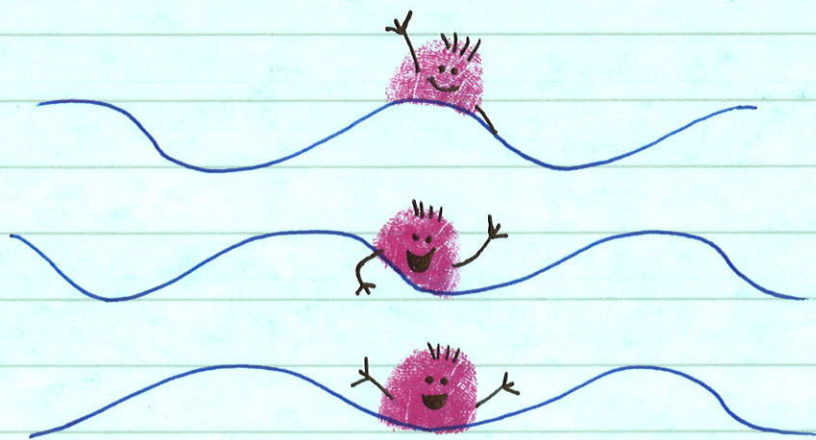


Chapter 10

Waves

10-1 A wave is a disturbance that transfers energy - but not matter.

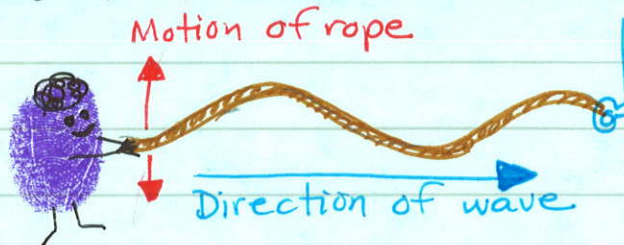
Mechanical waves require a medium to travel through - a solid, liquid, or gas



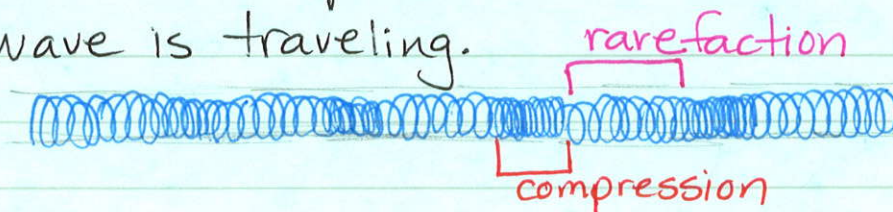
Waves travel through the water. The particles move up and down, not forward.

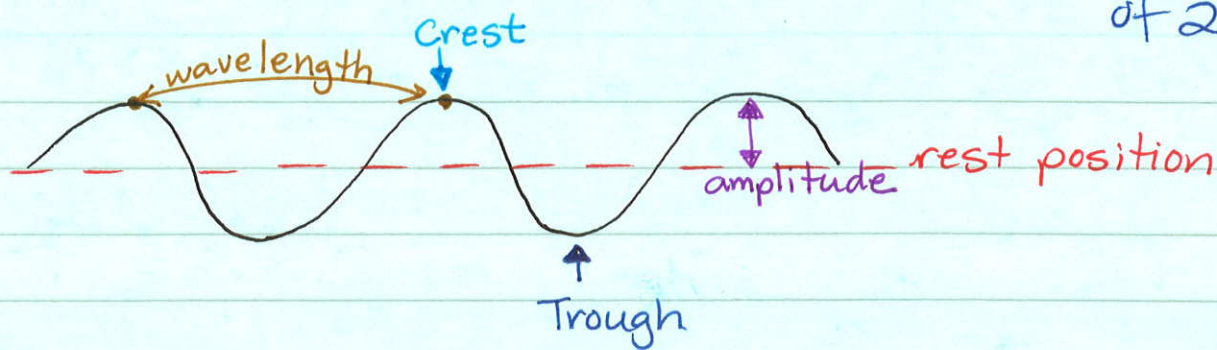
There are 2 types of waves:

Transverse Waves move through the medium at right angles to the direction the wave is traveling.




Longitudinal waves move the particles of the medium parallel to the direction the wave is traveling.





Combination waves (called surface waves) occur at the surface between two mediums.

Example: water and air 

Examples of mechanical waves:

Sound waves • longitudinal wave that travels in a solid, liquid, or gas
 • the speaker cone produces the compressions and rarefactions

Water waves • Combination wave - both transverse and longitudinal
 • usually produced by wind blowing across the surface

Seismic waves • Waves travel within the Earth or on Earth's surface
 • Causes earthquakes and tsunamis

Electromagnetic Waves

are waves that can travel through empty space AND matter

Remember to include the entire electromagnetic spectrum!

Every object gives off electromagnetic waves.

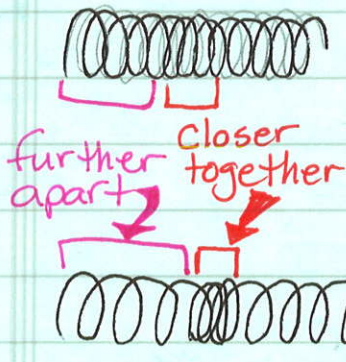
Since you are not that hot, (sorry to disappoint some of you) you give off infrared waves.

Energy carried by electromagnetic waves is called radiant energy.

- 92% of the radiant energy reaching us from the sun is infrared and visible light
- 7% is ultraviolet

10-2 Wave Properties

Amplitude - the maximum distance a wave moves from rest position

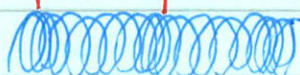


In longitudinal waves, the amplitude measures how compressed/rarefied the medium becomes.

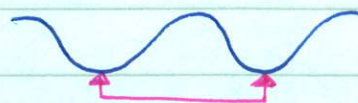
This longitudinal wave has a higher amplitude than the one above it.

Wave length - the distance from one point on a wave to the same point on the next wave.

compression to compression



rarefaction to rarefaction



Frequency - the number of wavelengths that pass by a point each second

* The unit for frequency is hertz (Hz)

$$\text{Frequency} = \frac{\# \text{ of } \lambda}{\text{time (sec)}}$$

Wave Speed

- Different waves travel at different speeds

- Speed of light 300,000 km/sec
186,000 mi/sec

- Speed of sound 1,200 km/hr
760 mi/hr

- Waves travel at different speeds through different mediums

- Mechanical waves (ie: sound) travels fastest in solids and slowest in gases

- Electromagnetic waves travel fastest through empty space and slowest in solids

- Mechanical waves usually travel faster as the temperature of the medium increases.

Wave Speed

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

10-3

Wave interactions

- Absorption - transfer of energy to the medium it is traveling through
- Transmission - the passage of light through an object (like a window)
- Reflection - the bouncing of a wave off a surface. When waves reflect, they change directions



- * Law of reflection - when a wave is reflected from a surface, the angle of reflection is equal to the angle of incidence
- Refraction - the change in direction of a wave that happens when the wave changes what ~~the~~ medium it is traveling in
- Diffraction - the change in direction of a wave as it travels through an opening



- Interference - waves overlapping to form new waves... interference ~~can~~ can be constructive or destructive
- Standing wave - a wave formed from two waves that seems to stand still