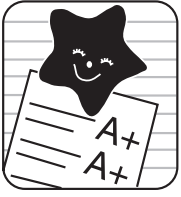


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Unit 44

Radiation Protection in Medical

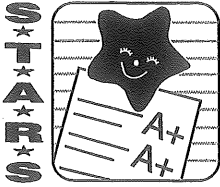
Radiography

by

**Mary Alice Statkiewicz Sherer,
Paula J. Visconti & E. Russell Ritenour**

Sixth Edition

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



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- All unit post test answer sheets must be returned for the designated ce credit in each set.
- Please remember that others may share your published texts & only order post tests to get ce credit too. The ce online tab allows you to print additional post tests or you may order hard copy if you have the designated textbook(s).
- Expired units are listed on the web site so that historical purchases can be used appropriately before expiration dates! Please check the web site periodically for A.S.R.T. updates!
- Always submit post tests **BEFORE** the expiration date!!

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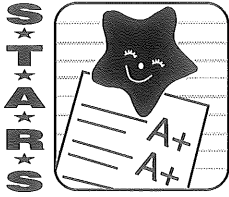
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Editorial Changes Notification for Participants

Some of our self-learning participants purchased the fifth edition of **Unit 44: Radiation Protection in Medical Radiography** BEFORE the sixth edition was made available to the general public and BEFORE they have submitted the answer sheet for certification evaluation. The content is identical in either edition with a few minor chapter changes as listed below. We continue to evaluate post test answer sheets regardless of the edition used since the educational content remains the same, but the answer location may be in a different chapter number.

The A.S.R.T. also increased the continuing education credits from 15 to 17!

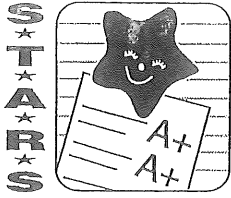
There is no penalty or reduction in Category A ce credits since more than enough questions were prepared for ce credit determination by the A.S.R.T.

The exceptions are listed below for the **fifth edition**:

Fifth edition	Please put N/A for questions 9; 40; 41; 45; 70; 73; 79; 86; 89; & 91 on your post test answer sheet.
Sixth edition	Please answer all questions since this is the latest published textbook.

I hope this does not create confusion. It allows other participants to submit a valid answer sheet who may have the fifth edition. The fifth edition will be eliminated in the future since both I and the A.S.R.T. want participants to use current editions even though the content has not be altered significantly. Thank you for your consideration.

Please note: "The American Society of Radiologic Technologists (ASRT) Practice Standards for Medical Imaging and Radiation Therapy, the author of this CE course, and others concerned with radiation protection standards support the position that all patients, whether they have the potential to reproduce or not, should be shielded."



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Dear GXMO,

This home study product was originally developed for radiographers who are registered with the American Registry of Radiologic Technologists (ARRT) and approved by the American Society of Radiologic Technologists (ASRT). Expiration dates were required.

In the spring of 2013, The Ohio Department of Health (ODH) approved it for license renewal for GXMOs. The O.D.H. does NOT require an expiration date on the product. You must complete it BEFORE your license expires to get your approved CE credit!

Please disregard any references to the ASRT on the post test instructional page or answer sheet.

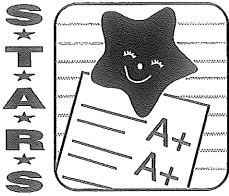
Thank you for selecting **S.T.A.R.S.** to meet your educational needs!

Sincerely,

A handwritten signature in cursive script, appearing to read 'Carolyn', with a small star to its right.

Carolyn J. Frigmanski, M.A., B.S.R.T. ®

Founder



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Instructions for Mailing your Continuing Education Post Tests

Complete ALL hard copy unit post tests for the products you purchased in legible printing BEFORE your license expires. Mail is processed the same day it is received.

You may want to copy them BEFORE you mail them to the S.T.A.R.S. office to minimize mail delivery complications. They will NOT be returned to you unless you get a 75% or less. If you do NOT get a 75% or better after evaluation, the post tests will be sent back to you with the questions needing a new answer selection. After completing the questions, send them ALL back to the S.T.A.R.S. office for re-evaluation.

