Reading Hospital School of Health Sciences
Medical Imaging Program

MI 132 – Imaging Principles and Equipment
Unit 5 Study Guide
2022

1. List the three different types of x-ray interactions with matter that are important to the diagnostic energy range.

2. Explain how classical scattering occurs.

3. During classical scattering, how does the scattered photon's energy, frequency and wavelength compare to the incident x-ray photon?

4. Explain how Compton scattering interactions occur.

5. How does the wavelength, frequency and energy of a Compton scattered x-ray relate to the incident x-ray photon?

6. The electron that is ejected during a Compton interaction is called a _____ electron.

7. The closer the deflection of the scattered x-ray is to zero during Compton scattering, the **lower / higher** the energy of the scattered x-ray photon.

8. What happens to the probability of Compton scattering occurring as incident photon energy increases? As atomic number increases?

9. How does Compton scatter effect patient dose? Image quality? Occupational dose?

10. Explain how the photoelectric effect occurs.

11. The electron that is ejected during a photoelectric interaction is called a _____.

12. How can you determine the energy that a photoelectron will have after a photoelectric interaction?

13. What type of effect does the photoelectric effect have on patient dose? Image quality? Occupational exposure?

14. What happens to the probability of the photoelectric effect occurring as incident photon energy increases? As atomic number increases?

15. What type of relationship must exist between the electron binding energy and incident photon energy for the photoelectric effect to occur?

16. With higher incident photon energy, which type of interaction with matter (Compton or photoelectric) is predominant?

17. The photoelectron will have more energy in a photoelectric interaction occurring in **bone / soft tissue**.

18. Which x-ray interactions with matter involve ionization of an orbital electron in tissue?

19. Explain how secondary photons are produced. What effect do secondary photons have on patient dose? Occupational dose? Image quality?

20. What is the definition of differential absorption?

21. Define transmission and absorption and describe how they would appear on the image receptor (black or white).

22. Define beam attenuation. List the four factors that affect beam attenuation.

23. As tissue thickness decreases, beam attenuation **increases / decreases**.

24. X-rays are attenuated by about 50% for each _____ cm of tissue thickness.

25. As atomic number of tissue increases, beam attenuation **increases / decreases**.

26. As tissue density decreases, beam attenuation **increases / decreases**.

27. As beam quality increases, beam attenuation **increases / decreases**.

28. Number the following tissues in order of greatest beam attenuation (1) to least beam attenuation (4).

_____ Air _____ Fat

_____ Bone _____ Muscle