

Sherer: Radiation Protection in Medical Radiography, 6th Edition

Chapter 02: Interaction of X-Radiation with Matter

Test Bank

MULTIPLE CHOICE

1. Particles associated with electromagnetic radiation that have *no* mass or electric charge are:
 - A. ions
 - B. negatrons
 - C. positrons
 - D. x-ray photons

ANS: D REF: 32

2. Coherent scattering is *most likely* to occur _____, even though some of this unmodified scattering occurs throughout the diagnostic range and may result in small amounts of radiographic fog.
 - A. below 10 keV
 - B. between 30 keV and 60 keV
 - C. between 60 keV and 90 keV
 - D. above 100 keV

ANS: A REF: 37

3. Which of the following is *not* a type of interaction between x-radiation and biologic matter?
 - A. Compton scattering
 - B. Bremsstrahlung
 - C. Pair production
 - D. Photoelectric absorption

ANS: B REF: 37

4. The symbol *Z* indicates the:
 - A. atomic number of an atom
 - B. atomic weight of an atom
 - C. fluorescent yield
 - D. number of vacancies in an atomic shell

ANS: A REF: 42

5. In photoelectric absorption to dislodge an inner-shell electron from its atomic orbit, the incoming x-ray photon must be able to transfer a quantity of energy:
 - A. less than the energy that binds the atom together
 - B. ten times as great as the energy that binds the atom together

- C. as large as or larger than the amount of energy that binds the electron in its orbit
- D. equal to or greater than 1.022 MeV, regardless of the energy that binds the electron in its orbit

ANS: C REF: 42

6. Which of the following interactions between photons and matter involves a matter-antimatter annihilation reaction?
- A. Compton scattering
 - B. Coherent scattering
 - C. Pair production
 - D. Photoelectric absorption

ANS: C REF: 46

7. The probability of occurrence of photoelectric absorption _____ as the energy of the incident photon decreases and the atomic number of the irradiated atoms _____.
- A. increases markedly, decreases
 - B. decreases markedly, increases
 - C. increases markedly, increases
 - D. stays the same, increases

ANS: C REF: 42

8. Which of the following terms refers to the radiation that occurs when an electron drops down from an outer orbit to fill a vacancy in an inner orbit of the parent atom?
- A. Characteristic radiation
 - B. Bremsstrahlung
 - C. Photoelectric radiation
 - D. Primary radiation

ANS: A REF: 41

9. Fluorescent radiation is also known as:
- A. characteristic radiation
 - B. coherent scattering
 - C. Compton scattering
 - D. unmodified scattering

ANS: A REF: 41

10. What is the effective atomic number of compact bone?
- A. 5.9
 - B. 7.4
 - C. 7.6
 - D. 13.8

ANS: D REF: 42

11. Which of the following is *not* another term for coherent scattering?
- A. Characteristic
 - B. Classical
 - C. Elastic
 - D. Unmodified

ANS: A REF: 37

12. Which of the following are byproducts of photoelectric absorption?
- A. Photoelectron and Compton scattered electron
 - B. Low-energy scattered x-ray photon and characteristic photon
 - C. Low-energy scattered x-ray photon and Compton scattered electron
 - D. Photoelectron and characteristic photon

ANS: D REF: 42

13. Which two interactions between x-radiation and matter may result in the production of small-angle scatter?
- A. Photoelectric absorption and Compton scattering
 - B. Coherent scattering and Compton scattering
 - C. Photoelectric absorption and pair production
 - D. Coherent scattering and pair production

ANS: B REF: 33

14. Which of the following particles is considered to be a form of antimatter?
- A. Electron
 - B. Positron
 - C. X-ray photon
 - D. Scattered x-ray photon

ANS: B REF: 47

15. Which of the following interactions results in the conversion of matter into energy?
- A. Classical scattering
 - B. Photoelectric absorption
 - C. Modified scattering
 - D. Annihilation reaction

ANS: D REF: 47

16. Compton scattering is *synonymous* with:
- A. coherent scattering
 - B. incoherent scattering
 - C. photoelectric absorption
 - D. photodisintegration

ANS: B REF: 38

17. During the process of coherent scattering, the incident x-ray photon interacts with a(n):
- A. single inner shell electron, ejecting it from its orbit
 - B. single outer shell electron, ejecting it from its orbit
 - C. atom transferring its energy by causing some or all of the electrons of the atom to vibrate momentarily and radiate energy in the form of electromagnetic waves
 - D. scattered photon of lesser energy, annihilating it

ANS: C REF: 37

18. What is the term for the number of x-rays emitted per inner-shell vacancy during the process of photoelectric absorption?
- A. Characteristic absorption
 - B. Classical gain
 - C. Fluorescent yield
 - D. Modified pair production

ANS: C REF: 41

19. Which of the following results in all-directional scatter?
- A. Classical interaction
 - B. Coherent interaction
 - C. Photoelectric interaction
 - D. Compton interaction

ANS: D REF: 39

20. Annihilation radiation is used in which of the following modalities?
- A. Computed tomography (CT)
 - B. Digital mammography
 - C. Positron emission tomography (PET)
 - D. Computed radiography (CR)

ANS: C REF: 47

21. The x-ray photon energy *required* to initiate pair production is:
- A. 0.511 keV
 - B. 1.022 keV
 - C. 0.511 MeV
 - D. 1.022 MeV

ANS: D REF: 47

22. Differences in density level between radiographic images of adjacent structures as seen in a completed radiograph define:
- A. image attenuation
 - B. radiographic contrast
 - C. radiographic density
 - D. photodisintegration

ANS: B REF: 44

23. Radiographic density is:
- A. caused by photodisintegration
 - B. defined as the degree of overall blackening on a completed radiograph
 - C. not affected by milliamperes-seconds (mAs)
 - D. not relevant in the production of a diagnostic radiograph

ANS: B REF: 44

24. When a vacancy exists in an inner electron shell of an atom (as a result of photoelectric effect, Compton scattering, or bombardment by other electrons), the energy liberated when this vacancy is filled, instead of emerging from the atom as fluorescent radiation, can be transferred to another electron of the atom, thereby ejecting the electron. Such an emitted electron is called a(n) _____ electron.
- A. Auger
 - B. Compton
 - C. Edison
 - D. Sievert

ANS: A REF: 41

25. X-rays are carriers of:
- A. disease
 - B. electrons
 - C. fluorescent properties that make them visible
 - D. manmade, electromagnetic energy

ANS: D REF: 31