КЫРГЫЗ РЕСПУБЛИКАСЫНЫН БИЛИМ БЕРҮҮ ЖАНА ИЛИМ МИНИСТРЛИГИ
ОШ МАМЛЕКЕТТИК УНИВЕРСИТЕТИ
ЭЛ АРАЛЫК МАТЕМАТИКА ФАКУЛЬТЕТИ
ТАБИГЫЙ ИЛИМДЕР ЖАНА МАТЕМАТИКА КАФЕДРАСЫ

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дисциплинасы үчүн

ТЕСТТИК ТАПШЫРМАЛАР ФОНДУ

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Ош, 2025

B) Therapeutic and Diagnostic
C) Diagnostic and Surgical
D) Diagnostic and Rehabilitative

2. What surgical functions are performed by the diathermy machine?
   A) Cutting, coagulation, fulguration **(Correct)**
   B) Cutting, fulguration
   C) Cutting, coagulation
   D) Coagulation, fulguration

3. The types of therapeutic diathermy machines that exist are _____
   A) Short wave, microwave and ultrasound **(Correct)**
   B) Short wave, ultrasound and cold compress
   C) Cold compress, microwave and electrical impulse
   D) Electrical impulse, microwave and ultrasound

4. Which of the diathermy machine is good for deep tissue healing?
   A) Short wave **(Correct)**
   B) Ultrasound
   C) Cold compress
   D) Electrical impulse

5. What is the frequency range of the sound used for ultrasound diathermy?
   A) 0.1 – 0.7 MHz
   B) 0.7 – 3.3 MHz **(Correct)**
   C) 3.3 – 5 MHz
   D) 5 – 15 MHz

6. What precaution is used in diathermy?
   A) The patient is made to lie on a soft pillow
   B) Pads are used for grounding and completing the circuit **(Correct)**
   C) The patient is made to drink a large number of fluids
   D) Wooden blocks are used for grounding

7. In heat wave diathermy, the maximum power given out is 500 W and the maximum voltage possible is 4000V. Thus, what is the highest resistance that heat wave diathermy machine can deal with?
   A) 3.2 K ohm
   B) 32 K ohm **(Correct)**
   C) 320 K ohm
   D) 3200 K ohm

8. Which of the following is used to measure the biological damage caused by radiation?
   A) Curie
   B) Rem **(Correct)**

C) Rad
D) Roentgens

9. Beyond what dose does the cerebral system show signs of failure?
A) 25 – 200 rad
B) 200 – 600 rad
C) 600 – 1000 rad
D) > 1000 rad **(Correct)**

10. What is the relation between 1 Rad, 1 Rem and 1 R?
A) 1 Rad ≈ 1.5 Rem ≈ 1000 R
B) 1 Rad ≈ 10 Rem ≈ 1.8 R
C) 1 Rad ≈ 1 Rem ≈ 1 R **(Correct)**
D) 1 Rad ≈ 10 Rem ≈ 100 R

11. The two known units of radioactivity and the relation between the two are _____
A) Curie and Becquerel 1 Ci = 3.7 x 10^{10} Bq **(Correct)**
B) Curie and Becquerel 1 Bq = 3.7 x 10^{10} Ci
C) Curie and Roentgens 1 Ci = 1000 R
D) Roentgen and Becquerel 1 R = 1000 Bq

12. In a hypothetical radioactive material, the total number of active photons are 20000 and the decay constant is found out to be 4.916×10^{-17} per second. How much of the material will be left in 100 years?
A) 1589.99999
B) 19,999.9999 **(Correct)**
C) 19.999999
D) 123.99999

13. If the half-life is found to be 100 msec, what is the decay constant?
A) 693 per second
B) 24948 per hour **(Correct)**
C) 0.1155 per minute
D) 59875.2 per day

14. With what energy must the radiation be given to image a bone of thickness 5 cm which has covering of skin of thickness of 2 cm on both sides and the emerging intensity of the X-ray is 200 MeV?
A) 2000e9
B) 200e(4s + 5B) **(Correct)**
C) 20/e
D) 2e

15. In the induction field diathermy, the heating effects are done by
A) Using magnetic field
B) Induce an electrical current within body parts

C) Using an electric field **(Correct)**
D) Made of metal that is shaped into a coil

16. A low dielectric constant & conductivity is to
A) High water content, muscle, nerve, blood vessels, internal organs & moist skin
B) Low water content, bone, capsule, ligaments, fat, dry skin **(Correct)**
C) All of the above

17. A high dielectric constant & conductivity is to
A) High water content, muscle, nerve, blood vessels, internal organs & moist skin **(Correct)**
B) Low water content, bone, capsule, ligaments, fat, dry skin
C) All of the above

18. The electric field will
A) Converge onto substance with high dielectric constant **(Correct)**
B) Converge onto substance with low dielectric constant
C) Diverge within substances with high dielectric constant
D) Diverge within substances with low dielectric constant

19. The process of destroying cancer cells with the help of radiation is _____
A) Radiotherapy **(Correct)**
B) Physiotherapy
C) Uroplasty
D) Rehabilitation

20. Which of the following pair of scattering is important for diagnostic purposes?
A) Coherent and Compton
B) Photoelectric and Pair Production
C) Compton and Photoelectric **(Correct)**
D) Pair Production and Disintegration

21. Which technique separates charged particles using electric field?
A) Hydrolysis
B) Electrophoresis **(Correct)**
C) Protein synthesis
D) Protein denaturing

22. Electrophoresis was developed by:
A) Tswett
B) Tsvedberg
C) Tiselius **(Correct)**
D) Sanger

23. The speed of migration of ions in electric field depends upon:
A) Shape and size of molecule
B) Magnitude of charge, shape and mass of molecule **(Correct)**

C) Magnitude of charge and shape of molecule
D) Magnitude of charge and mass of molecule

24. Which of the following statements is true about migration of biomolecules?
A) The rate of migration is directly proportional to the resistance of medium
B) Rate of migration is directly proportional to current **(Correct)**
C) Low voltage is used for separation of high mass molecules
D) Rate of migration is inversely proportional to current

25. What does the electrophoresis apparatus consist of?
A) Gel, buffer chamber and fire pack
B) Buffer chamber and electrophoresis unit
C) Electrophoresis unit and gel separator
D) Power pack and electrophoresis unit **(Correct)**

