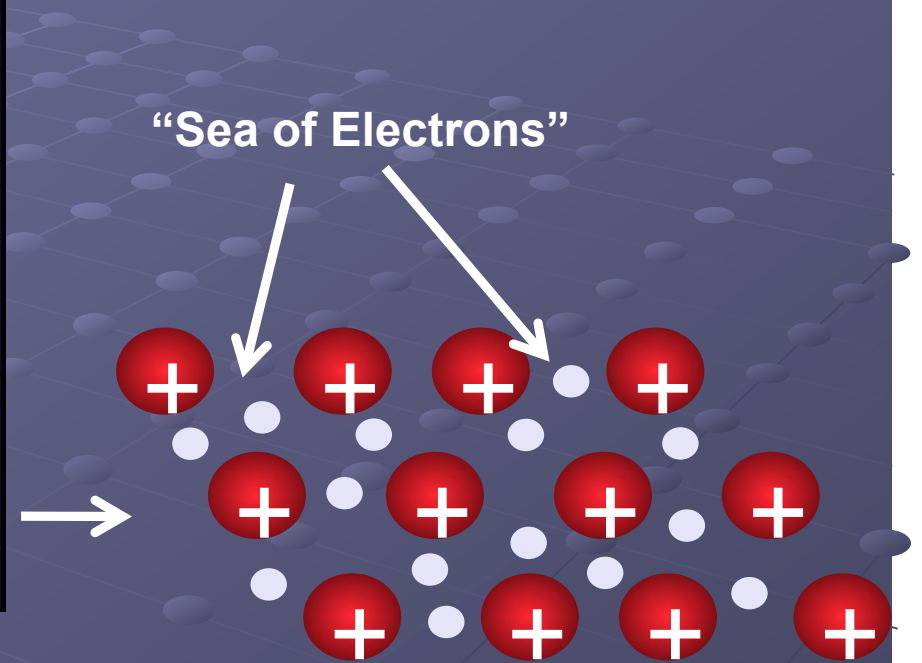
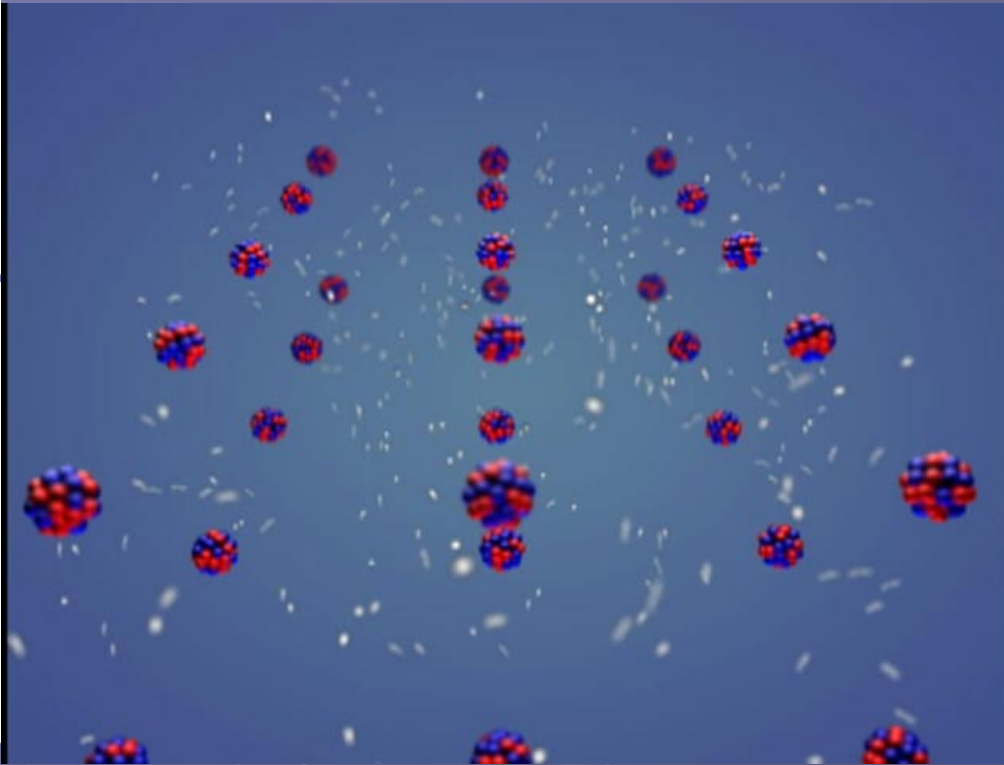
Review: Valence Electrons



The most important electrons in the atom are the **Valence Electrons**.

