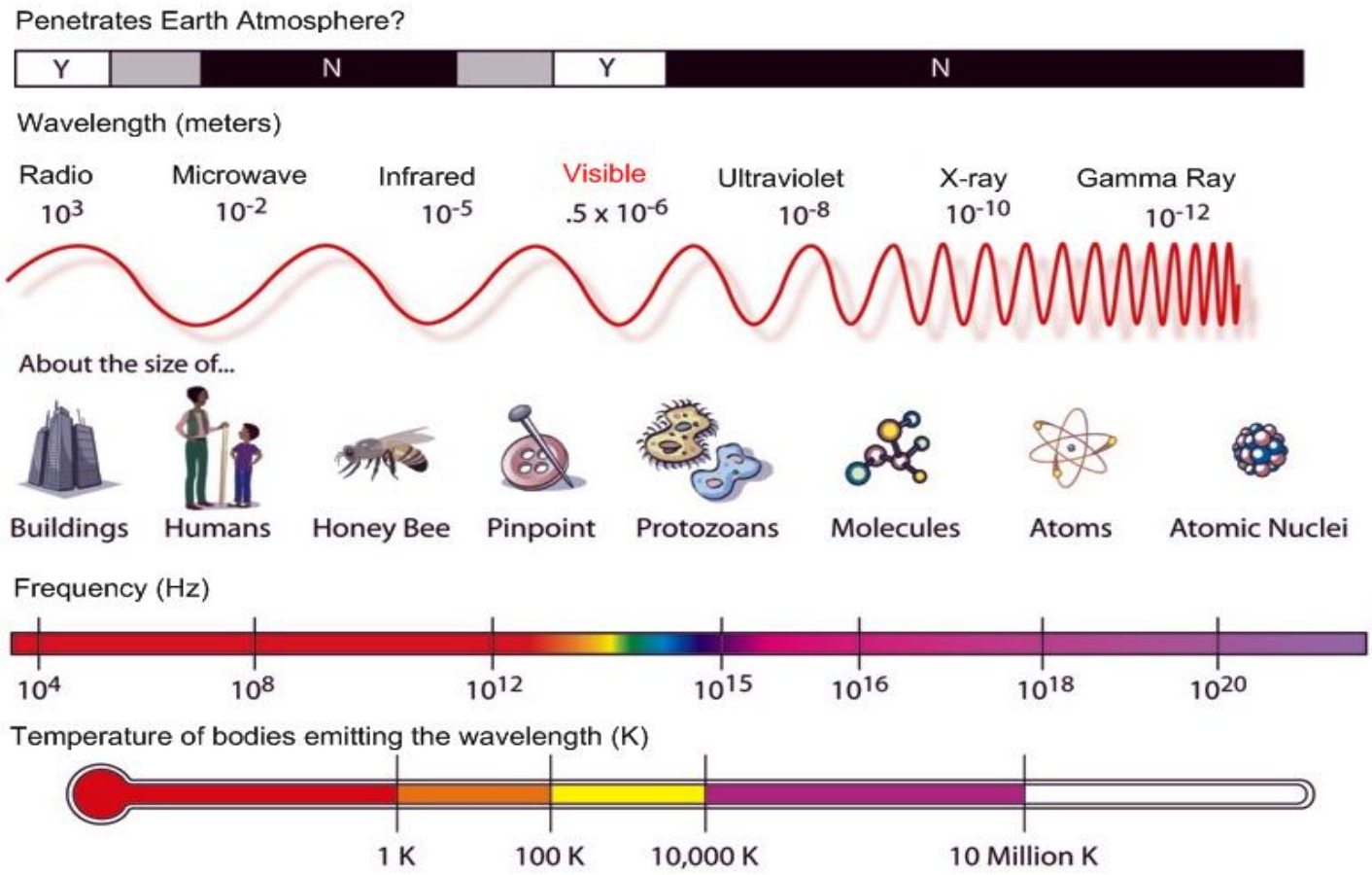
Name: _____ **Period:** ____

CHAPTER 12



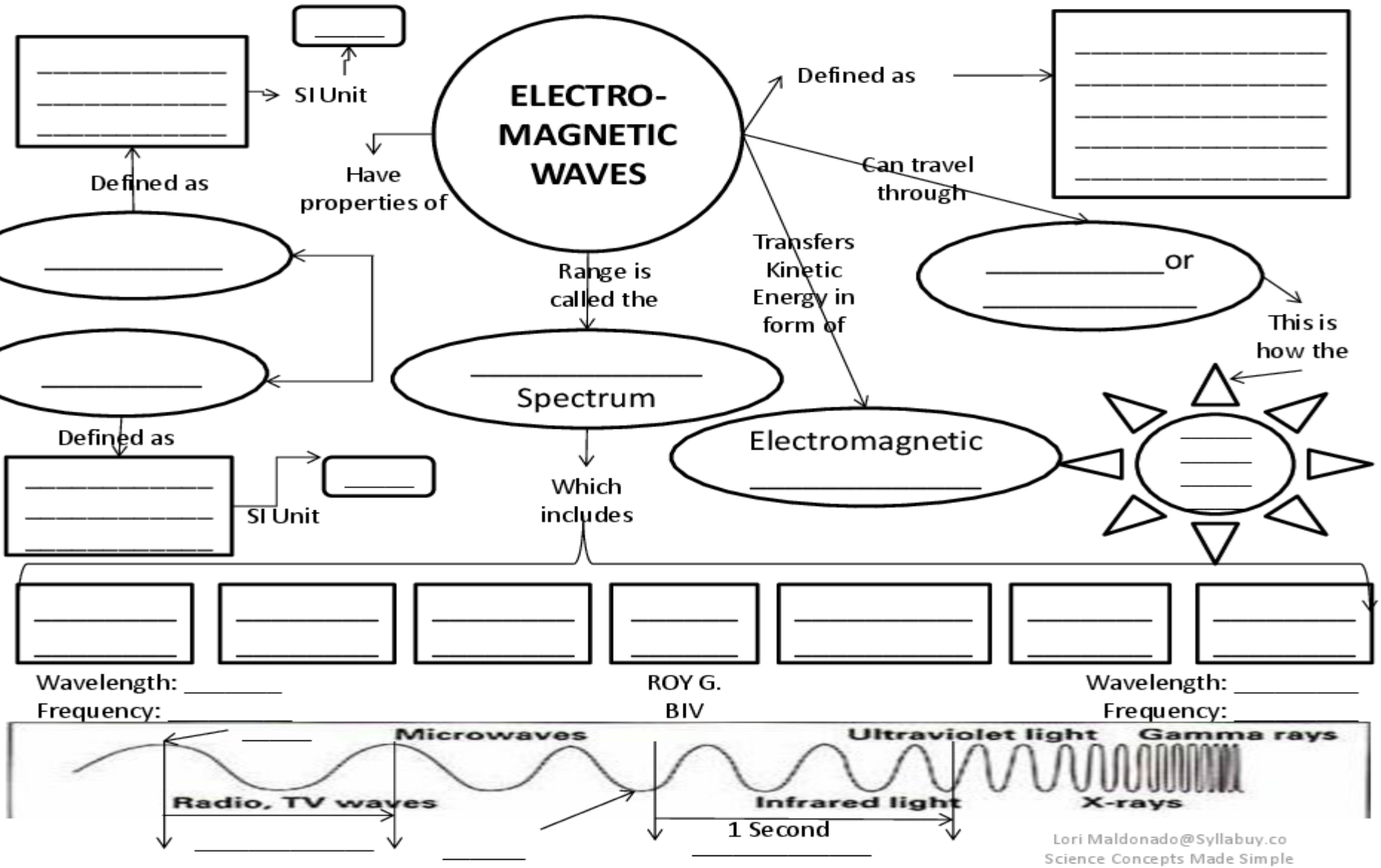
Electromagnetic Waves

Chapter 12 – Electromagnetic Spectrum Vocabulary Words

Vocabulary Word	Definition
1. Carrier Wave	
2. Cathode Ray Tube	
3. Electromagnetic Wave	
4. Gamma Rays	
5. Global Positioning System	
6. Infrared Waves	
7. Microwaves	
8. Photon	
9. Radiant Energy	
10. Radio Waves	
11. Transceiver	
12. Ultraviolet Waves	
13. Visible Light	
14. X-Rays	

