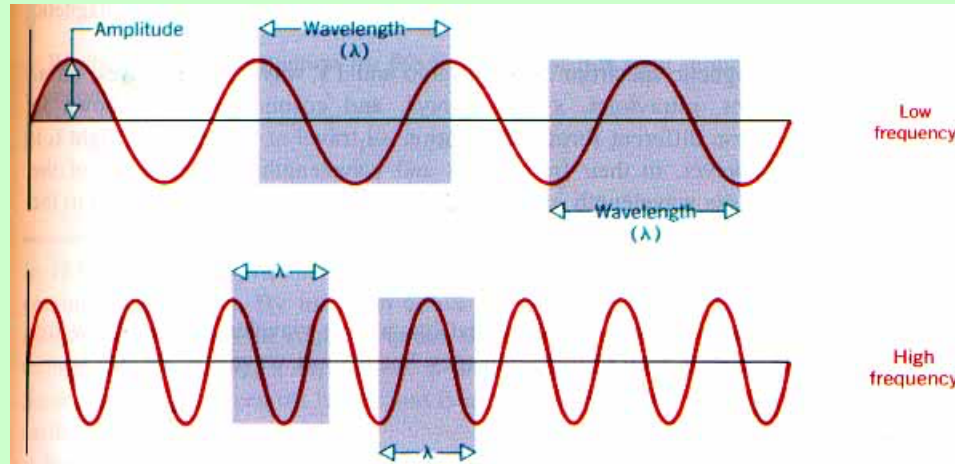


# Atomic Structure and Periodicity

## Waves & Math

**Electromagnetic radiation propagates through space as a wave moving at the speed of light.**



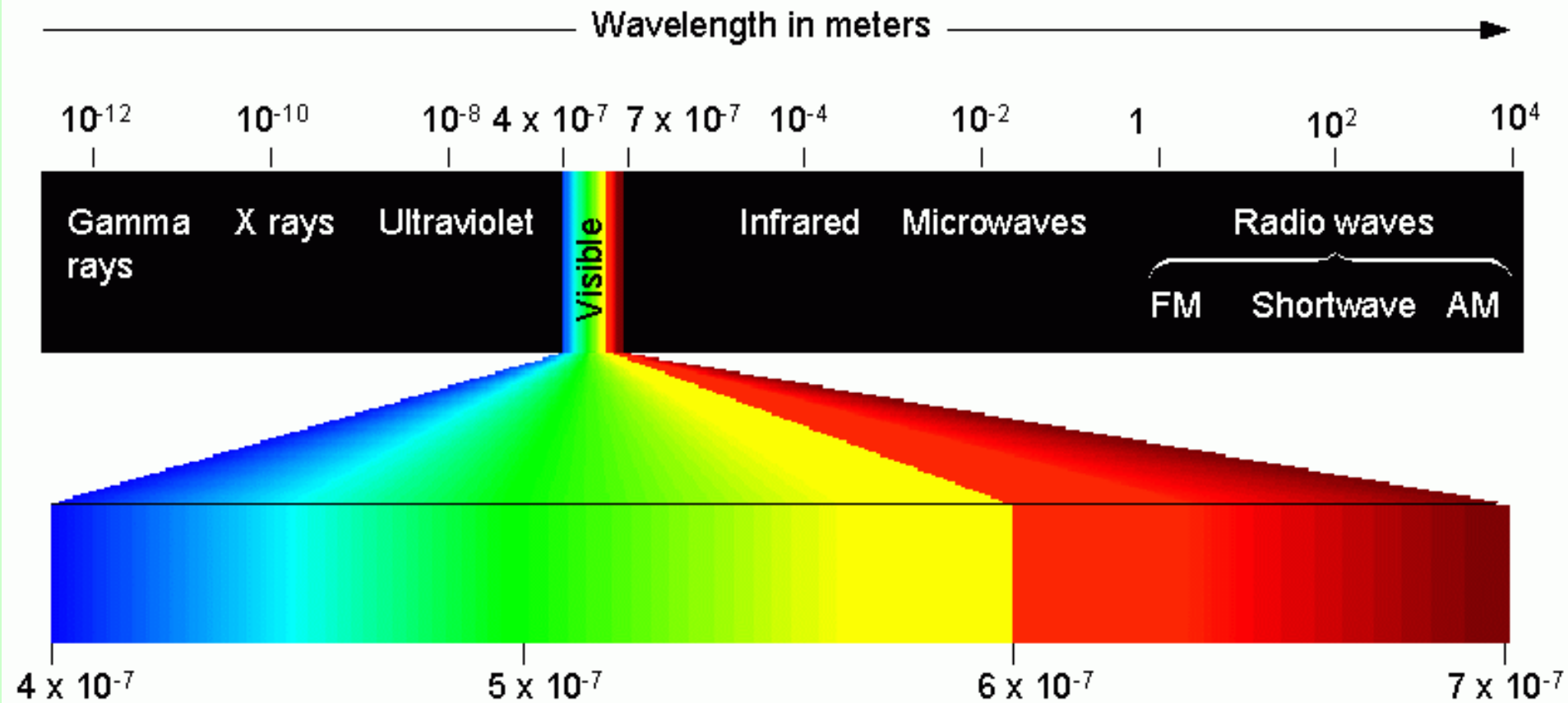
$$c = \nu\lambda$$

$c$  = speed of light, a constant ( $3.00 \times 10^8$  m/s)

$\nu$  = frequency, in units of hertz (hz,  $\text{sec}^{-1}$ )

$\lambda$  = wavelength, in meters

## Types of electromagnetic radiation:



The energy ( $E$ ) of electromagnetic radiation is directly proportional to the frequency ( $\nu$ ) of the radiation.

