1. The biological effects of radiation are known to be influenced by all of the following EXCEPT the:
   a. type of radiation and dose rate deliver to the tissue
   b. size of the cells in the tissue exposed
   c. total dose received by the tissue
   d. type of cells in the tissue exposed

2. As the kilovoltage peak is increased and the milliampere seconds correspondingly decreased, which of the following occurs?
   a. image contrast increases
   b. image distortion increases
   c. patient skin exposure increases
   d. patient skin exposure decreases

3. The greatest contribution of unnecessary radiation exposure to the patient comes from the x-ray operator's failure occurs?
   a. collimate the x-ray beam to the area of clinical interest only
   b. use proper gonadal shielding
   c. use fast screens and films
   d. use proper exposure (technical) factors

4. All of the following must be posted in areas where x-ray producing machines are utilized EXCEPT:
   a. each x-ray supervisor and operator permit
   b. each certified radiologic and operator permit
   c. Radiologic Health Department Form RH-2364, “Notice to Employees”
   d. each physician’s license for the healing arts

5. During a 2-minute (fluoroscopy exposure time) routine upper G.I. series examination, a typical x-ray exposure to the patient is:
   a. 0.5 roentgens
   b. 1.0 roentgens
   c. 6.0 roentgens
   d. 30.0 roentgen

6. The California Radiation Control Regulations define dose to mean radiation absorbed per unit mass. Whole-Body dose means exposure to which of the following:
   I Major portions of the whole body
   II Head and trunk
   III Gonads
   IV Lens of the eye
   V Active blood-forming organs
   VI Whole body
   a. I only
   b. I, III, IV & VI only
   c. I & IV only
   d. all of the above
7. According to the California radiation Control Regulations, all EXCEPT which of the following is defined as an occupational dose? The dose received by any occupationally exposed person:
   a. in a controlled area
   b. in the course of employment
   c. during the course of training
   d. for his/her own medical or dental diagnosis

8. The major source of secondary radiation in radiography is the:
   a. walls, floor and ceiling
   b. cassette
   c. patient’s body
   d. x-ray tabletop

9. What kind of barrier, if any, must be in all walls, floors and ceilings
   a. barrier equivalent to 1.5 mm of aluminum
   b. primary barrier
   c. secondary barrier
   d. no barrier is needed

10. Film badges/dosimeters are used by radiation workers, because:
    I. they are the only reliable means of dose measurement
    II. they absorb part of the radiation and thus protect the worker from overexposure
    III. they are a practical means of providing long-term exposure records
    IV. they can measure exposure to the worker with reasonable accuracy
   a. I and III only
   b. II and IV only
   c. III and IV only
   d. I and II only

11. Four fluoroscopic system equipped with an automatic brightness control (automatic exposure control) mechanism and where the x-ray tube is fixed below the table, moving the image intensifier away from the patient will:
   a. reduce the image size of an anatomic structure
   b. increase the size of the radiation field at the table top
   c. decrease patient dose
   d. increase patient dose

12. If the exposure area is doubled by opening the collimator, patient dose and exposure to the operator will:
   a. quadruple
   b. triple
   c. double
   d. remain the same

13. If at one foot from the radiation source the intensity of exposure is 240 milliroentgens (mR) per hour and you remain at this location for 10 minutes, you will receive an exposure of 40 milliroentgens (mR). What would be your exposure if you moved 2 feet away from the radiation source and remained there for 20 minutes?
   a. 2 milliroentgens
   b. 4 milliroentgens
   c. 20 milliroentgens
   d. 80 milliroentgens
14. You are fluoroscopying a patient using 80 kilovolt peak (kVp) technique. At this kVp, the intensity of the x-ray beam at table top should not exceed how many roentgens per minute for each milliampere (mA) of current?
   a. 0.2 roentgens per minute  
   b. 1.0 roentgens per minute 
   c. 2.2 roentgens per minute 
   d. 5.0 roentgens per minute

