1. The power generating unit of a cell is :
   (A) Mitochondria (B) Endoplasmic reticulum
   (C) Golgi complex (D) Centrosome

2. The white blood corpuscle which has multiple lobes is :
   (A) Basophil (B) Lymphocyte (C) Neutrophil (D) Eosinophil

3. Highest area for perception of visual sensation is :
   (A) Frontal lobe (B) Occipital lobe (C) Parietal lobe (D) Temporal lobe

4. Bowman's capsule is located in :
   (A) Kidney (B) Eye (C) Liver (D) Heart

5. Caseating granuloma is feature of :
   (A) Pneumonia (B) Typhoid (C) Leptospirosis (D) Tuberculosis

6. The caloric value of carbohydrate is :
   (A) 2 Kcal/kg (B) 4 Kcal/kg (C) 6 Kcal/kg (D) 9 Kcal/kg

7. Right ventricle pumps blood into :
   (A) Aorta (B) Pulmonary vein
   (C) Superior vena cava (D) Pulmonary artery

8. Outermost coat of blood vessel is :
   (A) Tunica media (B) Tunica albuginia
   (C) Tunica intima (D) Tunica adventitia

9. Sensation mediated by nociceptors is :
   (A) Touch (B) Temperature (C) Pain (D) Vibration

10. Acromegaly is due to excess secretion of :
   (A) ACTH (B) TSH
   (C) Growth hormone (D) Prolactin

11. Curie is the unit of :
   (A) Energy of gamma rays (B) Half life
   (C) Radioactivity (D) Intensity of X-rays

12. Ways of hardening the X-ray beam :
(A) Using filtration
(B) Increasing the voltage
(C) Both of the above
(D) None of the above

13. Thermions are :
(A) Protons (B) Electrons (C) Photons (D) Positrons

14. Isotopes are atoms having :
(A) Same number of protons, but different number of neutrons
(B) Same number of neutrons, but different number of protons
(C) Same number of protons and neutrons
(D) None of the above

15. Advantages of cancer screening include the following except :
(A) Reduction in mortality
(B) Reduced number of patients requiring radical treatment
(C) Over diagnosis of non-progressive lesions
(D) Reassurance of patients whose screening test is negative

16. Permissible annul radiation exposure limit for a radiation worker is :
(A) 1 mSv (B) 10 mSv (C) 20 mSv (D) 100 mSv

17. Which of the following is **not** a mode of radioactive decay ?
(A) Nuclear fusion
(B) Positron emission
(C) Electron capture
(D) Alpha decay

18. The definitive treatment of gastric cancer is :
(A) Surgery
(B) Chemotherapy
(C) Radiotherapy
(D) Hormone therapy

19. Alpha rays emitted from a radioactive substance are :
(A) Uncharged particles
(B) Mass and charge equal to that of a proton
(C) Negatively charged particle
(D) Doubly ionized Helium atom

20. A radioisotope has a half life of 75 years. The fraction of atoms of this element that will decay in 150 years will be :
(A) 75% (B) 66.6% (C) 83.5% (D) 25%

21. The target material in an X-ray tube must have :
(A) High atomic number (B) Low melting point
(C) High mass number (D) High cost

22. Radionuclides are produced by :
(A) Nuclear fission (B) Nuclear reactor
(C) Cyclotron (D) All of the above

23. Background radiation is contributed by the following **except** :
(A) Terrestrial radiation (B) Cosmic radiation
(C) Ultraviolet rays (D) Radioactive elements in our body

24. All are teletherapy sources **except** :
(A) Cobalt 60 (B) Cesium 137 (C) Iridium 192 (D) Radium 226

25. The following are electromagnetic radiation **except** :
(A) Characteristic radiation (B) Beta radiation
(C) Bremsstrahlung radiation (D) Annihilation radiation

26. Interactions of photons with matter include all **except** :
(A) Pair production (B) Leakage radiation
(C) Photoelectric effect (D) Compton scattering

27. X-ray beam quality depends on the :
(A) Accelerating voltage (B) Target material
(C) Inherent filtration (D) All of the above

