Chapter 38

1. Individuals in Denver, Colorado receive more receive more cosmic radiation than those on the Gulf Coast because:
   1. the atmospheric temperature is higher at sea level
   2. there is more mineral content in the ground in Denver
   3. the altitude is lower in Denver
   4. there is less atmosphere to shield individuals in Denver
2. The half-life of a radioactive substance:

*1. is characteristic of the isotope 2. varies with time 3. is constant*

a. 1 only

b. 2 only

c. 3 only

d. 1 & 2 only

e. 1 & 3 only

1. A sample of Oklahoma Soonerium emits 81 mCi of radioactivity at 1:30 p.m. In how many half lives will exactly 1.5625% of this amount remain?
   1. 4
   2. 5
   3. 6
   4. 7
   5. 8

4. A sample of Michigan Wolverinium, with a half-life of 9 hours, is emitting 120 mCi of

radioactivity. How radioactive will it be in exactly 39 hours?

a. 4.33 mCi

b. 27.3 mCi

c. 27.7 mCi

d. 6.25 mCi

e. 5 mCi

1. A sample of Texas Longhornium with an original radioactivity of 66 Ci is found 20 hours later to have diminished to 12.375 Ci. What is the half-life for Texas Longhornium?
   1. 8 hours
   2. 26.4 hours
   3. 2.5 hours
   4. 5.33 hours
   5. 8.25 hours
2. If the activity of a radioactive source is 400 mGy per hour, and it has a half-life of 6 hours, what will the activity be in one full day?
   1. 133 mGy/hr
   2. 25 mGy/hr
   3. 12.5 mGy/hr
   4. 6.25 mGy/hr
3. A radioactive source has a half-life of 6 hours. How long would it take to reduce a 100 mCi/hr sample of it to a level of 12.5 mCi/hr?
   1. 24 hours
   2. 18 hours
   3. 12 hours
   4. 6 hours
   5. None of the above
4. Which of the following is related to the number of times that the atoms of a particular material disintegrate per second?
   1. exposure
   2. absorbed dose
   3. absorbed dose equivalent
   4. radioactivity
5. In the most general terms, “background radiation” can be divided into what two broad categories?
   1. natural and man-made
   2. cosmic and terrestrial
   3. confluent and regressive
   4. internal and external
6. Which of the following most closely approximates the minimum amount of material it would take to stop a beam of beta particles?
   1. a meter of air
   2. a single sheet of paper
   3. 2 cm of soft tissue
   4. 20 cm of soft tissue

11. Medical procedures now constitute about \_\_\_ percent of all radiation sources to

which we are subjected, including radon gas, all man-made sources, and all

natural sources:

1. 6%
2. 25%
3. 32%
4. 40%
5. 68%

12. The only case of an accidental nuclear core meltdown at a nuclear power plant was at:

a. Three-mile Island, USA

b. Fukushima, Japan

c. Chernobyl, Russia

d. None of the above

13. Which of the following resulted in acute cases of ARS and deaths within days to

weeks:

a. Three-mile Island, USA

b. Fukushima, Japan

c. Chernobyl, Russia

d. None of the above

14. For worldwide deaths per Terawatt of power production per year, which of the

following ranks, by far, the lowest:

1. Nuclear
2. Gas
3. Biomass
4. Oil
5. Coal

15. The first documented death directly attributed to excessive radiation exposure was

that of in 1904:

1. Clarence Dalley
2. Wilhelm Roentgen
3. Michael Pupin
4. Thomas Edision
5. Marie Curie

16. Dr. M.K. Kassabian is noted for having developed the first:

a. fluoroscope

b. units for measuring radiation

c. set of rules for radiation protection

d. experimental methods for detecting naturally-occurring radiation

e. integrated x-ray machine

17. Which of the following ranks 9th among all categories for health risk, but is usually

underestimated by the public?

1. medical x-rays
2. natural background radiation
3. nuclear power plants
4. industrial use of radiation

18. When all sources of natural background radiation, including radon gas, are combined,

the world-wide average exposure to natural radiation each year is about:

1. 200 microgray
2. 1 mGy
3. 3 mGy
4. 6 mGy
5. 120 mGy

19. In terms of the levels of radiation exposure received, which of the following is closest

to the average annual natural background radiation exposure?