15. The ability of the human eye to perceive detail is called:
   a. visual acuity  
   b. photopic vision 
   c. vignetting 
   d. integration

16. The central portion of the image intensified tube possesses the greatest
   a. detail 
   b. aberration 
   c. brightness 
   d. resolution

17. Which of the following is directly proportional to the exposure delivered to the patient?
   a. kilovolt peak (kVp)  
   b. milliampere (mA) 
   c. thickness of the filter 
   d. target-to-panel or target-to-table top distance

18. Which of the following is not required on mobile fluoroscopic equipment?
   a. image intensifier  
   b. device to prevent operation when the x-ray beam is not intercepted by the primary barrier 
   c. device to prevent operation source-to-skin distance less than 12 inches 
   d. automatic brightness control circuit

19. A film badge report expresses an individual’s radiation dose equivalent in:
   a. roentgens 
   b. rads 
   c. rems 
   d. ergs

20. The California Radiation Control Regulations require that individual radiation monitoring records shall be preserved by the employer after termination of employment by a technologist or x-ray technician:
   a. for a period of not less than 1 year  
   b. for a period of not less than 3 years 
   c. for a period of not less than 7 years 
   d. indefinitely
21. A certain x-ray tube, at some given kilovolt peak (k Vp), delivers 4 milliroentgens (mR) per one milliampere-second (mAs) at 40 inches distance. At 80 inches distance, the radiation output from the x-ray tube (in mR/mAs) will be:
   a. 16
   b. 8
   c. 2
   d. 1

22. If you convert 12 milliroentgens (mR) to roentgens (R) you will obtain:
   a. 1.2 roentgens
   b. 12,000,000 roentgens
   c. 0.012 roentgens
   d. 12,000 roentgens

23. All of the following influence the table top exposure rate EXCEPT:
   a. filtration
   b. kilovolt peak (k Vp)
   c. target-to-panel distance
   d. light in the fluoroscopy room

24. A protective curtain should be interposed between the operator and the patient because scattered radiation exposure at 1 foot from the patient could be as high as:
   a. 5 milliroentgens (mR) per hour
   b. 25 milliroentgens (mR) per hour
   c. 100 milliroentgens (mR) per hour
   d. 500 milliroentgens (mR) per hour

25. All fluoroscopy machines must have an exposure switch that is of a “dead-man” type. This type of switch is one that stops:
   a. when the pressure on it is released
   b. automatically
   c. after a preset time
   d. after five minutes

26. The California Radiation Control Regulations require that protective aprons used during fluoroscopy shall be of at least:
   a. 0.25 millimeters of lead equivalent
   b. 0.35 millimeters of lead equivalent
   c. 0.50 millimeters of lead equivalent
   d. 0.75 millimeters of lead equivalent

27. The normal viewing distance for binocular vision is:
   a. 1 to 2 inches
   b. 4 to 8 inches
   c. 10 to 15 inches
   d. 16 to 20 inches
28. If the X-ray tube is moved rapidly during fluoroscopic examination the image will blur. This is the result of which of the following:
   a. kilovolt peak (k Vp) too low
   b. milliampere (mA) too low
   c. image intensifier tube lag
   d. quantum mottle

29. The function of an automatic brightness control (automatic exposure control) mechanism of an image intensified fluoroscopic system is to:
   a. maintain a fixed dose rate to the patient
   b. limit the exposure time
   c. maintain a fixed dose rate to the image intensifier
   d. prevent excessive x-ray tube heating

30. An image intensified fluoroscopy system is switched to the magnification mode so that the center 6 inches of the input screen is now visualized over the entire 9-inch diameter input screen. Under automatic brightness control with constant kilovoltage peak (k Vp), what relative increase in exposure rate has occurred?
   a. 2.25
   b. 1.50
   c. 0.66
   d. zero

