



Buy Course:- [Diagnostic Radiology Handbook](#)

Test Questions

(hint: print questions & mark answers before starting online test)

### Chapter 1

1. Electromagnetic waves can be characterized by which of the following?
  - A. amplitude
  - B. wavelength ( $\lambda$ )
  - C. frequency ( $\nu$ ) and speed
  - D. all of the above
  
2. The \_\_\_\_\_ is composed of a central nucleus surrounded by a cloud of negatively charged electrons.
  - A. atom
  - B. proton
  - C. neutron
  - D. none of the above
  
3. \_\_\_\_\_ can be produced as photons pass through matter by interactions such as the photoelectric effect and incoherent scattering.
  - A. Magnification
  - B. Electrification
  - C. Ionization
  - D. Vibration

### Chapter 2

4. The interactions of radiations such as photons and electrons are \_\_\_\_\_ and obey the laws of chance.
  - A. non-stochastic
  - B. stochastic
  - C. curvy
  - D. none of the above
  
5. Coherent scattering is also called \_\_\_\_\_.
  - A. Thomson scattering
  - B. Rayleigh scattering
  - C. Photoelectric effect
  - D. Incoherent scattering
  
6. When a high energy photon passes near to an atomic nucleus, the photon may interact with the nuclear coulomb field by a process called pair production.
  - A. True
  - B. False
  
7. The \_\_\_\_\_ makes the dominant contribution to the total interaction cross-section at the lowest photon energies.
  - A. Thomson scattering
  - B. photoelectric interaction
  - C. pair production
  - D. incoherent scattering

### Chapter 3

8. Determination of the energy imparted to matter by radiation is the subject of \_\_\_\_\_.
  - A. photometry
  - B. magnification

- C. dosimetry
- D. optometry

9. \_\_\_\_\_ is the quantity that better indicates the effects of radiation on materials or on human beings, and, accordingly, all the protection related quantities are based on it.

- A. Absorbed dose
- B. Occupational dose
- C. Fetal dose
- D. none of the above

10. \_\_\_\_\_ is the acronym for kinetic energy released per unit mass.

- A. Terminal dose
- B. Occupational dose
- C. Rem
- D. Kerma

11. Which of the following are expressed with the same units and related to the quantification of the interaction of radiation with the matter?

- A. Kerma
- B. absorbed dose
- C. Rem
- D. both A and B

#### **Chapter 4**

12. A \_\_\_\_\_ image is a pictorial representation of a measurement of an object or function of the body.

- A. social media
- B. medical
- C. photo
- D. computer

13. A \_\_\_\_\_ system is one in which the output of the system can be expressed as a weighted sum of the input constituents.

- A. linear
- B. non-linear
- C. sinusoidal
- D. none of the above

14. A \_\_\_\_\_ in a digital image represents the smallest region that can uniquely encode a single value in the image.

- A. blood vessel
- B. matrix
- C. pixel
- D. gray-scale window

15. In all real imaging systems, it is necessary to consider both the degradation of the image from blurring, given by the transfer characteristics, and the degradation of the image from the presence of noise.

- A. True
- B. False

16. Which of the following can cause image noise?

- A. signal carriers
- B. imaging process
- C. imaging electronics
- D. all of the above

17. The exact treatment of the image noise is dependent upon which of the following?

- A. nature of the noise present when the image is recorded
  - B. imaging system
  - C. use of contrast media
  - D. both A and B
18. The X ray quantum noise is frequently referred to as \_\_\_\_\_.
- A. detector noise
  - B. white noise
  - C. pixel noise
  - D. none of the above
19. A digital image in modern imaging system is only defined as discrete points in space, called \_\_\_\_\_.
- A. sampling points
  - B. vacuum grid points
  - C. air gap points
  - D. none of the above
20. Aliasing improves the sampled image because it correctly portrays high frequency information present in the scene as lower frequency information in the image.
- A. True
  - B. False
21. \_\_\_\_\_ is defined as the ratio of the signal difference to the average signal.
- A. Contrast
  - B. Gray-scale
  - C. MTF
  - D. HVL
22. In general, in medical imaging, we will want to achieve a high contrast to visualize disease features well.
- A. True
  - B. False
23. In radiographic imaging, whether analogue or digital the image contrast is affected by which of the following?
- A. X ray spectrum incident upon the X ray converter
  - B. X ray converter composition and thickness
  - C. Greyscale characteristics of the x ray converter
  - D. All of the above
24. In the absence of blurring, the ratio of the image contrast to the subject contrast is defined as the \_\_\_\_\_ of the imaging system.
- A. technical conversion
  - B. statistical function
  - C. transfer function
  - D. none of the above
25. The \_\_\_\_\_ is a metric to quantify the ability of an imaging system to display two unique objects closely separated in space.
- A. contrast
  - B. spatial resolution
  - C. MTF
  - D. HVL
26. In radiography, the limiting resolution can be measured by which of the following?
- A. arrays of cylinders
  - B. heat units (HU) charts