26. If proteins are separated according to their electrophoretic mobility then the type of electrophoresis is:
A) SDS PAGE **(Correct)**
B) Affinity Electrophoresis
C) Electro focusing
D) Free flow electrophoresis

27. The electrophoretic mobility denoted as μ is mathematically expressed as:
A) VE
B) E/V
C) 1/EV
D) V/E **(Correct)**

28. Which of the following factors does not influence electrophoretic mobility?
A) Molecular weight
B) Shape of molecule
C) Size of molecule
D) Stereochemistry of molecule **(Correct)**

29. When is electrophoresis not used?
A) Separation of proteins
B) Separation of amino acids
C) Separation of lipids **(Correct)**
D) Separation of nucleic acids

30. What cannot be a reason for using electrophoresis?
A) Comparing two sets of DNA
B) Organizing DNA by shape of backbone **(Correct)**
C) Organizing DNA fragments from largest to smallest
D) Organizing DNA in order we can see

31. In electrophoresis, DNA will migrate towards
A) Cathode or positive electrode
B) Anode or negative electrode
C) Cathode or negative electrode
D) Anode or positive electrode **(Correct)**

32. The speed of migration of ions in an electric field depends on
A) Magnitude of charge and mass of molecules
B) Magnitude of charge, shape and mass of molecules **(Correct)**
C) Shape and size of the molecule
D) Magnitude of charge and shape of molecules

33. Which of the following statements is true regarding migration of biomolecules?
A) The rate of migration is directly proportional to the current **(Correct)**
B) The rate of migration is inversely proportional to current
C) The rate of migration is directly proportional to the resistance of the medium
D) Low voltage is used for the separation of high molecular weight compounds

34. The most common type of gel used for DNA separation is
A) Agar
B) Polyacrylamide
C) Agarose **(Correct)**
D) All of the above

35. Which is the technique suited for the separation of large DNA fragments
A) AGE
B) PAGE
C) PFGE **(Correct)**
D) SDS-PAGE

36. What is the role of SDS in SDS-PAGE?
A) Protein denaturing and imparting net negative charge **(Correct)**
B) Imparting overall negative charge to the protein
C) Imparting equal mass to all proteins
D) Protein unfolding and imparting net positive charge

37. In SDS-PAGE, separation is based on
A) Molecular weight **(Correct)**
B) Shape
C) Charge
D) All of the above

38. The electrophoresis technique that uses isoelectric focusing is
A) AGE
B) PFGE

C) 2D-PAGE **(Correct)**
D) SDS-PAGE

39. In agarose gel electrophoresis, DNA is moved towards the
A) Cathode **(Correct)**
B) Anode
C) DNA doesn't move
D) Moves slowly

40. A technique which separates charged particles using electric field is
A) Hydrolysis
B) Electrophoresis **(Correct)**
C) Protein synthesis
D) Protein denaturing

41. Sounds of frequency higher than 20,000 Hz which are inaudible to normal human ear are called
A) Noise
B) Frequency
C) Ultrasonics **(Correct)**
D) Amplitude

42. SONAR is abbreviation of
A) Small navigation and random
B) Sky navigation and ranging
C) Sun nuclear ranging
D) Sound navigation and ranging **(Correct)**

43. A ship sends ultrasound that returns from seabed and is detected after 3.42 s. If speed of ultrasound through seawater is 1300 m/s, then distance of seabed from ship would be
A) 3000 m
B) 2600 m **(Correct)**
C) 2200 m
D) 2800 m

44. Ultrasonic waves carry more
A) Energy
B) Frequency
C) Heat
D) Both frequency and energy **(Correct)**

45. Wavelength of ultrasonic waves is
A) More than audible sound
B) Less than audible sound
C) Equal to audible sound **(Correct)**
D) Greater than light wave

46. Ultrasound is also useful for _____ i. detecting fault in metal sheets ii. imaging marine depths iii. looking for metals beneath the earth's surface iv. detecting distances v. detecting earthquakes
A) ii, iii, v **(Correct)**
B) i, iv, v
C) i, ii, iv
D) ii, iii

47. What property of sound waves acts like the principle of ultrasound?
A) Reflection and Refraction
B) Reflection only
C) Refraction only **(Correct)**
D) Propagation

48. Which of the following medical imaging modality other than ultrasound does not use any form of radiation?
A) PET Scan
B) SPECT Scan
C) CT Scan
D) MRI **(Correct)**

49. For which of these areas can the ultrasound be taken for an infant but not for an adult?
A) Cranium **(Correct)**
B) Chest
C) Arms
D) Legs

50. A piezoelectric crystal is used to produce the ultrasound waves. What kind of ultrasound is produced?
A) Pressure wave ultrasound **(Correct)**
B) Electrical wave ultrasound
C) Sound wave ultrasound
D) Simple ultrasound

51. Piezoelectric crystal converts:
A) Mechanical energy into electrical energy **(Correct)**
B) Electrical energy into light energy
C) Sound energy into magnetic energy
D) Chemical energy into electrical energy

52. The range of frequency used for medical ultrasound is
A) 1–10 kHz
B) 20–200 kHz
C) 1–20 MHz **(Correct)**
D) 100–1000 MHz

53. Which of the following ultrasound type is used for deep tissue imaging?
A) Low frequency ultrasound **(Correct)**
B) High frequency ultrasound
C) Audible frequency ultrasound
D) Very high frequency ultrasound

54. Which phenomenon helps ultrasound to image internal body structures?
A) Refraction
B) Reflection **(Correct)**
C) Diffraction
D) Dispersion

55. Echogenicity in ultrasound imaging represents:
A) Tissue density
B) The ability of tissue to reflect ultrasound **(Correct)**
C) Blood flow
D) Tissue temperature

56. Doppler ultrasound is primarily used to measure:
A) Tissue elasticity
B) Blood flow **(Correct)**
C) Bone density
D) Muscle strength

57. In Doppler ultrasound, red shift indicates:
A) Flow towards the transducer
B) Flow away from the transducer **(Correct)**
C) No flow
D) Turbulent flow

58. Piezoelectric materials in ultrasound transducers are often made of:
A) Silicon
B) Quartz **(Correct)**
C) Iron
D) Copper