Be sure to use the CORRECT postage by having it weighed at the post office if it consists of more than 5 pages. Envelopes with INSUFFICIENT POSTAGE will be sent back to the participant and delay your post test evaluation and certificate creation.

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Do NOT send your study media i.e. CD, DVD, booklets and/or books back to me.

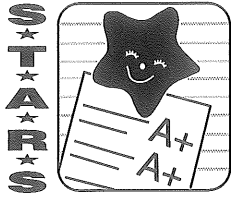
United States Postal Service (USPS):

If you are using USPS for priority or express mailing, please keep your receipt with the tracking number in case of a problem with the delivery. Please mark the section for NO SIGNATURE REQUIRED for express mail and send it to my home address: Carolyn J. Frigmanski, MA, BSRT (R) 3134 Aldringham Road Toledo, Ohio 43606. The USPS does NOT deliver to my P.O. Box address. Please call to let me know I should be expecting it at 419 471-1973.

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If you are using these delivery services, please keep your receipts with the tracking number in case of a problem with the delivery. Please mark the section for NO SIGNATURE REQUIRED for express mail and send it to my home address: Carolyn J. Frigmanski, MA, BSRT(R) 3134 Aldringham Road Toledo, Ohio 43606. Please call to let me know I should be expecting it at 419 471-1973.

Thank you very much.



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How to renew your GXMO license in Ohio:

The Ohio Dept. of Health (ODH) requires a minimum of 12 continuing education credits (ceus) to be completed every 2 years (your biennium) BEFORE your license expires. You may do more than 12 ceus, but not less than 12 ceus, if you so choose. Ceus in excess of 12 cannot be carried over to the next biennium.

You will receive a hard copy renewal notice by mail from the ODH 60 days BEFORE your license expires. It is your responsibility to amend your personal information to the ODH whenever you change your name, address or place of employment as soon as possible by using the ODH website or contacting the ODH by telephone at 614 752-4319 for assistance. Failure to receive an ODH notice is not an acceptable reason for failing to renew on time. You can add completion of clinical modules to your GXMO license on the ODH web site.

Your ODH notice informs you that you may renew online or request a hard copy form from them. You must have your S.T.A.R.S. certificate(s) of completion immediately available when you renew since your course title(s), number of ceus, and ODH accreditation number(s) and date(s) of completion are printed on it.

You can renew immediately when you receive your notice or you have 30 days to complete the renewal process and payment to the ODH after your license expires. Online renewal requires your credit card for payment. If you chose hard copy renewal, you may submit a check or money order.

You and/or your employer can view and/or print your renewed license on line upon completion of the process. Problems that exist with renewal should be addressed to the ODH by calling for assistance.

S.T.A.R.S. personnel are NOT responsible for your renewal. Please direct any questions or needed assistance with renewal to the ODH personnel.

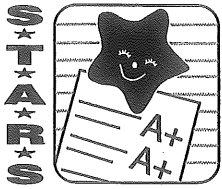
GXMOs must notify the ODH in writing within 30 days of any changes in the physician providing direct supervision. If your scope of practice changes (e.g. chiropractic to podiatric), a competency form must be completed and submitted to the ODH.

You may also want to check the ODH web site periodically for changes that may have occurred during your biennium and to share this information with your co-workers and/or administrative staff members.

The ODH website is: <http://www.odh.ohio.gov/odhPrograms/rp/rlic/ristatus.aspx>

Email is: BRadiation@odh.ohio.gov

Thank you very much.



