

DIGITAL RADIOGRAPHY AND PACS

CHAPTER 1 – INTRODUCTION TO DIGITAL RADIOGRAPHY AND PACS

1. The concept of moving images digitally was introduced by Abler Jutras during his experimentation with _____ in the 1950s.
 - a. PACS
 - b. CT
 - c. Teleradiology
 - d. MRI
2. What system uses an x-ray absorber material coupled to a thin film transistor to form the image?
 - a. Image capture system
 - b. Electronic annotation system
 - c. Film/screen system
 - d. Flat panel detector system
3. Flat panel detector systems are divided into how many categories?
 - a. One
 - b. Two
 - c. Three
 - d. Four
4. What devices convert the incident x-ray energy directly into an electrical signal?
 - a. Indirect capture digital radiography
 - b. Direct capture digital radiography
 - c. Flat pane detectors
 - d. Teleradiology
5. In digital projection imaging, image processing takes place in a _____.
 - a. Darkroom
 - b. Computer
 - c. Cassette
 - d. Digital recorder
6. The acronym PACS stands for which of the following terms?
 - a. Picture arrival computer system
 - b. Picture archival computer system
 - c. Picture arrival communication system
 - d. Picture archiving and communication system
7. PACS is a networked group of _____ that can be used to manage digital images.
 - a. Computers and servers
 - b. Archives
 - c. Darkrooms
 - d. A&B
8. A PACS consists of different parts such as:
 - a. Reading and physician review stations
 - b. Technologist's QC station
 - c. Administrative stations
 - d. All the above

9. PACS can receive images from any hospital department that send in a _____ format.
- Film
 - Analog
 - Enhanced
 - DICOM
10. Digital images are easily retrieved if they have **not** been properly and accurately identified.
- True
 - False
11. Technologists markers are critical because digital image receptors and related software may show images on the monitor _____ making the determination of side (L/R) nearly impossible.
- Upside down
 - Flipped
 - Upside down and/or backward
 - Rotated
12. Intensifying screens are used to increase the effect of x-ray _____.
- Electrons
 - Protons
 - Photons
 - Neutrons
13. Technical factors should change to _____ the exposure as much a possible without sacrificing image quality.
- Increase
 - Lower
 - Alter
 - Impact

CHAPTER 2 – DIGITAL IMAGE CHARACTERISTICS

14. The pixel size is directly related to the amount of _____ in the image.
- Detail
 - Contrast
 - Latitude
 - Magnification
15. What is a square arrangement of columns and rows known as?
- Pixelization
 - Magnification
 - Matrix
 - Standardization
16. What refers to the amount of a patient's body part included in an image?
- Contrast resolution
 - Pixel size
 - Matrix size
 - Field of view

17. What is the term used to describe the digital image appearance on the computer monitor?
- Contrast resolution
 - Gray scale
 - Brightness
 - Signal
18. _____ refers to the digital system's ability to demonstrate subtle differences.
- Latitude
 - Contrast resolution
 - Detail
 - Image quality
19. The ability of the imaging system to demonstrate small details of an object is known as _____.
- Contrast
 - Latitude
 - Field of view
 - Spatial resolution
20. What is the ability of a system to record available spatial frequencies known as?
- Histogram
 - Processing function
 - Sampling function
 - Modulation transfer function
21. Anatomic noise can be controlled by the radiographer while equipment noise cannot.
- True
 - False
22. What refers to the range of exposure image values the detector is able to produce?
- Signal
 - Resolution
 - Latitude
 - Contrast

CHAPTER 3 – DIGITAL RADIOGRAPHIC IMAGE PROCESSING AND MANIPULATION

23. The data within the collimated area produces a graphic representation of the optimal densities is called a _____.
- Image
 - Histogram
 - Data point
 - Processor
24. With _____, the plate is scanned and the image's location is determined and a value placed on each pixel.
- Image sampling
 - Image resolution
 - Pixel processing
 - High resolution