1. A single-view chest radiograph
2. The average annual occupational exposure for radiographers
3. A barium enema series
4. The average annual public exposure from nuclear power plants

20. The radiation exposure to the patient for a barium enema series, including all

fluoroscopy, spot-views and overheads, is approximately equal to that of how

many single-view chest radiographs?

1. 20
2. 50
3. 100
4. 300
5. 600

21. In the history of radiography, which of the following does **not** qualify as one of the

historical landmark developments that further reduced patient exposure levels:

1. The advent of intensifying screens
2. The advent of the image intensifier for fluoroscopy
3. The advent of automatic exposure control
4. The advent of rare earth phosphors
5. The advent of computed radiography (CR)

22. The worst nuclear power plant disaster in the history of the United States, the Three-

Mile Island accident, released about how much radiation into the atmosphere:

1. 5 R
2. 17 Ci
3. 200 R
4. 50,000 Ci
5. 50 million Ci

23. For a large population exposed to an acute dose of radiation, some deaths will occur

any time exposure exceeds at least:

1. 50 mGy
2. 500 mGy
3. 1 Gray
4. 3.5 Gray
5. 6 Gray

24. Potassium 40 and Strontium 90 are classic examples for sources of:

a. internal radiation

b. terrestrial radiation

c. cosmic radiation

d. man-made background radiation from technological products

e. man-made radiation from medical use

25. In which of the following immediate environments would a worker receive the

highest amount of background radiation?

1. out-of-doors
2. inside a wooden building
3. inside a brick building
4. inside a granite or marble building

26. By living within 80 kilometers of a coal-fired power plant, the public will receive

what fraction or multiple of the industrial radiation exposure when compared to

living within the same distance from a nuclear power plant?

1. 1/3
2. ½
3. Approximately the same amount
4. 2 times more
5. 3 times more

27. Which of the following types of radiation has the highest average penetration

capability through human tissue:

a. alpha particles

b. beta particles

c. x-rays

d. gamma rays

28. Which of the following types of radiation can *repel* orbital electrons out of their shells

in an atom, without physically colliding with the orbital electrons but only by

passing in close proximity to them:

1. alpha particles
2. beta particles
3. gamma rays
4. x-rays
5. sound waves

29. From tobacco smoke, particles containing polonium 210 and lead 210 are aspirated permanently into the lungs. These are alpha-emitting radioisotopes.

Which of the following explains the high degree of damage caused to the lung

tissues by these smoke particles:

1. The low penetration of alpha particles causes a high local concentration of

radiation dose

1. The large size and double charge of alpha particles makes them highly

ionizing to atoms

1. Lung tissue absorbs the alpha particles in a 360-degree radius in all three

dimensions around each particle

1. All of these explanations apply
2. None of these explanations apply

30. Which of the following is most accurate in describing the penetration capability of x-

rays through the human body:

1. All are absorbed within about 1 mm
2. All are absorbed within about 2 centimeters
3. 1-2% penetrate all the way through the body
4. About 10% penetrate all the way through the body
5. About 90% penetrate all the way through the body

31. What is the relationship between the penetration capability of different types of

radiation and the degree of biological harm they cause?

1. Lower penetration causes more harm
2. Higher penetration causes more harm
3. The greatest harm is caused at an intermediate level of penetration
4. There is no direct relationship between penetration and harm

32. A mineral sample with which of the following combinations of characteristics would

be the most dangerous to humans?

1. low decay rate and short half-life
2. high decay rate and short half-life
3. low decay rate and long half-life
4. high decay rate and long half-life

33. Which of the following is best suited for treating malignant tumors deep within the

body?

1. alpha radiation
2. beta radiation
3. x-rays
4. gamma radiation

34. Of the following man-made technologies, which is the largest source of human

exposure to radiation?

1. fallout from nuclear weapons
2. diagnostic x-rays
3. radioactive materials in consumer products
4. nuclear power stations

35. In just two decades in the United States, from 1985 to 2005, the contribution of

medical practice to our overall radiation dose has increased to more than \_\_\_\_ of

all sources of radiation:

1. 1/10th
2. 1/4th
3. 1/2
4. 2/3

36. In recent decades, by far, the largest increase in radiation dose to medical patients has

come from the burgeoning use of:

1. Diagnostic radiography procedures
2. Angiography and cardiovascular procedures
3. Computerized tomography scans
4. MRI scans