

Specialized Topics in Areas of Radiologic Sciences
P.O. Box 2931 Toledo, Ohio 43606 419-471-1973
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Unit 36

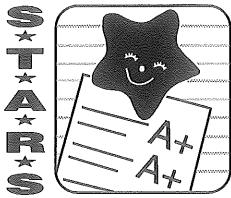
Radiographic Imaging & Exposure

Fourth Edition

by

Terri L. Fauber

Prepared by: Carolyn J. Frigmanski, M.A., B.S.R.T. ®
Founder, S.T.A.R.S.



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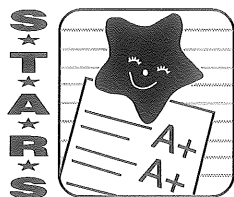
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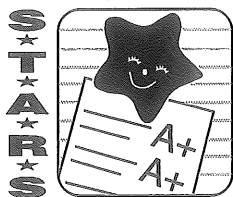
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Thank you very much.



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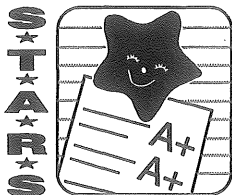
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Unit 36

Title: **Radiographic Imaging & Exposure** by Terri L. Fauber

Please complete the answer sheet at the conclusion of this post test and return to the S.T.A.R.S. office.
Chapter 1

1. The crystals Dr. Wilhelm Conrad Roentgen used to produce the first x-ray were
 - a. calcium tungstate
 - b. barium platinocyanide
 - c. lanthanum oxybromide
 - d. gadolinium oxysulfide
2. The instantaneous production of light resulting from some type of energy is called
 - a. luminescence
 - b. phosphorescence
 - c. fluorescence
 - d. scintillation
3. The world's first radiograph was a hand image of
 - a. Dr. Wilhelm Conrad Roentgen
 - b. Thomas Edison
 - c. Marie Curie
 - d. Anna Bertha Roentgen
4. The state that attempted to enact legislation to ban x-ray producing devices in opera glasses was
 - a. New Jersey
 - b. Washington, DC
 - c. New York
 - d. New Mexico
5. The first indications of the damaging biologic effects from x-rays were
 - a. tumors & sterility
 - b. redness & burns of the skin
 - c. mental challenges & fatigue
 - d. soft tissue tumors and anemia
6. The most energetic electromagnetic radiation on the electromagnetic spectrum is
 - a. cosmic radiation
 - b. infrared radiation
 - c. gamma rays
 - d. visible light
7. An angstrom is a metric unit of length equal to _____ of a meter.
 - a. one two millionth
 - b. one three millionth
 - c. one ten millionth
 - d. one ten billionth
8. The energy of an individual photon is measured in units of
 - a. velocity
 - b. wavelength
 - c. cycles
 - d. electron volts

9. X-rays can cause chemical and biological changes in living tissue because of the process of

- a. ionization
- b. reduction
- c. scatter
- d. oxidation

Chapter 2

10. The coiled tungsten wire that provides electrons during x-ray production is called the

- a. cathode
- b. filament
- c. anode
- d. focusing cup

11. The revolutions per minute of rotating anodes is

- a. 1,000 to 2,000
- b. 500 to 2,500
- c. 3,000 to 10,000
- d. 300 to 1,000

12. Tungsten is used in the target because it possesses a

- a. high atomic number
- b. low atomic number
- c. low heat storage capacity
- d. limited capacity to produce scatter

13. The physical area of the target that is bombarded by electrons during x-ray production is

- a. focal track
- b. focusing cup
- c. stator
- d. focal spot

14. The radiation that results when projectile electrons interact with K-shell electrons is called

- a. characteristic
- b. x-ray emission
- c. bremsstrahlung
- d. Compton effect

15. The portion of the x-ray circuit that operates on 3 to 5 amps and about 10 volts is called the

- a. high voltage circuit
- b. filament circuit
- c. low voltage circuit
- d. rectification system

16. Electron flow from cathode to anode in the x-ray tube is called

- a. actual focal spot
- b. high voltage flow
- c. effective focal spot
- d. tube current

17. Beam penetrability increases as

- a. mA increases
- b. filter thickness increases
- c. kVp increases
- d. kVp decreases