31. A correct position to wear a film badge/dosimeter during fluoroscopy is:
   a. under the apron at waist level
   b. under the apron at gonad level
   c. above the apron at waist level
   d. above the apron at collar level

32. If 3 grams of tissue absorb 300 ergs of x-rays, what is the dose?
   a. 1 rad
   b. 3 rads
   c. 4 rads
   d. 300 rads

33. Which of the following describe the correct usage of the "boost" position or high-level control in fluoroscopy?
   I. increases the tube current and potential above normal limits
   II. automatically raises the level of the table
   III. continuous manual activation is required
   IV. continuous audible signal is required
   a. II only
   b. I, III, and IV only
   c. I and II only
   d. III and IV only
34. When a C-Arm is used for a lying supine on the table, in which direction is there the most scatter?
   a. at 45 degrees from the primary beam
   b. at 90 degrees from the primary beam
   c. at 135 degrees from the primary beam
   d. at 180 degrees from the primary beam

35. Which method of gonadal shielding is best for use during fluoroscopy?
   a. shaped, contact shielding
   b. shadow shielding
   c. flat contact shielding
   d. none is needed

36. What is a typical setting for milliamperage (mA) during sport filming?
   a. 2
   b. 5
   c. 10
   d. 150

37. The California radiation Control Regulations require that tube potential (k Vp) and current (mA) be monitored:
   a. daily
   b. weekly
   c. monthly
   d. yearly

38. For mobile (C-arm) fluoroscopic equipment, inherent provisions must ensure a minimum source-to-skin distance of:
   a. 6 inches
   b. 12 inches
   c. 18 inches
   d. 24 inches

39. The California radiation Control Regulations require that the minimum lead equivalence of gonadal shielding must be:
   a. 0.25 mm lead
   b. 0.50 mm lead
   c. 1.00 mm lead
   d. 1.50 mm lead

40. What is vignetting?
   a. the ability of the eye to perceive detail
   b. automatic brightness control circuit
   c. decrease in light intensity at the periphery of an image
   d. excessive heating of the X-ray tube
41. What is the maximum exposure a pregnant occupational worker may receive during a nine-month gestational period?
   a. she may not receive any exposure, she must be reassigned to non-exposure related duties or forced to resign
   b. 100 millirems
   c. 100 rems
   d. 500 millirems

42. How is resolving power measured?
   a. line pairs per millimeter
   b. millirems per hour
   c. milliampere seconds
   d. millimeters of aluminum

43. Characteristics, which describe contrast media or contrast agents are:
   I. solid in form
   II. high atomic number
   III. low atomic number
   IV. low toxicity
   a. III only
   b. I, II, and IV only
   c. II and IV only
   d. III and IV only

44. How long does it typically take for a fluoroscopy table to move from the horizontal to the vertical position?
   a. 5 - 15 seconds
   b. 10 - 20 seconds
   c. 20 - 30 seconds
   d. 30 - 40 seconds

45. What is the most commonly used videodisc frame rate:
   a. 1 frame/sec
   b. 5 frame/sec
   c. 15 frame/sec
   d. 30 frame/sec

46. What film size in spot filming cameras results in the greatest dose to the patient?
   a. 35 mm
   b. 70 mm
   c. 90 mm
   d. 105 mm
47. What is the purpose of synchronization in CINE?
   a. to restrict the X-ray beam to the smallest size practicable for the examination and thus decrease dose.
   b. to keep the target-to-panel distance set at 18 inches
   c. to operate the camera shutters at the same frequency as x-ray pulses and thus decrease patient dose
   d. to determine the physiological motion of the organ being imaged

48. The recognition or integration time of the human eye is the time it takes for recognition of an image. How long is this time?
   a. 0.1 sec
   b. 0.2 sec
   c. 0.5 sec
   d. 0.7 sec

