

**Note-taking
Worksheet**

Electromagnetic Waves

Section 1 What are electromagnetic waves?

- A. **Electromagnetic waves** are made by vibrating electric charges and can travel through _____.
- B. Electric and magnetic fields—related _____ that operate even in empty space
1. A _____ electric charge creates a magnetic field.
 2. _____ magnetic fields create changing electric fields and vice versa.
- C. Electromagnetic waves are produced when an electric charge is _____.
1. Vibrating electric charges are _____ by vibrating electric and magnetic fields.
 2. Vibrating electric and magnetic fields travel _____ from the moving charge.
- D. Properties of electromagnetic _____—carry **radiant energy**
1. **Frequency** and wavelength—as frequency _____, wavelength decreases
 - a. Frequency is the number of _____ per second; measured in hertz.
 - b. Wavelength is the _____ from one crest to another and is measured in meters.
 2. Wave speed—in the vacuum of space, _____; electromagnetic waves slow as they travel through matter.
- E. Waves and particles—_____ not clear
1. Light can behave as a particle, a _____, whose energy depends on frequency.
 2. All _____ can behave like a wave

Section 2 The Electromagnetic Spectrum

- A. The entire _____ of electromagnetic wave frequencies is called the electromagnetic spectrum.
- B. _____ **waves**—low-frequency electromagnetic waves with wavelengths from less than a centimeter to about 1000 meters
1. **Microwaves**—radio wave lengths of about 1 to _____ cm
 2. _____—radio waves bounced off an object to determine its speed and location

Note-taking Worksheet (continued)

3. _____ (MRI)—radio waves produce an image of the inside of the body

C. **Infrared waves**—electromagnetic wave with a slightly _____ frequency than radio waves; people feel it as thermal energy or warmth

D. _____—has wavelengths between about 390 to 770 billionth of a meter; can be seen with the eye

E. _____—have frequencies slightly higher than visible light; can damage skin

1. Ultraviolet light can kill _____.

2. Ultraviolet light can be absorbed by some _____ materials and released as visible light.

3. _____ layer above Earth's surface absorbs most of the Sun's harmful ultraviolet waves.

F. _____ and **gamma rays**—ultra-high-frequency electromagnetic waves that can travel through matter, break molecular bonds, and damage cells

1. X rays are used to provide images of _____ and to examine suitcases at airports without opening them.

2. Radiation therapy is used to _____ diseased cells.

Section 3 Radio Communication

A. Radio _____—radio converts electromagnetic waves into sound waves

1. The _____ is the specific frequency of the radio wave to which a radio station is assigned.

2. AM radio stations broadcast electronic signals by varying the _____ of the carrier wave; frequencies range from 540 to 1,600 thousand vibrations per second.

3. FM radio stations transmit electronic signals by varying the _____ of the carrier wave; frequencies range from 88 million to 108 million vibrations per second.

Note-taking Worksheet (continued)

- B. _____—sounds and images changed into electronic signals broadcast by carrier waves
1. Audio sent by _____ radio waves.
 2. Video sent by _____ signals.
 3. A sealed vacuum chamber called a **cathode-ray tube** has a coated screen that receives _____ to provide images.
- C. Telephones—microphone converts _____ into electrical signal
1. _____—electrical signal creates a radio wave that is transmitted to and from a microwave tower
 2. _____—uses a **transceiver** to send one radio signal and receive another at a different frequency from a base unit
 3. _____—a radio receiver on which a message is left
- D. Communication satellites—high frequency _____ signal is transmitted to a satellite, which amplifies it and returns it to Earth at a different frequency
1. Satellite telephone systems—_____ phones transmit radio signals to a satellite, which relays them back to a ground station that passes the call into the telephone network
 2. Television satellites—uses _____ rather than longer-wavelength radio wave; ground receiver dish focuses the microwave beam onto an antenna
- E. _____ **system**—system of satellites, ground stations, and receivers that provide information about the receiver's location on or above the Earth's surface