18. The exposure factor that produces or controls the number of x-rays is

- a. distance
- b. mA
- c. kVp
- d. distance

19. The anode angle typically ranges from

- a. 10 to 15 degrees
- b. 6 to 18 degrees
- c. 5 to 20 degrees
- d. 10 to 20 degrees

20. Thicker anatomic body parts should be positioned at the

- a. cathode end of the x-ray tube
- b. head of the x-ray table
- c. anode end of the x-ray tube
- d. transverse axis of a grid

21. Total filtration for x-ray tubes operating above 70 kVp in the United States is

- a. 1.5 mm of aluminum
- b. 2 mm of aluminum or its equivalent
- c. 2.5 mm of aluminum or its equivalent
- d. 3.5 mm of aluminum

22. Failure of the rotor to rotate the anode will cause

- a. pitting
- b. melting of the focal tract
- c. uneven x-ray beam distribution
- d. damage to the cathode structure

Chapter 3

23. The reduction in energy of the primary x-ray beam as it passes through anatomic tissue is called

- a. attenuation
- b. differential absorption
- c. absorption
- d. braking radiation

24. The process of creating photoelectrons occurs with

- a. Compton effect
- b. scatter
- c. exit radiation
- d. photoelectric effect

25. The combination of transmitted and scattered radiation is called

- a. secondary radiation
- b. absorbed radiation
- c. primary radiation
- d. exit radiation

26. Less than ____% of the primary x-ray beam interacting with an anatomic part reaches the image receptor.

- a. 1
- b. 5
- c. 10
- d. 25

27. The latent or invisible image is created by _____ radiation.

- a. primary
- b. scatter
- c. secondary
- d. exit

28. The visibility of recorded detail is also referred to as

- a. geometric properties
- b. sensitometric properties
- c. brightness or density
- d. differential absorption

29. The amount of luminance (light emission) of a display monitor is called

- a. brightness
- b. contrast
- c. density
- d. resolution

30. Increasing the penetrating power of the x-ray beam will

- a. increases absorption
- b. decreases attenuation
- c. decreases transmission
- d. increases attenuation

31. A film image with few densities but great differences between them is referred to as

- a. long-scale contrast
- b. grayscale
- c. low contrast
- d. short-scale contrast

32. The term used to refer to the smallest object that can be detected in an image is

- a. spatial resolution
- b. recorded detail
- c. minification
- d. structural detail

33. Misalignment of the x-ray tube, part, or image receptor will produce

- a. size distortion
- b. magnification
- c. shape distortion
- d. minification

34. Quantum noise will increase when _____ photons reach the image receptor.

- a. more
- b. fewer
- c. scattered
- d. penetrating

35. Any unwanted image on a radiograph is called

- a. fog
- b. quantum mottle
- c. an artifact
- d. quantum noise

36. The range of exposure intensities a digital imaging receptor can accurately detect is called

- a. dynamic range
- b. scale of contrast
- c. latitude
- d. brightness

37. The smallest component of the matrix is called a

- a. bit
- b. byte
- c. bit depth
- d. pixel

38. The device used to numerically determine the degree of blackness on a radiograph is a

- a. sensitometer
- b. penetrometer
- c. densitometer
- d. step wedge

39. The diagnostic range of optical densities for diagnostic radiography usually falls between

- a. 0.50 – 2.0
- b. 1.0-2.5
- c. 1.5 – 3.0
- d. 2.0 – 3.5

Chapter 4

40. As the quantity of x-rays is increased, the exposure to the image receptor will

- a. decrease
- b. increase
- c. remain the same
- d. decrease density

41. A numeric value indicating the level of x-ray exposure received by a digital imaging receptor is called

- a. scale of contrast
- b. exposure index
- c. brightness reading
- d. exposure indicator

42. The minimum amount of change in mAs to make a visible change in density is _____ %.

- a. 10
- b. 20
- c. 30
- d. 40

43. Maintaining or adjusting exposure can be accomplished by using the _____ % rule.

- a. 15
- b. 20
- c. 30
- d. 40

44. Changing _____ affects x-ray absorption and transmission with anatomic parts.

- a. mAs
- b. kVp
- c. time
- d. mA

45. The physical dimensions of the focal spot in x-ray tubes used in diagnostic radiography are

- a. 0.5 to 1.2 mm
- b. 1.0 to 2 mm
- c. 2 to 3 mm
- d. 1 to 3 mm

46. Increasing SID (source-to-image receptor distance) will result in

- a. increasing spatial resolution
- b. less structural detail
- c. reducing patient doses
- d. decreasing the amount of contrast

