Diagnostic Radiology Handbook Test Questions

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

Chapter 1

1. Electromagnetic waves can be characterized by which of the following?
A. amplitude
B. wavelength (λ)
C. frequency (v) 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

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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. Which of the following can cause image noise?
A. signal carriers
B. imaging process
C. imaging electronics
D. all of the above

14. _____ is defined as the ratio of the signal difference to the average signal.
A. Contrast
B. Gray-scale
C. MTF
D. HVL

15. 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

Chapter 5

16. 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

17. The binding energy is highest in the most inner _____ shell and decreasing for the outer shells.
A. K
B. L
C. M
D. N

18. 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

19. 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

20. The _____ maintains the required vacuum in the X ray tube.
A. target
B. tube envelope
C. filament
D. collimator

Chapter 6

21. Geometrical distortion can be considerable and confusing in projection radiographs.
A. TRUE
B. FALSE

22. 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

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

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

24. An increase in kV of _____ is equivalent to a doubling of the mAs.
A. 5%
B. 10%
C. *15%*
D. 30%

Chapter 7
25. 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

26. Spatial resolution in radiography is determined both by the receptor characteristics and by factors unrelated to the receptor.
A. TRUE
B. FALSE

27. Screen film systems employ a _____ in the initial stage to absorb X rays and produce light.
A. phosphor
B. tungsten
C. barium
D. wood

Chapter 8
28. _____ 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

29. The **major** difference between radiographic and fluoroscopic equipment is the _____.
A. patient
B. transformer
C. *image receptor*
D. radiologist

30. In fluoroscopy, _____ is the **most** commonly used input phosphor material used to convert X rays to light.
A. Tungsten
B. Caesium iodide (CsI:Tl)
C. Lead
D. Thorium

31. _____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

32. 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

33. 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

34. The _____ camera in fluoroscopy, is a solid state device composed of many discrete photo-conducting cells.
A. LED
B. CCD
C. Digital

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D. TFT

35. 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

36. _____ 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

37. Which of the following contrast agents **commonly** used in fluoroscopic imaging?
A. barium
B. iodine
C. *milk of magnesia*
D. both A and B

38. 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

39. _____ 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
40. 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

41. _____ often use shorter focus to image distances, and smaller FOVs than other types of fluoroscope.
A. Mobile fluoroscopes
B. DXA
C. Computed Tomography
D. none of the above

42. A _____ device is used to acquire radiographs during a fluoroscopically guided procedure.
A. spot film
B. wall bucky
C. ionization chamber
D. focal grid

43. Pulsed fluoroscopy offers which of the following?
A. Lower radiation dose
B. Improved image quality
C. *Reduced tube loading*
D. all of the above

44. _____ 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

45. 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

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46. _____ cancer is a **major** killer of women.
A. Lung
B. Prostate
C. *Breast*
D. Brain

47. 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

48. Digital mammography, introduced commercially in _____.
A. 2000
B. 2012
C. 2015
D. 2017

49. 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
50. 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

51. _____ 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
52. 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

53. 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

54. 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

55. 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
56. 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

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57. Ultrasonic transducers were made possible by the discovery of piezoelectricity in quartz by Pierre and Jacques Curie in 1880.
A. TRUE
B. FALSE
58. _____ ultrasound is a method used to image moving blood and thereby estimate blood velocity.
A. Doppler
B. 2D
C. 3D
D. 4D

Chapter 13
59. In the conventional method of ultrasonography, images are acquired in reflection, or _____, mode.
A. x ray
B. pulse echo
C. MRI
D. DXA

60. _____ with sizes typically ranging from 1 to 4 μm diameter are used as blood pool contrast agents in diagnostic ultrasound.
A. Barium compound
B. Iodine
C. *Gas filled encapsulated microbubbles*
D. Gadolinium

61. 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
62. 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

63. Aside from a few exceptions encountered in research, MRI involves imaging the nucleus of the _____.
A. barium
B. hydrogen atom
C. iodine
D. helium

64. Common *T*1 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
65. 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

66. 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

67. 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
68. 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)

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C. *screen film radiography*
D. both A and B

69. 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

70. Pixels are typically _____.
A. triangular
B. rectangular
C. *square*
D. *round*

71. 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

72. 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

73. 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*

74. 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)

75. 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

76. _____ are designed for scanning radiographic film, or laser printed medical film into digital format.
A. Ionization chambers
B. Film digitizers
C. Histograms
D. Transformers

77. 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 other artifact
C. correct labeling *and identification*
D. all of the above

78. 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

79. A primary purpose of DICOM is the interchange of images and their accompanying information.
A. TRUE
B. FALSE

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

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

81. Which of the following are examples of an ordinary network hardware?
A. routers
B. switches
C. *cables*
D. all of the above

82. The lossless compression of an image is also known as _____.
A. irreversible compression
B. non-reversible compression
C. reversible compression
D. *hard compression*

83. _____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. *R*eversible compression
D. H*ard compression*

84. Lossy compression can results in _____ that become visible in the reconstructed image.
A. under-exposed
B. artifacts
C. over-exposed
D. one of the above

Chapter 17
85. 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

86. _____ 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*

87. _____ 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*

88. The disadvantage of median filtering is that it can remove important features, such as _____.
A. thin edges
B. anatomy
C. *artifact*
D. *gray-scale*

89. An edge is a discontinuity in the image intensity.
A. TRUE
B. FALSE

90. *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
91. The _____ is the light sensitive part of the eye.
A. hypothalamus
B. thyroid
C. *retina*
D. *eyelid*

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92. In _____, luminance levels are low and only rods respond to light.
A. scotopic (night) vision
B. photopic (day) vision
C. *blind vision*
D. h*ard vision*

93. 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
94. _____ 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

95. 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

96. 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*

97. 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
98. _____ is the study of the action of ionizing radiations on living matter.
A. Cardiology
B. R*adiobiology*
C. Neurology
D. Ophthalmology

99. _____ contains the genetic information of the cell.
A. Lysosomes
B. *Deoxyribonucleic acid (DNA)*
C. Erythrocytes
D. Bone marrow

100. _____ damage is the **primary** cause of cell death induced by radiation.
A. Brain
B. *DNA*
C. Erythrocytes
D. Bone marrow

101. The ICRP recommendations for radiation protection purposes are based on the Japanese study and other epidemiological studies.
A. TRUE
B. FALSE

Chapter 21
102. A _____ is an instrument that measures ionizing radiation.
A. densitometer
B. sensitometer
C. *dosimeter*
D. *kVp meter*

103. 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

104. 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

105. 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
106. 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*

107. 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

108. 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

109. 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*

110. 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
111. _____ 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*

112. Before an examination, patients undergoing medical imaging procedures should be informed of the potential risk associated with the examination.
A. TRUE
B. FALSE

113. 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

114. The maximum luminance of image viewing monitors ranges between _____ and _____ cd/m^2.

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

Chapter 24

115. _____ are intentional exposures for the diagnostic or therapeutic benefit of the patient.
A. Occupational *exposures*
B. *Medical exposures*
C. Public exposure
D. Natural exposure

116. 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

117. 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

118. Which of the following is highly sensitive to radiation?
A. hair
B. nails
C. *the lens of the eye*
D. *extremities*

119. 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

120. _____ is an obvious choice for shielding material.
A. *Wood*
B. *Plastic*
C. *Barium*
D. Lead

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