

Sound and light

1) Sound waves - caused by vibrations and carry energy through a medium as longitudinal waves.

2) Speed of sound - dependent on the matter the sound wave travels through. The closer the particles are to each other the faster it travels.

Note: (Best) Solid \rightarrow liquid \rightarrow gas (worst)

3) Intensity of sound - loudness of a sound depends on the amplitude of the sound wave.

4) Decibels (dB) - measure of the amplitude of sound.

Note: An increase in intensity of 10 dB seems to double the loudness.

1) Cats purring - 30 dB

2) Vacuum cleaner - 70 dB

3) Lawn Mower - 90 dB

4) Threshold of Pain - 120 dB

5) Pitch - measure of the frequency of a sound.

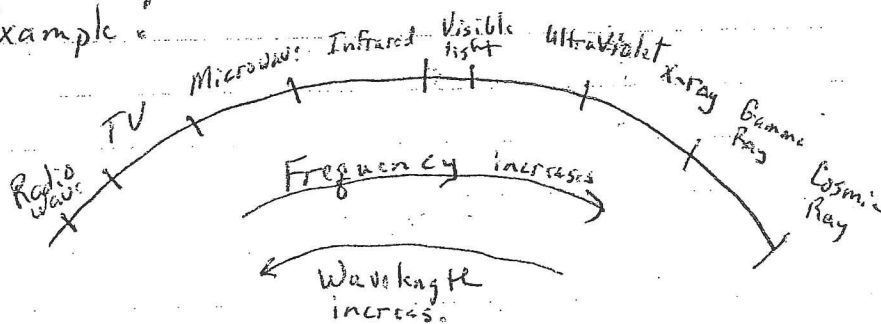
6) Infrasound - sound waves whose frequency is below the range of human hearing.

7) Ultrasound - sound waves whose frequency is above the range of human hearing.

- 8) Sonar - System that uses reflected sound waves for measurement and can measure large distances.
- 9) Musical instrument - device used to produce sound through the vibration of strings, air column, or membranes.
Note: It uses standing waves to produce sound.
- 10) Natural Frequencies - Specific frequencies at which an instrument is most likely to vibrate.
- 11) Resonance - Occurs when the forced vibration causes the instrument to vibrate at a natural frequency.
- 12) Light - Form of energy that has the characteristics of both waves and streams of particles.
Note: It is electromagnetic waves.
- 13) photons - like particles with no mass acting as little bundles of energy.
Notes: 1) Wave model - explains interference of light.
2) Particle model - ^{A)} Explains light knocking electrons off metal.
^{B)} Explains light traveling in a vacuum.
- 14) Speed of light - 3.00×10^8 m/s, this represents the fastest moving entity in the universe.
- 15) Intensity - measures the amount of light illuminating a surface and depends on the number of photons/sec that passes through a certain area of space.

16) Electromagnetic Spectrum - Consists of waves at all possible energies, frequencies and wavelengths.

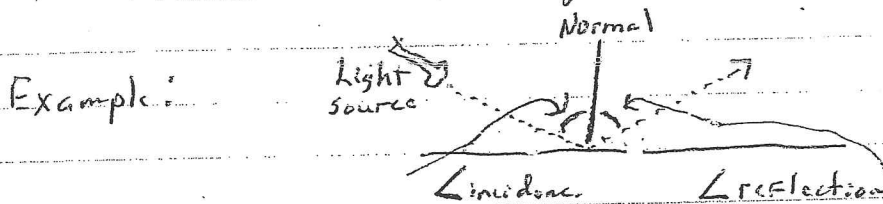
17) Example:



18) Note: $C = \lambda F$ $F = \frac{C}{\lambda}$ $\lambda = \frac{C}{F}$

19) Reflection of light - light waves bounce off a surface.

20) Law of reflection - angle of incidence equals the angle of reflection.



21) Virtual image - An image formed through reflection or refraction that can be seen by an observer but cannot be projected on a screen because light from the object doesn't actually come to a focus.

22 Real image - when light rays from an object are focused onto a small area.

23 Types of Mirrors:

1) Plane mirror - a flat mirror surface has the rays of light reflecting in all directions. This causes the image to be the same size and distance for the object observed.

2) Convex mirror - the mirror's surface is curved outward causing the image to appear to be smaller and closer.

3) Concave mirror - the mirror's surface is curved inward causing the image to appear to be larger and farther away.

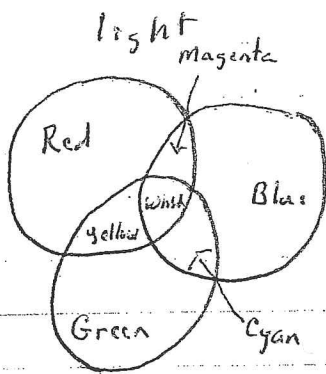
24) Diffused reflection - occurs when light is incident on a rough surface having many different angles reflects the light in many different directions.

25) Spectrum - different frequencies of visible light that makes colors, ROYGBIV low freq \rightarrow high
Red, Orange, Yellow, Green, Blue, Indigo, Violet.

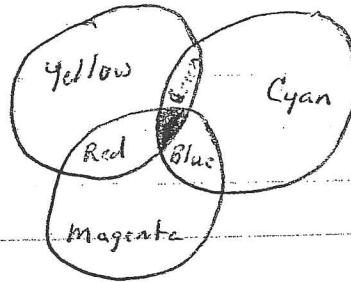
26) Primary Colors of light - Red, Green, Blue

27) Primary Colors of Pigment - Yellow, Magenta, Cyan

28)



Pigment

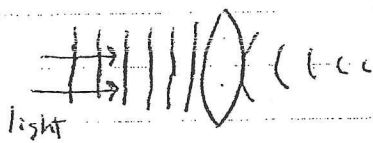


29) Refraction - light waves bend when they pass from one transparent material to another.

30) Lens - a piece of transparent material that can bend parallel rays of light so that they cross or appear to cross at a single point.

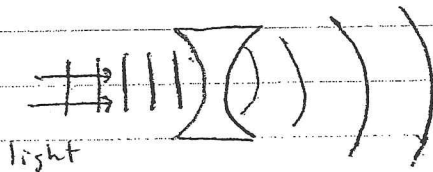
31) Converging Lens - lens is thicker in the middle and rays of light that are initially parallel (straight wave fronts) are made to converge.

Example:



32) Diverging Lens - lens is thinner in the middle and the rays of light are made to diverge.

Example:



33) Prism - in optics a system that can separate the colors of light that makes up white light.