47. Increasing OID (object-to-image receptor distance) will result in

- a. increasing spatial resolution
- b. more structural detail
- c. increasing magnification
- d. decreasing magnification

48. To minimize shape distortion, the radiographer must keep the tube, film and patient

- a. perpendicular to each other
- b. properly aligned
- c. as close as possible
- d. horizontal to the table

49. The grid conversion factor for a 12:1 grid ratio is

- a. 2
- b. 3
- c. 4
- d. 5

50. A greater amount of scatter will be produced whenever

- a. more tissue is irradiated
- b. collimation is small
- c. tissue volume increases
- d. patient thickness is decreased

51. The body habitus described as normal or average build is

- a. asthenic
- b. hyposthenic
- c. sthenic
- d. hypersthenic

52. When a fiberglass cast is applied, exposure factors should

- a. be increased
- b. be decreased
- c. be changed by 4 kVp
- d. remain the same

53. Ascites is considered to be a _____ condition.

- a. destructive
- b. additive
- c. life-threatening
- d. acute

54. Barium and iodine are considered _____ contrast agents.

- a. negative
- b. positive
- c. radiolucent
- d. dangerous

Chapter 5

55. As beam restriction or collimation increases, the patient dose will

- a. increase
- b. decrease by at least 50%
- c. will not be affected
- d. decrease

56. Significant collimation requires an increase in mAs of

- a. 30 to 50%
- b. 35 to 50%
- c. 40 to 55%
- d. 60% or more

57. The beam-restricting device that utilizes two or three sets of lead shutters is called a

- a. flared extension cone
- b. cylinder cone
- c. collimator
- d. diaphragm

58. Another term for an automatic collimator is

- a. adjustable
- b. self-regulating
- c. electronic
- d. positive beam-limiting

59. A grid should be utilized whenever an anatomic body part measures

- a. 5 cm or more
- b. 10 cm or more
- c. 15 to 20 cm
- d. 20 to 30 cm

60. The grid type that has a convergence point is the

- a. parallel
- b. cross-hatched
- c. wafer
- d. linear focused

61. The grid conversion factor when changing from no grid to a 16:1 grid is

- a. 3
- b. 4
- c. 5
- d. 6

62. Misalignment of the grid in relationship to the primary x-ray beam results in

- a. contrast improvement
- b. grid cutoff
- c. increased density
- d. reduced patient dose

63. The grid ratios typically used in diagnostic radiography are

- a. 6:1 & 8:1
- b. 5:1 & 10:1
- c. 8:1 & 12:1
- d. 10:1 & 12:1

Chapter 6

64. A photostimulable phosphor is used in

- a. digital radiography (DR)
- b. xerography
- c. computed tomography
- d. computed radiography (CR)

65. Barium fluorohalide crystals coated with europium are found in

- a. imaging plates
- b. input phosphors
- c. rare earth screens
- d. super fast screen speeds

66. To prevent fading, computed radiography (CR) plates should be processed within

- a. 1 hour of exposure
- b. 2 hours of exposure
- c. 4 hours of exposure
- d. 8 hours of exposure

67. Indirect conversion detectors use a scintillator such as

- a. lanthanum oxybromide
- b. cesium iodide
- c. calcium tungstate
- d. gadolinium oxysulfide

68. Direct conversion detectors use amorphous _____.

- a. silicon
- b. iodine
- c. cesium
- d. selenium

69. Increasing the SNR (signal-to-noise ratio) will _____ the visibility of anatomic details.

- a. increase
- b. obscure
- c. decrease
- d. distort

70. The most widely used radiographic film is

- a. non-screen
- b. single-emulsion film
- c. screen film
- d. blue sensitive film

71. Sensitivity specks are the site of

- a. x-ray absorption
- b. latent image formation
- c. positive ion formation
- d. film processing

72. The emission of light from the screens when stimulated by radiation is called

- a. photo-emission
- b. fluorescence
- c. phosphorescence
- d. luminescence

73. Screens with thicker phosphor layers will

- a. reduce patient dose
- b. decrease screen speed
- c. increase recorded detail
- d. improve contrast

Chapter 7

74. Representation of the number of pixel values versus the relative prevalence of those values is

- a. known as values of interest
- b. referred to as lookup tables
- c. called a histogram
- d. considered an exposure indicator