59. In ultrasound imaging, A-mode represents:
A) Amplitude vs time **(Correct)**
B) Angle vs distance
C) Area vs volume
D) Amplitude vs frequency

60. In ultrasound imaging, B-mode represents:
A) Brightness **(Correct)**
B) Blood velocity

C) Bone density
D) Bulk modulus

61. The resolution of ultrasound imaging depends on:
A) Wavelength **(Correct)**
B) Temperature
C) Electrical voltage
D) Tissue color

62. Which is the non-ionizing imaging technique?
A) X-ray
B) CT scan
C) MRI **(Correct)**
D) PET scan

63. MRI images are formed based on:
A) X-ray absorption
B) Nuclear magnetic resonance **(Correct)**
C) Ultrasound reflection
D) Gamma emission

64. The main contrast in MRI comes from:
A) Proton density and relaxation times **(Correct)**
B) Electron density
C) Gamma rays
D) Electrical conductivity

65. In T1-weighted MRI images, fat appears:
A) Dark
B) Bright **(Correct)**
C) Black
D) Grey

66. In T2-weighted MRI images, water appears:
A) Dark
B) Bright **(Correct)**
C) Black
D) Grey

67. CT scan imaging is based on:
A) Ultrasound reflection
B) X-ray attenuation **(Correct)**
C) Nuclear resonance
D) MRI

68. Which imaging modality uses positron emission?
A) SPECT

B) PET **(Correct)**
C) MRI
D) Ultrasound

69. Gamma camera in nuclear medicine detects:
A) Alpha particles
B) Beta particles
C) Gamma rays **(Correct)**
D) Neutrons

70. Ionizing radiation can damage tissues primarily by:
A) Heating
B) Ionization of molecules **(Correct)**
C) Pressure
D) Magnetism

71. The unit of absorbed dose in SI is:
A) Rad
B) Rem
C) Gray **(Correct)**
D) Curie

72. The unit of equivalent dose in SI is:
A) Gray
B) Sievert **(Correct)**
C) Roentgen
D) Curie

73. Which of the following is true about X-rays?
A) They are longitudinal waves
B) They are electromagnetic waves **(Correct)**
C) They are sound waves
D) They are mechanical waves

74. The typical energy range of X-rays used in diagnostic radiology is:
A) 0.1–0.5 keV
B) 1–150 keV **(Correct)**
C) 1–10 MeV
D) 0.01–0.1 keV

75. Coherent scattering is also called:
A) Rayleigh scattering **(Correct)**
B) Compton scattering
C) Photoelectric effect
D) Pair production

76. Compton scattering occurs when:
A) Low-energy photons interact with outer electrons **(Correct)**
B) High-energy photons are absorbed
C) Pair production happens
D) Coherent reflection occurs

77. Photoelectric effect in X-rays occurs predominantly with:
A) Low atomic number elements
B) High atomic number elements **(Correct)**
C) Gases only
D) Water

78. The main advantage of digital radiography over conventional film is:
A) Faster image acquisition **(Correct)**
B) Lower resolution
C) Higher radiation dose
D) Longer processing time

79. In fluoroscopy, real-time imaging is achieved using:
A) MRI
B) X-ray **(Correct)**
C) Ultrasound
D) Gamma camera

80. Lead shielding in X-ray rooms is used to:
A) Enhance image quality
B) Protect patients and staff from radiation **(Correct)**
C) Reduce noise
D) Focus X-rays

81. What does ALARA principle stand for?
A) As Low As Reasonably Achievable **(Correct)**
B) As Long As Radiation Accumulates
C) As Light As Radiant Area
D) As Low As Radiation Appears

82. The energy required to remove an electron from an atom is called:
A) Binding energy **(Correct)**
B) Kinetic energy
C) Potential energy
D) Thermal energy

83. Half-life of a radioactive substance is:
A) Time taken for activity to double
B) Time taken for activity to decrease by half **(Correct)**

C) Time taken for activity to disappear
D) Time taken for half the atoms to move

84. In gamma camera imaging, which isotope is commonly used?
A) Technetium-99m **(Correct)**
B) Iodine-131
C) Carbon-14
D) Radon-222

85. The resolution in MRI is mainly limited by:
A) Signal-to-noise ratio **(Correct)**
B) Wavelength of X-ray
C) Frequency of ultrasound
D) Gamma ray intensity

86. The main advantage of PET over SPECT is:
A) Higher resolution and quantification **(Correct)**
B) Lower cost
C) No radioactivity
D) No need for detectors

87. Radiation therapy mainly uses:
A) Ultrasound
B) X-rays and gamma rays **(Correct)**
C) MRI
D) PET

88. In radiotherapy, the target volume is defined as:
A) Volume of tumor **(Correct)**
B) Entire body
C) Volume of healthy tissue
D) Volume of organs only

89. Linear accelerator in radiotherapy produces:
A) High-energy X-rays **(Correct)**
B) Ultrasound
C) Gamma rays only
D) MRI signals

90. The Bragg peak is characteristic of:
A) X-ray beams
B) Proton beams **(Correct)**
C) Ultrasound waves
D) MRI signals

91. In electrophysiology, ECG measures:
A) Mechanical activity of the heart

B) Electrical activity of the heart **(Correct)**
C) Blood flow
D) Blood pressure

92. Standard ECG leads are:
A) 6
B) 12 **(Correct)**
C) 3
D) 9

93. In ECG, P wave represents:
A) Ventricular depolarization
B) Atrial depolarization **(Correct)**
C) Ventricular repolarization
D) Atrial repolarization

94. QRS complex in ECG represents:
A) Atrial depolarization
B) Ventricular depolarization **(Correct)**
C) Ventricular repolarization
D) Atrial repolarization

95. T wave in ECG represents:
A) Atrial depolarization
B) Ventricular depolarization
C) Ventricular repolarization **(Correct)**
D) Atrial repolarization

96. In EEG, alpha waves are predominant in:
A) Deep sleep
B) Relaxed wakefulness **(Correct)**
C) Active mental task
D) Epileptic seizure

97. Beta waves in EEG are associated with:
A) Relaxed state
B) Active thinking and alertness **(Correct)**
C) Sleep
D) Coma