- C. imaging line patterns or star patterns
- D. H and D curve

27. The presampling MTF is measured using a high sampling frequency, so that no aliasing is present in the measurement.

- A. True
- B. False

28. The image noise arises from the random generation of the \_\_\_\_\_.

- A. patient's anatomy
- B. image signal
- C. contrast media
- D. fluoroscopic images

29. Which of the following are frequency dependent characterizations of the detector?

- A. MTF and NPS
- B. NEQ
- C. DQE
- D. all of the above

### Chapter 5

30. The differential absorption of X rays in tissues and organs, owing to their atomic composition, is the basis for the various imaging methods used in diagnostic radiology.

- A. True
- B. False

31. The production of X rays involves the bombardment of a thick target with energetic \_\_\_\_\_.

- A. protons
- B. neutrons
- C. electrons
- D. none of the above

32. The energy of the bremsstrahlung photon depends on the attractive \_\_\_\_\_ and hence on the distance of the electron from the nucleus.

- A. Magnetic forces
- B. Coulomb forces
- C. Chemical bond
- D. None of the above

33. The binding energy is highest in the most inner \_\_\_\_\_ shell and decreasing for the outer shells.

- A. K
- B. L
- C. M
- D. N

34. What is the K shell binding energy of a Tungsten (W) used as an anode material?

- A. 20.00
- B. 23.22
- C. 33.89
- D. 69.53

35. The electrons are slowed down and stopped in the target, within a range of a few tens of micrometers, depending on the \_\_\_\_\_.

- A. filament current
- B. anode angle
- C. tube voltage
- D. target size

36. What is the atomic number (Z) of Tungsten that can withstands high temperatures?

- A. 49
- B. 55
- C. 63
- D. 74

37. The production of both bremsstrahlung and characteristic radiation requires energetic electrons hitting a target.

- A. True
- B. False

38. The filament is heated by a current that controls the \_\_\_\_\_ of electrons, which, in turn, determines the electronic current flowing from the cathode to the anode

- A. size and shape
- B. thermionic emission
- C. spinning rate
- D. none of the above

39. Typical anode currents, depending on the examination mode, are \_\_\_\_\_ in fluoroscopy and 100 mA to >1000 mA in single exposures.

- A. <1 mA
- B. <2 mA
- C. <3 mA
- D. <10 mA

40. X ray tubes with two focal spots usually employ four separate filament/cup assemblies.

- A. True
- B. False

41. An attempt to increase the anode current by increasing the filament current might eventually end in \_\_\_\_\_.

- A. filament failure
- B. increase patient dose
- C. decreased scattered radiation
- D. none of the above

42. Because of the low effectiveness of X ray production, it is essential that the thermal properties of an anode are determined by which of the following?

- A. melting point and vapor pressure
- B. heat conduction
- C. density
- D. all of the above

43. Which of the following is used to balance the need for substantial heat dissipation with that of a small focal spot size?

- A. inverse square law
- B. heat unit chart
- C. line focus principle
- D. none of the above

44. The actual focal spot size depends on the position within the field of view, increasing from the cathode side of the tube to the anode.

- A. True
- B. False

45. The reduction of anode angles to achieve smaller effective focus sizes is limited by the \_\_\_\_\_ required as the X ray beam is cut off by the anode.

- A. size of the field of view
- B. size of the filament

- C. anode material
- D. scattered radiation

46. Which of the following increases patient dose?

- A. collimation
- B. radiation shielding
- C. off focus radiation
- D. longer SID

47. Which of the following use an x- ray tube with a stationary anode?

- A. computed tomography systems
- B. portable X ray units
- C. operating room fluoroscopy systems
- D. all of the above

48. The rotational speed of the anode is determined by which of the following?

- A. frequency of the power supply
- B. number of active windings in the stator
- C. x-ray tube size and shape
- D. both A and B

49. The main limiting factor in the use of X ray tubes is the thermal loading capacity of the anode.

- A. True
- B. False

50. Which of the following procedures need longer exposure times (10 s to >200 s)?

- A. computed tomography (CT)
- B. fluoroscopic
- C. radiography
- D. both A and B

51. The \_\_\_\_\_ maintains the required vacuum in the X ray tube.

- A. target
- B. tube envelope
- C. filament
- D. collimator

52. The \_\_\_\_\_ provides all the electrical power sources and signals required for the operation of the X ray tube and controls the operational conditions of X ray production and the operating sequence of exposure during an examination.

