Electromagnetic Radiation

Chapter 2

1. The wave-particle duality of radiation is described by (the): 5:5

   A. Coulomb's law
   B. Einstein's theory
   C. Ohm's law
   D. Quantum theory

2. The principal difference between an x-ray photon and a gamma ray is the: 5:29

   A. Wavelength of the photon
   B. Frequency of the photon
   C. Origin of the photon
   D. Speed of the photon

3. As the energy of electromagnetic radiation increases, the: 5:6

   1. Frequency decreases *2. Wavelength decreases* *3. Speed increases*

   A. 1 only
   B. 2 only
   C. 3 only
   D. 1, 2, & 3

4. The frequency (hertz) of a wave can be defined as the: 5:6

   A. Distance the wave travels
   B. Number of cycles per second
   C. Height of the wave
   D. Distance between the adjacent wave peaks

5. Which of the following electromagnetic radiation(s) is most likely to interact with matter as if it were a wave?

   1. Visible light *2. Microwaves* *3. X-rays*

   A. 1 & 2 only
   B. 1 & 3 only
   C. 2 & 3 only 5:6
   D. 1, 2, & 3

6. The shorter wavelength photons of the electromagnetic spectrum are often measured by the _____ which is the equivalent of 10^{-9} centimeter.

   A. Nanometer
   B. Micrometer
   C. Millimeter
   D. Kilometer

7. It would be possible to produce a homogeneous x-ray beam if the kilovoltage were held constant and all off-target radiations were prevented at the anode. 4.37

   A. True
   B. False

8. Which member of the electromagnetic spectrum will normally possess photon wavelengths shorter than those of x-ray photons? 5:30

   A. Cosmic rays
   B. Infrared rays
   C. Microwaves
   D. Radio waves

9. The energy of the photons produced in Bremstrahlung x-ray production is dependent upon the:

   1. Projectile speed *2. Atomic number of the target* *3 Electron to nucleus distance*

   A. 1 only
   B. 2 only
   C. 3 only
   D. 1, 2, & 3

10. The relationship of energy (keV) and photon wavelength Å is expressed by the formula: 2:55

A. $E = \lambda c$
B. $E = \frac{12.4}{\lambda}$
C. $C = \lambda v$
D. $E = h c$

11. Which is not true of the members of the electromagnetic spectrum? They all have the same: 8:9

A. Velocity
B. Energy
C. Mass
D. Charge

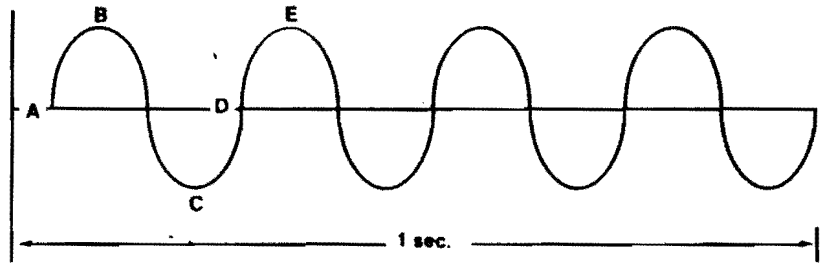
12. Which of the following can be used to deflect the path of an electromagnetic photon beam? 8:9

A. Strong magnetic field
B. Strong electrostatic field
C. Weak gravitational field
D. None of the above

13. An individual packet of energy that interacts with matter in a specified manner according to the laws of electromagnetic forces is called a: 8:10

A. Vector
B. Disturbance
C. Photon
D. Spiral

Pertaining to the following diagram answer questions 14 and 15.



14. In the above diagram of an electromagnetic wave, which letters best define wavelength? 5:7

A. A-B
B. B-C
C. A-C
D. B-E

15. In the diagram, this photon would have a frequency of: 5:7

A. Two Hertz
B. Three Hertz
C. Four Hertz
D. Eight Hertz

16. The energy of an electromagnetic radiation is directly proportional to the 5:7

A. Wavelength of the radiation
B. Frequency of the radiation
C. Speed of the radiation
D. Mass of the radiation

17. The x-radiation emission in an x ray tube is considered to be _____ in nature. 5:30

1. Homogeneous *2 Heterogeneous* *3. Monocromatic*

A. 1 only
B. 2 only
C. 3 only
D. 1, 2, & 3

18. The speed of all electromagnetic radiations in a vacuum is:

A. 3×10^{10} cm/sec
B. 3×10^{10} m/sec
C. 3×10^{10} km/sec
D. Photons cannot travel in a vacuum

19. One of the principal dangers of exposure to radiation is the ability to cause ionization in the exposed tissue. Which type of radiation possesses sufficient energies to cause ionization? 5:6