98. ECG electrodes should be placed on:
A) Only chest
B) Chest and limbs **(Correct)**
C) Only limbs
D) Forehead

99. Electromyography (EMG) measures:
A) Brain electrical activity
B) Muscle electrical activity **(Correct)**
C) Heart electrical activity
D) Lung function

100. Bioimpedance measures:
A) Electrical resistance of body tissues **(Correct)**
B) Electrical activity of brain
C) Blood pressure
D) Heart rate

101. The basic principle of X-ray production involves:
A) Electron acceleration and sudden deceleration **(Correct)**
B) Proton emission
C) Neutron decay
D) Photon absorption

102. The energy of diagnostic X-rays is typically measured in:
A) Electronvolts (eV)
B) Kiloelectronvolts (keV) **(Correct)**
C) Megaelectronvolts (MeV)
D) Joules

103. Filtration in X-ray tubes is used to:
A) Increase patient dose
B) Remove low-energy X-rays **(Correct)**
C) Increase scatter
D) Decrease tube voltage

104. The heel effect in X-ray imaging results in:
A) Uneven beam intensity across the field **(Correct)**
B) Increase in photon energy
C) Reduction of image contrast
D) Change in focal spot size

105. The source-to-image distance (SID) affects:
A) Image magnification and sharpness **(Correct)**
B) X-ray wavelength
C) Tube current
D) Patient heart rate

106. Contrast agents in X-ray imaging are often:
A) Low atomic number elements
B) High atomic number elements **(Correct)**

C) Gases only
D) Radioactive isotopes

107. The Hounsfield unit (HU) in CT represents:
A) Radiation dose
B) Linear attenuation coefficient **(Correct)**
C) Magnetic field strength
D) Ultrasound velocity

108. Multislice CT scanners improve:
A) Slice thickness and scanning speed **(Correct)**
B) Patient heart rate
C) MRI signal-to-noise ratio
D) Ultrasound resolution

109. The term “windowing” in CT refers to:
A) Adjusting brightness and contrast **(Correct)**
B) Opening X-ray tube
C) Positioning patient
D) Changing slice thickness

110. SPECT imaging uses:
A) Single photon emission **(Correct)**
B) Positron emission
C) Magnetic resonance
D) Ultrasound

111. PET imaging requires:
A) Gamma rays only
B) Positron-emitting radiotracers **(Correct)**
C) High-frequency sound
D) X-ray filtration

112. MRI relaxation times are:
A) T1 (spin-lattice) and T2 (spin-spin) **(Correct)**
B) Alpha and Beta
C) Gamma and Delta
D) Delta and Omega

113. Functional MRI (fMRI) detects:
A) Tissue density
B) Blood oxygen level-dependent (BOLD) signal **(Correct)**
C) X-ray attenuation
D) Ultrasound reflection

114. MRI safety concerns include:
A) Ionizing radiation

B) Strong magnetic fields **(Correct)**
C) Ultrasound exposure
D) Nuclear decay

115. CT contrast media are often based on:
A) Iodine **(Correct)**
B) Barium **(Correct)**
C) Gadolinium
D) Silicon

116. Gadolinium-based agents are primarily used in:
A) CT
B) MRI **(Correct)**
C) X-ray
D) PET

117. The pitch in CT scanning defines:
A) Table movement per rotation relative to slice thickness **(Correct)**
B) X-ray wavelength
C) MRI signal
D) Ultrasound frequency

118. Scatter radiation reduces:
A) Image contrast **(Correct)**
B) Patient dose
C) Beam energy
D) Slice thickness

119. Radiographic magnification occurs when:
A) Patient is closer to detector
B) Patient is farther from detector **(Correct)**
C) Tube voltage decreases
D) Tube current increases

120. In ultrasound, attenuation increases with:
A) Decreasing frequency
B) Increasing frequency **(Correct)**
C) Increasing wavelength
D) Decreasing intensity

121. Acoustic impedance mismatch causes:
A) Ultrasound absorption
B) Ultrasound reflection **(Correct)**
C) Doppler shift
D) Image noise

122. Time-gain compensation (TGC) in ultrasound corrects for:
A) Variation in beam frequency
B) Attenuation with depth **(Correct)**
C) Doppler shift
D) MRI artifacts

123. Ultrasound gel is used to:
A) Cool the transducer
B) Reduce impedance mismatch **(Correct)**
C) Improve Doppler shift
D) Increase wavelength

124. Continuous-wave Doppler differs from pulsed-wave Doppler in that it:
A) Measures only peak velocity **(Correct)**
B) Can measure location precisely
C) Uses MRI
D) Uses CT

125. In ECG, standard limb leads are:
A) I, II, III **(Correct)**
B) aVR, aVL, aVF
C) V1–V6
D) All of the above

126. Augmented limb leads are:
A) I, II, III
B) aVR, aVL, aVF **(Correct)**
C) V1–V6
D) None

127. Chest leads in ECG are:
A) I–III
B) aVR–aVF
C) V1–V6 **(Correct)**
D) None

128. ECG paper speed is typically:
A) 10 mm/s
B) 25 mm/s **(Correct)**
C) 50 mm/s
D) 100 mm/s

129. Standard ECG calibration is:
A) 0.1 mV/mm
B) 1 mV/cm **(Correct)**

C) 5 mV/cm
D) 10 mV/mm

130. The QRS duration normally is:
A) <80 ms
B) 80–120 ms **(Correct)**
C) 120–200 ms
D) >200 ms

131. QT interval represents:
A) Atrial depolarization
B) Ventricular depolarization and repolarization **(Correct)**
C) Ventricular depolarization only
D) Atrial repolarization

132. PR interval represents:
A) Conduction from SA to AV node **(Correct)**
B) Ventricular contraction
C) Atrial repolarization
D) None

133. In EEG, delta waves are predominant in:
A) Awake state
B) Deep sleep **(Correct)**
C) Relaxed wakefulness
D) Alert activity

134. Theta waves in EEG are associated with:
A) Alertness
B) Drowsiness and early sleep **(Correct)**
C) Deep sleep
D) Active thinking

135. EMG measures:
A) Brain activity
B) Muscle electrical activity **(Correct)**
C) Heart electrical activity
D) Lung pressure

136. Nerve conduction studies measure:
A) Muscle contraction strength
B) Conduction velocity of peripheral nerves **(Correct)**
C) Blood flow
D) EEG frequency