- A. focusing cup
- B. x ray tube housing
- C. x ray generator
- D. collimator

### **Chapter 6**

53. Which of the following minimizes scatter and reduces the radiation dose to the patient?

- A. Accurate collimation
- B. High mAs
- C. High anode speed
- D. Large focal spot

54. Geometrical distortion can be considerable and confusing in projection radiographs.

- A. True
- B. False

55. Which of the following states that an x ray beam intensity is inversely proportional to the square of the distance from the source?

- A. Newton's law

- B. Faraday's law
- C. Inverse square law
- D. Tesla's law

56. The ideal image sharpness is limited by which of the following image receptor factors?

- A. phosphor layer thickness
- B. lateral spread of light in scintillators
- C. image matrix
- D. all of the above

57. The spatial resolution depends on the focal spot size and the image receptor.

- A. True
- B. False

58. Which of the following is a disadvantage of a very small focal spot?

- A. long exposure time
- B. increased risk of motion blur
- C. good spatial resolution
- D. both A and B

59. The focal spot MTF may be measured using a pinhole to determine the point spread function, or a slit to determine the line spread function, and calculating the normalized modulus of the fourier transform of the spread function.

- A. True
- B. False

60. Magnification is achieved by increasing the \_\_\_\_\_, which generally requires an increase in the FID as well.

- A. kVp
- B. OID
- C. mAs
- D. none of the above

61. Which of the following is the consequence for using magnification?

- A. patient dose
- B. spatial resolution
- C. signal to noise ratio (SNR)
- D. all of the above

62. Any decrease in the OID leads to a reduction in image sharpness due to the geometric blur of the focal spot.

- A. True
- B. False

63. Which of the following contrast agents are used in x-ray?

- A. barium compounds
- B. iodine compounds
- C. gadolinium
- D. both A and B

64. Which of following is an optimum kV setting for radiography barium examinations?

- A. 25
- B. 40
- C. 50
- D. 80

65. The dual energy imaging reflects which of the following?

- A. Photoelectric process
- B. Compton effect

- C. Pair production process
- D. Both A and B

66. The primary source of noise in Radiography is generally the random arrival of photons at the image receptor called a \_\_\_\_\_.

- A. Contrast media effect
- B. Speckle process
- C. Poisson process
- D. None of the above

67. An increase in the mAs leads to an increase in patient dose.

- A. True
- B. False

68. The increase in kV will result in which of the following?

- A. reduction in the contrast to noise ratio (CNR)
- B. reduction in patient dose
- C. increase in motion blur
- D. both A and B

69. The images exposed with a kV below the optimum level and a mAs above the optimum level look better but lead to the phenomenon of \_\_\_\_\_.

- A. inverse square law
- B. penumbra
- C. exposure creep
- D. none of the above

70. An increase in kV of \_\_\_\_\_ is equivalent to a doubling of the mAs.

- A. 5%
- B. 10%
- C. 15%
- D. 30%

71. AEC systems are intended to increase exposure consistency and reduce reject and repeat rates.

- A. True
- B. False

72. The magnitude of the scattered radiation depends on which of the following variable?

- A. radiographic procedure
- B. X ray beam size
- C. patient thickness
- D. all of the above

73. Which of the following can reduce scattered radiation during radiographic exams?

- A. grids
- B. collimation
- C. compression
- D. all of the above

### **Chapter 7**

74. In order to produce a signal, the X ray quanta must interact with the receptor material.

- A. True
- B. False

75. The photoelectric interaction of an X ray quantum with the receptor generates a high speed \_\_\_\_\_.

- A. proton
- B. photoelectron
- C. hydrogen nucleus



D. soundwaves

76. The phosphors in x ray image receptor are also called \_\_\_\_\_.

- A. pixels
- B. scintillators
- C. matrix
- D. coils

77. The noise in X ray images is related to the number of X rays per \_\_\_\_\_ in the image and hence to the X ray exposure to the receptor.