75. Brightness and contrast of the original pixel values can be altered by a method using

- a. values of interest
- b. lookup tables
- c. histogram analysis
- d. exposure indicators

76. The recommended scanning for CRT monitors is at least _____ lines at 1/30 of a second.

- a. 100
- b. 200
- c. 350
- d. 525

77. The display monitor for diagnostic interpretation should have high-resolution with _____ pixels.

- a. 2048 x 2560
- b. 2048 x 4096
- c. 2560 x 4096
- d. 4096 x 4096

78. Brightness in a digital image is controlled by

- a. window width
- b. histogram analysis
- c. window level
- d. exposure indicators

79. A postprocessing technique that improves the visibility of small, high contract structures is called

- a. subtraction
- b. edge enhancement
- c. contrast enhancement
- d. black/white reversal

80. The communication standard for medical information is known as

- a. picture archival and communication system
- b. radiology information system
- c. hospital information system
- d. Health Level Seven standard (HL7)

81. The chemical that is fast acting and produces gray densities on film is

- a. phenidone
- b. sodium sulfite
- c. hydroquinone
- d. potassium bromide

82. Temperature control in automatic processors is provided by the

- a. mixing valves
- b. external thermostat
- c. immersion heater
- d. dryer assembly

83. A brown or thiosulfate stain results from

- a. exhausted developer
- b. inadequate washing
- c. contamination of solutions
- d. inadequate fixation

84. Silver recovery refers to the removal of silver from

- a. used developer
- b. replenishing solutions
- c. wash water
- d. used fixer

Chapter 8

85. The electronic device that converts visible light energy into electrical energy is

- a. an ionization chamber
- b. AEC detector
- c. photomultiplier tube (PM)
- d. input phosphor

86. Most of today's automatic exposure systems (AEC) utilize

- a. ionization chambers
- b. photomultiplier tubes
- c. one AEC chamber
- d. excessive kVp to penetrate all parts

87. Radiographers should note the mAs readout display so that they can

- a. write it down for documentation
- b. make adjustments for manual techniques
- c. perform all quality control tests
- d. tell the patient the dose

88. The device that prevents the x-ray tube from reaching or exceeding its heat loading capacity is

- a. the rectifiers
- b. the ionization chamber
- c. the rheostat
- d. the backup timer

89. A critical factor for radiographers to remember when using an AEC system is to

- a. adjust time for disease processes
- b. always use high kVp
- c. disregard SID
- d. select the correct detector

90. Density selections with AEC systems can be adjusted in increments of

- a. 25 to 50%
- b. 30 to 50%
- c. 40 to 50%
- d. 10 kVp

91. A critical factor for radiographers to remember when using an AEC system is to

- a. disregard collimation
- b. properly center the part
- c. disregard using gonadal shielding
- d. select all chambers for all exams

92. A system using a preprogrammed set of exposure factors with visual anatomic buttons is called

- a. anatomically programmed
- b. anatomic adjustment
- c. preprogrammed AEC
- d. anatomic AEC

93. Baseline kVp should have 2 kVp added for every increase of patient tissue of

- a. 1 cm
- b. 2 cm
- c. 3 cm
- d. 4 cm

94. Variable kVp/Fixed mAs technique charts are recommended for use with

- a. abdomen studies
- b. chest radiography
- c. small extremities
- d. gastrointestinal tract examinations

95. The kVp value that is high enough to ensure penetration of the part is called

- a. recommended
- b. optimal
- c. diagnostic
- d. useful

Chapter 9

96. The amount of overall blackness on a radiograph is called

- a. density
- b. contrast
- c. brightness
- d. visibility

97. Variations in the brightness and density in both digital and film-screen imaging is called

- a. exposure values
- b. resolution
- b. visibility
- d. image contrast

98. Visible fluctuations in brightness or density on the image is called

- a. scale of contrast
- b. distortion
- c. quantum noise
- d. monitor flare

99. The vendor-specific exposure indicators using exposure index (EI) is

- a. Carestream (Kodak)
- b. Agfa
- c. Fuji
- d. Konica

100. Artifacts having greater density than the area of the image immediately surrounding them are

- a. minus-density
- b. plus-density
- c. fog
- d. radiopaque

Match the exposure technique factor in **Column A** that affects quality for **film-screen image receptors** in **Column B**:

