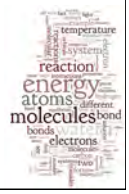
Chapter 2

Light is a wave



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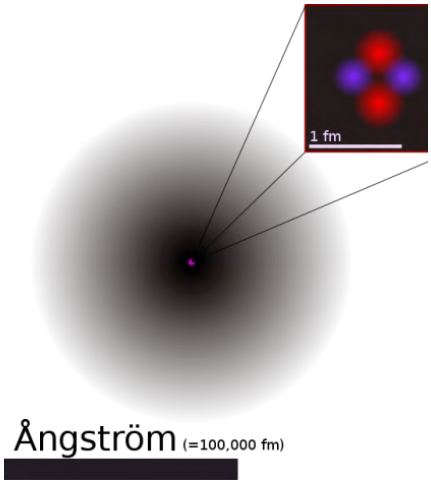
Model of atom

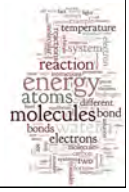


- We know this is not the whole story!
- In this chapter we are going to look at where the electrons are and how they affect some properties of elements
- For example why He only interacts by LDFs and H atoms interact to form covalent bonds

To understand atomic structure we need to understand electromagnetic radiation

What is electromagnetic radiation?

What are some examples that you encounter?



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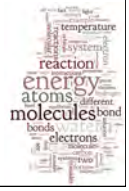
Examples of electromagnetic radiation

- Radio waves
- Microwaves
- Infrared
- Ultraviolet
- Xrays
- Gamma Rays



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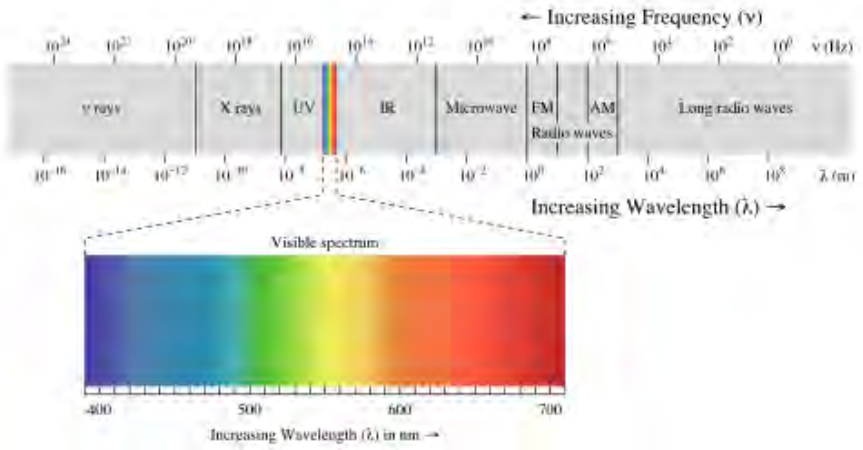
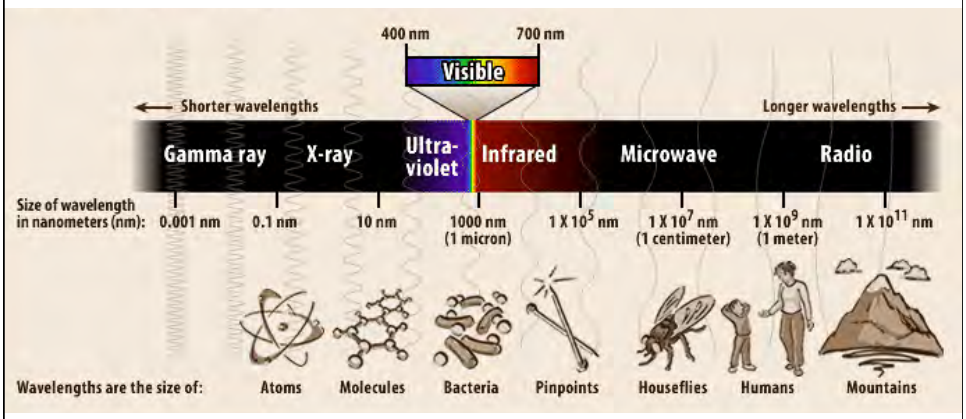
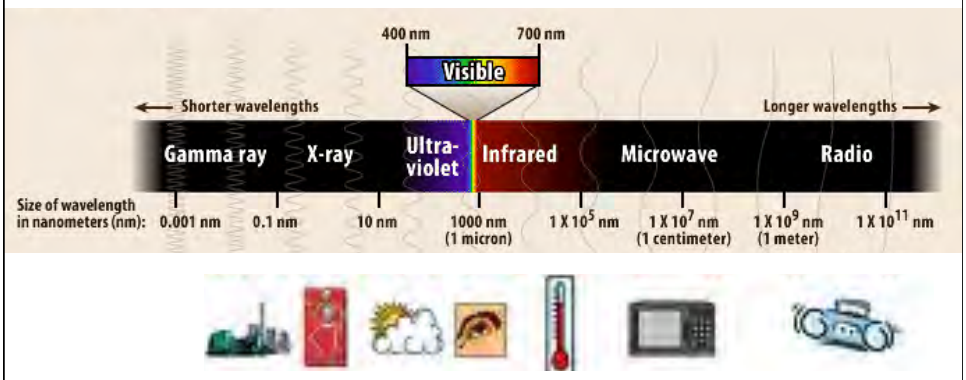
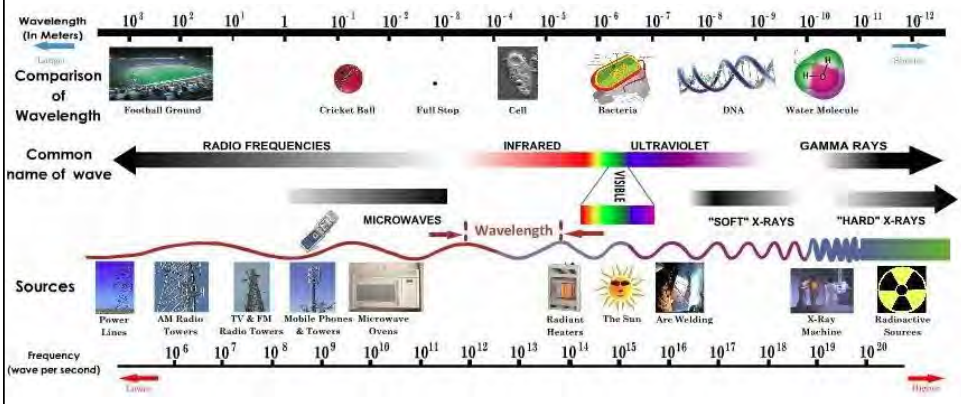
The electromagnetic spectrum