Responsible for all reactions.

Review: Valence Electrons in Metals



- Metals hold onto their valence electrons very weakly which allows the valence electrons to be mobile. This results in an ***electric current*** being produced in metal wires, electrolytes, and other charged materials.

Electrons & Batteries

- Batteries are devices that store electrical potential energy in chemical form.
- Batteries work by **electrolysis**, which is where metal compounds are split-up by an electrical current.
- As a result, these compounds produce charged positive and negative atoms/molecules called **ions**.



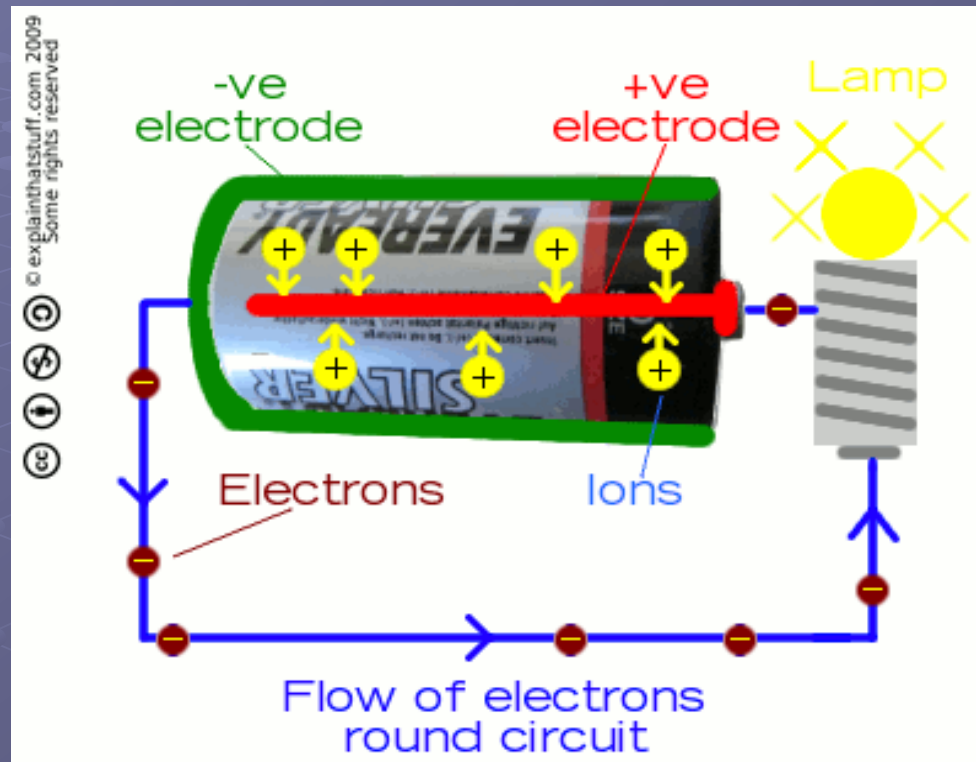
Electrons & Batteries

- All batteries contain a certain **voltage** (V). Voltage is the measure of stored electrical energy or is the charge in electrical potential the battery contains.