25. The shape of a histogram generated from a chest x-ray on an adult will look very different from a pediatric knee histogram.
- True
 - False
26. Who described a way to convert analog signals into digital signals that would accurately transmit over telephone lines?
- Harry Smith
 - Joe Bledsoe
 - Harry Nyquist
 - Neil Armstrong
27. What is caused when signal frequencies are produced above the Nyquist frequency?
- Heat
 - Contrast
 - Aliasing
 - Scatter
28. _____ means that images are produced with uniform density and contrast, regardless of the amount of exposure.
- Transmitted
 - Foldover
 - Automatic rescaling
 - Manipulation
29. What term is widely used to explain the use of higher mAs values than is necessary to avoid quantum mottle?
- Frequency
 - Exposure
 - Detection
 - Dose creep
30. Converting the digital input data to an image with appropriate brightness and contrast enhancement parameters is called _____.
- Rescaling
 - Sampling
 - Resolution adjustment
 - Contrast manipulation
31. Detail or sharpness is referred to as _____.
- Spatial frequency resolution
 - Filtering
 - Smoothing
 - Enhancement
32. Many health care facilities **do** want the technologist to manipulate the image before it goes to the picture archiving and PACS.
- True
 - False

33. What occurs when fewer pixels are included in the signal average?
- Contrasting
 - Filtering
 - Edge enhancement
 - Digitizing
34. Low pass filtering is also known as what?
- Image enhancement
 - Masking
 - Manipulation
 - Smoothing
35. Brightness and contrast are the most common image processing parameters.
- True
 - False
36. What controls how bright or dark the screen is?
- Filtering
 - Smoothing
 - Window level
 - Noise reduction
37. What controls the ratio of black and white, or contrast?
- Shuttering
 - Magnification
 - Window width
 - Filtering
38. In digital imaging, automatic _____ is used to blacken out the white collimation borders.
- Controls
 - Contrast
 - Shuttering
 - Parameters
39. What refers to the way anatomy is oriented on the imaging plate?
- Image identification
 - Image orientation
 - Image annotation
 - Image manipulation
40. When anatomy is too large to fit on one cassette, the process of joining multiple images is called what?
- Image enhancement
 - Image stitching
 - Image contour
 - Image correction
41. The _____ function allows selection of reset terms and/or manual text input.
- Image parameter
 - Image reduction
 - Image collimation
 - Image annotation

42. How many types of magnification techniques come standard with digital systems?
- 1
 - 2
 - 3
 - 4
43. The zoom technique **does not** allow magnification of the entire image.
- True
 - False
44. Patient demographics include:
- Patient name and date of birth
 - Healthcare facility and patient ID number
 - Examination date
 - All of the above
45. The _____ function allows the quality control technologist to select one or more local computers to receive images.
- Image manipulation
 - Archive query
 - Manual send
 - Distribution
46. What is the function that allows retrieval of images from the PACS?
- Image stitching
 - Image distribution
 - Archive query
 - Image query

CHAPTER 4 – PHOTOSTIMULABLE PHOSPHOR IMAGE CAPTURE

47. In PCP systems, the radiographic image is recorded on a thin sheet of plastic known as the _____.
- Cassette
 - Reader
 - Imaging plate
 - sheet enhancer
48. The phosphor layer “traps” _____ during image exposure.
- Photons
 - Neutrons
 - Electrons
 - Protons
49. What layer of an image plate sends light in a forward direction when it is released in a cassette reader?
- Protective layer
 - Phosphor layer
 - Conductive layer
 - Reflective layer

50. What layer of the imaging plate absorbs and reduces static electricity?
- Protective layer
 - Reflective layer
 - Conductive layer
 - Phosphor layer
51. What is the movement of the laser across the imaging plate called?
- Slow scan direction
 - Translation
 - Sub-scan direction
 - Fast scan direction
52. During the image plate scanning, how many electron volts are necessary to energize the trapped electrons?
- 2 eV
 - 4 eV
 - 6 eV
 - 8 eV
53. What is the amount of detail present on an image called?
- Image contrast
 - Image brightness
 - Spatial resolution
 - Image enhancement
54. What is the kVp range on most digital projection systems?
- 45-100 kVp
 - 45-110 kVp
 - 45-115 kVp
 - 45-120 kVp

CHAPTER 5 – FLAT PANEL IMAGE ACQUISITION

55. What year was the first thin-film transistor (TFT) introduced?
- 1986
 - 1990
 - 1995
 - 1996
56. A photoconductor:
- Produces light when absorbing x-rays
 - Produces x-rays when absorbing light
 - Absorbs light and produces electric charges
 - Absorbs x-ray and produces electric charges
57. A field effect transistor (FET) can read more than a million pixels in less than how many seconds?
- 1
 - 2
 - 3
 - 4

