

Magnetic Field Brief Notes:

- What is a magnetic force?
- Magnetic field?
- Magnetic fields look like?
- Movement of magnets produces what?

Magnetic Force

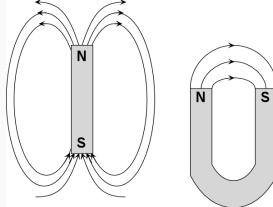
- Definition- The interaction between two magnetic fields.
- If two magnets move closer their strength increases
- If magnets move further their strength decreases

A magnet is surrounded by a magnetic field

All magnets have a magnetic field!!!

Magnetic Field

- Definition- area around a magnet that exerts the magnetic force
- Magnets have a North & South pole (which attract with each other)



Purpose of Magnets – pg 234

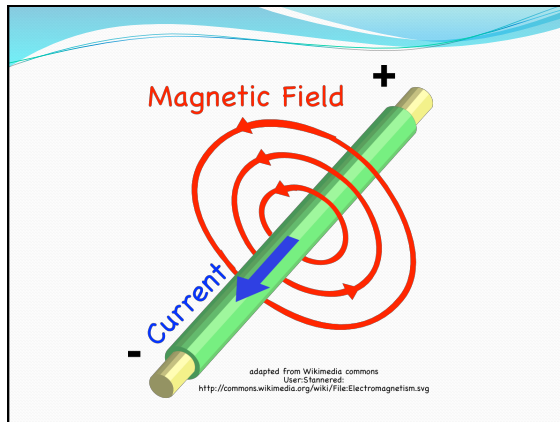
- Electromagnets – temporary magnet made by placing a piece of iron inside a current-carrying coil of wire
 - Iron core becomes a magnet
 - When current flows through the electromagnet and it moves toward or away from another magnet, it converts electric energy into mechanical energy to do work.
 - Used in stereo speakers, electric motors,
- Moving magnets produces electricity in:
 - Generator – produces electric current by rotating a coil of wire in a magnetic field (moving magnet)
 - Motor – device that converts electrical energy to mechanical energy to do work
 - Transformer – device that increases or decreases alternating current generated by a power plant so it can enter homes safely

What are Electromagnetic Waves?

- Electromagnetic waves do not require matter to transfer energy
 - They can travel through empty space
- Electromagnetic waves are made by vibrating electric charges
- Any object that carries charge and moves with a nonzero acceleration radiates EM waves. (Steadily moving objects do not radiate.)
- Everything in the Universe emits EM radiation over a continuum of wavelengths. (above absolute zero)

What are Electromagnetic Waves?, *continued*

- Electric and Magnetic Fields are related
 - Electric charges are surrounded by electric fields
 - An electric current flowing through an object is surrounded by a magnetic field because the motion of the electrons creates a magnetic field
 - This means any moving electric charge is surrounded by a magnetic **and** electric field
 - A changing magnetic field creates a changing electric field and vice versa

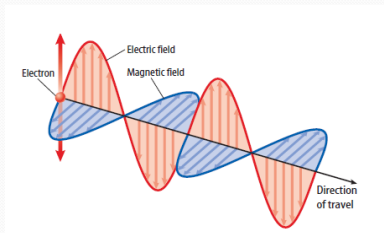


What are Electromagnetic Waves?, *continued*

- Making Electromagnetic Waves
 - When an electric charge vibrates, the electric field around it vibrates
 - This creates a magnetic field
 - The magnetic field changes as the charge moves back and forth
 - This causes changes in the electric field
 - This process continues over and over
 - The electric and magnetic fields are perpendicular to each other and travel outward from the moving charge

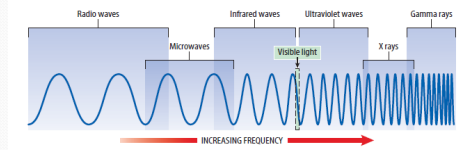
(PICTURE)

Electromagnetic Wave



The Electromagnetic Spectrum

- A Range of Frequencies
 - Light comes in a wide range of frequencies, and thus wavelengths
 - As a result, they have different names

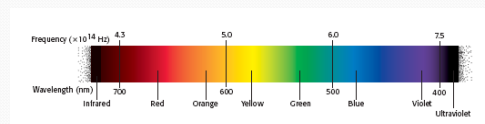


The Electromagnetic Spectrum, *continued*

- Radio Waves
 - Radio waves are low-frequency electromagnetic waves with wavelengths greater than about 1 mm
 - Radio waves with wavelengths of less than 1 mm are called microwaves
- Infrared Waves
 - Warmth/heat you feel is thermal energy emitted through infrared waves
 - Wavelengths range from about 1 mm to 750 billionths of a meter (750/1,000,000,000)

The Electromagnetic Spectrum, *continued*

- Visible Light
 - Our eyes can detect light with wavelengths ranging from about 400 billionths (400/1,000,000,000) to 750 billionths of a meter (750/1,000,000,000)
 - this range is called visible light



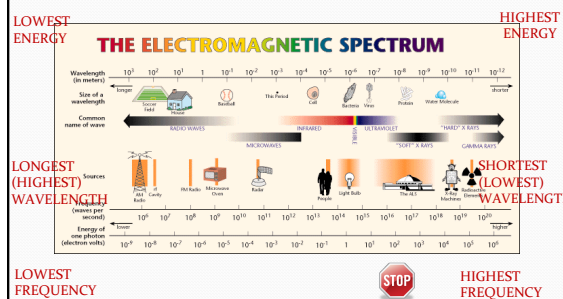
The Electromagnetic Spectrum, continued

- Ultraviolet Waves
 - Electromagnetic waves with wavelengths from 400 billionths ($400/1,000,000,000$) of a meter to 10 billions of a meter ($10/1,000,000,000$)
 - Some UV radiation is good for us – it allows our bodies to make vitamin D needed for healthy bones and teeth
 - Overexposure to UV radiation can cause skin damage and cancer

The Electromagnetic Spectrum, continued

- X Rays and Gamma Rays
 - Ultra-high-frequency waves that have so much energy they can travel through matter and break molecular bonds
 - Radiation therapy exposes parts of the human body to X rays or gamma rays
 - This causes damage to the cells that come in contact with the radiation

Electromagnetic Spectrum – Wavelength, Frequency and Energy



Energy waves → Other forms of E

- Sun light is EM radiation (mixture of UV, infrared, visible light)
- How does the metal part of a seatbelt feel in the summer on a hot day?
- Why?
- How is this an example of waves changing into other forms of energy?