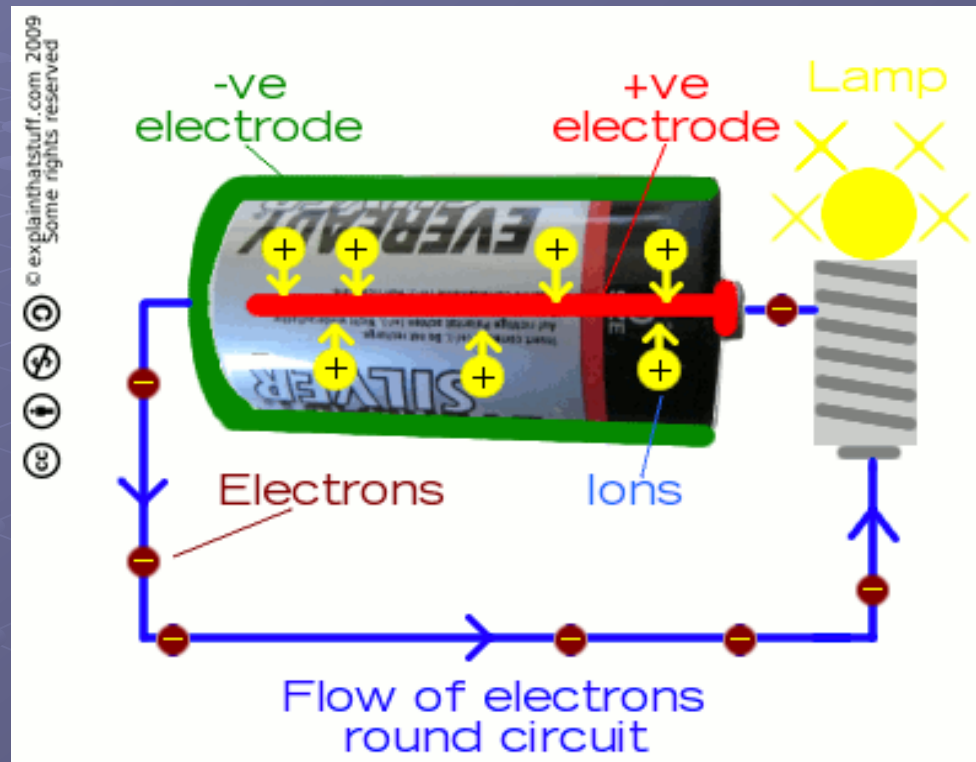
- Standard batteries have a voltage rating ranging from 1.5 – 9 volts.

Electrons & Batteries



- A circuit is a pathway (or series of paths) in which electrons are routed through a system that produces a negative terminal and a positive terminal and which forms a loop around the "+" terminal.

Electrons & Batteries



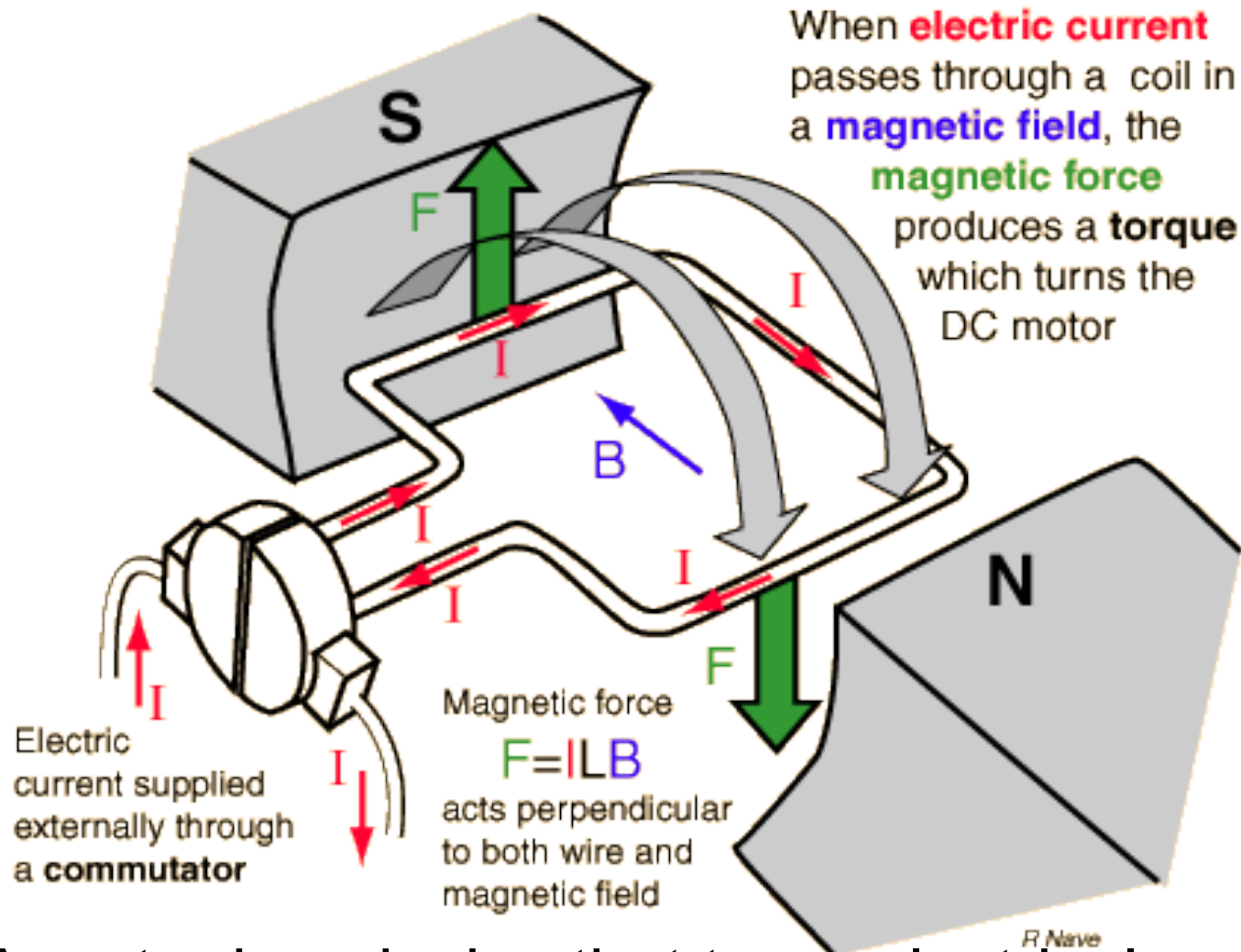
- However some materials resist the flow of electrical movement. This is called **resistance** (measured in Ohms Ω) (smaller wire, less) resistance).