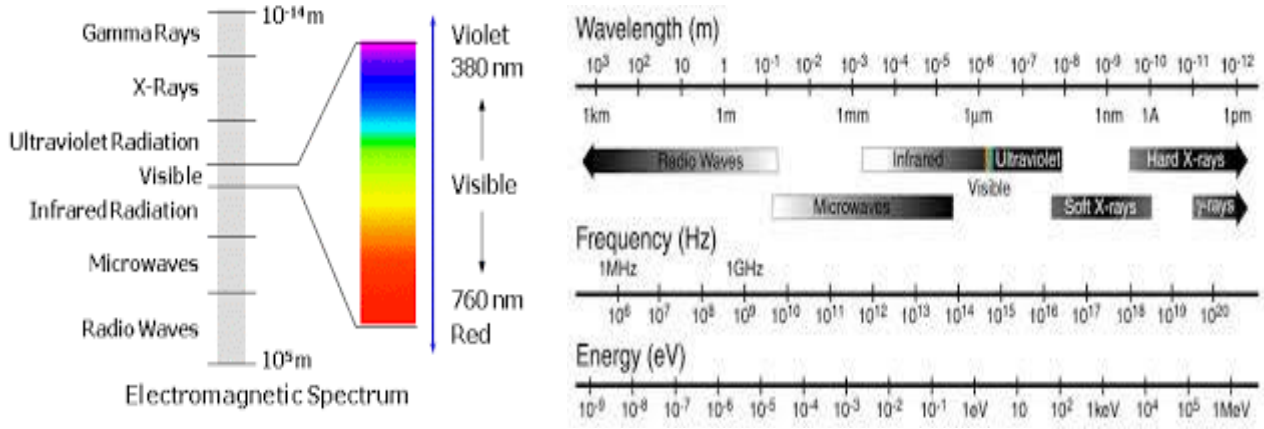
Supplementary Insert

THE ELECTROMAGNETIC SPECTRUM



Electromagnetic waves are waves that are capable of traveling through a vacuum. Unlike **mechanical waves** that require a medium in order to transport their energy, electromagnetic waves are capable of transporting energy through the vacuum of outer space. Electromagnetic waves are produced by a vibrating electric charge and as such, they consist of both an electric and a magnetic component.

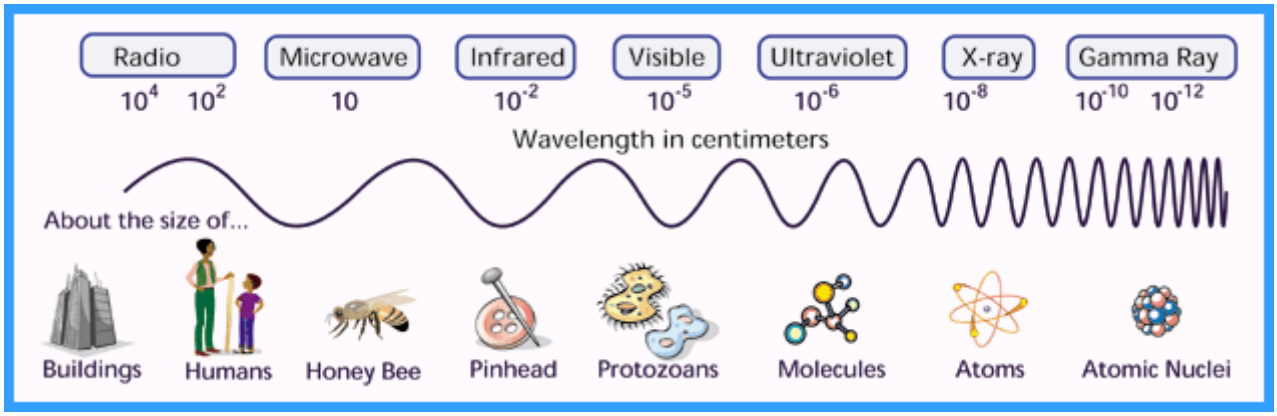
Electromagnetic waves exist with an enormous range of frequencies. This continuous range of frequencies is known as the **electromagnetic spectrum**. The entire range of the spectrum is often broken into specific regions. The subdividing of the entire spectrum into smaller spectra is done mostly on the basis of how each region of electromagnetic waves interacts with matter. The diagram below depicts the electromagnetic spectrum and its various regions. The longer wavelength, lower frequency regions are located on the far left of the spectrum and the shorter wavelength, higher frequency regions are on the far right. Two very narrow regions within the spectrum are the visible light region and the X-ray region. You are undoubtedly familiar with some of the other regions of the electromagnetic spectrum.

