X-Ray and Gamma Ray Interactions

45. The amount of attenuation of a photon beam by a material depends upon:

  A.   Energy of the photon
  B.   Linear attenuation coefficient of the material
  C.   Thickness of the material
  D.   All of the above

46. Monoenergetic photon beams interacting with tissue are attenuated:

  A.   Linearly
  B.   Exponentially
  C.   Proportional to the density of tissue
  D.   None of the above

47. Most often when a photon undergoes scattering:

  A.   It gains energy
  B.   Its energy remains unchanged
  C.   Its energy decreases
  D.   None of the above

48. In coherent scattering, the energy of the photon is:

  A.   Increased
  B.   Decreased
  C.   Unchanged
  D.   None of the above

49. Which coefficient is used to calculate energy absorbed:

  A.   Attenuation
  B.   Transfer
  C.   Absorption
  D.   Scatter

50. The photoelectric process is most significant in the energy range of:

  A.   1 keV to 100 keV
  B.   100 keV to 500 keV
  C.   500 keV to 1 MeV
  D.   1 MeV to 5 MeV

51. When a photon undergoes a Compton process:

  A.   A photon of reduced energy is scattered
  B.   It is completely absorbed
  C.   Characteristic x-rays are produced
  D.   Two Compton electrons are produced

52. The annihilation radiation produces:

    A.   2 electrons
    B.   1 electron and 1 positron
    C.   2 photons of energy 0.511 MeV each
    D.   1 photon of 1.02 MeV

53. A half value layer of a photon beam is:

    A.   The thickness required to reduce the beam to half of its initial
          intensity
    B.   Half of the number of photons in the beam
    C.   The photon beam is blocked into half
    D.   None of the above

54. The linear attenuation coefficient (μ)for monoenergetic photons is equal to:

    A.   HVL x 1.44
    B.   0.693/HVL
    C.   HVL x 0.693
    D.   (HVL) to the power half

55. X-rays and gamma rays in their interaction with tissue:

    A.   Produce high speed electrons
    B.   Deposit energy
    C.   Undergo scattering
    D.   Produce ionization
    E.   All of the above

56. Photons transfer their energy directly to tissue by:

    A.   Scatter
    B.   The production of Cerenkov radiation
    C.   Absorption
    D.   Attenuation
    E.   Production of bremsstrahlung

57. The major type of interaction in megavoltage photon therapy is:

    A.   Photoelectric
    B.   Compton
    C.   Pair production
    D.   Triplet production

58. The photoelectric process of interaction is between the photons and:

    A.   The nucleus of the atom
    B.   The orbital electrons
    C.   Either of the above
    D.   None of the above

59. Pair production refers to:

    A.   Two orbital electrons are ejected from the atom
    B.   One electron and one positron is ejected from the atom
    C.   In the field of the nucleus, the energy of the interacting photon is converted into a positron and an electron
    D.   Any of the above

60. What is the threshold energy for pair production:

    A.   0.511 MeV
    B.   1.02 MeV
    C.   1.533 MeV
    D.   981 MeV

61. The probability that a photon interacts with a material is:

    A.   Dependent on its density
    B.   Proportional to the total attenuation coefficient
    C.   Inversely proportional to the number of protons in the atom
    D.   All of the above

62. Which of the following materials will be most effective in attenuating a high energy photon beam:

    A.   Air
    B.   Water
    C.   Lead
    D.   Copper

63. Pair production becomes significant (i.e., not accounted for in routine calculations) in tissue above:

    A.   5 MeV
    B.   10 MeV
    C.   15 MeV
    D.   20 MeV

64. The mass attenuation for photons in soft tissue:

    A.   Is maximum at 25 MeV
    B.   Increases continuously with energy
    C.   Decreases continuously with energy
    D.   Decreases to about 3 MeV, then increases