Department of Chemistry, IIT Kharagpur
Inorganic Chemistry

Tutorial 1

1. Write down the Hamiltonian for (a) H atom and (b) H_2^+ molecule

2. Write down the MO ground state wave function for H_2 molecule and normalize the function.

3. The threshold wavelength for the ejection of photoelectrons from sodium metal is 5420 Å. Calculate the velocity of photoelectrons ejected by light of wavelength 4000 Å.

4. The emitter in a photoelectric tube has a threshold wavelength of 600 nm. Determine the wavelength of the light incident on the tube if the stopping potential for this light is 2.5 V.

5. Electrons are accelerated by a potential of 10 Volts.

(a) Determine their velocity.

(b) Determine their deBroglie wavelength (λ).

6. A red laser pointer emits light with a wavelength of 700nm. A fancy green laser pointer emits light with a wavelength of 500nm. Which emits more energy per photon? (You might also compare the two tools' operating frequencies.)

7. The wavelength of a diagnostic x-ray is only 0.01 nm. What frequency does the doctor's machine operate with?

8. A student removes the spinning plate from his microwave oven. He places a chocolate bar inside on a paper plate and zaps it for 10 seconds. Removing the candy, he sees two melted spots approximately 6cm apart. The microwave says on the back that it operates at 24.5 GHz. Considering that the speed of light in air is *very* close to the speed of light in a vacuum, he calculates the wavelength of a microwave. Show his work... then maybe try the experiment yourself!