Electrons & Batteries



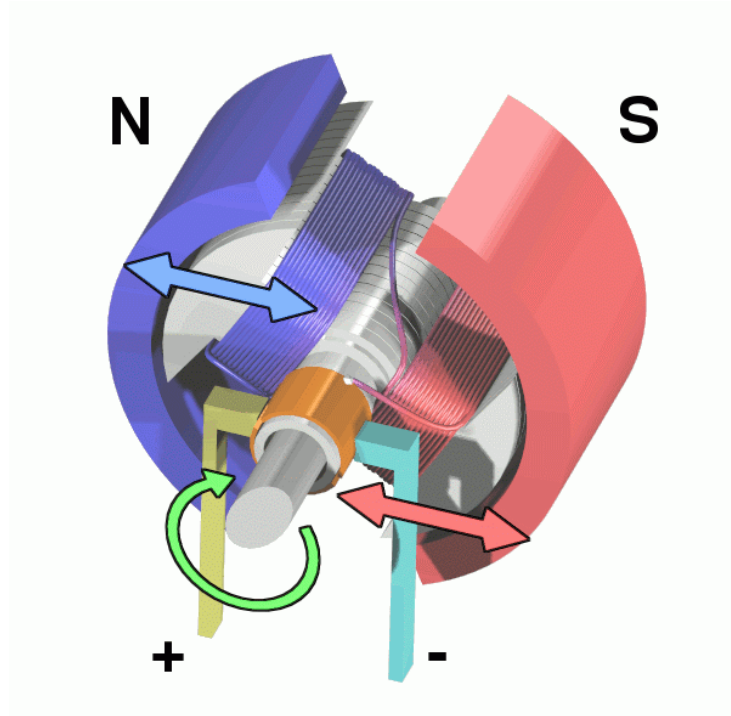
- However, when electrical flow through a circuit is complete, work is done.

Electric Motors



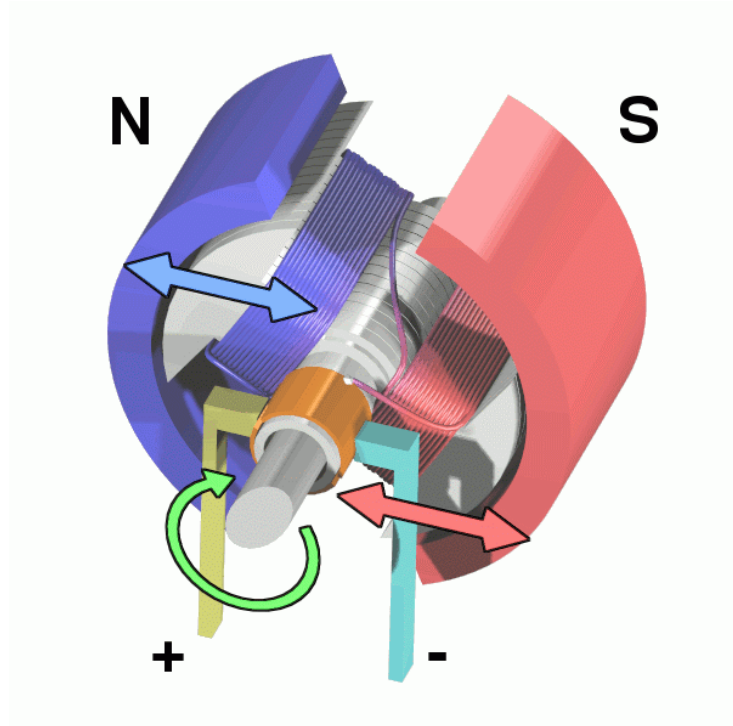
- A motor is a device that turns electrical energy into mechanical energy.

