- 1. Put the following examples or EMR in order from longest to shortest wavelength:
 - a. green light b. x-rays c. microwaves d. ultraviolet e. blue light
- 2. A single pulse of a laser yields an average of 5.00 X 10^{18} photons with λ =633 nm. If melting ice to water at 0°C requires 6.01 kJ/mol, what is the fewest number of laser pulses needed to melt 10.0 g of ice?
- 3. The human eye contains a molecule called 11-cis-retinal that changes conformation when struck with light of sufficient energy. The minimum energy required to change the conformation of 11-cis-retinal within the eye is about 164 kJ/mol. Calculate the longest wavelength visible to the human eye.



- 4. Match the scientist with the experiment whose results he explained: Scientists: Bohr, Plank, Einstein Experiments: Photoelectric Effect, Atomic Spectra, Black Body Radiation
- ^{5.} The bonds of oxygen molecules are broken by sunlight. The minimum energy required to break the oxygen-oxygen bond is 495 kJ/mol. What is the wavelength of sunlight that can cause this bond breakage? (*Hint: one photon breaks the bonds of one oxygen molecule*)