- A. target
- B. pixel
- C. focusing cup
- D. transformer

78. The gain fluctuation noise in an image receptor can be determined experimentally using the \_\_\_\_\_.

- A. H and D curve
- B. anode heat unit chart
- C. pulse height spectrum (PHS)
- D. step-wedge filter

79. K escape is the emission of a K fluorescent X ray following a photoelectric interaction, which then escapes from the receptor without depositing further energy.

- A. True
- B. False

80. The greyscale response used for an imaging system includes which of the following?

- A. physics of X ray detection
- B. imaging task to be performed
- C. response of the human eye-brain system to optical images
- D. all of the above

81. Regarding human vision, there is a \_\_\_\_\_ in which the human eye is most acute.

- A. electromagnetic spectrum
- B. spatial frequency range
- C. optic nerve pathway
- D. none of the above

82. The range of intensities that can be represented by an imaging system is called the \_\_\_\_\_ and depends on the pixel size that is used, in a manner that depends on the modulation transfer function (MTF).

- A. therapeutic index
- B. diagnostic range
- C. dynamic range
- D. statistical data

83. Spatial resolution in radiography is determined both by the receptor characteristics and by factors unrelated to the receptor.

- A. True
- B. False

84. Which of the following can cause motion blurring?

- A. anode angle
- B. low mAs
- C. small SID
- D. patient

85. Which of the following issue is related to imaging receptor blur?
- A. geometrical
  - B. primary electron range
  - C. K fluorescence reabsorption
  - D. all of the above
86. The screen film combination consists of \_\_\_\_\_ and film designed to work together enclosed within a cassette.
- A. phosphor screen
  - B. pixels
  - C. matrix
  - D. TFT
87. Screen film systems employ a \_\_\_\_\_ in the initial stage to absorb X rays and produce light.
- A. phosphor
  - B. tungsten
  - C. barium
  - D. wood
88. In digital radiography, after exposure of the film to light, the latent image is formed at the sensitivity specks on the individual film grains.
- A. True
  - B. False
89. The curve that relates the optical density (OD) of the film to the logarithm of the exposure is known as the \_\_\_\_\_.
- A. Heat unit (HU) chart
  - B. Inverse square law
  - C. H&D curve
  - D. Non-stochastic curve
90. An image receptor that produces the same response for a given exposure, independent of the exposure time, is said to exhibit \_\_\_\_\_.
- A. discrepancy
  - B. reciprocity
  - C. dissimilitude
  - D. incomparability
91. In screen film radiography, the back of the cassette is made of \_\_\_\_\_ to control X ray backscatter from external objects.
- A. plastic
  - B. lead
  - C. wood
  - D. glass
92. In digital imaging systems, the pixel is the corresponding elemental region of the image.
- A. True
  - B. False
93. Which of the following can show aliasing effects in digital imaging systems?
- A. signal
  - B. noise
  - C. 3D software
  - D. both A and B
94. In computed radiography (CR), the screen in imaging plate is made of a \_\_\_\_\_.
- A. silver halide crystal
  - B. calcium tungstate
  - C. photostimulable phosphor

D. gadolinium oxysulphide

95. The image quality of computed radiography (CR) is greater than the image quality of digital radiography (DR).

- A. True
- B. False

96. In computed radiography (CR), the photostimulable phosphor screen in the imaging plate uses a phosphor that contains traps for excited \_\_\_\_\_.

- A. pixels
- B. voxels
- C. electrons
- D. hydrogen atoms

97. The key digital technology permitting an advance in medical X ray applications is the flat panel active matrix array, originally developed for laptop computer displays.

- A. True
- B. False

98. Active-matrix arrays use \_\_\_\_\_ as the semiconductor deposited on a thin glass substrate, which facilitates large area manufacture.

- A. photomultiplier signal
- B. hydrogenated amorphous silicon
- C. barium fluorohalide
- D. none of the above

99. In the direct conversion approach, a phosphor layer is placed in intimate contact with an active-matrix array.

- A. True
- B. False

### Chapter 8

100. \_\_\_\_\_ refers to the use of an X ray beam and a suitable image receptor for viewing images of processes or instruments in the body in real time.