58. Gain calibration is used to correct flaws in the _____.
- Cassette
 - Image
 - Detector
 - Pixels
59. What is it called when a faint image from a previous exposure is visible?
- Image shadowing
 - Image duplication
 - Image lag
 - Image overexposure

CHAPTER 6 – CCD/CMOS IMAGE CAPTURE

60. What components make up a charge-coupled device (CCD)?
- Photosensitive receptor
 - Sensors
 - Embedded electronics
 - A&C
61. Each pixel or detector element (del) contains _____ electrodes that hold the electrons in an electrical potential well.
- two
 - three
 - six
 - seven
62. The type of scintillator and the way it is constructed will determine:
- How much of the incident x-ray photons are absorbed
 - How much light is produced
 - The wavelength or color of the light
 - All the above
63. CsI is **not** a particularly common scintillator.
- True
 - False
64. The lens or fiber optics is used to focus what onto the CCD chip?
- Images
 - Light
 - Electrons
 - Signal
65. The amount of electrons produced relative to the incident light from the scintillator is the _____ of the CCD.
- Spectrum sensitivity
 - Application
 - Quantum efficiency
 - Effectiveness

66. What types of noise is associated with CCD technology?
- Statistical noise
 - Current noise
 - Amplification noise
 - All the above
67. Amplification noise is common to what systems?
- Analog systems
 - Digital systems
 - Fiber optic systems
 - All systems
68. For stereotactic breast biopsies what size chip is used that results in some demagnification?
- 0.5 cm × 0.5 cm
 - 1.0 cm × 1.0 cm
 - 2.0 cm × 2.0 cm
 - 2.5 cm × 2.5 cm
69. In general radiography, CCD's may be tiled in a _____ array to a single CCD.
- 5 × 7
 - 8 × 10
 - 14 × 17
 - 16 × 12
70. What company developed complementary metal oxide semiconductors systems?
- IBM
 - NASA
 - Boeing
 - Orbital Sciences
71. What is a solid chemical element or compound that conducts electricity under some conditions but not others?
- Detector element
 - Capacitor
 - Scintillator
 - Semiconductor

CHAPTER 7 – PICTURING ARCHIVING AND COMMUNICATION SYSTEM

72. Binary code uses a language of _____ and _____ to process data.
- 1s & 0s
 - 1s & 2s
 - 1s & 3s
 - 1s & 4s
73. A byte is made up of how many bits?
- 1
 - 5
 - 6
 - 8

74. What is the largest circuitry board inside a computer?
- Primary board
 - Motherboard
 - Processing board
 - Secondary board
75. Where is the central processing unit (CPU) found?
- Hard drive
 - Motherboard
 - Operating system
 - Memory board
76. What is the brain of the computer?
- Microprocessor
 - Primary board
 - Memory board
 - Network card
77. What year did Intel place the first microprocessor in a computer?
- 1969
 - 1974
 - 1979
 - 1982
78. What is the collection of connectors sticking out the back of the PC called?
- Hard drive
 - Port
 - Memory board
 - CPU
79. What is the main repository for programs and documents on a PC?
- Network card
 - Motherboard
 - CPU
 - Hard drive
80. A digital versatile disc (DVD) hold up to _____ time more data than the CD
- four
 - six
 - seven
 - ten
81. What software controls the computer hardware and acts as a bridge between applications and the hardware?
- CPU
 - Motherboard
 - Operation system
 - None of the above

CHAPTER 8 – NETWORKING AND COMMUNICATION BASICS

82. A network is classified into what two major geographic categories?
- CAN & LAN
 - CAN & TAN
 - WAN & CAN
 - LAN & WAN
83. What is small area networked with a series of cables that allow computers to share information?
- WAN
 - LAN
 - CAN
 - MAN
84. What network spans a large area?
- CAN
 - LAN
 - WAN
 - MAN
85. What is a computer that manages resources for other computers, servers and networked devices called?
- Client based network
 - Local area network
 - Server
 - Readers
86. A _____ is a computer that can work independently of the network and processes and manages its own files?
- Thin client
 - Thick client
 - Server
 - Fit client
87. What provides the physical connection between the network and the computer?
- Network hub
 - Wireless connection
 - Fiber optic cable
 - Network interface card
88. How many topology configurations are there on a network?
- 3
 - 4
 - 5
 - 6
89. What year was digital imaging and communication in medicine (DICOM) developed?
- 1974
 - 1980
 - 1985
 - 1987

