Chapter 1 - Digital Radiography: An Overview

TRUE/FALSE

1. Film-screen radiography has been the workhorse of radiology ever since the discovery of X-ray by W. C. Roentgen in 1895.

   ANS: T PTS: 1 REF: Introduction

2. As a radiation detector, film-screen cannot show differences in tissue contrast less than 30%.

   ANS: F PTS: 1 REF: Film-Based Radiography: A Brief Review

3. The film gamma refers to the sensitivity of the film to radiation.

   ANS: F PTS: 1 REF: Film-Based Radiography: A Brief Review

4. For digital radiography, special electronic (digital) detectors are used that replace the X-ray film cassette used in film-based radiography.

   ANS: T PTS: 1
   REF: A Digital Radiographic Imaging System: Major Components

5. The purpose of image compression is to increase storage space and decrease the image transmission time.

   ANS: F PTS: 1
   REF: A Digital Radiographic Imaging System: Major Components

6. Digital radiography imaging modalities include communication radiography (CR), flat-panel digital radiography (DR), digital mammography (DM), and digital fluorescence (DF) and the laser film digitizer.

   ANS: F PTS: 1 REF: Digital Radiography Modalities

7. The digital detector output signal is linear with the input radiation exposure.

   ANS: T PTS: 1 REF: Digital Radiography Modalities

8. A high-end computer is the heart of the PACS system.

   ANS: T PTS: 1 REF: Picture Archiving and Communication Systems

9. The major components of PACS include image acquisition devices, a PACS computer, devices called interfaces, and display workstations, all of which are connected and linked to the HIS and RIS through digital communication networks.

   ANS: T PTS: 1 REF: Picture Archiving and Communication Systems

10. A digital fluoroscopy system consists of very few of the imaging components found in a conventional fluoroscopic imaging system.

ANS: F PTS: 1 REF: Digital Radiography Modalities

MULTIPLE CHOICE

1. The term ____, as used in this book, refers to projection radiography, whereby computers process data collected from patients using special electronic detectors that have replaced the X-ray film cassette.
   a. filmless imaging
   b. digital radiography
   c. film-screen radiography
   d. digital mammography

ANS: B PTS: 1 REF: Introduction

2. ____ is used to describe the degree of film blackening as a result of radiation exposure, and it can be measured by a densitometer.
   a. Chemical processing
   b. The film characteristic curve
   c. Optical density
   d. Film speed

ANS: D PTS: 1 REF: Film-Based Radiography: A Brief Review

3. The ____ refers to the sensitivity of the film to radiation.
   a. film speed
   b. OD
   c. fog density
   d. film density

ANS: A PTS: 1 REF: Film-Based Radiography: A Brief Review

4. In order to change a(n) ____ (optical range and contrast), an additional set of exposure technique factors must be used, thus increasing the dose to the patient from repeated exposures.
   a. display medium
   b. film screen
   c. spatial resolution
   d. image display

ANS: D PTS: 1 REF: Film-Based Radiography: A Brief Review

5. If the radiation exposure is too ____, the film is overexposed and the processed image appears too ____ and the radiologist cannot make a diagnosis from such an image.
   a. low; dark
   b. high; dark
   c. light; light
   d. dark; dark

ANS: B PTS: 1 REF: Film-Based Radiography: A Brief Review

6. As a radiation detector, film-screen cannot show differences in tissue contrast less than ____.
   a. 5%
   b. 10%
   c. 15%
   d. 20%

ANS: B PTS: 1 REF: Film-Based Radiography: A Brief Review

7. For radiography, which of the following is the highest of all the other imaging modalities, and can range from 5 –15 line pairs/mm?
   a. spatial resolution
   b. film-screen
   c. contrast resolution
   d. optical range

ANS: A PTS: 1 REF: Film-Based Radiography: A Brief Review

8. Which major technical component of a digital radiography system refers to the collection of X-rays transmitted through the patient?
   a. image display
   b. post processing
   c. image storage
   d. data acquisition

   ANS: D PTS: 1
   REF: A Digital Radiographic Imaging System: Major Components

9. The output of computer processing, or the ____, must first be converted into an analog signal before it can be displayed on a monitor for viewing by the observer.
   a. digital data
   b. binary digit
   c. digital image
   d. digital processor

   ANS: C PTS: 1
   REF: A Digital Radiographic Imaging System: Major Components

10. Other than retrospective analysis, why do vast amount of images generated for the wide range of digital radiology examinations need to be stored?
   a. medico-legal purposes
   b. training purposes
   c. billing purposes
   d. reference purposes

   ANS: A PTS: 1
   REF: A Digital Radiographic Imaging System: Major Components

11. Which of the following makes use of photostimulable or storage phosphors to produce digital images using existing X-ray imaging equipment?
   a. DF
   b. DM
   c. DR
   d. CR

   ANS: D PTS: 1 REF: Digital Radiography Modalities

12. Which of the following is one important objective descriptor of digital image quality?
   a. DQE
   b. PMT
   c. CCD
   d. IP

   ANS: A PTS: 1 REF: Digital Radiography Modalities

13. The wide exposure latitude of the ____ will produce acceptable images even when the input exposure is low or high.
   a. charge-coupled device
   b. digital detector
   c. digital image
   d. light guide

   ANS: B PTS: 1 REF: Digital Radiography Modalities

14. Which digital radiography modality requires a great deal of special technical considerations in order to detect breast cancer?
   a. digital mammography
   b. digital fluoroscopy
   c. conventional fluoroscopy
   d. film-screen mammography