28. D max for Cobalt 60 gamma rays is :
(A) 1.33 cm (B) 1.17 cm (C) 0.5 cm (D) 1.5 cm

29. Personal monitoring devices include all **except** :
(A) TLD (B) Film badge (C) Gun monitor (D) Pocket dosimeter

30. Advantage of diagnostic ultrasound over CT scan :

(A) No harmful side effects (B) Relatively cheap

(C) Non-invasive (D) All of the above

31. Gamma rays are deflected in :

(A) Magnetic field, but not in electric field

(B) Electric field, but not in magnetic field

(C) Both magnetic and electric fields

(D) Neither magnetic nor electric fields

32. A radiotherapy simulator :

(A) Uses X-rays for imaging (B) Uses Gamma rays for therapy

(C) Is a brachytherapy machine (D) All of the above

33. Radiographic film is coated with gelatine layer containing :

(A) Silver halide crystals (B) Silver sulphide crystals

(C) Both of the above (D) None of the above

34. Radioisotopes used in brachytherapy include all **except** :

(A) Iodine 131 (B) Cesium 137

(C) Gold 198 (D) Radium 226

35. Beta rays emitted by a radioactive material are :

(A) Neutral particles

(B) Electrons orbiting around the nucleus

(C) Charged particles emitted by nucleus

(D) Electromagnetic radiations

36. Which of the following uses Gamma rays ?

(A) Simulator (B) Brachytherapy with iridium 192

(C) LINAC (D) IMRT

37. Principles of radiation protection include all **except** :

(A) Time (B) Distance (C) Shielding (D) Monitoring

38. In photoelectric emission, the velocity of electrons ejected from near the surface is :

(A) Same as those coming from interior of metal

(B) Less than those coming from interior of metal

(C) Larger than those coming from interior of metal

(D) None of the above

39. Radiation detecting instrument used in Nuclear Medicine :

(A) Gamma knife (B) Gamma camera

(C) Gamma zone monitor (D) Cyber knife

40. Isotope of iodine used in PET :

(A) I-123 (B) I-124 (C) I-127 (D) I-131

41. The half life of a radioactive element depends upon :

(A) Amount of element present (B) Temperature

(C) Pressure (D) None of the above

42. Mantle field radiotherapy is used in :

(A) Hodgkin's lymphoma (B) Non-Hodgkin's lymphoma

(C) Breast cancer (D) Thyroid cancer

43. Scintillation crystals used in clinical PET imaging include all **except** :

(A) Bismuth germanium oxide (BGO)

(B) Gadolinium oxyorthosilicate (GSO)

(C) Sodium iodide (Thallium)

(D) Lutetium oxyorthosilicate (LSO)

44. A moderator is used in Nuclear Reactor in order to :

(A) Accelerate the neutrons

(B) Slow down the speed of neutrons

(C) Increase the number of neutrons

(D) Decrease the number of neutrons

45. Pure Beta emitters include all except :
(A) Phosphorous 32
(B) Iodine 123
(C) Yttrium 90
(D) Strontium 89

46. Dose of palliative radiotherapy for brain metastases :
(A) 30 Gy in 10 fractions
(B) 40 Gy in 10 fractions
(C) 60 Gy in 30 fractions
(D) None of the above

47. Non-stochastic effect of radiation :
(A) Epilation
(B) Carcinogenesis
(C) Genetic effect
(D) All of the above

48. Cobalt 60 is produced from Cobalt 59 by :
(A) Proton bombardment
(B) Deuteron bombardment
(C) Neutron bombardment
(D) Electron bombardment

49. X-ray photons produced by an X-ray machine are :
(A) Heterogeneous in energy
(B) Homogeneous in energy
(C) Both of the above
(D) None of the above

50. Radioactivity is :
(A) An irreversible process
(B) Self disintegrative process
(C) Spontaneous
(D) All of the above

51. Linear accelerator is used in :
(A) Contact therapy
(B) Superficial therapy
(C) Teletherapy
(D) Grenz-Ray therapy

52. Which among the following is an electron accelerator ?
(A) Microtron
(B) Betatron
(C) Linear Accelerator
(D) All of the above