49. Which of the following factors result in a brighter image being produce at the output phosphor of an image intensifier?
   I. fluorescent material
   II. tungsten filament (cathode)
   III. flux gain
   IV. minification
   a. I and IV only
   b. III and IV only
   c. II only
   d. II and IV only

50. The best description of virtual image is:
   a. image created by actual intersection of light rays
   b. image on cine film
   c. television image
   d. image that cannot be projected and exists only for computation purposes

51. What is the average number of horizontal lines on a TV monitor?
   a. 1064
   b. 786
   c. 525
   d. 350

52. When switching from a 15 inch to a 19 inch TV screen, does the number of horizontal lines change?
   a. no
   b. yes, by one and one-half times
   c. yes, by two times
   d. yes by four times
53. A closed circuit TV system:
   a. broadcasts through airwaves
   b. has all its signals carried through cables
   c. has all its circuits on one line
   d. produces no signal at all

54. The output intensity of a fluoroscopy tube is measured in:
   a. ergs
   b. milliroentgens
   c. milliards
   d. milliamperes

55. In an image intensifier, electronic intensification occurs when:
   a. electrons are moved at high speed from the photocathode to the output phosphor
   b. a stream of electrons are directed at high velocity against a target (anode)
   c. When the tungsten filament (cathode) is heated and a very high potential (kV) is applied between the cathode and anode
   d. electrons are emitted from the cathode and accelerated toward the anode

56. When x-rays are directed toward the patient, most are:
   a. absorbed by the patient
   b. absorbed by the operator
   c. scattered by the patient
   d. absorbed in air

57. Which of the following gives the least patient exposure?
   a. mirror optical system
   b. vidicon TV camera
   c. plumicon TV camera
   d. image orthocon

58. The California Radiation Control Regulations require that the total filtration permanently fixed in the useful beam for fluoroscopy may not be less than:
   a. 1.0 mm Aluminum equivalent
   b. 2.0 mm Aluminum equivalent
   c. 2.5 mm Aluminum equivalent
   d. 3.0 mm Aluminum equivalent

59. The intensity of the X-ray beam at the table top during fluoroscopy should not exceed how many roentgen(s) per minute for each mA of operating tube current at 80 kVp?
   a. 1.0
   b. 1.3
   c. 2.0
   d. 2.2

60. The mA setting for conventional fluoroscopy is typically less than?
   a. 5  b. 7  c. 10  d. 150
61. Doubling the exposure time of the patient ______ the total exposure to the patient
   a. doubles
   b. triples
   c. quadruples
   d. does not affect the total exposure

62. The California Radiation Control Regulations require that a cumulative manual-reset timer
    activated by the exposure switch that produces an audible signal or temporarily interrupts the x-ray
    beam when the fluoroscopy time has exceeded a predetermined time limit must not exceed
    a. 1 minute
    b. 2 minute
    c. 5 minutes
    d. 10 minutes

63. Fluoroscopic equipment manufactured after August 1, 1974, equipped with automatic exposure
    controls (AEC) shall not be operable at any combination of the tube potential and current which will
    result in an exposure rate at the point where the useful x-ray beam enters the patient in excess of:
    How many roentgen/minute: a. 1.0 b. 2.0 c. 5.0 d. 10.0

64. Fluoroscopic equipment manufactured after August 1, 1974, without AEC shall not be operable at
    any combination of x-ray tube potential and current which will result in an exposure rate at the point
    where the center of the useful x-ray beam enters the patient in excess of:
    How many roentgen/minute: a. 1.0 b. 2.0 c. 5.0 d. 10.0

65. Genetic dose refers to:
    a. effects of radiation on an irradiated person’s gonads
    b. exposure measured by film badges worn at the gonadal level
    c. effects exhibited in future offspring of persons who have been irradiated
    d. dose which penetrates gonadal shielding

66. The most conservative type of dose-effect curve and also the curve upon which radiation
    protection guides and regulatory requirements are based is the:
    a. linear non-threshold curve
    b. linear threshold curve
    c. nonlinear non-threshold curve
    d. nonlinear threshold curve

