

# Electromagnetic spectrum

HW: Light subject

↓  
A.K.A. "Light"

## E&M waves

- consist of changing electric & magnetic fields moving through space at  $3 \times 10^8 \text{ m/s}$  (video 1301 4min-6:30min)  
speed of light
- produced by vibrating charged particles
- do not require a medium

## E&M spectrum

- range of frequencies of E&M waves

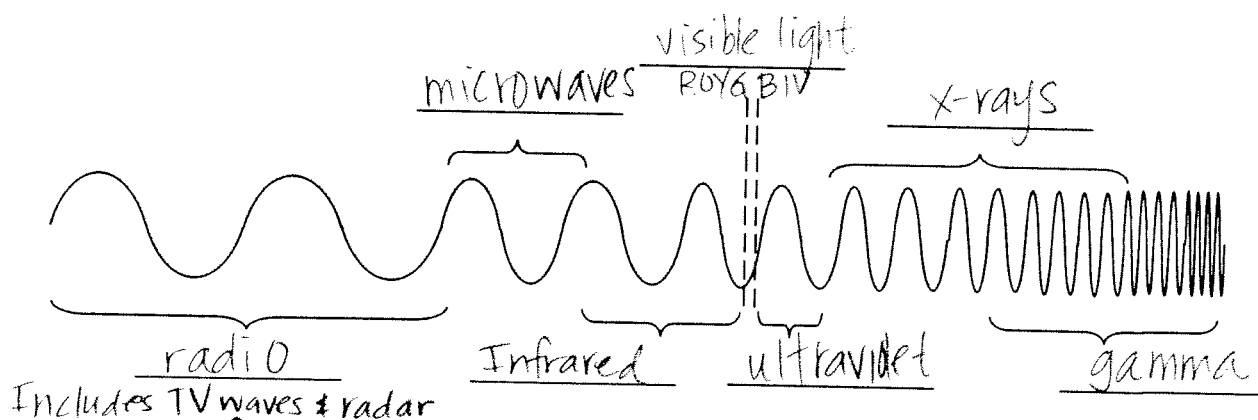
• as  $f \uparrow$ ,  $\lambda \downarrow$

• as  $f \uparrow$ , Energy  $\uparrow$

ex: visible light spectrum from low  $f$  to high  $f$

R O Y G B I V  
↑ lowest  $f$  highest  $f$   
longest  $\lambda$  shortest  $\lambda$   
lowest E highest E

# • the entire spectrum:



$f: 10^4 \text{ Hz}$   
 $\lambda: 10^5 \text{ m}$   
 lowest E

$f: 10^{25} \text{ Hz}$   
 $\lambda: 10^{-15} \text{ m}$   
 highest E

ex: radio station: 90.1 FM

$$f = 90.1 \text{ MHz} = 90.1 \times 10^6 \text{ Hz}$$

frequency modulation

ex: radio station: 1070 AM

$$f = 1070 \text{ kHz} = 1070 \times 10^3 \text{ Hz}$$

amplitude modulation

Tuning to a radio station

↓↓  
 sets the  $f$  at which  
 resonance will occur  
 in the antennae

you may watch last half of video [30] to learn interesting facts about the other types of electromagnetic waves.