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Unit 44

Title: Radiation Protection in Medical Radiography by Mary Alice Statkiewicz Sherer, Paula J. Visconti, & E. Russell Ritenour

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

Chapter 1

1. _____ produces positively and negatively charged particles when passing through matter.
 - a. Infrared radiation
 - b. Ultraviolet radiation
 - c. Ionizing radiation
 - d. Visible light
2. The _____ assumes the risk from the exposure to ionizing radiation when specific imaging procedures for health screening purposes are performed.
 - a. radiologist
 - b. technologist
 - c. patient
 - d. physician
3. Diagnostic efficacy is the degree to which the diagnostic study accurately reveals
 - a. the presence or absence of disease
 - b. the organs to be studied
 - c. soft tissue shadows
 - d. bone density
4. As low as reasonably achievable (ALARA) is a radiation protection principle applicable for
 - a. nursing staff
 - b. medical doctors
 - c. patients
 - d. radiologists & radiographers
5. Management should perform periodic _____ to determine how radiation exposure in the workplace might be lowered.
 - a. patient surveys
 - b. worker seminars
 - c. exposure audits
 - d. radiation surveys
6. Patients can be made to feel that they are active participants in their own health care by utilizing
 - a. printed directions
 - b. effective communication
 - c. asking questions
 - d. following directions
7. The radiation workers' responsibilities for an effective radiation safety program include an awareness of rules governing the workplace and performing duties consistent with
 - a. the job description
 - b. doctor's orders
 - c. ALARA
 - d. universal precautions
8. The background equivalent radiation time (BERT) emphasizes that radiation
 - a. is an innate part of our environment
 - b. comes from radon gas
 - c. escapes from our microwaves
 - d. lingers in x-ray rooms
9. On the electromagnetic spectrum, only x-rays and _____ are classified as ionizing radiation.
 - a. microwaves
 - b. infrared
 - c. high level ultraviolet
 - d. gamma

22. The interaction that results when the energy of the incident photon is at least 1.022 megaelectron volts is
- Compton scattering
 - photoelectric absorption
 - pair production
 - coherent scattering
23. In positron emission tomography (PET) scanning, the source of the positrons are atomic nuclei that are unstable because they contain too many
- neutrons
 - protons
 - neutrinos
 - electrons
24. The process in which a high-energy photon collides with the nucleus of an atom absorbing all of the photon's energy is called
- photodisintegration
 - annihilation radiation
 - positron decay
 - photon instability

Chapter 3

25. The first reported American fatality from exposure to ionizing radiation was
- Herbert Crookes
 - Thomas Edison
 - Bertha Roentgen
 - Clarence Dally
26. As early as 1910, many radiologists and dentists developed a reddening of the skin as a result of occupational exposure called
- radiokeratitis
 - radiodermatitis
 - erythematosis
 - skin lesions
27. From 1900 to 1930, the unit in use for measuring radiation exposure was called the
- skin erythema dose
 - absorbed dose
 - effective dose
 - equivalent dose
28. In 1928 the Second International Congress of Radiology accepted the _____ as a unit of exposure.
- rad
 - roentgen
 - sievert
 - curie
29. Nausea, fatigue, and loss of hair are considered to be _____ effects of exposure to ionizing radiation.
- somatic
 - latent
 - acute
 - needless
30. The _____ dose is a radiation dose below which an individual has a negligible chance of sustaining specific biologic damage.
- threshold
 - safe
 - tolerance
 - occupational
31. The international system standardizing the interchange of units among all branches of science is called
- International Radiation Protection Units
 - International System of Units
 - International Units of Science
 - International System of Weights & Measures
32. By the 1950's the tolerance dose for radiation protection purposes was changed to
- maximum permissible dose (MPD)
 - maximum occupational dose (MOD)
 - maximum exposure dose (MED)
 - maximum absorbed dose (MAD)
33. The term measuring the overall risk arising from whole body irradiation of biologic tissue is called
- absorbed dose
 - equivalent dose
 - whole dose
 - effective dose

34. The internationally accepted unit for the measurement of exposure to x-radiation and gamma radiation is
- sievert (Sv)
 - “radiation-equivalent man” (Rem)
 - radiation absorbed dose (rad)
 - Roentgen (R)
35. _____ dose is the quantity that attempts to summarize the overall potential for biologic damage to a human due to exposure to ionizing radiation.
- Equivalent
 - Exposure
 - Effective
 - Absorbed
36. The _____ represents the quantity of electrical charge flowing past a point in a circuit in 1 second when an electrical current of 1 ampere is used.
- sievert
 - gray
 - coulomb
 - rad
37. The amount of energy per unit mass absorbed by the irradiated object is called the
- absorbed dose
 - equivalent dose (D)
 - exposure (X)
 - effective dose (E_fD)
38. Rads can easily be converted into the equivalent number of grays by dividing the rads by
- 50
 - 2
 - 100
 - 1000
39. The term used to describe radiation exposure of a population or group from low doses of different sources of ionizing radiation
- equivalent dose
 - collective effective dose
 - effective dose
 - exposure rate