   ANS: D PTS: 1 REF: Digital Radiography Modalities

15. The detector in digital fluoroscopy is also the ____, since it captures the radiation passing through the patient.
   a. TV camera tube
   b. digital subtraction tube
   c. optic tube
   d. image intensifier tube

ANS: D PTS: 1 REF: Digital Radiography Modalities

16. Which of the following serve to display images on a monitor for the purpose of image interpretation?
    a. PACS
    b. IMACS
    c. softcopy workstations
    d. laser optical disks

    ANS: C PTS: 1 REF: Picture Archiving and Communication Systems

17. While DICOM is concerned primarily with images from the digital image acquisition modalities, HL-7 is concerned mainly with textual information from the ____ and ____.
    a. HIS; RIS
    b. CCD; HIS
    c. PACS; RIS
    d. CCD; PACS

    ANS: A PTS: 1 REF: Picture Archiving and Communication Systems

18. Quality assurance and ____ procedures are effective strategies to ensure continuous quality improvement of a product.
    a. ALARA
    b. CR
    c. QC
    d. IT

    ANS: C PTS: 1 REF: Quality Assurance in Digital Radiography

19. Which of the following involves the use of computer technology coupled with communications technology to solve problems in society, including medical imaging and health care?
    a. IT
    b. MII
    c. QC
    d. CR

    ANS: A PTS: 1 REF: Medical Imaging Informatics

20. Since the PACS contains confidential patient data and information, it is essential that they be secured; hence, ____ is of central importance in a digital hospital as well as in a PACS environment.
    a. image security
    b. diagnostic
    c. interface security
    d. data security

    ANS: D PTS: 1 REF: Picture Archiving and Communication Systems

COMPLETION

1. In the production of film-based radiographic images, X-rays pass through the patient and fall upon the film to form a(n) _____.

   ANS: latent image

   PTS: 1 REF: Film-Based Radiography: A Brief Review

2. The film contrast can be described by what is popularly known as the _____ or the Hurter-Driffield (H and D) curve.

   ANS: film characteristic curve

PTS: 1 REF: Film-Based Radiography: A Brief Review

3. One of the major problems with the _____ process is poor image quality if the initial radiation exposure has not been accurately determined.

   ANS: radiographic imaging

   PTS: 1 REF: Film-Based Radiography: A Brief Review

4. Film-based imaging is limited in its _____.

   ANS: contrast resolution

   PTS: 1 REF: Film-Based Radiography: A Brief Review

5. As a display medium, the optical range and contrast for film are _____ and limited.

   ANS: fixed

   PTS: 1 REF: Film-Based Radiography: A Brief Review

6. The conversion of analog signals into digital data is the function of the _____.

   ANS:
   analog-to-digital converter
   analog to digital converter

   PTS: 1 REF: A Digital Radiographic Imaging System: Major Components

7. Image and data communications are concerned with the use of computer communication networks to transmit images from the acquisition phase to the display/viewing and _____.

   ANS: storage phase

   PTS: 1 REF: A Digital Radiographic Imaging System: Major Components

8. An important element of image and data communications is that of _____.

   ANS: image compression

   PTS: 1 REF: A Digital Radiographic Imaging System: Major Components

9. While the RIS and HIS handle essentially textual information, specifically dealing with business operations for the entire hospital, the PACS handle images generated by the various _____.

   ANS: digital imaging modalities

   PTS: 1 REF: A Digital Radiographic Imaging System: Major Components

10. A major drawback of CR systems is their limited ability to image detail, also known as _____.

ANS: spatial resolution

PTS: 1 REF: Digital Radiography Modalities

11. Direct conversion digital radiography systems use detectors that convert X-rays directly into _____.

ANS: electrical signals

PTS: 1 REF: Digital Radiography Modalities

12. The application of digital image processing to fluoroscopy is referred to as _____.

ANS: digital fluoroscopy

PTS: 1 REF: Digital Radiography Modalities

13. The application of digital fluoroscopy to angiography is referred to as _____.

ANS: digital subtraction angiography

PTS: 1 REF: Digital Radiography Modalities

14. While radiography produces static images, fluoroscopy produces dynamic images acquired in real time to allow for the study of motion of organ systems and _____.

ANS: hollow internal structures

PTS: 1 REF: Digital Radiography Modalities

15. A major feature of workstations is that they allow users to perform digital post processing of images for the purpose of enhancing _____.

ANS: diagnosis

PTS: 1 REF: Picture Archiving and Communication Systems

16. Two standards that are currently used in a PACS environment are the DICOM and _____.

ANS:
HL-7
HL 7

PTS: 1 REF: Picture Archiving and Communication Systems

17. The application of information technology to medical imaging is referred to as _____.

ANS: medical imaging informatics

PTS: 1 REF: Medical Imaging Informatics

18. One of the significant differences between CR and film-screen radiography is that the exposure latitude of CR is about 104 times wider than that of the widest range of _____.

    ANS:
    film-screen systems
    film screen systems

    PTS: 1 REF: Digital Radiography Modalities

19. The digital detectors used in CR and flat-panel digital radiography have a characteristic response to radiation exposure that is fundamentally different to the _____.

    ANS: film characteristic curve

    PTS: 1 REF: Digital Radiography Modalities

20. To be effective and efficient in ensuring the integrity of the PACS, technologists must not only educate themselves in all aspects of IT but also continue to learn more about the digital world of radiology, including _____.

    ANS: digital image processing

    PTS: 1 REF: Medial Imaging Informatics