

# High Energy Generators

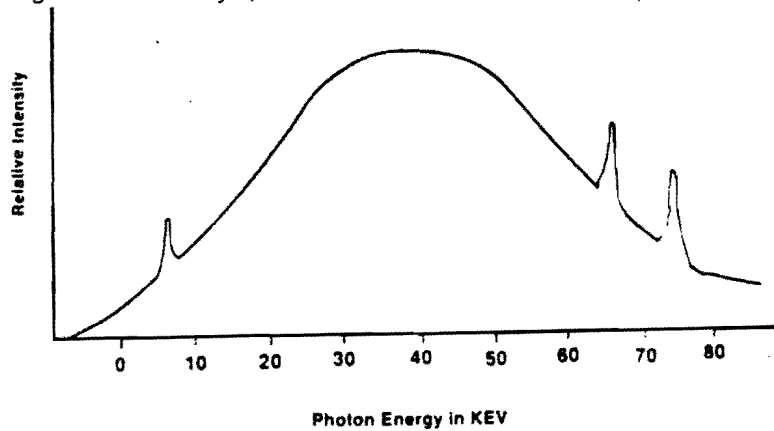
## Chapter 7

1. The power supply required for the proper operation of the modulator of a linear accelerator is: 8:53
  - A. 3 phase alternating current
  - B. Single phase alternating current
  - C. Pulsating direct current
  - D. None of the above
2. The acceleration of the charged particles in a linear accelerator (linac) primarily results from their exposure to: 8:53
  - A. High frequency electromagnetic waves
  - B. High energy magnetic fields
  - C. Hyperthermal coupling devices
  - D. High electrical potential
3. The highly evacuated section of a cyclotron in which the particles are accelerated is called the: 8:61
  - A. Dee
  - B. Stripper
  - C. Waveguide
  - D. Injection chamber
4. The linear accelerator is often preferred over a betatron because it allows for: 8:59
  1. Higher dose rates
  2. larger field sizes
  3. Increased range of energies
  - A. 1 & 2 only
  - B. 1 & 3 only
  - C. 2 & 3 only
  - D. 1, 2, & 3
5. The two major energies associated with Co-60 beta decay are gamma photon energies of: 8:61
  - A. .66 and .83 MeV
  - B. 1.17 and 1.33 MeV
  - C. 1.2 and 3.1 MeV
  - D. 2.8 and 3.4 MeV
6. A megavoltage therapy unit is one that produces x-ray or electron beam energies above: 8:51
  - A.  $10^2$  eV
  - B.  $10^3$  eV
  - C.  $10^5$  eV
  - D.  $10^6$  eV
7. The beam hardening of an orthovoltage (deep) therapy unit is normally accomplished with a few millimeters of: 8:49
  - A. Aluminum
  - B. Lead
  - C. Tin
  - D. Copper
8. Which of the following will reduce the output of a Co-60 teletherapy unit. 8:62
  - A. Insufficient warm-up time
  - B. Low klystron energy
  - C. Excessive target angle
  - D. None of the above
9. The timer of a gamma beam therapy unit shall be accurate to within: 15:74
  - A. 1%
  - B. 3%
  - C. 5%
  - D. 10%
10. An increase in the uniformity of the x-ray beam intensity of a linear accelerator can be accomplished by the use of a: 8:55
  - A. Bending magnet
  - B. Klystron
  - C. Flattening filter
  - D. Scattering foil

