

## Nuclear Medicine and Radiotherapy

### 1. Nuclear medicine

- (a) The field involving the clinical use of sealed radionuclides.
- (b) The field involving the clinical use of non-sealed radionuclides.
- (c) The field involving the non-ionizing radiations.
- (d) A branch in which ionizing radiation is used to treat malignant diseases.

**Ans. (b).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

### 2. How many artificial radionuclides are as on date?

- (a) 114
- (b) 3900
- (c) 18000
- (d) 2500

**Ans. (d).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

### 3. $^{99m}\text{Tc}$ is obtained from

- (a)  $^{99}\text{Mo}$
- (b)  $^{67}\text{Ga}$
- (c)  $^{111}\text{In}$
- (d)  $^{125}\text{I}$

**Ans. (a).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

### 4. Which radionuclide is an ideal radionuclide and accounts for over 70% in nuclear imaging?

- (a)  $^{131}\text{I}$
- (b)  $^{99}\text{Mo}$
- (c)  $^{99m}\text{Tc}$
- (d)  $^{201}\text{Tl}$

**Ans. (c).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

5.  $^{99m}\text{Tc}$  has a half-life of

- (a) 128 days (b) 2.5 hr  
(c) 6 hr (d) 2 days

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

6.  $^{99m}\text{Tc}$  release \_\_\_\_\_ gamma rays.

- (a) 50% (b) 88%  
(c) 95% (d) 99%

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

7. Iodine has a half life of

- (a) 6 hr (b) 8.06 days  
(c) 128 days (d) 23 hr

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

8. Iodine decays by

- (a) Electron capture (b) Isomeric transition  
(c) Beta emission (d) Alpha emission

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

9. Iodine gives a whole body dose of

- (a) 0.2 to 0.6 mrad/mCi (b) 0.5 to 3.5 rad/mCi  
(c) 2 to 4.8 rad/mCi (d) 7 to 12 rad/mCi

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

10. The time required for a radionuclide to decay to half of its original activity is known as

- (a) Decay constant (b) Half life  
(c) Curie (d) Activity

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

11. The relation between the effective biological and physical half life is

- (a)  $T_e = T_b + T_{1/2}$  (b)  $T_e = T_b^2 + T_{1/2}^2$   
(c)  $1/T_e = 1/T_b + 1/T_{1/2}$  (d)  $T_e^2 = T_b + T_{1/2}$

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**12. The detector efficiency is expressed in**

- (a) Efficiency = number of photons detected  $\times$  number of photons emitted
- (b) Efficiency = number of photons detected / number of photons emitted
- (c) Efficiency =  $\sqrt{\text{number of photons detected}} / \sqrt{\text{number of photons emitted}}$
- (d) Efficiency = number of photons emitted / number of photons detected

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**13. In technetium generator \_\_\_\_\_ is passed through the column to remove (elute)  $\text{Tc}^{99\text{m}}$ .**

- (a) weak HCl (0.2%)
- (b) strong NaOH (0.2%)
- (c) isotonic saline (0.9%)
- (d) distilled water

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**14. Which of the following is used in PET?**

- (a) NaI:Tl
- (b)  $\text{Bi}_4\text{Ge}_3\text{O}_{12}$
- (c)  $\text{CaWO}_4$
- (d) Xenon

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**15. The atomic number of bismuth is**

- (a) 83
- (b) 4
- (c) 74
- (d) 131

*Ans. (a). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**16. PMT supply**

- (a) 150–250 volts power
- (b) 350–800 volts power
- (c) 800–1200 volts power
- (d) 1200–1800 volts power

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**17. In MCA, when the acquisition of a spectrum begins, the entire channel is set to**

- (a) Zero
- (b) Negative
- (c) Positive
- (d) None of the above

*Ans. (a). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**18. DTPA**

- (a) Di Triamine Penta Amine acid
- (b) Diethylene Triamine Penta Acetic acid
- (c) Dicyclo Tetraamine Penta Acetic acid
- (d) None of the above

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**19. Radioiodine is used for**

- (a) Liver scanning
- (b) Bone scanning
- (c) Thyroid scanning
- (d) Lung scanning

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**20. Radioiodine-labelled hippuran is used to evaluate**

- (a) Thyroid function
- (b) Kidney function
- (c) Heart function
- (d) Liver function

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**21. For lung perfusion imaging, which of the following is used?**

- (a) Cr-51
- (b) In-111
- (c) Ga-67
- (d) Xe-133

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**22. Gamma scintillation camera was developed by**

- (a) Macovski
- (b) Hookes
- (c) Dandy Walker
- (d) Haloanger

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**23. Which of the following is not a radiopharmaceutical localization mechanism?**

- (a) Diffusion
- (b) Phagocytosis
- (c) Capillary blockage
- (d) Elution

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**24. PET scanners detect**

- (a) Positron of the same energy in coincidence.
- (b) Positrons and electrons in coincidence.
- (c) Photons of different energies in coincidence.
- (d) Annihilation photons in coincidence.

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 626-631.*

**25. The best radionuclide spatial resolution is normally achieved by using**

- |           |                                 |
|-----------|---------------------------------|
| (a) SPECT | (b) High resolution collimator  |
| (c) PET   | (d) High sensitivity collimator |

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 626-631.*

**26. In which year gamma camera was developed?**

- |          |          |
|----------|----------|
| (a) 1914 | (b) 1950 |
| (c) 1976 | (d) 1984 |

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**27. NaI crystals are coupled with**

- |         |         |
|---------|---------|
| (a) PHA | (b) SCA |
| (c) ADC | (d) PMT |

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**28. Why crystals and PMT are coupled together?**

- (a) To reduce patient dose.
- (b) To reduce geometric unsharpness.
- (c) To decrease artifact.
- (d) To improve light transmittance.