- A. MRI
- B. Ultrasound
- C. Fluoroscopy
- D. Bone densitometry

101. The major difference between radiographic and fluoroscopic equipment is the \_\_\_\_\_.

- A. patient
- B. transformer
- C. image receptor
- D. radiologist

102. In fluoroscopy, \_\_\_\_\_ is the most commonly used input phosphor material used to convert X rays to light.

- A. Tungsten
- B. Caesium iodide (CsI:TI)
- C. Lead
- D. Thorium

103. \_\_\_\_\_ is the product of the electronic gain and minification gain and is a measure of the overall fluoro system gain.

- A. Exposure gain
- B. Radiation gain
- C. kVp gain
- D. Brightness gain

104. A \_\_\_\_\_ is commonly used to capture the output image from an image intensifier in fluoroscopy.
- A. video camera
  - B. dual x-ray tube
  - C. bucky tray
  - D. grid
105. Digital fluoroscopy requires that the analogue waveform be digitized with the use of \_\_\_\_\_.
- A. step-up transformer
  - B. dual generator
  - C. analogue to digital converter (ADC)
  - D. none of the above
106. The \_\_\_\_\_ camera in fluoroscopy, is a solid state device composed of many discrete photo-conducting cells.
- A. LED
  - B. CCD
  - C. Digital
  - D. TFT
107. Electronic magnification in fluoroscopy offers which of the following?
- A. improving the image MTF
  - B. decreasing minification gain and sampling pitch of the input phosphor
  - C. increasing noise
  - D. all of the above
108. \_\_\_\_\_ is inherently poor in fluoroscopic imaging, especially at the high kV values used to maintain patient dose at an acceptable level.
- A. Subject contrast
  - B. Latent image
  - C. Digital image
  - D. none of the above
109. Which of the following contrast agents commonly used in fluoroscopic imaging?
- A. barium
  - B. iodine
  - C. milk of magnesia
  - D. both A and B
110. The sharpness of a fluoroscopic image is influenced by which of the following?
- A. display and video camera matrix
  - B. FOV, focal spot size & geometric magnification
  - C. image noise and motion
  - D. all of the above
111. \_\_\_\_\_ causes enlargement of the fluoroscopic image near the edges and results from the curvature of the input phosphor.
- A. Star pattern
  - B. Magnification
  - C. Pincushion distortion
  - D. Ghost image
112. Vascular and interventional radiology procedures are usually performed in angiographic suites equipped with \_\_\_\_\_.
- A. Sonography machines
  - B. C-arm fluoroscopes
  - C. MRI
  - D. none of the above

113. \_\_\_\_\_ often use shorter focus to image distances, and smaller FOVs than other types of fluoroscopes.

- A. Mobile fluoroscopes
- B. DXA
- C. Computed Tomography
- D. none of the above

114. A \_\_\_\_\_ device is used to acquire radiographs during a fluoroscopically guided procedure.

- A. spot film
- B. wall bucky
- C. ionization chamber
- D. focal grid

115. Pulsed fluoroscopy offers which of the following?

- A. Lower radiation dose
- B. Improved image quality
- C. Reduced tube loading
- D. all of the above

116. \_\_\_\_\_ is a feature that maintains the last fluoroscopic image on the viewing monitor pending fluoroscopy or acquisition being resumed.

- A. DQE
- B. Last image hold
- C. Air gap technique
- D. Image subtraction

117. Occupational radiation protection considerations are often variations on which of the following cardinal rules of radiation protection?

- A. time
- B. distance
- C. shielding
- D. all of the above

## Chapter 9

118. \_\_\_\_\_ cancer is a **major** killer of women.

- A. Lung
- B. Prostate
- C. Breast
- D. Brain

119. Breast compression during the mammographic examination causes which of the following?

- A. various breast tissues to be spread out
- B. minimizing superposition from different planes
- C. improving the conspicuity of structures
- D. all of the above

120. Digital mammography, introduced commercially in \_\_\_\_\_.

- A. 2000
- B. 2012
- C. 2015
- D. 2017

121. The goal of \_\_\_\_\_ is to assist radiologists in detecting breast cancer, principally in screening mammography.

- A. pre-processing
- B. computer aided diagnosis (CAD)
- C. PACS
- D. MTF

### Chapter 10

122. An orthopantomograph (OPG) is created by complex equipment where the X ray tube and image receptor assembly move in a horizontal plane around the head of the patient in \_\_\_\_\_.

- A. CT
- B. MRI
- C. Dentistry
- D. NM

123. \_\_\_\_\_ equipment is needed when the patient cannot be brought to a fixed installation for a radiographic examination.