137. Pacemaker spikes in ECG indicate:
A) Atrial or ventricular stimulation **(Correct)**

B) Ventricular repolarization
C) Heart block
D) Artifact

138. Holter monitoring records ECG for:
A) Seconds
B) Minutes
C) 24–48 hours **(Correct)**
D) Weeks

139. Cardiac stress testing is used to detect:
A) Resting heart rate
B) Ischemia during exercise **(Correct)**
C) Arrhythmia only
D) Blood pressure

140. Electrophysiology study (EPS) is used to:
A) Map heart electrical activity **(Correct)**
B) Measure blood pressure
C) Perform ultrasound
D) Image lungs

141. T-wave inversion may indicate:
A) Normal ECG
B) Ischemia **(Correct)**
C) Muscle activity
D) Artifact

142. ST-segment elevation is a marker of:
A) Arrhythmia
B) Acute myocardial infarction **(Correct)**
C) Hypertension
D) Hyperkalemia

143. Bundle branch block affects:
A) SA node
B) AV node
C) Ventricular conduction pathways **(Correct)**
D) Purkinje fibers only

144. Ventricular fibrillation is:
A) Organized contraction
B) Disorganized, life-threatening rhythm **(Correct)**
C) Slow heart rate
D) Normal variant

145. Pulmonary function tests (PFTs) include:
A) Spirometry **(Correct)**
B) ECG
C) EEG
D) EMG

146. Spirometry measures:
A) Blood pressure
B) Lung volumes and airflow **(Correct)**
C) Heart rate
D) Muscle activity

147. FEV1/FVC ratio is used to detect:
A) Heart disease
B) Obstructive vs restrictive lung disease **(Correct)**
C) Liver function
D) Kidney function

148. Pulse oximetry measures:
A) Blood pressure
B) Oxygen saturation **(Correct)**
C) Heart rate only
D) Blood sugar

149. Capnography measures:
A) Oxygen
B) Carbon dioxide in exhaled air **(Correct)**
C) Nitrogen
D) pH

150. In bioimpedance, fat tissue has:
A) Low resistance **(Correct)**
B) High resistance
C) Zero resistance
D) Infinite resistance

151. Ionizing radiation can cause:
A) DNA damage **(Correct)**
B) Muscle fatigue
C) Bone fracture
D) Hair loss only

152. Alpha particles are:
A) High-penetration radiation
B) Low-penetration, highly ionizing **(Correct)**

C) Neutrons
D) Electrons

153. Beta particles are:
A) Electrons or positrons **(Correct)**
B) Protons
C) Neutrons
D) Gamma rays

154. Gamma rays are:
A) Charged particles
B) High-energy photons **(Correct)**
C) Neutrons
D) Alpha particles

155. Half-life of a radionuclide is:
A) Time for activity to double
B) Time for half of nuclei to decay **(Correct)**
C) Time for radiation to stop
D) Time for energy release

156. Sievert (Sv) measures:
A) Absorbed dose
B) Equivalent/effective dose **(Correct)**
C) Radioactivity
D) Photon energy

157. Gray (Gy) measures:
A) Absorbed dose **(Correct)**
B) Radiation exposure
C) Dose equivalent
D) Magnetic field

158. ALARA principle in radiology means:
A) Maximize radiation
B) Keep exposure “As Low As Reasonably Achievable” **(Correct)**
C) Ignore safety
D) Increase contrast

159. In radiotherapy, fractionation is used to:
A) Deliver total dose in parts **(Correct)**
B) Increase single dose
C) Avoid imaging
D) Reduce photon energy

160. Linear accelerator (LINAC) produces:
A) Ultrasound waves

B) High-energy X-rays or electrons **(Correct)**
C) MRI signals
D) Gamma rays only

161. Radiopharmaceuticals are used in:
A) CT
B) PET and SPECT **(Correct)**
C) Ultrasound
D) MRI

162. Radiotherapy planning often uses:
A) MRI only
B) CT and MRI **(Correct)**
C) Ultrasound only
D) X-ray alone

163. Brachytherapy involves:
A) External radiation
B) Internal radiation **(Correct)**
C) Ultrasound therapy
D) MRI-guided surgery

164. In radiation therapy, megavoltage photons penetrate:
A) Superficial tissue
B) Deep tissue **(Correct)**
C) Only bone
D) Only air

165. Radioprotective agents reduce:
A) Image contrast
B) Radiation damage to tissues **(Correct)**
C) Radiation energy
D) Beam intensity

166. Stochastic effects of radiation include:
A) Deterministic injury
B) Cancer risk **(Correct)**
C) Hair loss
D) Skin burn

167. Deterministic effects appear:
A) Below threshold dose
B) Above threshold dose **(Correct)**
C) Randomly
D) After decades

168. MRI signal intensity depends on:
A) Proton density and relaxation times **(Correct)**
B) X-ray tube current
C) Ultrasound frequency
D) PET tracer concentration

169. T2-weighted MRI images highlight:
A) Fat
B) Water/edema **(Correct)**
C) Bone
D) Air

170. T1-weighted MRI images highlight:
A) Water
B) Fat **(Correct)**
C) Air
D) Metal

171. Diffusion-weighted MRI is used to detect:
A) Ischemic stroke **(Correct)**
B) Bone fractures
C) Heart valve defects
D) Pulmonary embolism

172. Gradient coils in MRI are used for:
A) Producing main magnetic field
B) Spatial encoding of signal **(Correct)**
C) Radiofrequency pulse
D) Cooling

173. RF coils in MRI:
A) Detect and transmit RF signal **(Correct)**
B) Produce gradient
C) Provide magnetic shielding
D) Measure X-rays

174. PET detects:
A) Emitted positrons directly
B) Coincident gamma photons from annihilation **(Correct)**
C) Ultrasound waves
D) X-ray scatter

175. PET tracers commonly include:
A) ^18F-FDG **(Correct)**
B) Iodine

C) Barium
D) Gadolinium

176. The principle of nuclear medicine imaging is:
A) External magnetic field
B) Detection of gamma rays from radiotracers **(Correct)**
C) Ultrasound reflection
D) X-ray attenuation

177. Gamma cameras use:
A) Scintillation detectors **(Correct)**
B) Electrodes
C) RF coils
D) Piezoelectric crystals

178. Spatial resolution in nuclear medicine is limited by:
A) Detector size and collimator design **(Correct)**
B) Tube voltage
C) Gradient strength
D) Sound frequency