11. The emission of beta particles from a cobalt 60 source is reduced by the use of (a): 8:62  
 A. Shadow tray C. Double layered steel capsules  
 B. Primary diaphragm D. Flattening filter
12. The production of high frequency sound waves which form electrical impulses employed in ultrasonic imaging systems is an accomplished process known as the:  
 A. Van deGraaf effect C. Modulation transfer effect  
 B. Piezoelectric effect D. Auger effect
13. When treating with a linear accelerator in the x-ray mode, the following will be in the electron beam's path:  
 1. Scattering foil 2. Flattening filter 3. Target  
 A. 1 & 2 only C. 2 & 3 only 8:55  
 B. 1 & 3 only D. 1, 2, & 3
14. A type of low (soft) energy x-ray generator producing x-rays below 20 kV is called a: 8:47  
 A. Kerma x-ray unit C. Barn x-ray unit  
 B. Granz x-ray unit D. Therma x-ray unit
15. Before operating a linear accelerator, which of the following should be determined? 22:25  
 1. Water pressure 2. Water level 3. Gas pressure  
 A. 1 only C. 3 only  
 B. 2 only D. 1, 2, & 3
16. When a Cobalt 60 teletherapy unit is employed, which of the following is a potential source of photon beam contamination? 8:62  
 1. Source itself 2. Source capsule 3. Source housing  
 A. 1 & 2 only C. 2 & 3 only  
 B. 1 & 3 only D. 1, 2, & 3
17. All of the following units use a timer to terminate radiation exposure, except 22:34  
 A. Superficial x-ray C. Cobalt 60  
 B. Orthovoltage x-ray D. Linear accelerator
18. Which of the following electron accelerators uses a klystron or magnetron for its microwave power source?  
 1. Microtron 2. Betatron 3. Linac  
 A. 1 & 2 only C. 2 & 3 only 8:59  
 B. 1 & 3 only D. 1, 2, & 3
19. The geometric penumbra for a 2.5cm diameter source at an 80cm SSD and a 40cm source to diaphragm distance and a depth of 10cm is 8:64  
 A. 1.09 C. 2.50  
 B. 1.25 D. 3.13
20. In a linear accelerator, the cathode is analogous to the. 8:53  
 A. Electron gun C. Tungsten target  
 B. Filament D. Anode
21. Which of the following will effect the output of a Cobalt 60 teletherapy machine? 8:62  
 A. Deficient source temperature C. Variation in the source half life  
 B. Incorrect target angle D. Incorrect decay correction factor

22. Because of the angular distribution of x-rays in megavoltage units, the most common target for these units is a: 8:41
- A. Hooded anode C. Low atomic number target  
 B. Transmission-type target D. Rotating anode

Pertaining to the diagram of the x-ray spectral distribution curve, answer question 23.



23. In the diagram of the x-ray spectral distribution curve of a tungsten target, the three peaks seen represent:
- A. K-edge absorption spectrum C. Brems x-ray production  
 B. Projectile electron energy D. Characteristic x-ray production
24. In a modern x-ray tube, the positively-charged electrode that serves as the target for the electron stream is the: 4:140
- A. Primary filament C. Anode  
 B. Secondary filament D. Cathode
25. The structure that provides the source of electrons injected into the accelerator structure of a linear accelerator is called the: 8:53
- A. Circulator C. Bending magnet  
 B. Electron gun D. Beam stopper
26. When treating with electron beam which of the following is moved off axis? 8:55
1. Target      2. Scattering foil      3. Flattening filter
- A. 1 & 2 only C. 2 & 3 only  
 B. 1 & 3 only D. 1, 2, & 3
27. In a traveling wave accelerator a backward reflection of the wave is prevented by a/an: 8:53
- A. Beam interceptor C. Terminating (dummy) load  
 B. Penumbra trimmer D. Insulation collector
28. Tungsten is the principal material used in the formation of the: 4:110
1. Target of a rotating anode      2. Target of a stationary anode      3. X-ray tube filament
- A. 1 only C. 3 only  
 B. 2 only D. 1, 2, & 3
29. The microwave cavities of the accelerator structure are constructed from: 8:53
- A. Lead C. Aluminum  
 B. Copper D. Steel

