**Additional Questions**

1. If the ratio of the velocities of proton and α-particle is 8:1, then find the ratio of their de Broglie wavelengths.
2. The uncertainty in the location of a particle is equal to its de-Broglie's wavelength. Calculate the uncertainty in its velocity.
3. In Compton Effect, a photon recoils back after striking the electron of the target material at rest. Find the Compton shift.
4. Give a comparison between Photoelectric effect and Compton scattering.

Photo electric effect occur in bound electron, while Compton effect occur in free electron.

In photo electron effect, the photon and hence energy of the photon is absorbed by the electron. While in Compton effect, photon is scattered.

Energy:

Photoelectric effect: The photon delivers its total amount of energy to a single electron.

Compton effect: The photon transfers part of its energy to a single electron.

First Theoretical Explanation:

Photoelectric effect: Photoelectric effect was explained by Albert Einstein.

Compton effect: Compton effect was explained by Arthur Compton.

Fate of the Photon after the interaction:

Photoelectric effect: The photon disappears after the interaction.

Compton effect: The wavelength of the scattered photon is higher than that of the incident photon.

1. Light is being emitted by a Ruby Laser and a He-Ne Laser. Which of them is emitting continuous laser ? Why can the other one not emit continuous Laser?
2. A laser beam of wavelength 7400Å has coherence time of 4 × 10-5 s. Determine the temporal coherence length.
3. What are the disadvantages of using fibre optic communication system?

* Cost effective.
* Requires more protection (viz., Glass type fiber requires more protection within an outer cable)
* Fiber optic cables are often more fragile. For example, the fibers can be broken or a signal can be lost if the cable is bent or curved around a radius of a few centimeters.

1. A ruby laser has its metastable state at 1.79 eV from which stimulated emission produces laser light. Calculate the wavelength of laser light.
2. What is the function of He atoms in He-Ne laser?
3. Why should clad glass have less refractive index than the core glass?
4. Draw the population of atoms in different energy levels in an atomic system in equilibrium.
5. What is the function of Cr ions in ruby laser?
6. Write down the ratio of number of He atoms to number of Ne atoms in a typical He:Ne laser.
7. What is the function of He atoms in He-Ne laser?
8. If the acceptance angle of an optical fiber is 68.16°, find the numerical aperture. If cladding has refractive index of 1.52, what is the refractive index of the core?
9. Which of the optical fibres, among single mode and multimode optical fibers, is used for long distance communication and why?