179. In cardiology, stress echocardiography assesses:
A) Heart valves and function under stress **(Correct)**
B) Bone density
C) Liver function
D) Brain activity

180. Myocardial perfusion imaging shows:
A) Heart anatomy
B) Blood flow distribution **(Correct)**
C) ECG intervals
D) Muscle strength

181. Doppler echocardiography measures:
A) Blood flow velocity **(Correct)**
B) Bone density
C) Heart rhythm only
D) Oxygen saturation

182. MRI angiography visualizes:
A) Blood vessels **(Correct)**
B) Bones
C) Lungs
D) Nerves

183. CT angiography uses:
A) Ultrasound

B) X-ray with contrast **(Correct)**
C) MRI
D) PET

184. Pulse Doppler in ultrasound gives:
A) Location-specific velocity **(Correct)**
B) Global average only
C) Image brightness
D) X-ray intensity

185. Continuous-wave Doppler cannot:
A) Measure peak velocity
B) Localize exact depth **(Correct)**
C) Detect blood flow
D) Detect valve stenosis

186. In EEG, alpha rhythm is predominant in:
A) Deep sleep
B) Relaxed wakefulness with eyes closed **(Correct)**
C) Alert mental activity
D) Drowsiness

187. Beta waves in EEG indicate:
A) Active thinking and attention **(Correct)**
B) Sleep
C) Muscle artifact
D) Resting state

188. EMG amplitude reflects:
A) Conduction velocity
B) Number of active motor units **(Correct)**
C) Heart activity
D) Oxygen saturation

189. Nerve conduction velocity decreases in:
A) Neuropathy **(Correct)**
B) Healthy nerves
C) Muscle fatigue
D) ECG

190. Surface EMG is less precise than:
A) EEG
B) Intramuscular EMG **(Correct)**
C) ECG
D) PET

191. In pulse oximetry, normal SpO2 is:
A) 70–80%
B) 95–100% **(Correct)**
C) 85–90%
D) 60–70%

192. Capnography waveform shows:
A) Arterial oxygen
B) Exhaled CO2 **(Correct)**
C) Blood pressure
D) Heart rate

193. Normal end-tidal CO2 (EtCO2) is:
A) 20–25 mmHg
B) 35–45 mmHg **(Correct)**
C) 50–60 mmHg
D) 10–15 mmHg

194. Bioimpedance is used to estimate:
A) Muscle activity
B) Body composition, especially fat and water **(Correct)**
C) Heart rhythm
D) Blood pressure

195. Electrical impedance tomography (EIT) images:
A) Brain activity
B) Lung ventilation **(Correct)**
C) Bone density
D) Heart valves

196. Ionizing radiation interacts with tissue via:
A) Photoelectric effect **(Correct)**
B) MRI
C) Ultrasound reflection
D) Doppler shift

197. Compton scattering dominates in:
A) Low-energy X-rays
B) Diagnostic to high-energy X-rays **(Correct)**
C) MRI
D) Ultrasound

198. Photoelectric effect increases with:
A) Low atomic number
B) High atomic number **(Correct)**

C) Low photon energy
D) Both b and c **(Correct)**

199. In CT, beam hardening artifacts result from:
A) Photon scatter
B) Polychromatic X-ray spectrum **(Correct)**
C) MRI interference
D) Ultrasound reflection

200. MRI safety contraindications include:
A) Pacemakers **(Correct)**
B) Cochlear implants **(Correct)**
C) Metallic foreign bodies **(Correct)**
D) All of the above **(Correct)**

201. X-ray tube voltage affects:
A) Image contrast
B) Photon energy **(Correct)**
C) Magnetic field
D) Ultrasound frequency

202. Increasing mA in X-ray increases:
A) Photon energy
B) Number of photons **(Correct)**
C) Magnetic resonance
D) Ultrasound amplitude

203. CT number (HU) of water is:
A) 0 **(Correct)**
B) 100
C) -100
D) 1000

204. Bone appears on CT as:
A) Hypodense
B) Hyperdense **(Correct)**
C) Isodense
D) Dark gray

205. Windowing in CT adjusts:
A) Scan time
B) Brightness and contrast **(Correct)**
C) Radiation dose
D) Ultrasound penetration

206. Spiral CT allows:
A) Slice-by-slice scanning

B) Continuous helical acquisition **(Correct)**
C) MRI compatibility
D) Doppler imaging

207. Contrast agents in CT commonly contain:
A) Gadolinium
B) Iodine **(Correct)**
C) Barium for MRI
D) Technetium

208. Ultrasound frequency affects:
A) Depth and resolution **(Correct)**
B) Magnetic field
C) Radiation dose
D) PET tracer uptake

209. Higher ultrasound frequency provides:
A) Greater depth
B) Higher resolution **(Correct)**
C) More scattering
D) Less image quality

210. Acoustic impedance depends on:
A) Tissue density and sound velocity **(Correct)**
B) Magnetic field
C) X-ray absorption
D) Electrode placement

211. Doppler angle affects:
A) Flow velocity measurement **(Correct)**
B) X-ray attenuation
C) MRI T1
D) EEG amplitude

212. Echogenicity is:
A) Tissue absorption
B) Tissue reflection of ultrasound **(Correct)**
C) Bone density
D) Radiation dose

213. Artifacts in ultrasound include:
A) Reverberation **(Correct)**
B) Motion blur
C) Photon scatter
D) Magnetic interference

214. MRI T2* images are sensitive to:
A) Water content
B) Magnetic susceptibility **(Correct)**
C) Fat only
D) X-rays

215. Functional MRI (fMRI) measures:
A) Blood oxygenation changes **(Correct)**
B) Tissue density
C) Electrical activity directly
D) Radiation dose

216. PET/CT combines:
A) Ultrasound and CT
B) Metabolic and anatomical imaging **(Correct)**
C) MRI and X-ray
D) EEG and EMG

217. SPECT uses:
A) Coincidence detection
B) Single gamma detection **(Correct)**
C) RF pulses
D) Ultrasound

218. In radiation therapy, bolus is used to:
A) Increase dose at surface **(Correct)**
B) Decrease total dose
C) Shield organs
D) Improve MRI contrast