- A. 3 phase generator
- B. Mobile X ray
- C. PACS
- D. Nuclear Medicine

### Chapter 11

124. In CT, the \_\_\_\_\_ contains all the system components that are required to record transmission profiles of the patient.

- A. gantry
- B. wall bucky
- C. ionization chamber
- D. focal grid

125. In CT, the X ray tube uses a \_\_\_\_\_ anode designed to withstand and dissipate high heat loads.

- A. phosphor
- B. tungsten
- C. barium
- D. lead

126. The helical CT scan was introduced in \_\_\_\_\_, whereby the acquisition with a rotating X ray tube was combined with a moving table.

- A. 1950
- B. 1960
- C. 1970
- D. 1989

127. Dynamic CT can be used for image guided interventions, using a technique known as \_\_\_\_\_.

- A. CT bone scan
- B. DXA
- C. CT fluoroscopy
- D. none of the above

### Chapter 12

128. Diagnostic imaging is generally performed using ultrasound in the frequency range of \_\_\_\_\_.

- A. 1–5 MHz
- B. 6–10 MHz
- C. 2–15 MHz
- D. 6–30 MHz

129. Ultrasonic transducers were made possible by the discovery of piezoelectricity in quartz by Pierre and Jacques Curie in 1880.

- A. True
- B. False

130. \_\_\_\_\_ ultrasound is a method used to image moving blood and thereby estimate blood velocity.

- A. Doppler
- B. 2D

- C. 3D
- D. 4D

### Chapter 13

131. In the conventional method of ultrasonography, images are acquired in reflection, or \_\_\_\_\_, mode.

- A. x ray
- B. pulse echo
- C. MRI
- D. DXA

132. \_\_\_\_\_ with sizes typically ranging from 1 to 4  $\mu\text{m}$  diameter are used as blood pool contrast agents in diagnostic ultrasound.

- A. Barium compound
- B. Iodine
- C. Gas filled encapsulated microbubbles
- D. Gadolinium

133. Imaging using coded excitation pulses is a technique that was developed to increase the penetration depth of ultrasound imaging systems.

- A. True
- B. False

### Chapter 14

134. Unlike other imaging modalities, such as X ray and computed tomography, MRI does not involve \_\_\_\_\_.

- A. magnetic coils
- B. gadolinium
- C. ionizing radiation
- D. none of the above

135. Aside from a few exceptions encountered in research, MRI involves imaging the nucleus of the \_\_\_\_\_.

- A. barium
- B. hydrogen atom
- C. iodine
- D. helium

136. Common T1 contrast agents in MRI include those based on the \_\_\_\_\_, which is strongly paramagnetic.

- A. iodine
- B. barium
- C. gadolinium (3+) ion
- D. Gas filled encapsulated microbubbles

### Chapter 15

137. Superconducting MRI systems in clinical use range from \_\_\_\_\_, with experimental clinical systems ranging to 8 T and above.

- A. 0.5 to 3.0 T
- B. 4.0 to 5.0 T
- C. 4.5 to 5.5 T
- D. 5.0 to 6.0 T

138. Ferromagnetic materials can cause major distortions on the local magnetic field, resulting in displacement of signals in position and also loss of signal.

- A. True
- B. False

139. Which of the following implants may be or become ferromagnetic, or may be damaged or

malfunction in a strong magnetic field?

- A. cardiac pacemakers
- B. hearing aids
- C. steel clips
- D. all of the above

### Chapter 16

140. Which of the following modalities are fundamentally digital in that they require image reconstruction from quantified digital signals?

- A. computed tomography (CT)
- B. magnetic resonance imaging (MRI)
- C. screen film radiography
- D. both A and B

141. Individual digital images typically consist of a 2-D rectangular array of regularly sampled \_\_\_\_\_.

- A. gray-scale
- B. picture elements or pixels
- C. histogram
- D. MTF

142. Pixels are typically \_\_\_\_\_.

- A. triangular
- B. rectangular
- C. square
- D. round

143. Voxels in a single slice are typically all of the same \_\_\_\_\_ and have the same spacing as the previous and following slices.

- A. thickness
- B. length
- C. color
- D. none of the above

144. The encoded pixel values are distinct from the information that describes the characteristics of the pixel data, sometimes referred to as \_\_\_\_\_.

- A. gray scale
- B. metadata
- C. histogram
- D. MTF

145. A \_\_\_\_\_, of which there is only one original, is physically located in one place and requires manual handling, storage, and transportation.

