

# Radiographic Imaging and Exposure 6th Edition Fauber

## Test Bank

### Chapter 01: Radiation and Its Discovery

#### Fauber: Radiographic Imaging and Exposure, 6th Edition

#### MULTIPLE CHOICE

1. When were x-rays discovered?
  - a. October 8, 1985
  - b. November 8, 1895
  - c. January 23, 1896
  - d. August 15, 1902

ANS: B

X-rays were discovered by Wilhelm Conrad Roentgen on November 8, 1895.

REF: p.1

2. What type of tube was Roentgen working with in his lab when x-rays were discovered?
  - a. Crookes tube
  - b. Fluorescent tube
  - c. High-vacuum tube
  - d. Wurzburg tube

ANS: A

Roentgen was working with a low-vacuum tube known as a Crookes tube.

REF: p.2

3. Which of the following terms could be defined as the instantaneous production of light only during an interaction between a type of energy and some element or compound?
  - a. Phosphorescence
  - b. Afterglow
  - c. Glowing
  - d. Fluorescence

ANS: D

Fluorescence is the instantaneous emission of light from a material due to the interaction with some type of energy.

REF: p.2

4. Barium platinocyanide was the:
  - a. type of dark paper Roentgen used to darken his laboratory.
  - b. material Roentgen used to produce the first radiograph of his wife's hand.
  - c. metal used to produce the low-vacuum tube.
  - d. fluorescent material that glowed when the tube was energized.

ANS: D

A piece of paper coated with barium platinocyanide glowed each time Roentgen energized his tube.

REF: p.2

5. The first radiograph produced by Roentgen, of his wife's hand, required an exposure time of:
- 15 s.
  - 150 s.
  - 15 min.
  - 150 min.

ANS: C

It took a 15-min exposure time to produce the first radiograph.

REF: p.3

6. The letter *x* in *x-ray* is the symbol for:
- electricity.
  - the unknown.
  - penetrating.
  - discovery.

ANS: B

The letter *x* represents the mathematical symbol of the unknown.

REF: p.3

7. The first Nobel Prize for physics was received in 1901 by:
- Marie Curie.
  - William Crookes.
  - Wilhelm Roentgen.
  - Albert Einstein.

ANS: C

Wilhelm Roentgen received the first Nobel Prize for physics in 1901.

REF: p.4

8. X-rays were at one time called:
- Becquerel rays.
  - Roentgen rays.
  - Z-rays.
  - none of the above.

ANS: B

X-rays were at one time called Roentgen rays.

REF: p.4

9. Erythema, an early sign of biologic damage due to x-ray exposure, is:
- reddening of the skin.
  - a malignant tumor.
  - a chromosomal change.
  - one of the most serious effects of x-ray exposure.

ANS: A

Erythema is reddening and burning of the skin, an early and less serious effect of exposure to large doses of x-radiation.

REF: p.5

10. X-rays have which of the following properties?
- Electrical
  - Magnetic
  - Chemical
  - A and B
  - A and C

ANS: D

X-rays, a type of electromagnetic radiation, have both electrical and magnetic properties.

REF: p.5

11. The distance between two successive crests of a sine wave is known as:
- an angstrom.
  - frequency.
  - the Greek letter *mu*.
  - wavelength

ANS: D

The distance between two successive crests or troughs of a sine wave is the measure of its wavelength.

REF: p.6

12. X-rays used in radiography have wavelengths that are measured in:
- angstroms.
  - millimeters.
  - centimeters.
  - hertz.

ANS: A

X-rays in the range used in radiography have wavelengths that are so short that they are measured in angstroms.

REF: p.6

13. The frequency of a wave is the number of waves passing a given point per given unit of time. Frequency is measured in:
- angstroms.
  - hertz.
  - inches.
  - eV.

ANS: B

The unit of frequency is hertz. The frequency of x-rays in the radiography range varies from about  $3 \times 10^{19}$  to  $3 \times 10^{18}$  Hz.

REF: p.6

14. Which of the following is a correct description of the relationship between the wavelength and frequency of the x-ray photon?
- Wavelength and frequency are directly proportional.
  - Wavelength and frequency are inversely related by the square root of lambda.
  - Frequency and wavelength are inversely related.
  - Wavelength and frequency have no relationship to each other.

ANS: C

Wavelength and frequency are inversely related; as one increases, the other decreases.

REF: p.6

15. A \_\_\_\_\_ is a small, discrete bundle of energy.
- phaser
  - quark
  - photon
  - mesion

ANS: C

A photon, or quantum, is a small, discrete bundle of energy.