219. Linear energy transfer (LET) is:
A) Energy deposited per unit distance **(Correct)**
B) Magnetic field gradient
C) X-ray tube voltage
D) Doppler frequency

220. High-LET radiation is:
A) Less damaging
B) More damaging **(Correct)**
C) Only X-rays
D) Only gamma rays

221. Low-LET radiation includes:
A) Alpha particles
B) Gamma rays and X-rays **(Correct)**

C) Protons
D) Neutrons

222. Thermoluminescent dosimeters (TLD) measure:
A) Electrical signals
B) Radiation dose **(Correct)**
C) Blood flow
D) Ultrasound intensity

223. Optically stimulated luminescence (OSL) dosimeters are:
A) Reusable **(Correct)**
B) Single-use only
C) MRI coils
D) Ultrasound probes

224. Radiographic contrast increases with:
A) Low kVp
B) High kVp
C) Low mA
D) High kVp and contrast media **(Correct)**

225. Scatter radiation in X-ray reduces:
A) Patient dose
B) Image contrast **(Correct)**
C) Beam intensity
D) Resolution

226. Collimators in X-ray:
A) Increase scatter
B) Reduce beam area **(Correct)**
C) Produce gamma rays
D) Detect RF signals

227. Grid in radiography:
A) Absorbs scattered radiation **(Correct)**
B) Enhances signal
C) Produces X-rays
D) Detects ultrasound

228. Half-value layer (HVL) indicates:
A) Beam penetration **(Correct)**
B) MRI field strength
C) Ultrasound velocity
D) PET tracer decay

229. MRI main magnetic field strength is:
A) 1–3 T typically **(Correct)**

B) 0.1 T
C) 10 T
D) 100 T

230. Superconducting magnets in MRI require:
A) Room temperature
B) Cryogenic cooling **(Correct)**
C) X-ray shielding
D) Ultrasound gel

231. MRI Larmor frequency depends on:
A) RF power
B) Magnetic field **(Correct)**
C) Tissue density
D) X-ray tube voltage

232. Spin-echo sequence reduces:
A) T1 contrast
B) T2* effects **(Correct)**
C) MRI signal
D) Doppler shift

233. Gradient echo sequence is sensitive to:
A) Susceptibility effects **(Correct)**
B) T1 only
C) Noise
D) Ultrasound reflection

234. Gadolinium contrast shortens:
A) T1 relaxation **(Correct)**
B) T2 relaxation
C) T2*
D) MRI noise

235. CT spatial resolution is limited by:
A) Detector size and focal spot **(Correct)**
B) RF coil
C) Gradient field
D) Patient age

236. Noise in CT can be reduced by:
A) Increasing mA **(Correct)**
B) Decreasing kVp
C) Using MRI coils
D) Using ultrasound

237. In SPECT, collimator resolution affects:
A) Depth only
B) Spatial resolution **(Correct)**
C) Photon energy
D) MRI signal

238. Half-life of ^99mTc is:
A) 6 hours **(Correct)**
B) 1 hour
C) 24 hours
D) 12 hours

239. Common PET isotope ^18F has half-life:
A) 110 minutes **(Correct)**
B) 6 hours
C) 1 hour
D) 24 hours

240. Lead aprons protect against:
A) Ultrasound
B) Ionizing radiation **(Correct)**
C) Magnetic field
D) RF noise

241. MRI safety: quenching occurs when:
A) Magnet warms rapidly **(Correct)**
B) Gradient fails
C) Coil detunes
D) RF fails

242. Electrode impedance in ECG should be:
A) High
B) Low **(Correct)**
C) Variable
D) Irrelevant

243. ECG paper speed is usually:
A) 10 mm/s
B) 25 mm/s **(Correct)**
C) 50 mm/s
D) 100 mm/s

244. Standard limb leads in ECG:
A) I, II, III **(Correct)**
B) aVR, aVL, aVF

C) V1–V6
D) All of the above

245. Precordial leads in ECG:
A) I–III
B) V1–V6 **(Correct)**
C) aVR–aVF
D) Limb leads

246. QT interval represents:
A) Atrial depolarization
B) Ventricular depolarization and repolarization **(Correct)**
C) AV conduction
D) T wave only

247. EMG measures:
A) Muscle electrical activity **(Correct)**
B) Nerve conduction only
C) EEG
D) Heart function

248. In nerve conduction studies, distal latency reflects:
A) Axon diameter
B) Conduction through distal segment **(Correct)**
C) Muscle fatigue
D) Brain activity

249. Conduction velocity is slowed in:
A) Myopathy
B) Demyelinating neuropathy **(Correct)**
C) Healthy nerves
D) Pacemaker patients

250. Reflex latency in EMG testing indicates:
A) Synaptic and nerve conduction time **(Correct)**
B) Muscle strength
C) ECG interval
D) Heart rate

251. EEG measures:
A) Muscle activity
B) Brain electrical activity **(Correct)**
C) Heart rate
D) Blood flow

252. Alpha rhythm in EEG is:
A) 8–13 Hz **(Correct)**

B) 4–7 Hz
C) 13–30 Hz
D) >30 Hz

253. Beta rhythm in EEG is:
A) 8–13 Hz
B) 13–30 Hz **(Correct)**
C) 4–7 Hz
D) <4 Hz

254. Theta rhythm in EEG is:
A) 4–7 Hz **(Correct)**
B) 8–13 Hz
C) 13–30 Hz
D) >30 Hz

255. Delta rhythm in EEG is:
A) 0.5–4 Hz **(Correct)**
B) 4–7 Hz
C) 8–13 Hz
D) 13–30 Hz

256. EEG electrodes follow:
A) 10–20 system **(Correct)**
B) 12-lead system
C) 6-lead system
D) 32-lead system

257. EEG artifact from blinking appears as:
A) Sharp spikes
B) Slow waves in frontal leads **(Correct)**
C) Delta rhythm
D) Beta activity

258. EMG needle electrodes are used for:
A) Surface recording
B) Intramuscular recording **(Correct)**
C) Heart monitoring
D) Brain activity

259. Nerve conduction velocity (NCV) is measured in:
A) m/s **(Correct)**
B) Hz
C) V
D) Ohms

260. CMAP amplitude reflects:
A) Muscle contraction strength **(Correct)**
B) Nerve myelination
C) Brain activity
D) ECG QRS