67. The radiosensitivity of tissues depends on which of the following?
    I. degree of mitotic activity
    II. number of undifferentiated cells
    III. length of time the cells of the tissue are in active proliferation
    IV. number of high specialized cells
    a. all of the above
    b. none of the above
    c. I and IV only
    d. I, II and III only
    e.
68. How many rads of acute X-radiation in the diagnostic energy range to the eyes will result in the formation of cataracts?
   a. 10 rads
   b. 50 rads
   c. 100 rads
   d. several hundred rads

69. A disadvantage of thermoluminescent dosimeters (TLDs) is:
   a. recharging is necessary
   b. range of measurement is limited
   c. no permanent record is provided since dose is cancelled when TLD is read
   d. not reusable

70. The California Radiation Control Regulations specifically limit the occupational whole-body dose equivalent for persons over 18 years of age to:
   a. 500 millirems per calendar quarter
   b. 1250 millirems per calendar quarter
   c. 1250 millirems per year
   d. 7500 millirems per calendar quarter

71. Which of the following individuals may perform fluoroscopic procedures if they possess a proper, valid, and up-to-date certificate or permit issued by the state?
   I. a certified radiologic technologist
   II. a limited permit technician
   III. a student of radiologic technology
   IV. a licentiate of the healing arts (physician)
   a. I and II only
   b. II and IV only
   c. IV only
   d. I and IV only

72. The National Council on Radiation Protectin and Measurements (NCRP) in their report Medical Exposure of Pregnant and Potentially Pregnant Women states that: The risk (to the embryo/fetus) is considered to be negligible at 5 rad or less when compared to the other risks of pregnancy, and the risk of malformation is significantly increased above control levels only at doses above:
   a. 7 rad
   b. 10 rad
   c. 15 rad
   d. 25 rad

73. The largest percentage of exposure to the population from man made radiation comes from which source?
   a. medical
   b. nuclear power plant
   c. color TV
   d. nuclear weapon testing
74. During fluoroscopic procedures a problem that occurs when utilizing television (vidicon) cameras is the blurring or lag of the image as the camera is moved during the procedure. This lag or blurring occurs because
   a. the center of the image intensifier has better resolution than the sides
   b. it takes a certain amount of time for the images to build up and decay on the vidicon target
   c. the source to table top distance is less than 12 inches
   d. unequal magnification exists

75. During fluoroscopy, the bucky tray is moved to the end of the examination table, leaving an opening in the side of the table approximately 2 inches wide at the gonadal level. This opening must be automatically covered with at least:
   a. .10 mm lead equivalent material
   b. .25 mm lead equivalent material
   c. .50 mm lead equivalent material
   d. .75 mm lead equivalent material

76. All of the following effect patient exposure except?
   a. three-phase generators
   b. collimation
   c. target-to-panel distance
   d. exposure time

77. A “high radiation” area is any area, accessible to individuals, in which there exists radiation at such levels that an individual could receive in any one hour a dose to the whole body in excess of?
   a. 5 millirems
   b. 10 millirems
   c. 50 millirems
   d. 100 millirems

78. A “radiation area” is any area accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour dose in excess of:
   a. 5 millirems
   b. 10 millirems
   c. 50 millirms
   d. 100 millirems

79. A “controlled area” is:
   a. any area where X-rays are taken and where access is restricted to authorized personnel only
   b. a radiology department
   c. any area where personnel are required to wear film badges
   d. an area in which radiation safety rules are enforced and the occupational exposure of personnel is under the supervision of the Radiation Safety Officer

80. The State of California Radiation Control Regulations require record-keeping for all of the following except:
   a. results of each required calibration, survey and test
   b. each receipt, transfer, and disposal of an x-ray machine
   c. each x-ray technologist who is hired by a hospital
   d. radiation exposure of all individuals for whom personnel monitoring is required:
81. The Roentgen is the unit of:
   a. absorbed dose
   b. absorbed dose equivalent
   c. exposure
   d. energy equivalent