Chapter 4

40. When a protective lead apron is used, the dosimeter should be worn
- outside the apron at collar level
 - outside the apron at waist level
 - under the apron at collar level
 - under the apron at waist level
41. The radiation-dosimetry film contained in the radiographic film packet is sensitive to doses ranging from as low as 0.1 mSv to as high as _____ millisieverts (mSv).
- 5
 - 50
 - 500
 - 5,000
42. The amount of radiation to which the dosimetry film was exposed is determined by locating the exposure value of a control film of a similar optical density on a
- densitometer
 - sensitometer
 - control curve
 - characteristic curve
43. The main advantage of the film badge is that the radiographic film itself constitutes a permanent _____ record of personnel exposure.
- written
 - legal
 - institutional
 - government
44. The most sensitive type of personnel dosimeter is called a
- film badge
 - optically stimulated luminescence (OSL)
 - pocket ionization chamber
 - thermoluminescent

45. The device that serves as the primary radiation survey instrument for area monitoring in nuclear medicine facilities is the
- a. Geiger-Muller (GM) detector
 - b. ionization chamber-type survey meter (cutie pie)
 - c. proportional counter
 - d. radioisotope control meter

Chapter 5

46. Cells are made of _____, the chemical building material for all living things.
- a. proteins
 - b. protoplasm
 - c. enzymes
 - d. amino acids
47. All _____ compounds contain carbon.
- a. organic
 - b. inorganic
 - c. structural
 - d. complex
48. Molecules produced when amino acids form into long, chainlike molecular complexes are called
- a. carbohydrates
 - b. lipids
 - c. proteins
 - d. nucleic acids
49. The chemical link connecting each amino acid in the molecular complex that form proteins is called
- a. protein synthesis
 - b. amino connectors
 - c. protein ties
 - d. peptide bonds
50. _____ proteins function as organic catalysts affecting the rate or speed of chemical reactions without being altered themselves.
- a. Structural
 - b. Building
 - c. Enzymatic
 - d. Acidic
51. The term used in radiation therapy when there is an attempt to deliver enough radiation to kill cancerous cells while delivering a less than cell killing, repairable, equivalent dose to surrounding healthy tissue is called
- a. survival dose
 - b. therapeutic ratio
 - c. repairable ratio
 - d. lethal target dose
52. The body's primary defense mechanism against infections and disease once the skin has been penetrated is
- a. lymphocytes
 - b. antibodies
 - c. antigens
 - d. white blood cells
53. The primary molecular energy source for the cell is
- a. glucose
 - b. protein
 - c. carbohydrate
 - d. lipid
54. Lipids are organic _____ built from smaller chemical structures.
- a. chains
 - b. macromolecules
 - c. compounds
 - d. helixes
55. The smaller structures that make up the large, complex nucleic acid macromolecules are called
- a. monosaccharides
 - b. glycerin
 - c. nucleotides
 - d. carbohydrates
56. The deoxyribonucleic acid (DNA) macromolecule is composed of two long chains composed of
- a. purines
 - b. adenine-guanines
 - c. hydrogen-carbons
 - d. sugar-phosphates