REF: p.7

16. The speed of light is:
- $3 \times 10^8$  meters per second
  - $3 \times 10^8$  miles per second
  - 186,000 miles per second
  - A and B
  - A and C

ANS: E

The speed of light can be described as either  $3 \times 10^8$  meters per second or 186,000 miles per second.

REF: p.8

17. When first developed, the branch of medicine using x-rays was called:
- radiology.
  - radiography.
  - roentgenology.
  - imaging sciences.

ANS: C

What we now call *radiology* was first called *roentgenology*.

REF: p.4

18. The electrical energy applied to an x-ray tube will be transformed to:
- heat.
  - light.

- c. x-rays.
- d. A and B.
- e. A and C.

ANS: E

The electrical energy applied to the x-ray tube will be transformed into heat (primarily) and x-rays.

REF: p.5

19. The Greek symbol lambda ( $\lambda$ ) represents the x-ray's:
- a. wavelength.
  - b. speed.
  - c. frequency.
  - d. quantity.

ANS: A

Lambda ( $\lambda$ ) is the Greek symbol that represents wavelength.

REF: p.6

20. An angstrom ( $\text{\AA}$ ) is equal to:
- a.  $10^{-1}$  meter
  - b.  $10^{-10}$  meter
  - c.  $10^{-1}$  foot
  - d.  $10^{-10}$  foot

ANS: B

One angstrom is equal to  $10^{-10}$  meter.

REF: p.6

21. X-rays used in radiography have wavelengths ranging from 0.1 to:
- a. 0.01  $\text{\AA}$ .
  - b. 1  $\text{\AA}$ .
  - c. 10  $\text{\AA}$ .
  - d. 100  $\text{\AA}$ .

ANS: B

X-rays used in radiography have wavelengths ranging from 0.1 to 1  $\text{\AA}$ .

REF: p.6

22. X-rays used in radiography have wavelengths ranging from  $3 \times 10^{19}$  to:
- a.  $3 \times 10^8$  Hz.
  - b.  $3 \times 10^{-10}$  Hz.
  - c.  $3 \times 10^{10}$  Hz.
  - d.  $3 \times 10^{18}$  Hz.

ANS: D

X-rays used in radiography have wavelengths ranging from  $3 \times 10^{19}$  to  $3 \times 10^{18}$  Hz.

REF: p.6

23. In the formula  $c = \lambda v$ ,  $c$  represents:
- frequency.
  - the speed of light.
  - wavelength.
  - kinetic energy.

ANS: B

In this formula,  $c$  represents the speed of light.

REF: p.6

24. In the formula  $c = \lambda v$ ,  $v$  represents:
- frequency.
  - the speed of light.
  - wavelength.
  - kinetic energy.

ANS: A

In this formula,  $v$  represents frequency.

REF: p.6

25. The energy of an individual x-ray photon is measured in:
- frequency.
  - wavelength.
  - kilovolts peak (kVp).
  - electron volts (eV).

ANS: D

X-ray photon energy is measured in electron volts (eV).

REF: p.7

26. An x-ray beam that has photons with many different energies is:
- homogenous.
  - monoenergetic.
  - heterogeneous.
  - never found.

ANS: C

A heterogeneous x-ray beam consists of photons with many different energies.

REF: p.8

27. X-rays can:
- penetrate the human body.
  - be absorbed in the human body.
  - change direction in the human body.
  - A and B only.
  - all of the above.

ANS: E

X-rays can penetrate, be absorbed in, or change direction (due to scattering) in the human body.

REF: p.9

28. In conjunction with ALARA, which of the following cardinal principles help to minimize radiation exposure?
- I. Time—Increase time exposed to ionizing radiation
  - II. Time—Decrease time exposed to ionizing radiation
  - III. Distance—Increase distance from ionizing radiation
  - IV. Distance—Decrease distance from ionizing radiation
  - V. Shielding—Maximize use of shielding from ionizing radiation
- a. I, III, and V
  - b. I, IV, and V
  - c. II, III, and V
  - d. II, IV, and V

ANS: C

The cardinal principles include decreasing time exposed to ionizing radiation, increasing distance from ionizing radiation, and maximizing use of shielding from ionizing radiation.

REF: p.9

#### **TRUE/FALSE**

1. X-rays are invisible.

ANS: T

A characteristic of x-rays is that they are invisible.

REF: p.9

2. X-rays carry a negative charge that causes ionization.

ANS: F

X-rays are electrically neutral.

REF: p.9

3. X-ray photons travel at the speed of light in a vacuum.

ANS: T

In a vacuum, x-rays will travel at the speed of light.

REF: p.9

4. X-ray photons are capable of traveling around corners.

ANS: F

X-rays travel in straight lines, so they are unable to travel around corners.