Electromagnetic vs. Mechanical Waves

There are two main types of waves:
Electromagnetic waves and mechanical waves.

Mechanical waves are waves made of actual physical oscillating particles that are oscillating. These can include water molecules, air molecules, ropes and slinkies, or rocks. If there is an actual thing that is oscillating, it is called a mechanical wave.
Electromagnetic waves are made of oscillating electric and magnetic energy. No physical thing that you can feel or touch is moving. It is only energy that is moving through space.

Examples of Mechanical Waves	Examples of Electromagnetic Waves
The MOST IMPORTANT type of mechanical wave is a **Sound Wave**. There are some other types of mechanical waves:	The MOST IMPORTANT type of electromagnetic wave is a **Visible Light Wave**. All of the types of electromagnetic waves are:
Waves in a cord, slinky, or rope	Radio Waves
Water Waves	Microwaves
Seismic waves, or waves inside the earth during an earthquake	Infrared Waves
Ultrasonic Waves. These are sound waves with a frequency higher than humans can hear.	Visible Light Waves
	Ultraviolet Waves
	X-Rays*
	Gamma Rays*

[*Don't be confused by the use of the word *rays* instead of *waves*. It's the same thing! We just chose to use a cooler sounding word for the highest energy waves.]

It is very easy to remember all of the types of electromagnetic waves!
Just remember this silly sentence:

Raging Martians Invade Venus Using X-Ray Guns

Radio Microwave Infrared Visible Light Ultraviolet X-Ray Gamma Ray

It's also very important you memorize them in this order, because that is the order of increasing energy!

Real life image of a Raging Martian Invading Venus Using an X-Ray Gun:

Problems:

For each wave listed, write if it is an electromagnetic wave or a mechanical wave:

1. Water Waves
2. Light waves
3. Sound waves
4. Seismic (earthquake) waves
5. Radio Waves
6. X-ray Waves
7. Ultraviolet waves
8. Ultrasonic Waves
9. Gamma Rays
10. Microwaves
11. Waves in a rope
12. Waves in a guitar string
13. Infrared Waves

14. Fill in the Blank

Raging _____ Invade _____ Using X-Ray Guns

15. List all of the types of electromagnetic waves in order:

More about electromagnetic and Mechanical Waves

Speed of Electromagnetic Waves All electromagnetic waves move at a speed of 300,000,000 m/s in a vacuum. This number is sometimes called *c* or the SPEED OF LIGHT. $c = 3.0 \times 10^8$ m/s
Speed of a Mechanical Wave All mechanical waves are much much slower than electromagnetic waves. The most important mechanical wave is a sound wave in air, which moves at a speed of approximately 330 m/s.
Vacuums Electromagnetic waves can move through a vacuum. Mechanical waves *can never* move through a vacuum; they must always move through a medium.
Medium A medium is the substance that a wave is moving through.

True or false:

16 Electromagnetic waves can move through a vacuum.

17 Mechanical waves can move through a vacuum.

18 Electromagnetic waves are faster than mechanical waves.

19 Microwaves move at a speed of 300,000,000 m/s.

20 Mechanical waves must move through a medium.

Vocabulary matching
Match each vocabulary word to a definition

Linear Motion	**A.** Medium moves parallel to direction of wave
Harmonic Motion	**B.** a moving oscillation
Wave	**C.** Wave made of oscillating electric and magnetic energy
Mechanical Wave	**D.** Medium moves perpendicular to the direction of the wave
Electromagnetic Wave	**E.** Something moves in one direction
Medium	**F.** The material that a mechanical wave moves through
Transverse Wave	**G.** Wave made of actual matter
Longitudinal Wave	**H.** Something moves in a repeating pattern