30. Which of the following gases can be used to pressurize the waveguide of a linear accelerator? 19:106
1. Hydrogen                      2. Helium                      3. Sulfur hexafluoride
- A. 1 only                                      C. 3 only  
B. 2 only                                      D. 1, 2, & 3
31. In the electron mode of a linear accelerator, spreading of the electron beam is accomplished by a thin metallic layer called (a): 8:55
- A. Scattering foil                                      C. Dispersion modulator  
B. Flattening foil                                      D. Circulator
32. The generation of relatively high potentials in the 300-2000 kV range were first made possible by the use of a/an: 8:51
- A. Autotransformer                                      C. Resonant transformer  
B. 3-phase transformer                                      D. Step-down transformer
33. In order to monitor the output of a treatment beam with an ionization chamber, the monitor chamber should be placed entirely within the beam: 8:55
- A. Before the collimator                                      C. On the skin surface  
B. Below the collimator                                      D. Below the patient
34. Which is the proper sequence of materials traveled by the x-ray beam of a linear accelerator? 8:55
1. Primary collimator                      2. Ion chamber                      3. Flattening filter
- A. 1, 2, 3                                      C. 3, 1, 2  
B. 3, 2, 1                                      D. 2, 3, 1
35. The negative electrode of an x-ray tube is commonly called the: 8:36
- A. Filament                                      C. Target  
B. Anode                                      D. Diaphragm
36. In a linear accelerator (Linac), the treatment head contains the: 8:55
1. X-ray target                      2. Flattening filter                      3. Collimator
- A. 1 & 2 only                                      C. 2 & 3 only  
B. 1 & 3 only                                      D. 1, 2, & 3
37. To increase the uniform intensity of the x-ray beam of a megavoltage unit, a/an \_\_\_\_\_ is usually employed. 8:55
- A. Compensating filter                                      C. Flattening filter  
B. Ion chamber                                      D. Scattering foil filter
38. The material most suitable for the reduction of electron contamination in megavoltage units is: 8:283
- A. Copper/Barium                                      C. Lucite/Tin  
B. Lead/Tungsten                                      D. Helium/water
39. The major process by which x-rays are produced in a linear accelerator is termed 8:54
- A. Photo-disintegration                                      C. Inductance  
B. Fluctuance                                      D. Bremsstrahlung
40. When a contact therapy unit is employed, the low energy components of the x-ray beam are filtered by the use of about: 8:48
- A. .5-1 mm Al                                      C. 1-3mm Cu  
B. 3-6 mm Sn                                      D. .5-1mm Pb

41. The large leaded, steel shell that serves to house the treatment isotope in a teletherapy unit is called the: 8:62  
 A. Primary interceptor C. Resonant cavity  
 B. Source head D. Beam extractor
42. Which of the following sections of the linear accelerator must be gas-evacuated to insure its proper operation? 8:53  
 A. Electron gun C. Accelerator tube  
 B. Magnetron D. Treatment head
43. In order to prevent the movement of electrons from the anode to the cathode during the exposure cycle, the type of current employed for x-ray tubes is: 4:129  
 A. Space charge limited current C. Fully rectified direct current  
 B. Single phase alternating current D. Three phase alternating current
44. The modulator of a linear accelerator includes the: 8:53  
 1. Pulse forming network 2. Hydrogen thyratron 3. Electron gun  
 A. 1 & 2 only C. 2 & 3 only  
 B. 1 & 3 only D. 1, 2, & 3
45. In order to precisely regulate the output of a linear accelerator, it should be checked at least once a year to determine: 15:74  
 1. Radiation quality 2. Radiation quantity 3. Timer accuracy  
 A. 1 only C. 3 only  
 B. 2 only D. 1, 2, & 3
46. The difference in charge between the cathode and anode during an x-ray exposure is termed the: 4:150  
 A. Power gradient C. Intensity factor  
 B. Space charge D. Potential difference
47. The type of therapy unit that is most likely operated at a tube current of 10-20 mA and 150-200 kV potential is a/an: 8:49  
 A. Grenz x-ray unit C. Contact x-ray unit  
 B. Orthovoltage x-ray unit D. Supervoltage x-ray unit
48. The control panel for a megavoltage therapy treatment unit must have a visual display for the: 17:125  
 A. Operating voltage C. Patient set up parameters  
 B. Line voltage fluctuation D. Back scatter factor
49. The proper sequence of materials traveled by an electron in the electron therapy mode of a linear accelerator is: 8:55  
 1. Ion chamber 2. Scattering foil 3. Collimator shutter  
 A. 1, 2, 3 C. 3, 2, 1  
 B. 2, 1, 3 D. 3, 1, 2
50. Failure of which of the following may effect the output energy of a linear accelerator in the x-ray beam mode? 19:106  
 1. Ion chambers 2. Dual foil device 3. Electron gun  
 A. 1 only C. 3 only  
 B. 2 only D. 1, 2, & 3

