

Worksheet 2: Spectroscopy

1. A mixture of 35g  $N_2$  and 80g  $H_2$  is allowed to react by the reaction:  $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ . How much ammonia is produced?

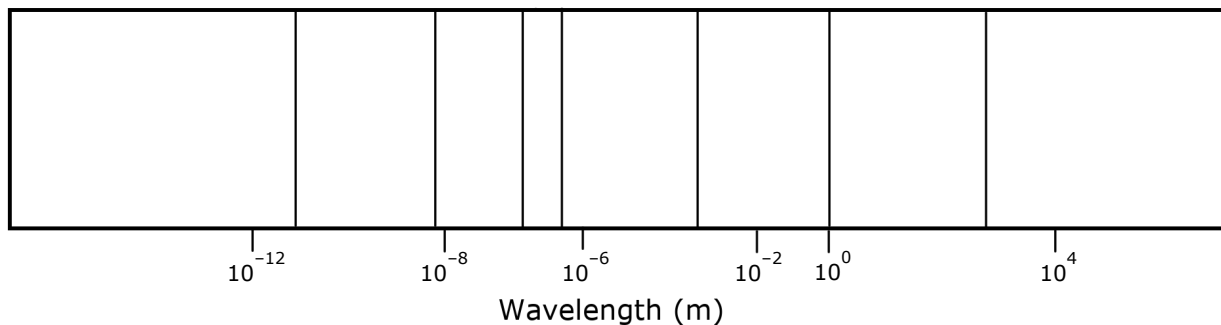
2. How are the energy, frequency, and wavelength of light related? Write the equations that relate them.

3. Given the relationships above,

(a) As wavelength increases, frequency \_\_\_\_\_.

(b) As energy decreases, wavelength \_\_\_\_\_.

4. Label the types of electromagnetic radiation and the types of transitions you would expect them to cause on the picture below.



5. A spectrophotometer outputs photons with an energy of 22.2 eV. What type of electromagnetic radiation is it using? ( $h = 6.626 \times 10^{-34}$  J s,  $c = 2.998 \times 10^8$  m/s,  $1 \text{ eV} = 1.602 \times 10^{-19}$  J)

6. Sketch an example of an atomic and a molecular absorption spectrum below. What are the major differences between the plots?