Column A

101. increasing mAs

102. decreased focal spot size

103. increasing patient thickness

104. decreasing kVp

105. increasing grid ratio

Column B

a. decreased contrast

b. increased density

c. increased recorded detail

d. decreased density

e. increased contrast

Match the exposure technique factor in **Column A** that affects quality for **digital image receptors** in **Column B**:

Column A

Column B

- | | |
|----------------------------------|---------------------------------|
| 106. increasing mAs | a. decreased contrast |
| 107. increasing beam restriction | b. increased contrast |
| 108. patient motion | c. decreased spatial resolution |
| 109. increasing kVp | d. no effect |
| 110. increasing SID | e. increased spatial resolution |

Chapter 10

111. The milliamperage used in conventional fluoroscopy is

- | | | | |
|-------------|-------------|------------|------------|
| a. 0.3 to 5 | b. 0.5 to 5 | c. 1 to 10 | d. 5 to 15 |
|-------------|-------------|------------|------------|

112. Exit radiation from the anatomic area of interest interacts with the

- | | |
|-------------------|----------------------------------|
| a. input phosphor | c. output phosphor |
| b. photocathode | d. electrostatic focusing lenses |

113. Flux gain occurs when accelerated electrons increase the light intensities at the

- | | |
|-------------------|----------------------------------|
| a. input phosphor | c. output phosphor |
| b. photocathode | d. electrostatic focusing lenses |

114. Multifield mode is a synonym for _____ mode.

- | | |
|--------------------|-----------------|
| a. magnification | c. spot |
| b. intensification | d. minification |

115. Loss of brightness around the periphery of the image is referred to as

- | | | | |
|-------------|-------------|------------|---------------|
| a. cropping | b. blurring | c. dimming | d. vignetting |
|-------------|-------------|------------|---------------|

116. A light-sensitive semiconducting device that generates an electrical charge is a

- | | |
|---------------------------|----------------------|
| a. camera tube | c. rectifier |
| b. charged-coupled device | d. image intensifier |

117. The image intensifier is capable of resolving _____ line pairs per millimeter.

- | | | | |
|------|------|------|-------|
| a. 3 | b. 4 | c. 5 | d. 10 |
|------|------|------|-------|

118. Any residual exposure charge from the previous frame is referred to as

- | | | | |
|---------------|--------------------|----------------|-----------------|
| a. "ghosting" | b. double exposure | c. overlapping | d. spot filming |
|---------------|--------------------|----------------|-----------------|

119. Fluoroscopic time should be monitored and documented in _____ minute increments.

a. 1

b. 3

c. 5

d. 10

120. Quality control checks on fluoroscopic equipment should be performed every

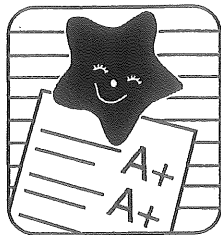
a. 3 months

b. 6 months

c. year

d. 2 years

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Specialized Topics in Areas of Radiologic Sciences

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Answer Sheet for: Unit 36 Radiographic Imaging & Exposure by Terri L. Fauber

**Please place your lettered selection for each question in the respective box and return
*ONLY this post test sheet to S.T.A.R.S.***

1.	11.	21.	31.	41.	51.	61.
2.	12.	22.	32.	42.	52.	62.
3.	13.	23.	33.	43.	53.	63.
4.	14.	24.	34.	44.	54.	64.
5.	15.	25.	35.	45.	55.	65.
6.	16.	26.	36.	46.	56.	66.
7.	17.	27.	37.	47.	57.	67.
8.	18.	28.	38.	48.	58.	68.
9.	19.	29.	39.	49.	59.	69.
10.	20.	30.	40.	50.	60.	70.

Please continue on the reverse side.

Answer Sheet for: Unit 36 Radiographic Imaging & Exposure by Terri L. Fauber

**Please place your lettered selection for each question in the respective box and return
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71.	81.	91.	101.	111.
72.	82.	92.	102.	112.
73.	83.	93.	103.	113.
74.	84.	94.	104.	114.
75.	85.	95.	105.	115.
76.	86.	96.	106.	116.
77.	87.	97.	107.	117.
78.	88.	98.	108.	118.
79.	89.	99.	109.	119.
80.	90.	100.	110.	120.