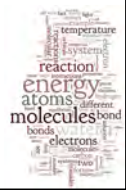




The electromagnetic spectrum



There are two models that are used to describe the behavior of light (electromagnetic radiation)



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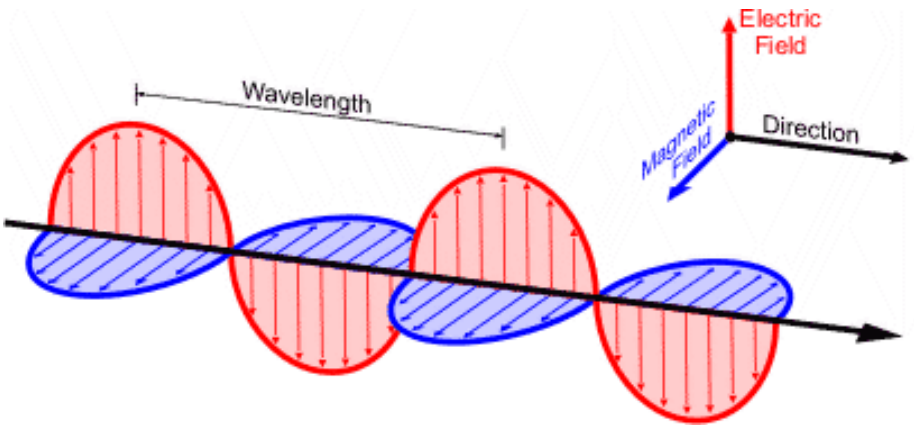
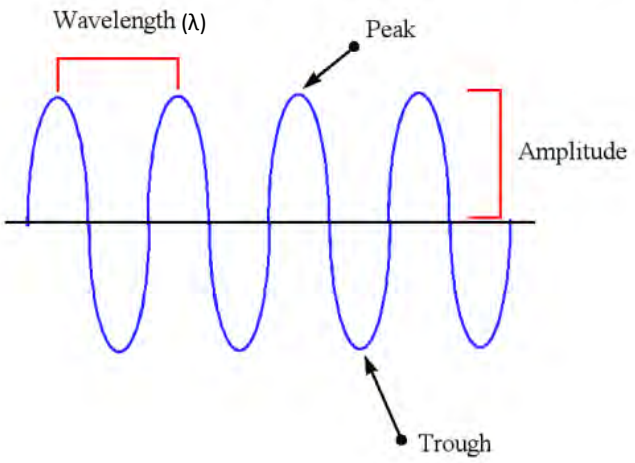
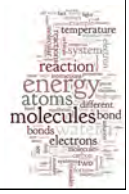
Light is a "wave"