261. In EEG, spike-and-wave pattern is typical for:
A) Focal seizure
B) Absence seizure **(Correct)**
C) Muscle artifact
D) Beta rhythm

262. In EEG, posterior dominant rhythm appears during:
A) Sleep
B) Eyes closed, awake **(Correct)**
C) Seizure
D) EMG artifact

263. Action potential propagation is:
A) Electrical conduction along axon **(Correct)**
B) Muscle contraction
C) Blood flow
D) Ultrasound wave

264. Myelin increases:
A) Conduction velocity **(Correct)**
B) Muscle strength
C) EEG amplitude
D) CT contrast

265. Synaptic transmission occurs at:
A) Node of Ranvier
B) Synapse **(Correct)**
C) Axon hillock
D) T-tubule

266. Resting membrane potential is typically:
A) 0 mV
B) -70 mV **(Correct)**
C) +70 mV
D) -100 mV

267. Depolarization occurs when:
A) Na+ enters the cell **(Correct)**
B) K+ enters the cell

C) Cl- enters the cell
D) Ca2+ exits the cell

268. Repolarization occurs when:
A) Na+ enters
B) K+ exits **(Correct)**
C) Cl- enters
D) Ca2+ enters

269. ECG R wave represents:
A) Atrial depolarization
B) Ventricular depolarization **(Correct)**
C) Ventricular repolarization
D) P wave

270. ECG T wave represents:
A) Atrial depolarization
B) Ventricular depolarization
C) Ventricular repolarization **(Correct)**
D) QRS complex

271. ST segment elevation indicates:
A) Myocardial ischemia
B) Myocardial infarction **(Correct)**
C) AV block
D) Normal variant

272. QT prolongation may lead to:
A) Bradycardia
B) Torsades de pointes **(Correct)**
C) Stroke
D) Pulmonary embolism

273. Signal-to-noise ratio (SNR) in MRI improves with:
A) Lower field strength
B) Higher field strength **(Correct)**
C) Lower voxel size
D) Faster scan

274. In diffusion-weighted MRI, restricted diffusion indicates:
A) Ischemic stroke **(Correct)**
B) Hemorrhage
C) Tumor
D) Fatty liver

275. Functional MRI BOLD signal reflects:
A) Electrical activity

B) Blood oxygenation level **(Correct)**
C) Tissue density
D) Ion concentration

276. PET measures:
A) Anatomy only
B) Metabolic activity **(Correct)**
C) Ultrasound reflection
D) Magnetic susceptibility

277. Gamma camera detects:
A) Beta particles
B) Gamma photons **(Correct)**
C) RF signals
D) Ultrasound echoes

278. Radiopharmaceutical ^131I is used for:
A) Bone scan
B) Thyroid imaging **(Correct)**
C) Cardiac perfusion
D) PET oncology

279. Half-life of ^18F in PET is:
A) 110 minutes **(Correct)**
B) 6 hours
C) 24 hours
D) 12 hours

280. SPECT tracer Tc-99m decays by:
A) Alpha emission
B) Beta emission
C) Gamma emission **(Correct)**
D) Positron emission

281. X-ray contrast is enhanced by:
A) High photon energy
B) Iodine-based agents **(Correct)**
C) Ultrasound gel
D) Low field MRI

282. Lead shielding in X-ray protects:
A) Patient only
B) Staff only
C) Both patient and staff **(Correct)**
D) MRI coils

283. Grid ratio in radiography affects:
A) Scatter absorption **(Correct)**
B) Spatial resolution
C) MRI T1
D) Ultrasound frequency

284. Half-value layer (HVL) depends on:
A) X-ray energy **(Correct)**
B) Field strength
C) Ultrasound frequency
D) EEG amplitude

285. Radiotherapy dose distribution is optimized using:
A) CT imaging **(Correct)**
B) Ultrasound
C) EEG
D) PET only

286. Fractionated radiotherapy reduces:
A) Tumor effect
B) Normal tissue damage **(Correct)**
C) Scan time
D) Radiation energy

287. LET (linear energy transfer) affects:
A) Tissue penetration
B) Biological effect per unit dose **(Correct)**
C) MRI SNR
D) Ultrasound reflection

288. High LET radiation includes:
A) X-rays
B) Gamma rays
C) Alpha particles **(Correct)**
D) Ultrasound

289. Low LET radiation includes:
A) Protons
B) Beta, X-ray, gamma **(Correct)**
C) Alpha particles
D) Neutrons

290. Thermoluminescent dosimeter (TLD) works by:
A) Absorbing photons and releasing light when heated **(Correct)**
B) Generating magnetic field

C) Conducting electricity
D) Ultrasound reflection

291. Optically stimulated luminescent (OSL) dosimeters:
A) Use heat
B) Use light for readout **(Correct)**
C) Measure current
D) Detect ultrasound

292. MRI safety: main risk in pacemaker patients is:
A) RF heating **(Correct)**
B) X-ray dose
C) Ultrasound artifact
D) EEG interference

293. MRI gradient switching may cause:
A) Nausea
B) Peripheral nerve stimulation **(Correct)**
C) Radiation
D) Ultrasound reflection

294. Cryogenic cooling in MRI is used for:
A) RF coils
B) Superconducting magnet **(Correct)**
C) Gradient
D) Patient cooling

295. fMRI temporal resolution depends on:
A) TR (repetition time) **(Correct)**
B) TE only
C) Field strength
D) Voxel size

296. ECG QRS duration represents:
A) Atrial depolarization
B) Ventricular depolarization **(Correct)**
C) Ventricular repolarization
D) PR interval

297. EMG detects:
A) Muscle electrical activity **(Correct)**
B) Brain waves
C) Heart rate
D) Blood pressure

298. Nerve conduction slowing occurs in:
A) Myopathy

B) Demyelination **(Correct)**
C) Muscle fatigue
D) EEG abnormality

299. Synaptic delay is approximately:
A) 1 ms **(Correct)**
B) 10 ms
C) 100 ms
D) 0.1 ms

300. Action potential amplitude in large myelinated fibers is:
A) Larger than small fibers **(Correct)**
B) Smaller than small fibers
C) Same as unmyelinated
D) Zero