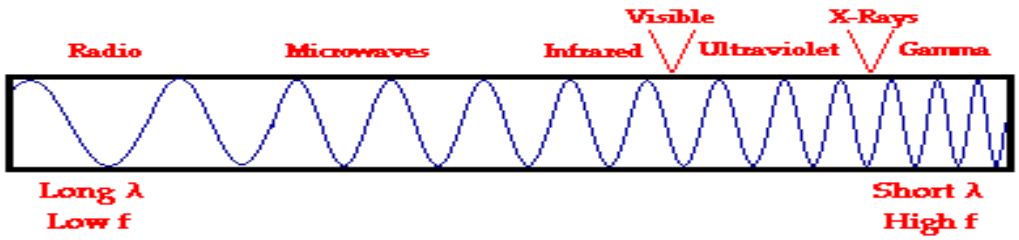


The Visible Light Spectrum

Red
Long λ
Low f

Violet
Short λ
High f





Name _____

Waves & Electromagnetic Spectrum Worksheet

Directions: Use the word bank to answer the following questions. **Each word will be used only once.**

Crest	Frequency	Mechanical	Infrared
Trough	Transverse	Radio	Gamma
Wavelength	Longitudinal	Ultraviolet	X-Rays
Visible Light	Amplitude	Electromagnetic	

1. _____ waves are used to penetrate solids and are used in doctor's offices and as airports.

2. _____ is the distance between one point of a wave to the same point in the next wave.

3. _____ is the number of waves per unit of time.

4. _____ waves occur when the motion of the medium is parallel to the direction of the wave.

5. _____ waves have a color spectrum known as ROYGBIV.

6. _____ waves disturb matter.

7. The _____ is the top of a wave.

8. The _____ is the bottom of a wave.

9. _____ is the maximum distance that matter is displaced from the resting position.

10. _____ waves are produced by stars and galaxies.

11. _____ waves occur when the motion of the medium is at right angles (perpendicular) to the direction of the wave.

12. _____ waves are often used in heat lamps.

13. _____ waves are utilized by insects to locate nectar.

14. _____ waves are transverse waves that disturb electromagnetic fields.

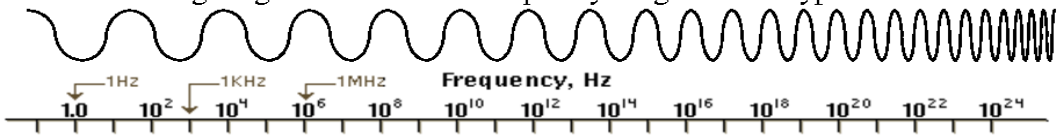
15. _____ waves have the shortest wavelength and the highest frequency.

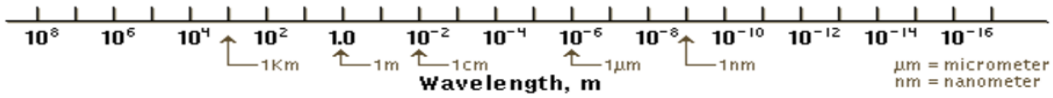
Electromagnetic Waves

The EM Spectrum

List the waves of the electromagnetic spectrum in order from the longest wavelength to the shortest wavelength. Then draw symbols to help you remember each of them.

On the following diagram indicate the frequency range of each type of em wave.