53. Bragg peak characteristic is utilized in :
(A) Proton therapy
(B) Neutron therapy
(C) Megavoltage therapy
(D) Electron therapy

54. Phase of cell cycle most sensitive to radiation :

(A) M phase (B) G1 phase (C) S phase (D) G2 phase

55. Directly ionizing radiation include :

(A) Photons (B) Electrons (C) Neutrons (D) None of the above

56. Photoelectric attenuation is :

(A) Directly proportional to the cube of atomic number

(B) Directly proportional to the square of atomic number

(C) Inversely proportional to the square of atomic number

(D) Inversely proportional to the cube of mass number

57. Minimum energy required for pair production :

(A) 0.51 MeV (B) 1.02 MeV (C) 10.2 Mev (D) 1.02 KeV

58. Electron interact with matter by :

(A) Ionization (B) Excitation

(C) Both of the above (D) None of the above

59. Ideal radionuclide for imaging should be :

(A) Monoenergetic (B) Having short half life

(C) Pure Gamma emitter (D) All of the above

60. Indirectly ionizing radiation include :

(A) X-rays (B) Gamma rays (C) Neutrons (D) All of the above

61. The unit of exposure is :

(A) Curie (B) Roentgen (C) RAD (D) Gray

62. Bolus is often used in electron beam therapy to :

(A) Flatten out an irregular surface

(B) Reduce the penetration of electrons in parts of the field

(C) Increase the surface dose

(D) All of the above

63. Which among the following is **not** a permanent implant ?

(A) Palladium 103 (B) Iodine 125 (C) Iridium 192 (D) Gold 198

64. Curable cancers include all **except** :

(A) Carcinoma of vocal cord

(B) Seminoma testis

(C) Metastatic pancreatic carcinoma

(D) Lymphoma

65. The following are brachytherapy applications **except** :

(A) Surface mold (B) Interstitial therapy

(C) Intraoperative therapy (D) Intracavitary therapy

66. Output of an X -ray machine is :

(A) Proportional to kilovoltage

(B) Proportional to square of kilovoltage

(C) Inversely proportional to square of kilovoltage

(D) None of the above

67. Quality factor (radiation weighting factor) for Alpha particle is :

(A) 1 (B) 4 (C) 5 (D) 20

68. Radiation Hormesis is :

(A) Beneficial effect of radiation

(B) Terratogenic effect of radiaton

(C) Radiation protection parameter

(D) None of the above

69. Which among the following is stochastic effect of radiation ?

(A) Fibrosis
(B) Cataract
(C) Genetic effect
(D) Decrease in sperm count

70. Treatment of choice for small cell lung cancer :

(A) Surgery
(B) Radiotherapy
(C) Chemotherapy
(D) Hormonal therapy

71. NCRP recommended annual radiation exposure limit for trainee radiation worker :

(A) 1 mSv (B) 5 mSv (C) 20 mSv (D) 50 mSv

72. Detectors most often used for X-ray measurements are :

(A) Ionization chamber
(B) Geiger counter
(C) Thermo Luminescent Dosimeter (TLD)
(D) All of the above

73. Spread of cancer occur by the following ways :

(A) Local invasion
(B) Lymphatic spread
(C) Haematogenous spread
(D) All of the above

74. Output of an X-ray machine :

(A) Increases with tube current
(B) Decreases with voltage
(C) Increases with filtration
(D) None of the above

75. Compton interaction is :

(A) Directly proportional to the square of atomic number
(B) Inversely proportional to the cube of atomic number
(C) Independent of atomic number
(D) None of the above

76. Highly radiosensitive tissue among the following is :

(A) Muscle (B) Bone (C) Epidermis (D) Nerve

77. Cancer of which among the following organs is likely to spread to bone ?
(A) Lip (B) Nasopharynx (C) Tongue (D) Maxilla

78. Radioiodine is used in the treatment of all **except** :
(A) Differentiated thyroid cancer (B) Medullary thyroid cancer
(C) Grave's disease (D) Multinodular goitre

