Chapter 12

1. The total subject contrast created between two tissues within the patient is dependent upon the

differential absorption resulting from:

a. all interactions combined

b. Compton interactions only

c. photoelectric interactions only

d. Thompson interactions only

e. Rayleigh interactions only

2. Of the following, the most likely initial interaction of diagnostic-energy x-rays in high Z-

number materials such as bone and contrast agents is:

a. photoelectric interaction

b. Compton interaction

c. characteristic interaction

d. Thompson interaction

e. bremsstrahlung

3. A photon with much 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

4. Which type of interaction is responsible for making a radiographic image possible?

a. Compton

b. Rayleigh

c. photoelectric

d. unmodified scattering

e. characteristic

5. Lead is commonly used as shielding against x-rays because of its very high atomic number.

This high Z number makes it most likely that x-rays passing through lead will interact

by:

a. photoelectric interaction

b. Compton interaction

c. bremsstrahlung interaction

d. characteristic interaction

e. Thompson interaction

6. Gaseous contrast agents, such as air, work to produce high contrast primarily because of their:

a. viscosity

b. density

c. volume

d. atomic mass

e. atomic number

7. To increase the *proportion* of photoelectric interactions (compared to Compton) occurring

within the patient, one should:

a. increase mAs

b. decrease mAs

c. increase kVp

d. introduce barium into the anatomy

e. increase field size

8. The intensity of the entire x-ray beam is doubled, such that twice as many photons pass into

the patient. The *ratio* between the number of photoelectric interactions and the number

of Compton interactions taking place will:

a. double

b. increase

c. decrease

d. remain equal

e. be cut to ½

9. Which of the following is *not* a reason why higher kVp levels result in reduced image contrast:

a. photoelectric interactions are lost

b. scattered photons have higher penetrating power

c. a higher percentage of scattered photons are directed forward toward the image

receptor

d. Compton interactions increase in number

10. The reduction in the original number and energy of x-ray photons as they interact with atoms

within the patient is called:

a. absorption

b. diffusion

c. attenuation

d. scattering

e. filtration

11. Which of the following is *least* effective in producing subject contrast?

a. tissue density

b. tissue thickness

c. tissue atomic number

d. these all have an equal effect

12. Subject contrast within the remnant beam of x-rays is *directly proportional to*:

a. the Compton/photoelectric ratio

b. the photoelectric/penetration ratio

c. the Thompson/Compton ratio

d. the penetration ratio

13. Bone shows up with high contrast on a radiograph *primarily* because of its:

a. thickness

b. density

c. atomic number

d. hardness

e. viscosity

14. Which of the following is *directly proportional* to the number of interactions taking place

within a particular tissue in the patient?

a. atomic number of the tissue

b. thickness of the part

c. density of the tissue

d. fat content of the tissue

15. When the x-ray beam intensity is increased, the *ratio* of penetrating x-rays to interacting x-

rays:

a. remains equal

b. increases proportionately

c. decreases proportionately

d. increases exponentially

16. What is the prevalent interaction of x-rays in soft tissue at high kVp levels?

a. photoelectric

b. Compton

c. Rayleigh

d. Thompson

e. bremsstrahlung

17. A body part that is 8 cm thicker than average requires for radiographic technique:

a. a 50% increase in mAs

b. double the mAs

c. triple the mAs

d. four times the mAs

e. five times the mAs

18. A body part that is 5 cm thinner than average requires for radiographic technique:

a. 8% less kVp

b. 15% less kVp

c. 30% less kVp

d. 8% more kVp

e. 15% more kVp

19. Mathematically, subject contrast in the remnant beam signal is best thought of as the \_\_\_\_\_\_

between two adjacent areas of different x-ray intensities:

a. added sum

b. subtracted difference

c. divided ratio

d. multiplied product

20. X-ray absorption by the photoelectric effect is proportional to the of the atomic number

of the tissue or contrast agent through which the x-ray beam is passing:

a. absolute value

b. square

c. cube

d. 5th power

21. Due the difference in atomic number alone, we find the ratio of x-ray absorption between

bone and soft tissue to be about 8000/400. When we *combine* this with the fact that bone

is also about twice as dense as soft tissue, the *total factor by which bone absorbs x-rays*

*better than soft tissue does is approximately:*

a. 4 times more effective

b. 10 times more effective

c. 20 times more effective

d. 40 times more effective

e. 80 times more effective

22. Scatter radiation reduces subject contrast in the signal reaching the image receptor *because:*

a. it lays down a “blanket” of roughly even exposure across an area of the image receptor

b. it lays down a layer of exposure that decreases from the center outward across the

image receptor

c. it lays down a layer of exposure proportional to the different intensities already being

carried by the remnant beam

d. it lays down a layer of exposure that increases from the center outward across the

image receptor

23. Occurrence of the photoelectric effect is the set kVp:

a. proportional to

b. inversely proportional to

c. inversely proportional to the square of

d. proportional to the cube of

e. inversely proportional to the cube of

24. In the remnant x-ray beam signal, even if no scatter radiation is present at all, increasing the

kVp still due to the increasing number of tissues penetrated:

a. lengthens the gray scale

b. increases the subject contrast

c. decreases exposure intensity

d. improves the sharpness of detail

25. As the kVp is increased, the occurrence of Compton interactions:

a. increases very slightly

b. increases dramatically

c. decreases very slightly

d. plummets dramatically

26. The use of positive contrast agents greatly improves subject contrast by:

a. bringing physical densities up closer to x-ray energies

b. bringing x-ray energies down closer to physical densities

c. bringing binding energies up closer to x-ray energies

d. bringing x-ray energies down closer to x-ray energies

27. Compared to the effects of field size and patient size, the set kVp is a relatively factor

in the prevalence of scatter radiation:

a. minor

b. major

c. equal

d. unrelated

28. Coherent scattering by the Thompson effect is most likely to occur in the kVp range of:

a. 10-30 kVp

b. 50-70 kVp

c. 80-100 kVp

d. 100-120 kVp

29. To increase the subject contrast in the remnant beam, you must:

a. reduce Compton and photoelectric interactions in the patient by an equal amount

b. reduce Compton interactions more than you reduce photoelectrics

c. reduce photoelectric interactions more than you reduce Comptons

d. increase Compton interactions more than you increase photoelectrics

e. increase Compton and photoelectric interactions equally

30. As x-ray beam energy increases:

a. Compton scatter increases as a proportion of all interactions occurring in the patient

b. all interactions increase in number

c. Compton interactions increase in number

d. characteristic interactions increase in number

e. photoelectric interactions increase as a proportion of all interactions occurring in the

patient