$$E = h\nu$$

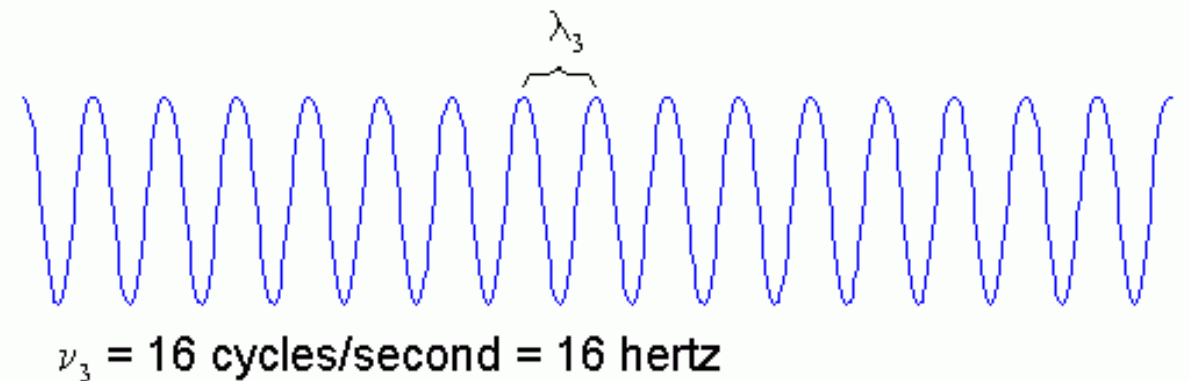
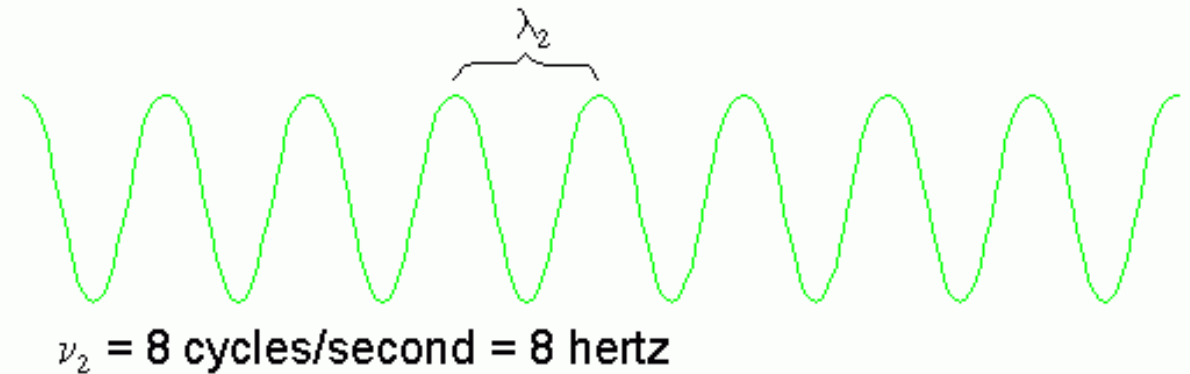
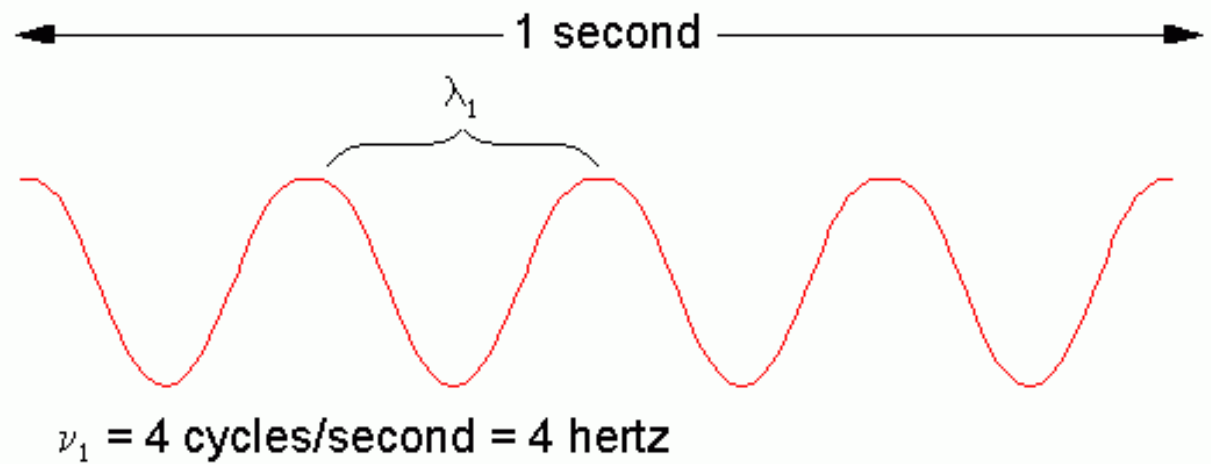
$E$  = Energy, in units of Joules ( $\text{kg} \cdot \text{m}^2/\text{s}^2$ )

$h$  = Planck's constant ( $6.626 \times 10^{-34} \text{ J} \cdot \text{s}$ )

