When an incident 50 keV photon interacts with soft tissue via the photoelectric effect, how is energy distributed?

A. Approximately half of the photon energy goes into overcoming the binding energy of the inner shell electron, and the remainder is approximately equally distributed between the kinetic energy of the photoelectron and recoil energy of the nucleus.

B. Approximately half of the photon energy goes into overcoming the binding energy of the inner shell electron, and the remainder is transferred to kinetic energy of the photoelectron.

C. Most of the photon energy is transferred to kinetic energy of the photoelectron.

D. The photon energy is approximately equally distributed between the kinetic energy of the photoelectron and recoil energy of the nucleus.

The binding energy of inner shell electrons in soft tissue is typically a fraction of a keV. Very little energy is transferred to the nucleus because of its mass, so most of the energy is transferred to kinetic energy of the photoelectron.

When an incident photon interacts with soft tissue via the photoelectric effect, all of the following radiations are emitted except blank.

A. Scattered photons that deposit energy some distance away from the site of interaction.

B. Auger electrons that deposit energy in the vicinity of the site of interaction.

C. Characteristic x-rays that deposit energy in the vicinity of the site of interaction.

D. Photoelectrons that deposit energy in the vicinity of the site of interaction.

Scattered photons are not emitted from a photoelectric interaction.

What effect would increasing the photon energy from 30 kVp to 60 kVp have on the photon interaction with soft tissue via the photoelectric effect?

A. The penetrating ability of the radiation would be significantly greater.

B. The penetrating ability of the radiation would be significantly less.

C. The penetrating ability of the radiation would be slightly greater.

D. The penetrating ability of the radiation would be slightly less.

Doubling the energy would decrease the linear attenuation coefficient by a factor of approximately 8, resulting in significantly greater penetrating ability of the radiation.
Can the mass attenuation coefficient for barium ever be greater than that for lead?

A. No, because the atomic number of lead is very much greater than that for barium.
B. No, because the density of lead is very much greater than that for barium.
C. Yes, at energies slightly above the K-edge for barium.
D. Yes, for very low energies.

Which of the following statements regarding the angular dependence of the ejection of the photoelectron is true?

A. For low energies of the incident photon, the ejection of the photoelectron is isotropic because no single direction is favored.
B. For low energies of the incident photon, the photoelectron is ejected at right angles relative to the incident photon because its induced motion is in the direction of the transverse electric field.
C. For low energies of the incident photon, the photoelectron is ejected in a more forward direction in order to conserve momentum.

Given the following graph of the photoelectric attenuation coefficient as a function of photon energy, what would be the energy of a characteristic x-ray that we would expect from lead?

A. 16 keV
B. 72 keV
C. 88 keV
D. 104 keV

We see from the diagram that the K-shell binding energy of Pb is 88 keV and the L-shell binding energy is 16 keV. When an electron moves from the L shell into a K shell vacancy, the emitted x ray has an energy of 88-16 = 72 keV.
When the photoelectric effect occurs in tissue, the mass energy absorption coefficient is _______ the mass energy transfer coefficient.

A. Greater than
B. Less than
C. Approximately equal to

At these energies, essentially no energy is re-emitted as Bremsstrahlung.