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**29. In SPECT, which of the following collimators is used?**

- |                           |                          |
|---------------------------|--------------------------|
| (a) Converging collimator | (b) Diverging collimator |
| (c) Parallel collimator   | (d) Fan beam collimator  |

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**30. Positron annihilation produces two photons of energy**

- |             |              |
|-------------|--------------|
| (a) 104 keV | (b) 232 keV  |
| (c) 511 keV | (d) 1022 keV |

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**31. ACD**

- (a) Analog to Digital Converter
- (b) Annihilation Coincidence Detection

- (c) Automatic Converter Device
- (d) Direct Amplitude Converter

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 486-515.*

**32. Which of the following radiopharmaceuticals is used in PET for metabolism study?**

- (a)  $^{13}\text{N}$
- (b)  $^{18}\text{F}$
- (c)  $^{15}\text{O}$
- (d)  $^{11}\text{C}$

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 626-631.*

**33. The major limitation of PET is**

- (a) More radiation to patient
- (b) More sensitive to humidity
- (c) The large cost of building
- (d) All of the above

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 626-631.*

## RADIOTHERAPY

**34. Radiation therapy is a branch of medicine in which**

- (a) Non-ionizing radiations are used to treat malignant diseases.
- (b) Ionizing radiations are used to treat malignant diseases.
- (c) Non-sealed radionuclides are used.
- (d) None of the above

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**35. Grenz-ray therapy is mainly used for**

- (a) Deep therapy
- (b) Internal therapy
- (c) Extremities conditions
- (d) Dermatological conditions

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**36. Grenz-ray therapy provides**

- (a) Soft X-rays
- (b) Hard X-rays
- (c) Very hard X-rays
- (d) All of the above

*Ans. (a). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**37. Superficial therapy unit is operated at \_\_\_\_\_ potential.**

- (a) 50–150 kV<sub>p</sub>
- (b) 20–30 kV<sub>p</sub>
- (c) 150–250 kV<sub>p</sub>
- (d) 250–500 kV<sub>p</sub>

*Ans. (a). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 38. X-ray machines, which are operated at a potential of 150–500 kV<sub>p</sub> are known as**

(a) Simulator (b) Telecobalt  
(c) Orthovoltage unit (d) Kilovoltage unit

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 39. Orthovoltage unit is also known as**

(a) Simulator (b) Deep therapy units  
(c) Kilovoltage unit (d) Telecobalt unit

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 40. In deep therapy X-ray tube, when the filament is heated, \_\_\_\_\_ are emitted.**

(a) Positron (b) Electron  
(c) Neutron (d) All of the above

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 41. To achieve proper cooling the entire X-ray tube should be**

(a) Used at low potential (b) Placed in coal place  
(c) Used one day in a week (d) Immersed in oil

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 42. The leakage radiation at 1 metre from the centre of the source must be less than**

(a) 0.0013 mR/hr (b) 0.5 mR/hr  
(c) 0.89 mR/hr (d) 2 mR/hr

*Ans. (d). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

- 43. The shielding materials should have**

(a) Low atomic number  
(b) High atomic number  
(c) Maximum unpaired number of electrons  
(d) Maximum thickness

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**44. Collimators is a device, which**

- (a) Brings the source in the front of an opening.
- (b) Is used to control size and shape of the beam.
- (c) Is used to absorb scatter and secondary radiation.
- (d) All of the above

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**45. Collimator is made-up of**

- (a) Aluminium
- (b) Lead
- (c) Tungsten
- (d) Nickle

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**46. The first LINAC was designed in**

- (a) 1930
- (b) 1928
- (c) 1989
- (d) 1978

*Ans. (b). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**47. A set of isodose curve is known as**

- (a) Scatter air ratio
- (b) Tissue phantom ratio
- (c) Isodose chart
- (d) Isodose family

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**48. The aim of treatment planning is**

- (a) To deliver optimum uniform dose to the target volume.
- (b) To deliver optimum uniform dose to the treated volume.
- (c) To deliver optimum uniform dose to the normal volume.
- (d) All of the above

*Ans. (a). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**49. Low melting alloy is also known as**

- (a) Weak metal
- (b) Phantom
- (c) Lipowitz metal
- (d) None of the above

*Ans. (c). Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**50. Lipowitz material consists of**

- 1. Bismuth
- 2. Lead
- 3. Tin
- 4. Cadmium



- (a) 1, 2 (b) 1, 3  
(c) 1, 4 (d) 1, 2, 3, 4

**Ans. (d).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**51. Cesium-137 has a half-life of**

- (a) 5.6 years (b) 30 years  
(c) 73.8 days (d) 2.7 days

**Ans. (b).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**52. LDR**

- (a) Local Distance Ratio (b) Low Dose Rate  
(c) Less Dose Recorder (d) None of the above

**Ans. (b).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**53. Telecobalt therapy units are performed in**

- (a) A half shielded room (b) A full shielded room  
(c) A partial shielded room (d) No need for shielded room

**Ans. (b).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*

**54. Which of the following methods is usually used to calculate treatment time?**

- (a) Percentage depth dose (b) Tissue air ratio  
(c) Back scatter factor (d) Scatter air ratio

**Ans. (a).** *Textbook of Radiology for Residents & Technicians, 5th ed., S.K. Bhargava & Sumeet Bhargava, p. 537-577.*