



## Enrichment

## More About Electromagnetic Waves

Can you guess how electromagnetic waves got their name? They consist of both electric and magnetic forces produced when electric charges move up and down. Like ocean waves, electromagnetic waves have crests and troughs. The distance between one crest and the next is the wavelength.

Electromagnetic waves exist in many different lengths, from very long to extremely short. Radio waves, for example, are sometimes as long as 10,000 meters. On the other hand, gamma rays—the smallest electromagnetic waves—are only trillionths of a meter long.

Below is a table that shows the lengths of electromagnetic waves. Notice that microwaves are among the electromagnetic waves listed in the table. Microwaves are used in items such as television equipment and ovens. The microwaves used in these items aren't captured from the atmosphere or outer space. They are produced electronically.

Electromagnetic waves	Length
Radio waves	1 to 10,000 meters
Microwaves	0.001 to 1 meter
Infrared	0.000001 to 0.001 meter
Visible light	400 to 800 nanometers*
Ultraviolet	10 to 400 nanometers*
X rays	0.0001 to 10 nanometers*
Gamma rays	0.1 to 0.0000001 nanometer*

\*1 nanometer = 0.00000001 meter

- If an electromagnetic wave, from crest to crest, measured 30 nanometers, what kind of wave would it be? \_\_\_\_\_
- Convert 400 nanometers to meters. \_\_\_\_\_
- Why do you think ultraviolet and visible light waves are usually measured in units of nanometers rather than meters or centimeters?  
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- Look at the electromagnetic spectrum in your textbook. Notice that it shows wavelengths measured using scientific notation. How many meters long is a wavelength that measures  $10^2$  m? \_\_\_\_\_
- If a wavelength measures 1 nanometer, how would you write this in scientific notation?  
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