57. The molecule that leaves the cell nucleus, enters the cytoplasm and directs the protein building process is
- a. DNA b. ribonucleic acid (RNA) c. messenger RNA d. transfer RNA
58. The total amount of DNA contained within the chromosomes of a human being is called the
- a. genetic coding b. human genome c. genetic mapping d. human genetic code
59. Acids, bases and salts found in the body and in nature independent of living things are categorized as
- a. pyrimidines b. organic compounds c. nitrogenous bases d. inorganic compounds
60. The process in which the cell must expend energy to pump substances into and out of itself is termed
- a. active transport b. particle transport c. osmosis d. hydration
61. The cytoplasm contains large amounts of all the cell's molecular components with the exception of
- a. mitochondria b. endoplasmic reticulum c. ribosomes d. DNA
62. In both mitosis and meiosis, DNA replicates during the stage called
- a. anaphase b. telophase c. interphase d. metaphase
63. Chromosome damage caused by radiation can be evaluated during
- a. anaphase b. telophase c. interphase d. metaphase
64. Male and female reproductive cells (germ cells) each contain ___ chromosomes at the beginning of meiosis.
- a. 46 b. 23 c. 92 d. 92

Chapter 6

65. Ionizing radiation damages living systems by removing _____ from the molecular structures of cells.
- a. neutrons b. electrons c. protons d. photons
66. The type of radiation interaction with biologic tissue causing damage primarily through an indirect action from the production of free radicals is called
- a. "high-linear transfer energy (LET)" b. alpha particle absorption
c. "low-linear transfer energy (LET)" d. low-energy neutron absorption
67. Low-LET radiation generally causes sublethal damage to DNA and reversible cellular damage to
- a. structural proteins b. therapeutic enzymes c. repair enzymes d. proteins
68. The term used to describe the relative capabilities of radiation with different LETs to produce a particular biologic reaction is known as
- a. wave-particle duality b. relative biologic effectiveness (RBE)
c. radiation weighting factor (W_R) d. oxygen enhancement ratio (OER)

69. The term used to identify a solitary atom or a combination of atoms that behave as an extremely reactive single entity as a result of a presence of an unpaired electron is called a
- a. free radical b. alpha particle c. beta particle d. photon
70. The presence of _____ in biologic tissues makes the damage produced by free radicals permanent.
- a. nitrogen b. hydrogen c. sodium d. oxygen
71. Indirect action of ionizing radiation refers to the effects produced by reactive free radicals created by the
- a. recombination of hydrogen & hydroxyl ions b. interaction of radiation with water
c. interaction with DNA d. damaged enzyme molecules
72. The severing of one of the DNA sugar phosphate chain side rails is called a
- a. point mutation b. covalent cross link c. base change d. cleaved chromosome
73. Irradiation that occurs early in interphase, before DNA synthesis takes place, may
- a. effect only one daughter cell b. effect separate chromatids
c. effect each daughter cell generated d. have no effect
74. The target theory states that an irradiated cell will die after exposure only if _____ molecules are inactivated.
- a. carbohydrate b. protein c. DNA d. enzyme
75. The term used to identify cell death without attempting division during interphase is
- a. instant death b. reproductive death c. genetic death d. apoptosis
76. Relatively small doses of radiation can cause _____ death after one or more cell divisions.
- a. reproductive b. mitotic c. programmed d. instant
77. A classic method of displaying the sensitivity of a particular type of cell to radiation is called the
- a. cell sensitivity curve b. sensitivity/survival curve c. survival logarithm d. cell survival curve
78. The principle describing the radiosensitivity of cells as directly proportional to their reproductive activity and inversely proportional to their degree of differentiation is called
- a. Marshall Proportional Sensitivity Law b. Law of Bergonie & Tribondeau
c. Law of Maturity and Specialization d. Cell Sensitivity Theory
79. Human beings who receive a whole-body dose in excess of _____ may die within 30 to 60 days.
- a. 500 rads b. 50 Gy c. 500 Gy d. 50 rads

Chapter 7

80. The term used to describe the biologic effects of radiation soon after humans receive high doses of ionizing radiation is called _____ effects.
- a. late b. delayed c. early d. chronic