79. PET scan :
(A) Is used in staging evaluation of lymphoma
(B) Is expensive
(C) ^{18}F-FDG is the tracer used
(D) All of the above

80. In radioactive equilibrium :
(A) The parent and daughter elements are stable
(B) The parent element is radioactive, the daughter is always stable
(C) The parent and daughter nuclide will decay at the same rate
(D) None of the above

81. The approximate energy of the radiation emitted from tungsten target when an electron falls from M shell to the K shell is :
(A) 70 KeV (B) 59 KeV (C) 67.5 KeV (D) 8.5 KeV

82. Isomers are :
(A) Atoms with same atomic number, different number of neutrons
(B) Atoms with same number of neutrons, different atomic number
(C) Atoms with same mass number, different number of neutrons
(D) Atoms with same mass number, same atomic number, different number of nuclear energy levels

83. In photon beam interaction with matter the process in which there is no net loss of energy is :
(A) Coherent scattering (B) Photo electric effect
(C) Compton effect (D) Pair production

84. The unit of KERMA is :
(A) Roentgen (B) Gray (C) Sievert (D) Joule

85. Most commonly used radioactive source in modern brachytherapy is :

(A) Ra-226 (B) Ir-192 (C) I-131 (D) Tc 99^m

86. The annual dose limit for general public as per Atomic Energy Regulatory Board (AERB) guideline is :

(A) 20 mSv (B) 5 mSv (C) 1 mSv (D) 2 mSv

87. The emulsion in a radiographic film contains :

(A) Caesium halide crystals (B) Calcium tungstate crystals

(C) Silver halide crystals (D) Silver atoms

88. When grids are used in radiography, the radiation dose to the patient :

(A) increases (B) decreases

(C) may or may not increase (D) remains same

89. In mammography the filter material used is :

(A) Aluminium (B) Tungsten (C) Copper (D) Molybdenum

90. The principle of Photostimulable phosphor luminescence is used in :

(A) Computed Radiography (CR) (B) Digital Radiography (DR)

(C) Image Intensifier (D) Darkroom Fluoroscopy

91. Among the following, which is **not** a component of Image Intensifier tube :

(A) Input screen (B) Photomultiplier tube

(C) Photo cathode (D) Output screen

92. The factor which does **not** affect subject contrast is :

(A) Tissue density (B) KVp (C) Atomic number (D) mA

93. Protective apron used by radiation workers in radiography should have a minimum lead equivalence of :

(A) 0.5 mm lead (B) 1 mm lead (C) 2 mm lead (D) 0.25 mm lead

94. The TLD badges used in India are made from :

(A) $CaSo_4$: Dy (B) LiF (C) $La_2B_4O_7$ (D) CaF_2 : Mn

95. A Co-60 source is having an activity of 10000 Ci. What will be its activity after an interval of time equal to its average life ?

(A) 2369 Ci (B) 100 Ci (C) 5000 Ci (D) 10000 Ci

96. A photon of 2.5 MeV undergoes pair production. The pair of electron and positron possesses equal kinetic energy of :

(A) 1.25 MeV each (B) 0.74 MeV each (C) 2.5 MeV each (D) 1.48 MeV each

97. What is the approximate ratio of bremsstrahlung to characteristic radiation coming out of an X-ray tube with tungsten target if it is operated at 70 KVp ?

(A) 1 : 1 (B) 1 : 0 (C) 0 : 1 (D) 1 : 10

98. Adjacent regions of a radiograph have optical densities of 1.0 and 2.0. The differences in the transmission of light through these two regions are :

(A) 1% and 2% (B) 1% and 0.5% (C) 10% and 20% (D) 10% and 1%

99. Ultrasound waves are propagated through tissue as :

(A) Transverse waves (B) Electromagnetic waves

(C) Longitudinal waves (D) Electrical waves

100. Noise in a radiographic film is **not** caused by :

(A) Quantum mottle (B) Focal spot size

(C) Film graininess (D) Structure mottle

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