Electromagnetic Radiation





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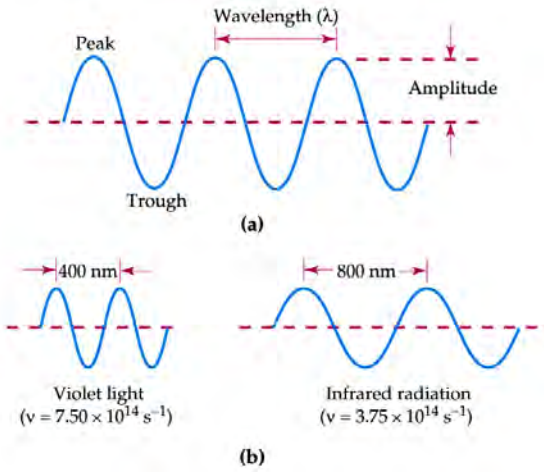
Electromagnetic Radiation

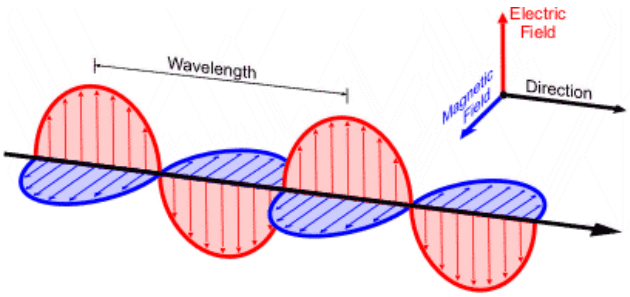


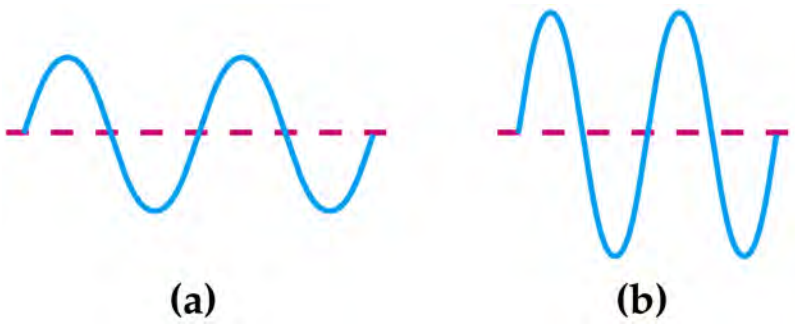
Electromagnetic Radiation

- Wavelength λ (m) - distance from peak to peak
- Frequency ν (Hz, s^{-1}) number of wavefronts per sec
- Amplitude height of peaks (intensity)
- $c = \lambda \nu$
  - Where c = velocity (3.00×10^8 ms^{-1} for light)

Determine the wavelength (in nm) of an X-ray with a frequency of 4.2×10^{18} Hz.

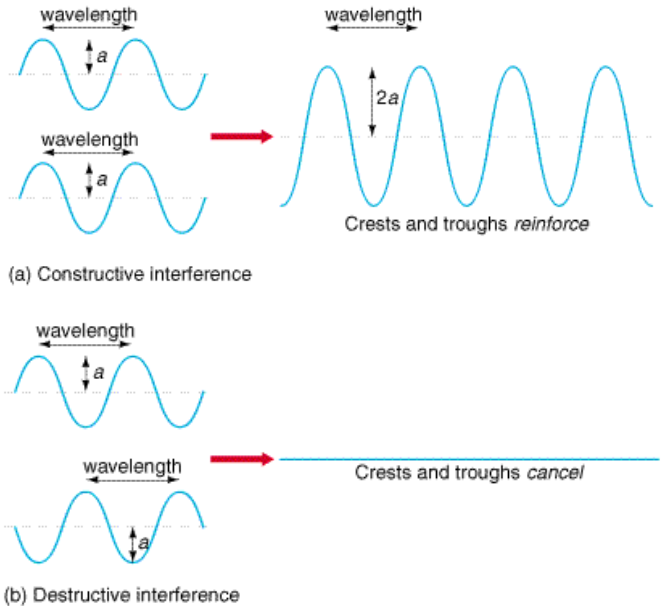
A. 7.1×10^{-11}
B. 7.1×10^{-2}
C. 1.3×10^{27}
D. 1.4×10^{10}
E. 7.1×10^{-18}