Common Properties of Electromagnetic Waves

Q. What type of waves are they?

Q. Do they require a medium to travel through?

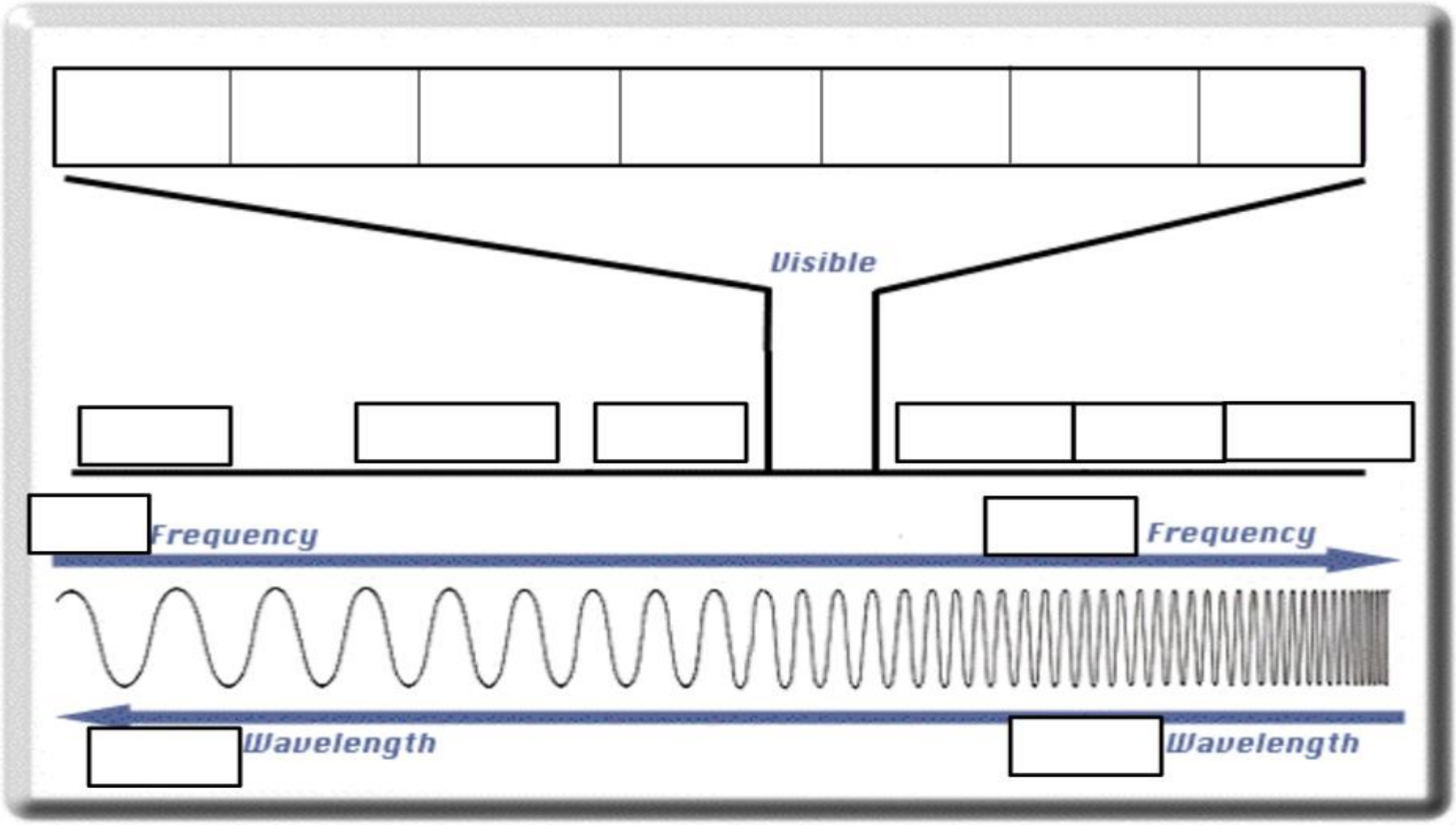
Q. Do they all obey the laws of reflection and refraction?

Q. What speed do em waves travel with in a vacuum?

Q. Does their speed vary as they pass through different materials?

- They all can be emitted and absorbed by matter.
- The wave equation can be used for all of them.
- They all transfer energy from one place to another.
- They are not charged.