81. The period when symptoms that affect the hematopoietic, gastrointestinal and cerebrovascular systems become visible is called the
- a. latent period b. manifest illness stage c. prodromal period d. initial stage
82. Follow-up studies of the survivors of the atomic bombing of Hiroshima and Nagasaki who did not die of acute radiation syndrome (ARS) have demonstrated late deterministic and _____ effects of ionizing radiation.
- a. stochastic b. nonstochastic c. mutational d. genetic
83. The _____ system is the most radiosensitive vital organ system in human beings.
- a. gastrointestinal b. cerebrovascular c. reproductive d. hematopoietic
84. The _____ form of ARS results when there is an exposure of 50 Grays or more of ionizing radiation.
- a. gastrointestinal b. cerebrovascular c. reproductive d. hematopoietic
85. With medical support, human beings have tolerated doses as high as _____ Grays (Gy).
- a. 6 b. 8.5 c. 20 d. 30
86. Lethal dose (LD) charted as ___/___ is more accurate for human beings when medical treatment is given promptly and the patients are supported through initial symptoms.
- a. 50/30 b. 10/30 c. 50/60 d. 100/60
87. _____ cells have a better prospect for recovery in the repair and recovery of cells receiving a sublethal dose of ionizing radiation
- a. Oxygenated b. Hypoxic c. Nerve d. Blood
88. Permanent sterility will most likely result from a radiation dose of ___ or ___ Grays to the reproductive organs of both sexes.
- a. 0.5/1 b. 1/2 c. 3/4 d. 5/6
89. The cell stage in which chromosome damage caused by radiation damage is called _____.
- a. prophase b. telophase c. anaphase d. metaphase

Chapter 8

90. Biological effects are observed only when the _____ level or dose is reached.
- a. threshold b. nonthreshold c. stochastic d. nonstochastic
91. Stochastic somatic effects are also called _____ effects.
- a. probabilistic b. problematic c. deterministic d. early
92. Cancer and genetic disorders are examples of _____ effects that probably do not have a threshold.
- a. nonstochastic b. early c. acute d. stochastic

93. An embryologic or birth defect is an example of a _____ event.
- a. deterministic b. stochastic c. threshold d. nonthreshold
94. A _____ risk predicts that a specific number of excess cancers will occur as a result of exposure.
- a. relative b. statistical c. probable d. absolute
95. _____ is the most important late stochastic effect caused by exposure to ionizing radiation.
- a. Erythema b. Desquamation c. Cancer d. Epilation
96. Radium poisoning was experienced by a population of
- a. watch-dial painters b. miners c. children d. bomb victims
97. Biologic effects of ionizing radiation on future generations are termed _____ effects.
- a. futuristic b. genetic c. chronic d. acute
98. The organisms used in ionizing radiation experiments to determine hereditary effects were
- a. cats & dogs b. bees & spiders c. pigs & chickens d. mice & flies

Chapter 9

99. The federal agency that has the authority to control the possession, use and production of atomic energy in the interest of national security is called the
- a. Environmental Protection Agency (EPA) c. Food and Drug Administration (FDA)
b. Nuclear Regulatory Commission (NRC) d. Occupational Safety & Health Admin. (OSHA)
100. The day-to-day supervision of a facility's radiation safety program is a responsibility of
- a. OSHA b. radiation safety committee (RSC)
c. radiation safety committee (RSO) d. FDA
101. The as low as reasonably achievable (ALARA) concept presents an extremely conservative model with respect to the relationship between ionizing radiation and
- a. potential risk b. biologic effects c. patient dose d. occupational dose
102. The frequency of occurrence of high-dose deterministic effects is _____ to the dose.
- a. directly proportional b. inversely proportional c. non-threshold d. nonlinear
103. The possibility of inducing a radiogenic cancer or genetic defect after irradiation in the medical imaging industry is termed
- a. vulnerability b. assumed probability c. risk d. cumulative effect
104. An annual occupational effective dose limit of _____ mSv has been established for the whole body.
- a. 10 b. 20 c. 30 d. 50