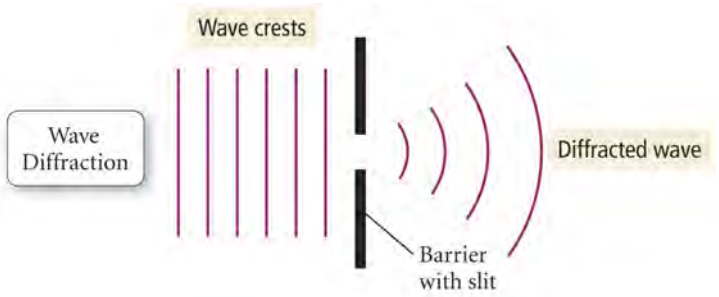


1. Which has higher intensity?
2. Which has higher frequency?
3. Longer Wavelength?
4. Which one is more likely to be red light (as opposed to blue)

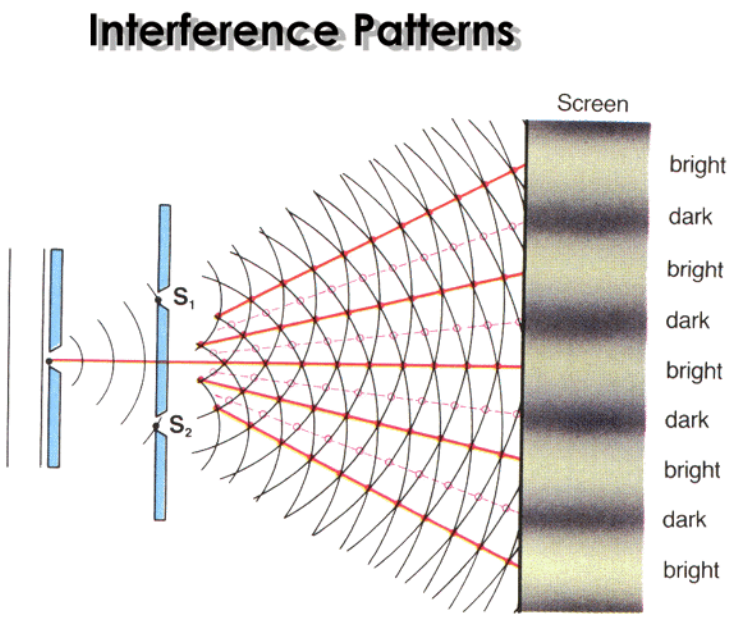
Properties of Waves: Interference



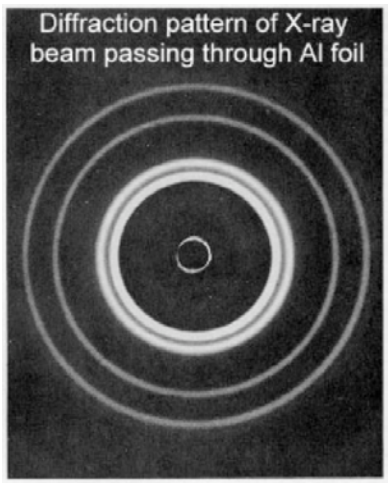
Properties of Waves: Diffraction

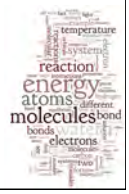


Properties of Waves: Diffraction Patterns



E/m radiation is a wave





Which has a longer wavelength?

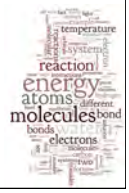
A. X-rays B. visible C. infrared

Which has a higher frequency?

A. X-rays B. visible C. infrared

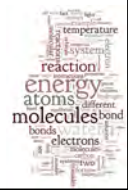
Which has a higher energy?

A. X-rays B. visible C. infrared



Energy of light

- Short wavelengths (and high frequency) are "higher in energy"
- How to explain on wave model?



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