Chapter 11

1. In coherent scattering of x-rays by the Thompson interaction:

a. an excited electron emits a photon

b. a ground state electron emits a photon

c. a photon causes an electron to be emitted from an atom

d. an electric current is composed of a stream of photons

e. a photon causes and electron and a scattered photon to be emitted from an atom

2. A photon with slightly more energy than the binding energy of the tissue through which it

passes will most likely interact by:

a. the photoelectric effect

b. unmodified scattering

c. Compton scattering

d. the characteristic interaction

e. bremsstrahlung

3. The *end product(s)* of the photoelectric effect is/are:

a. one scattered photon only

b. one scattered photon, one ejected electron, and an orbital vacancy

c. one ejected electron and an orbital vacancy

d. one orbital vacancy only

4. What characterizes Compton scattering:

a. a recoil electron

b. total absorption of a primary photon

c. an ejected photoelectron

d. no loss of energy by the primary photon

5. Total absorption of the energy of an incident x-ray photon occurs in what portion of the atom?

a. only the inner shells

b. only the outer shells

c. both inner and outer shells

d. near the nucleus

6. What x-ray interaction within the patient produces *no* scatter radiation, and therefore leaves

a microscopic “white” spot wherever it occurs in the resulting image:

a. classical interaction

b. photoelectric interaction

c. Compton interaction

d. bremsstrahlung

e. characteristic interaction

7. An incident x-ray photon within the patient has 80 kV of energy. An L-shell electron with a

binding energy of 2 kV speeds away from the atom, carrying 1 kV of kinetic energy. A

Compton scattered photon from this interaction must have of energy:

a. 83 kV

b. 82 kV

c. 78 kV

d. 77 kV

e. any amount less than 78 kV

8. An 80-kV photon undergoes a coherent scattering interaction with an orbital electron having a

binding energy of 8 kV. What is the energy of the resulting scattered photon?

a.. 72 kV

b. 88 kV

c. 8 kV

d. 80 kV

9. A high energy photon is partially absorbed by an orbital electron in the patient, and although

the electron is ejected from its orbit, the remaining energy of the incident photon is

emitted as a secondary photon. This describes which interaction:

a. characteristic

b. Thompson

c. coherent scatter

d. incoherent scatter

e. photoelectric

10. Which interaction produces *only* secondary photons within the patient?

a. Compton

b. coherent scattering

c. photoelectric

d. modified scattering

e. penetration (no atomic interaction)

11. Which of the following terms best describes the interaction of an incident x-ray photon with

an atom inside the patient followed by the emission of an x-ray photon in the *same*

direction as the original?

a. scatter

b. secondary

c. incident

d. recoil

e. inherent

12. Which of the following is *not* a term describing coherent scattering of an x-ray?

a. Rayleigh interaction

b. Thompson interaction

c. unmodified scattering

d. modified scattering

13. As a rule of thumb, how much of the primary x-ray beam penetrates through the patient

without interacting at all with any atoms in the patient?

a. Less than 1%

b. 2%

c. 5%

d. 10%

e. 20%

14. The partial absorption of the x-ray beam as it passes through the body is best referred as:

a. bremsstrahlung

b. absorption

c. heterogeneity

d. attenuation

15. The entire distance traversed by the central ray is known as the:

a. SID

b. OID

c. SOD

d. TTD

16. In projection geometry, which of the following portions of the x-ray beam diverges

*isotropically?*

a. the central ray in the primary beam

b. the central ray in the remnant beam

c. all primary rays except the central ray

d. all secondary rays except the central ray in the remnant beam

17. All variables affecting the acquisition and quality of a radiographic image can be categorized

into one of types of variables:

a. 3

b. 4

c. 5

d. 6

e. 7

18. Positioning of the patient, and patient motion, are both most accurately categorized as

variables.

a. patient status

b. technical

c. geometrical

d. prime factor

e. viewing condition

19. The energy conservation formula *EP* = *ES*  + *EB* + *EKE* is associated with which interaction:

a. Compton

b. Thompson

c. photoelectric

d. Rayleigh

e. characteristic

20. Which interaction refers to the momentary absorption of an x-ray photon’s energy by the

entire cloud of electrons in an atom, collectively?

a. Thompson

b. Rayleigh

c. Compton

d. characteristic

e. photoelectric

21. Within the patient’s body, a characteristic interaction can follow:

a. any ionizing event

b. any Thompson interaction

c. any Rayleigh interaction

d. only Compton interactions

e. only photoelectric interactions

22. Which interaction is the *only* interaction that takes place both in the x-ray tube and within the

patient’s body?

a. photoelctric

b. compton

c. coherent

d. bremsstrahlung

e. characteristic

23. What is the main reason that characteristic interactions occurring *within the patient’s body*

do not affect the radiographic image?

a. There are too few incoming photons from ionizing events

b. Photons emitted from these interactions have too low energy

c. Incoming photons from ionizing events have too low energy to excite these atoms

d. The atoms within the patient have too high atomic numbers

24. Normal attenuation of an x-ray beam through soft tissues proceeds at a rate of for every

4 to 5 cm of tissue thickness:

a. 5%

b. 10%

c. 25%

d. 35%

e. 50%

25. The *end product(s)* of the Rayleigh effect is/are:

a. one scattered photon only

b. one scattered photon, one ejected electron, and an orbital vacancy

c. one ejected electron and an orbital vacancy

d. one orbital vacancy only

26. The absorption rate of an x-ray beam through a particular thickness of soft tissues is:

a. exponential

b. inversely exponential

c. proportional

d. inversely proportional

27. The subtle differences in x-ray attenuation between various tissues in a body part is termed:

a. image contrast

b. differential absorption

c. progressive attenuation

d. contrast coefficient

e. density difference

28. The photoelectric interaction is essential not only to the production of subject contrast in the

remnant x-ray beam, but also to the:

a. capture of the image by the image receptor

b. sufficient penetration of the beam through the body

c. production of long gray scale in the image

d. minimizing of patient dose

29. Information missing from the signal in the remnant x-ray beam can:

a. be restored by subtraction techniques

b. be recovered by computerized post-processing

c. be regained by increasing the mAs

d. never be recovered

30. Name the interaction pictured here:

a. Compton interaction

b. Thompson interaction

c. characteristic interaction

d. unmodified scattering

e. bremsstrahlung