A. Infrared radiation
B. Radiowaves
C. Gamma rays
D. Radar waves

20. The number of waves passing through a point in a specified unit of time is termed: 5:5

A. Frequency
B. Wavelength
C. Persistence
D. Modulation

21. A 124 keV x-ray photon has a wavelength of: 5:7

A. .1 nm
B. .01 nm
C. .001 nm
D. None of the above

22. If the frequency of an electromagnetic photon is increased by a factor of 4, the wavelength will: 5:6

A. Increase 16 times
B. Increase 4 times
C. Decrease 16 times
D. Decrease 4 times

23. The unit used to measure the energy of a photon is the: 5:6

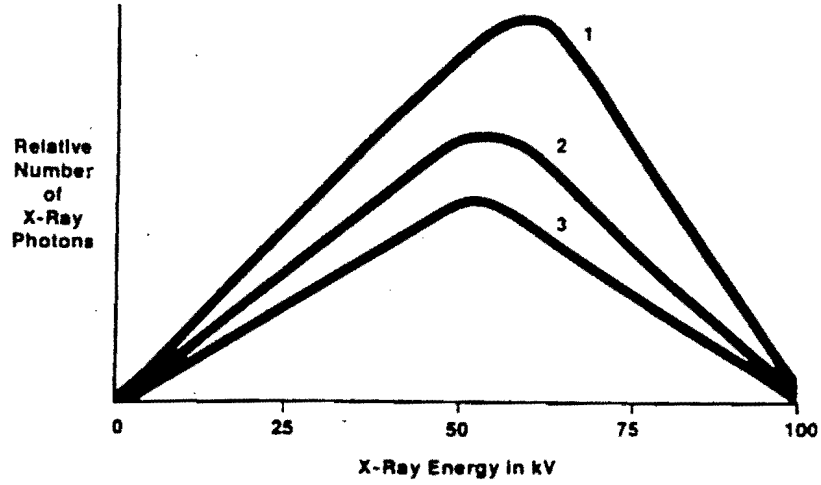
A. Angstrom unit
B. Quantum unit
C. Electron volt
D. Joule

24. The mass-energy equivalency of electromagnetic energy and matter is given by an equation developed by:

A. Albert Einstein
B. Max Plank
C. Neils Bohr
D. Wilhelm Roentgen

4:15

Pertaining to the x-ray intensity distribution curve, answer questions 25 and 26.



25. Which of the following curves resulted from the use of the lowest milliampere setting? 5:34

A. Curve 1
B. Curve 2
C. Curve 3

26. Curve 1 corresponds to the x-ray beam accomplished at a higher _____ than the other curves.

A. mA
B. kVp
C. Both of the above
D. Neither of the above

5:34

27. The energy of a 2.8×10^{19} Hz gamma ray where $h=4.15 \times 10^{-18}$ keV-sec. is: 8:10

A. 104 keV
B. 116 keV
C. 208 keV
D. 230 keV

28. The energy of a 6.2×10^{19} Hz x-ray photon where h=4.15 x 10^{-18} keV-sec. is: 8:10

A. 128 keV
B. 189 keV
C. 257 keV
D. 277 keV

29. A photon with a wavelength of .0001 nm has an energy of about: 5:30

A. 1.2 MeV
B. 1.7 MeV
C. 12.4 MeV
D. 484 MeV

30. The loss of energy by an x-ray tube electron as it passes by a tungsten atom in the anode results in a photon being produced by an event termed: 5:30

A. Characteristic radiation
B. Compton interaction
C. Bremsstrahlung
D. Pair production

31. On an x-ray spectral distribution curve, for a tungsten anode inhomogenieties an 11, 59, and 69 keV represent: 5:31

A. K-edge absorption spectrum
B. Projectile electron energy
C. Bremsstrahlung x-ray production
D. Characteristic x-ray production

32. When the stream of fast-moving electrons interact with the target of the anode, x-rays are generated by two different processes. They are: 5:31

A. Bremsstrahlung and characteristic radiation
B. Characteristic and primary radiation
C. Primary radiation and Bremsstrahlung
D. Compton and photoelectric interaction

33. A 24 keV x-ray photon has a wavelength of: 8:11

A. .05 nm
B. .5 nm
C. 1.5 nm
D. 2.5 nm

34. A gamma ray having a 1.1×10^{-10}cm wavelength will have an energy (keV) of _____ where h=4.15 x 10^{-18} keV-sec. and c=3 x 10^{10}cm/sec. 8:10

A. 1.13 MeV
B. 11.3 keV
C. 17.6 MeV
D. 29.2 keV

35. An x-ray photon having a 7×10^{-10}cm wavelength will have an energy (keV) of _____ where h=4.15 x 10^{-18} keV-sec. and c=3x10^{10} cm/sec. 8:10

A. 32 keV
B. 69 keV
C. 178 keV
D. 252 keV