CHAPTER 9 – PACS FUNDAMENTALS

90. The _____ is the most interactive part of a PACS and is used inside and outside of radiology
- Reading workstation
 - Display workstation
 - QC workstation
 - File room workstation
91. What term is used to describe how an exam is completed from order entry to transcribed report?
- Archives
 - Assignment
 - Workflow
 - Completion
92. In many ways the PACS workflow **is no** different from the film-based workflow.
- True
 - False
93. What is the hardware and software infrastructure of a computer called?
- Management system
 - Stand-alone system
 - System architecture
 - Client based system
94. What station does the technologist use to review images before sending them to the radiologist?
- Reading workstation
 - QC station workstation
 - File room workstation
 - Radiologist workstation

CHAPTER 10 – PACS ARCHIVING AND PERIPHERALS

95. The term archive can be defined as a place where records or documents are preserved.
- True
 - False
96. What contains the master database of everything that is in the archive?
- Data manager
 - Image manager
 - Software manager
 - Archive manager
97. The image storage or archive server commonly consists of _____ or _____ tiers of storage.
- One, two
 - Two, three
 - Three, four
 - Five, six
98. Tape is a high-cost archive medium.
- True
 - False

99. When using magnet discs for storage the RAID arrays may be configured into how many different but related fashions?
- 1
 - 3
 - 4
 - 5
100. A laser digitizer uses a _____ neon laser beam to convert the analog film image into a digital image.
- Argon
 - Helium
 - Carbon
 - Nitrogen
101. Wet images use _____ to process the film that has been exposed to the laser.
- Digitizer
 - Chemicals
 - Silver salts
 - A & C
102. What do dry imagers use to process the latent images?
- Chemicals
 - Water
 - Heat
 - Silver salts
103. Imagers will continue to be used in radiology departments as:
- Backup
 - Legal cases
 - Teaching purposes
 - All the above

CHAPTER 11 - QUALITY CONTROL AND QUALITY MANAGEMENT

104. What organization accredits most health care institutions in the United States?
- OSHA
 - The Joint Commission
 - American Hospital Association
 - American Medical Association
105. What is the defined plan for the systematic observation and assessment of the different aspects of a project, service or facility to make certain that standards of quality are being met called?
- Observation
 - Oversight
 - Monitoring
 - Quality assurance
106. Quality control can be defined as a comprehensive set of activities designed to monitor and maintain systems that produce a product.
- True
 - False

107. The major categories of QC tests that are used at various times are:
- Acceptance testing
 - Routine maintenance
 - Error maintenance
 - All the above
108. Continuous quality improvement tends to focus on the _____ rather than the people.
- Data
 - Situation
 - Surroundings
 - Process
109. What device is used to measure the luminance response of a monitor?
- Volt meter
 - Photometer
 - Ambient reader
 - Barometer
110. Workstation processing speed can be measured in which of the following ways?
- Open the study and note the loading time
 - Choose an image processing function and note the loading time
 - Open the patient's next record and note the loading time
 - All the above
111. One CQI activity that should be monitored is the documentation of the non-diagnostic images being forwarded to PACS
- True
 - False
112. Who is the person trained to oversee the PACS?
- Radiologist
 - Supervisor
 - PACS administrator
 - Lead technologist

CHAPTER 12 – QUALITY ACCEPTANCE TESTING WITHIN DIGITAL PROJECTION IMAGING

113. Total Quality Improvement (TQM) concepts includes:
- Maintenance of equipment
 - Image acquisition
 - Processing standards
 - All the above
114. The _____ requires compliance with standards of practice to assure quality in an imaging system.
- American Medical Association
 - World Health Organization
 - American College of Radiology
 - American Society of Radiologic Technologists

115. The _____ is the first line of defense in preventing, recognizing, and reporting quality control issues.
- Radiologist
 - Radiologic technologist
 - Physicist
 - Administration
116. How often should a reject analysis be done?
- Daily
 - Weekly
 - Monthly
 - Every other month
117. How often should Imaging plates be removed from the cassette and inspected?
- Daily
 - Weekly
 - Monthly
 - Every other month
118. Which of the following should not be used to clean imaging plates?
- Lint-free cloth
 - Camel hair brush
 - Specific cleaning solutions
 - Steel brush
119. Typically, how often is manufacturer preventative maintenance performed?
- Monthly
 - Semiannually
 - Annually
 - As needed
120. The American Association of Physicists in Medicine has established a set of QC parameters for PSP systems.
- True
 - False