82. The Rem is a unit of:
   a. absorbed dose
   b. absorbed dose equivalent
   c. exposure
   d. energy equivalent

83. The Rad is the unit of:
   a. absorbed dose
   b. absorbed dose equivalent
   c. exposure
   d. energy equivalent

84. The SI unit which is analogous to the Rad is the:
   a. sievert
   b. gray
   c. meter-kilogram-second
   d. dose/gram

85. The SI unit that is analogous to the REM is the:
   a. sievert
   b. gray
   c. meter-kilogram-second
   d. dose/gram

86. The half value layer is:
   a. the ratio of image size to patient thickness
   b. the patient thickness where one half of the primary beam has been absorbed
   c. the thickness of a specified substance which reduces the exposure rate of the primary beam by one half
   d. always 2.5 mm Aluminum equivalent

87. A cardiac catheterization examination results in a bone marrow dose of approximately:
   a. 10 millirads
   b. 70 millirads
   c. 110 millirads
   d. 190 millirads

88. What is the approximate exposure a patient would receive during 5 minutes of fluoroscopy:
   a. 1-3 roentgens
   b. 10-30 roentgens
   c. 40-60 roentgens
   d. over 60 roentgens
89. If an upper GI examination of a pregnant patient resulted in a total skin exposure of 5 roentgens, what is the approximate dose to the fetus?
   a. 10 millirads
   b. 100 millirads
   c. 1000 millirads
   d. 10000 millirads

90. During a CINE exam in which 35 mm film and a frame rate of 30 frames per second are utilized, what is the approximate skin exposure?
   a. 1 roentgen/minute
   b. 2-5 roentgens/minutes
   c. 5-10 roentgens/minutes
   d. 10 roentgens/minute

91. What is the approximate dose to a patients gonads resulting from a barium enema exam?
   a. 10 millirads
   b. 100 millirads
   c. 500 millirads
   d. 1000 millirads

92. Before doing any radiographic or fluoroscopic procedure, all except for which of the following must be done?
   a. all female patients of childbearing potential should be asked if they are pregnant or think they may be pregnant
   b. everyone in the exam room except the patient should be wearing a lead apron
   c. gonadal shielding should be placed on the patient when warranted
   d. film badges should be worn under the lead apron at the gonadal level

93. If an occupational worker receives an exposure of 5 rems to the skin or the whole body, the State must be notified:
   a. immediately
   b. within 24 hours
   c. within 30 days
   d. no notification is needed

94. If an occupational worker receives an exposure of 2 rems in a calendar quarter, the State must be notified:
   a. immediately
   b. within 24 hours
   c. within 30 days
   d. no notification is needed

95. Which of the following types of cells is most sensitive to the effects of radiation?
   a. muscle
   b. brain
   c. red bone marrow
   d. Skin
96. Which of the following has been called an occupationally-related disease of radiologists, particularly the early radiologists?
   a. liver cancer
   b. leukemia
   c. tuberculosis
   d. lymphoma

97. What is quantum mottle?
   a. a grainy appearance on an image caused by statistical fluctuation of absorbed X-ray photons
   b. the brightness ratio of the periphery to the center of the output intensifying screen
   c. excessive heating of the X-ray tube
   d. a decrease in light intensity at the periphery of an image

98. What is image contrast?
   a. a grainy appearance on an image caused by statistical fluctuation absorbed by X-ray photons
   b. the brightness ratio of the periphery to the center of the output intensifying screen
   c. excessive heating of the X-ray tube
   d. a decrease in light intensity at the periphery of an image

99. If a protective apron of 0.25 mm lead is worn, what is the typical exposure reduction?
   a. 55%
   b. 87%
   c. 97%
   d. 99.9%