- A. digital image
- B. computer image
- C. film image
- D. pixel image

146. The digital images may be replicated as many times as necessary with full fidelity, distributed, electronically archived, and displayed by \_\_\_\_\_.

- A. picture archiving and communications system (PACS)
- B. Grayscale Standard Display Function (GSDF)
- C. just noticeable difference (JND)
- D. Digital Imaging and Communications in Medicine (DICOM)

147. Which of the following are used for local archival of images?

- A. compact disc (CD)
- B. magneto-optical disc
- C. internet



D. both A and B

148. \_\_\_\_\_ are designed for scanning radiographic film, or laser printed medical film into digital format.

- A. Ionization chambers
- B. Film digitizers
- C. Histograms
- D. Transformers

149. After acquisition, quality control (QC) by a human operator is usually required to confirm which of the following?

- A. positioning & technique
- B. absence of motion or another artifact
- C. correct labeling and identification
- D. all of the above

150. Computer aided detection (CAD) can be useful for cancer detection in which of the following?

- A. contrast enhanced MRI & mammography
- B. chest X rays and chest CT
- C. CT virtual colonoscopy
- D. all of the above

151. A primary purpose of DICOM is the interchange of images and their accompanying information.

- A. True
- B. False

152. The Health Level 7 (HL7) defines which of the following?

- A. clinical document architecture
- B. means of encoding
- C. managing structured documents with consistent metadata
- D. all of the above

153. Which of the following are examples of an ordinary network hardware?

- A. routers
- B. switches
- C. cables
- D. all of the above

154. The lossless compression of an image is also known as \_\_\_\_\_.

- A. irreversible compression
- B. non-reversible compression
- C. reversible compression
- D. hard compression

155. \_\_\_\_\_ occurs when the decompressed result is not identical to the original, although the amount and type of loss is acceptable for some purposes.

- A. Lossy or irreversible compression
- B. Lossless compression
- C. Reversible compression
- D. Hard compression

156. Lossy compression can result in \_\_\_\_\_ that become visible in the reconstructed image.

- A. under-exposed
- B. artifacts
- C. over-exposed
- D. one of the above

## **Chapter 17**

157. Filtering is an operation that changes the observable quality of an image in terms of which of

the following?

- A. resolution
- B. contrast
- C. noise
- D. all of the above

158. \_\_\_\_\_ filter replaces each pixel in an image with the mean of the  $N \times N$  neighborhood around the pixel.

- A. Step-wedge
- B. Hard
- C. Mean
- D. Soft

159. \_\_\_\_\_ and removal of high frequency noise can help human observers understand medical images.

- A. Adding
- B. Pre-processing
- C. Smoothing
- D. none of the above

160. The disadvantage of median filtering is that it can remove important features, such as \_\_\_\_\_.

- A. thin edges
- B. anatomy
- C. artifact
- D. gray-scale

161. An edge is a discontinuity in the image intensity.

- A. True
- B. False

162. The problem of finding objects in images, known as \_\_\_\_\_, is the central problem in the field of image analysis.

- A. collimator cut
- B. segmentation
- C. H & D problem
- D. air-gap

### Chapter 18

163. The \_\_\_\_\_ is the light sensitive part of the eye.

- A. hypothalamus
- B. thyroid
- C. retina
- D. eyelid

164. In \_\_\_\_\_, luminance levels are low and only rods respond to light.

- A. scotopic (night) vision
- B. photopic (day) vision
- C. blind vision
- D. hard vision

165. Ambient lighting decreases performance and is recommended to be kept below \_\_\_\_\_ in a radiology reading room.

- A. 10 lx
- B. 20 lx
- C. 30 lx
- D. 50 lx

### Chapter 19

166. \_\_\_\_\_ is the process through which the actual quality performance is measured and

compared with existing standards, and the actions necessary to keep or regain conformance with the standards.

- A. Radiologist schedule
- B. Quality control (QC)
- C. H & D curve
- D. Work-flow

167. Which of the following stages are applicable to QA for imaging equipment?

- A. Equipment specification and tendering process
- B. Critical examination, Acceptance & Commissioning
- C. Routine performance testing
- D. all of the above

168. According to table 19.1, what is the QA frequency for X ray/light beam alignment?

- A. 1-2 monthly
- B. every 6 months
- C. annually
- D. every two years

169. According to table 19.5, what is the QA frequency for exposure index repeatability and consistency in digital radiography?