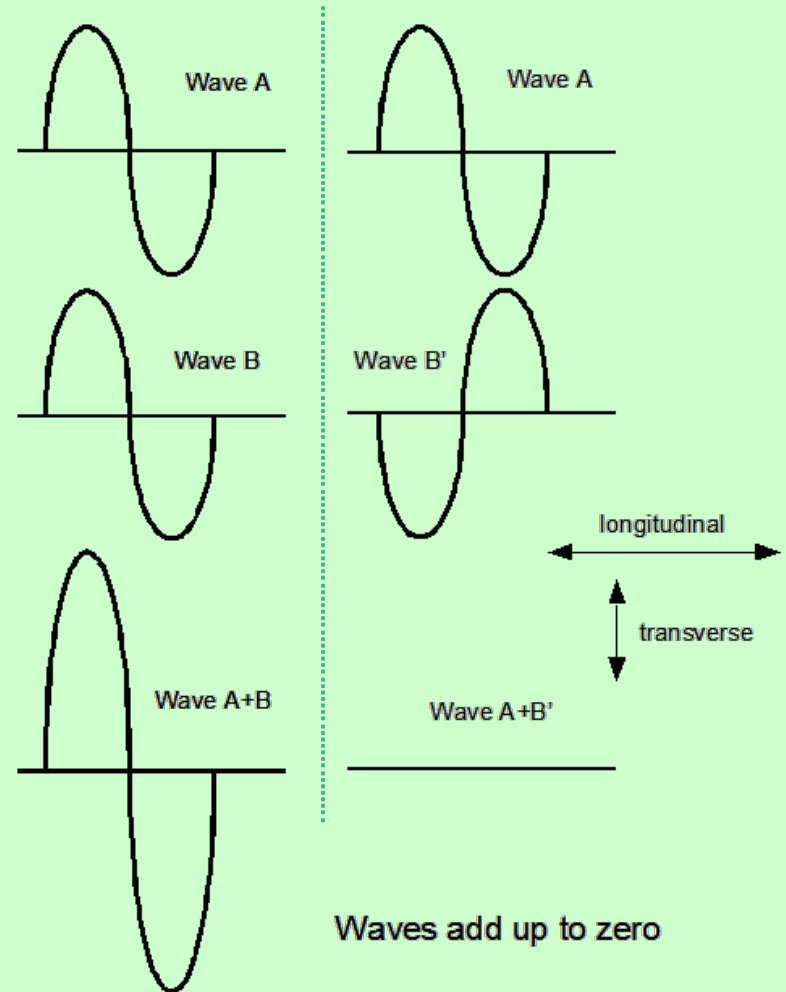
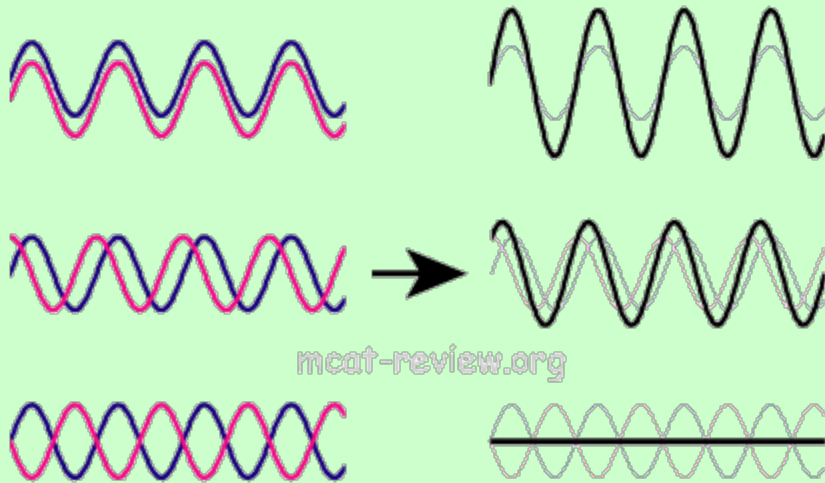
$\nu$  = frequency, in units of hertz ( $\text{hz}$ ,  $\text{sec}^{-1}$ )

**Long  
Wavelength  
=  
Low Frequency  
=  
Low ENERGY**

**Short  
Wavelength  
=  
High Frequency  
=  
High ENERGY**



# Wave properties



Waves add up to zero

Waves add up to twice the height

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# Relating Frequency, Wavelength and Energy

$$c = \nu \lambda$$

$$E = h \nu$$

Common re-arrangements:

$$E = \frac{hc}{\lambda}$$

$$\lambda = \frac{hc}{E}$$