Label the parts of the Electromagnetic Spectrum



Electromagnetic Waves

pp. 354 - 359

1. Electromagnetic waves are made by vibrating electric charges and can travel through _____.
2. Electric and magnetic fields – related _____ that operate even in empty space.
3. A _____ electric charge creates a magnetic field.
4. _____ magnetic fields create changing electric fields and vice versa.
5. Electromagnetic waves are produced when an electric charge is _____.
6. Vibrating electric charges are _____by vibrating electric & magnetic fields.
7. Vibrating electric and magnetic fields travel _____ from the moving charge.
8. Properties of electromagnetic _____ - carry **radiant energy**.
9. Frequency and wavelength – as frequency _____, wavelength decreases.
10. Waves and particles - _____ not clear.
11. Light can behave as a particle, a _____, whose energy depends on frequency.
12. All _____ can behave like a wave.
13. The entire _____of electromagnetic wave frequencies are called electromagnetic spectrum.
14. _____ **waves** – low frequency electromagnetic waves with wavelengths from less than a centimeter to about 1000 meters.
15. **Microwaves** – radio wave lengths to about 1 to _____ cm.
16. **_____** - radio waves bounced off an object an object to determine its speed and location.
17. **_____ (MRI)** – radio waves produce an image of the inside of the body.
18. **Infrared waves** – electromagnetic wave with a slightly _____ frequency than radio waves; people feel it as thermal energy or warmth.
19. _____ - has wavelengths between about 390 to 770 billionths of a meter; can be seen with the eye.
20. _____ - have frequencies slightly higher than visible light; can damage skin.

21. Ultraviolet light can kill _____.
22. Ultraviolet light can be absorbed by some _____ materials and released as visible light.
23. _____ layer above Earth's surface absorbs most of the Sun's harmful ultraviolet waves.
24. _____ and **gamma rays** – ultra high-frequency electromagnetic waves that can travel through matter, break molecular bonds, and damage cells.
25. X-rays are used to provide images of _____ and to examine suitcases at airports without opening them.
26. Radiation therapy is used to _____ disease cells.

1. Radio _____ - radio converts electromagnetic waves into sound waves.
2. The _____ is the specific frequency of the radio wave to which a radio station is assigned.
3. AM radio stations broadcast electronic signals by varying _____ of the carrier wave; frequencies range from 540 to 1,600 thousand vibrations per second.
4. FM radio stations transmit electronic signals by varying the _____ of the carrier wave; frequencies range from 88 million to 108 million vibrations per second.
5. _____ - sounds and images changed into electronic signals broadcast by carrier waves.
6. Audio sent by _____ radio waves.
7. Video sent by _____ signals.
8. A sealed vacuum chamber called a cathode-ray tube has a coated screen that receives _____ to provide images.
9. Telephones – microphone converts _____ into electrical signals.
10. _____ - -electrical signal creates a radio wave that is transmitted to and from a microwave tower.
11. _____ - uses a transceiver to send one signal and receive another at a different frequency from a base unit.
12. _____ - a radio receiver on which is left.
13. Communication satellites – high frequency _____ signal is transmitted to a satellite, which amplifies it and returns it to earth at a different frequency.
14. Satellite telephone systems - _____ phones transmits radio signals to a satellite, which relays them back to a ground station that passes the call into the telephone network.

15. Television satellites – uses _____ rather than longer-wavelength radio wave; ground receiver dish focuses the microwave.

16. _____ system – system of satellites, ground stations, and receivers that provide information about the receiver's location on or above the Earth's surface.

The Behavior of Light

pp. 382 - 399

17. Light and matter – objects must _____ light to be seen.

18. _____ materials do not allow light to pass through them; only a little light is absorbed or reflect light.

19. Some light passes through _____ materials.

20. _____ materials allow almost all light to pass through them; only a little light is absorbed and reflected.

21. Reflection of light – a light wave strikes an object and _____.

22. _____ - the angle at which light strikes a surface is the same as the angle it is reflected.

23. _____ reflection – reflection of light waves from a smooth surface.

24. _____ - change in the speed of a light wave when it passes from one material to another.

25. _____ indicates how much a material reduces the speed of light; the more light is slowed, the _____ the index of refraction.

26. _____ - separate white light into visible spectrum based on light wavelengths.

27. _____ - caused by water droplets refracting wavelengths of sunlight.

28. Refraction of light through air layers of different densities can result in a (n) _____.

29. _____- determine by wavelength of light an object reflects.

30. Objects appear to be _____ because they reflect all colors of visible light.

31. Objects appear to be _____ because they absorb, rather than reflect, all colors of visible light.