100. The best protective eyewear for the operator to utilize during fluoroscopy is?
    a. Polaroid sunglasses
    b. Lead glass contact lenses
    c. lead glass eyeglasses
    d. wraparound (side panel) lead glass eyeglasses

101. What is the definition of a filter:
    a. a material placed in the useful (primary) X-ray beam to absorb preferentially, the less penetrating radiations
    b. a series of lead strips separated by a spacer transparent to X-rays
    c. a device which sets the target-to-film distance
    d. a device located between the patient and the image intensifier to absorb radiation

102. A strong correlation exists between the incidence of leukemia and the mean radiation dose received by the:
    a. gonads
    b. thyroid
    c. bone marrow
    d. skin
103. Stray X-radiation which comes from the X-ray tube housing is called:
   a. scattered radiation
   b. leakage radiation
   c. gamma radiation
   d. tube housing radiation

104. All of the following are types of personal monitoring devices except:
   a. Geiger counters
   b. Pocket ion chambers
   c. thermoluminescent dosimeters (TLDs)
   d. film badges

105. The most common material used in thermoluminescent dosimeters is:
   a. calcium fluoride
   b. lithium fluoride
   c. potassium fluoride
   d. nitrous oxide

106. The three basic principles which may be used singly or in combination to reduce dose to X-radiation are:
   a. time, shielding, half-value layer
   b. half-value layer, distance, time
   c. roentgen, distance, shielding
   d. time, distance, shielding

107. Utilizing the inverse square law, if you double your distance from a source of radiation, your exposure will be reduced to what fraction of the original dose?
   a. ¾
   b. ½
   c. ¼
   d. 1/8

108. All of the following are possible long term somatic effects of low-level radiation exposure except:
   a. increased incidence of cancer
   b. embryological effects
   c. life-span shortening
   d. stomach ulcers

109. An occupationally exposed individual over 18 years of age may receive a maximum whole body dose equivalent of:
   a. 5 rems per year
   b. 5 rems per calendar quarter
   c. 1.25 rems per year
   d. .125 rems per calendar quarter
110. It may be advisable to wear a second personal monitoring device if a worker is:
   I. performing routine radiological procedures
   II. pregnant
   III. a student
   IV. performing special procedure examinations
       a. I only
       b. II, III, and IV only
       c. II only
       d. II and IV only

111. The useful or primary beam is defined as:
       a. leakage and scattered radiation
       b. radiation which passes through the x-ray tube window, aperture cone or other collimating device
       c. radiation which during its passage through matter, has been deviated in direction
       d. all stray radiation coming from the tube housing

112. All fluoroscopic and radiographic x-ray tubes must have “diagnostic-type tube housing”, this means that the x-ray tube housing must be constructed that when the tube is operated at any of its specified ratings, leakage radiation at a distance of 1 meter from the target cannot exceed:
       a. 100 milliroentgens in 1 hour
       b. 50 milliroentgens in 1 hour
       c. 25 milliroentgens in 1 hour
       d. 10 milliroentgens in 1 hour

113. For both fluoroscopic and radiographic mobile equipment, inherent provisions must be made so that the equipment cannot be operated at less than:
       a. 6 inches or 15 cm source-skin distance
       b. 12 inches or 30 cm source-skin distance
       c. 18 inches or 46 cm source-skin distance
       d. 24 inches or 61 cm source-skin distance

114. An instrument used to measure film density is a:
       a. Densitometer   b. sensitometer   c. step-wedge   d. pocket dosimeter

115. An instrument used to expose film to precisely controlled steps of increasing light intensity is:
       a. Densitometer   b. sensitometer   c. step-wedge   d. pocket dosimeter

116. A device which is made up of different density filters shaped in a step-like form where each step or filter differs in density by the square root of 2 is called a:
       a. Densitometer   b. sensitometer   c. step-wedge   d. pocket dosimeter

end of on line practice exam 116