- A. 1-2 monthly
- B. every 6 months
- C. annually
- D. every two years

## Chapter 20

170. \_\_\_\_\_ is the study of the action of ionizing radiations on living matter.

- A. Cardiology
- B. Radiobiology
- C. Neurology
- D. Ophthalmology

171. \_\_\_\_\_ contains the genetic information of the cell.

- A. Lysosomes
- B. Deoxyribonucleic acid (DNA)
- C. Erythrocytes
- D. Bone marrow

172. \_\_\_\_\_ damage is the primary cause of cell death induced by radiation.

- A. Brain
- B. DNA
- C. Erythrocytes
- D. Bone marrow

173. The ICRP recommendations for radiation protection purposes are based on the Japanese study and other epidemiological studies.

- A. True
- B. False

## Chapter 21

174. A \_\_\_\_\_ is an instrument that measures ionizing radiation.

- A. densitometer
- B. sensitometer
- C. dosimeter
- D. kVp meter

175. Which of the following devices are used to measure occupational and public dose?

- A. thermoluminescent dosimeters (TLDs)

- B. optically stimulated luminescent (OSL) dosimeters
- C. film dosimeters (including radiochromic film)
- D. all of the above

176. Determination of the air kerma (dose) is performed by ionization chambers in which of the following common diagnostic radiology applications?

- A. radiography
- B. fluoroscopy
- C. mammography
- D. all of the above

177. The \_\_\_\_\_ is positioned in the primary X ray beam and measures the X ray tube voltage with methods based on attenuation measurements.

- A. densitometer
- B. sensitometer
- C. ionization meter
- D. kV meter

### Chapter 22

178. Patient exposures arising from \_\_\_\_\_ form the largest part of the population exposure from artificial sources of radiation.

- A. radiological procedures
- B. cosmic radiation
- C. radon exposure
- D. terrestrial radiation

179. For radiation protection purposes, the ICRP has introduced the \_\_\_\_\_ as a measure of the combined detriment from stochastic effects for all organs and tissues for an average adult.

- A. occupational dose
- B. effective dose, E
- C. gonadal dose
- D. bone marrow dose

180. In fluoroscopy, the patient dose will depend on which of the following?

- A. size of the patient
- B. operator selections
- C. complexity of the case
- D. all of the above

181. For fluoroscopy systems, the total KAP for the examination and the total fluoroscopy time are displayed on the \_\_\_\_\_.

- A. spot film
- B. CR processor
- C. X ray console
- D. computer processor

182. For a gestational age of between 0 and 12 weeks, the dose to the \_\_\_\_\_ can be used as a surrogate for fetal dose.

- A. uterus
- B. chest
- C. head
- D. forearm

### Chapter 23

183. \_\_\_\_\_ is a systematic review of the medical procedures against agreed standards for good procedures, seeking to improve the quality and outcome of patient care.

- A. Clinical audit
- B. Insurance standards
- C. Physicians contract

D. Hippocratic oath

184. Before an examination, patients undergoing medical imaging procedures should be informed of the potential risk associated with the examination.

- A. True
- B. False

185. Limiting the radiation field to the area of interest will offer which of the following?

- A. reduce the radiation risk
- B. improve image quality
- C. increase patient immobility
- D. both A and B

186. The maximum luminance of image viewing monitors ranges between \_\_\_\_\_ and \_\_\_\_\_ cd/m<sup>2</sup>.

- A. 250, 450
- B. 600, 700
- C. 750, 880
- D. 900, 1,000

#### **Chapter 24**

187. \_\_\_\_\_ are intentional exposures for the diagnostic or therapeutic benefit of the patient.

- A. Occupational exposures
- B. Medical exposures
- C. Public exposure
- D. Natural exposure

188. Which of the following are fundamental principles of radiation protection by ICRP?

- A. The principle of justification
- B. The principle of optimization of protection
- C. The principle of limitation of doses
- D. all of the above

189. No person receives a medical exposure unless there has been appropriate referral that it is justified, and that the radiation protection has been optimized.

- A. True
- B. False

190. Which of the following is highly sensitive to radiation?

- A. hair
- B. nails
- C. the lens of the eye
- D. extremities

191. The use factor (U) ranges from 0 for fluoroscopy and mammography (where the image receptor is the primary barrier) to 1 for some radiographic situations.

- A. True
- B. False

192. \_\_\_\_\_ is an obvious choice for shielding material.

- A. Wood
- B. Plastic
- C. Barium
- D. Lead