Electric Motors



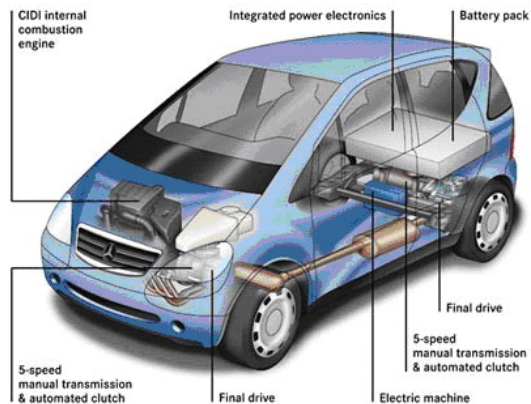
- Inside of a motor, the movement of electrons and alternating magnetic fields turns the commutator (needle). The commutator drives the main mechanical belt that puts the car in motion.

Electric Motors



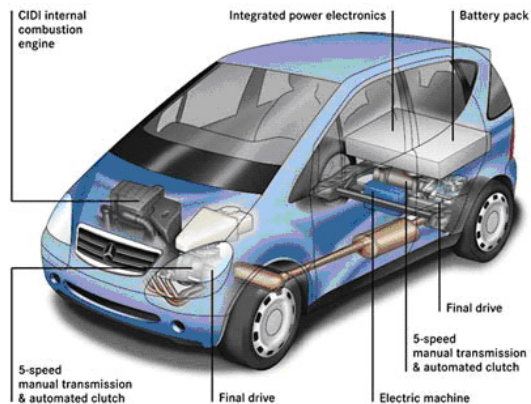
- Mechanical power (the amount of work done in a certain period of time) of a motor can increase as the electrical power supplied increases.
- The formula for electrical power is $W = V \times I$, where V is voltage (Volts) supply current (Amps), and W is power (watts). motor increases **electrical power**.

Electric Vehicle



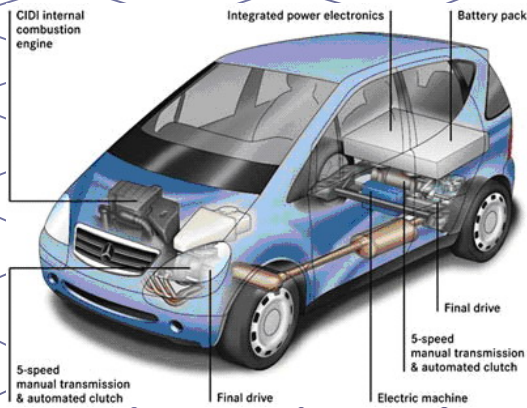
- Some of the principles used to power your battery-operated car are also the same that are to power larger vehicles today.
- Hybrid vehicles (cars that run off of electricity as well as gasoline) are gaining more attention today, because they are engineered to reduce exhaust pollution as well as reduce dependency on gasoline.

Electric Vehicle



- An **engineer** is a person who uses math and science concepts to create and build machines, electronics, computers, structures, processes, and many other things that benefit our lives.

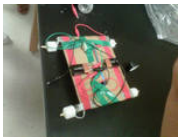
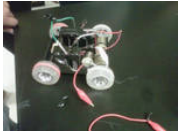
Electric Vehicle



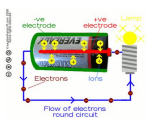
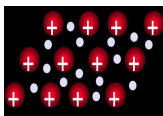
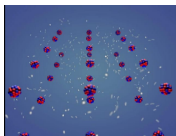
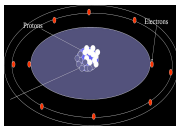
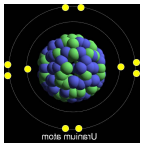
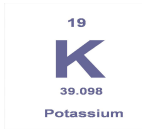
- Congratulations – consider yourself an engineer!!

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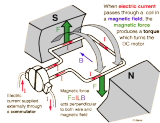
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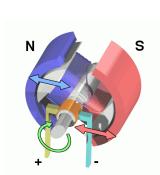
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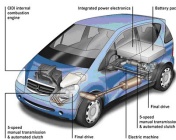
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