Chapter 10

105. X-ray tube housing construction must meet requirements to prevent excessive _____ radiation.
- a. secondary b. remnant c. leakage d. scatter
106. The patient's skin surface should be at least _____ cm below the collimator.
- a. 5 b. 10 c. 15 d. 20
107. In most states regulatory standards require accuracy of _____ % of the SID with PBL.
- a. 1 b. 2 c. 3 d. 4
108. _____ filtration includes the glass envelope, insulating oil and the glass window.
- a. inherent b. added c. total d. structural
109. The _____ filter can be used when performing chest radiographs.
- a. wedge b. angular c. added d. trough
110. _____ rare-earth film-screen image receptor systems increases quantum mottle.
- a. Slower b. Newer c. Regular/Par d. Faster
111. Patient dose increases whenever _____ grid ratios are utilized.
- a. lower b. higher c. focused d. parallel
112. The term _____ indicates the rows and columns of numeric values in a digital image.
- a. bit b. pixel c. matrix d. byte
113. Pixel size may be as small as _____ micrometers.
- a. 50 b. 100 c. 200 d. 300
114. The input phosphor is constructed of _____ crystals.
- a. amorphous silicon b. cesium iodide c. silver halide d. rare-earth
115. A primary protective barrier of _____ mm lead equivalent is required for an image intensifier unit.
- a. 0.5 b. 1.0 c. 1.5 d. 2.0
116. The time to onset of permanent epilation from fluoroscopy is
- a. 1 week b. 2 weeks c. 3 weeks d. 4 weeks

Chapter 11

117. Motion that occurs due to a patient's lack of control is called
- a. voluntary motion b. involuntary motion c. a spasm d. peristalsis

118. A _____ gonadal shield eliminates the radiographer's need to palpate the patient's anatomy.
- a. flat b. shaped c. clear d. shadow
119. Radiographic contrast is _____ as kVp increases and mAs decreases.
- a. optimized b. increased c. magnified d. reduced
120. A _____ program includes monitoring and maintenance of all processing and image display equipment.
- a. radiation control b. quality assurance c. quality control d. physics control
121. The estimated GSD for the U. S. population is about _____ millisieverts (mSv) or _____ millirem (mrem).
- a. 0.1/10 b. 0.20/20 c. 0.3/30 d. 0.4/40
122. The most common measurement of milliroentgens per milliamperere-second is at a distance of _____ inches from the x-ray tube target.
- a. 40 b. 36 c. 30 d. 25
123. Dose reduction in mammography can be achieved by
- a. using lower atomic number targets c. limiting the number of projections
b. converting to digital equipment d. x-raying the breasts during menses
124. Dissemination of information on pediatric CT dose reduction among various specialties is provided by the
- a. Pediatric Campaign b. Pediatric CT Program c. Peds CT Program d. Image Gently Campaign
125. Fetal dose calculations should be performed by
- a. a radiologist b. a radiologic physicist c. a biomedical engineer d. a radiographer

Chapter 12

126. The National Council on Radiation Protection and Measurements (NCRP) permit diagnostic imaging personnel to receive and "an annual occupational effective dose (E_{FD})" of _____ millisieverts (mSv).
- a. 25 b. 50 c. 100 d. 500
127. The cumulative effective dose (CumE_{FD}) for whole body for radiation workers is _____ mSv x your age.
- a. 10 b. 15 c. 20 d. 25
128. During a diagnostic examination the patient produces scattered radiation due to the _____ effect.
- a. classical b. coherent c. Compton d. photoelectric
129. The inverse square law (ISL) expresses the relationship between distance and
- a. quality b. intensity c. time d. exposure

130. The purpose of a _____ protective barrier is to prevent direct or unscattered radiation from reaching personnel or members of the general public on the other side of the barrier.
- a. safety b. secondary c. primary d. universal
131. When the protection factors of distance and shielding have been applied, the radiographer will receive the least amount of scatter by standing at a _____ degree angle to the x-ray beam.
- a. 15 b. 45 c. 90 d. 180
132. When patient immobilization is necessary and mechanical restraining devices are not feasible, the recommended person who should be used while wearing appropriate protective apparel is
- a. an occupationally exposed coworker b. the medical radiographer
c. a non-occupationally exposed person d. the radiologist
133. The weekly radiation use of a diagnostic x-ray unit is called its
- a. workload (W) b. use factor c. occupancy factor d. productivity factor

Chapter 13

134. _____ have the same number of protons within the nucleus but have different numbers of neutrons.
- a. Radioisotopes b. Isotopes c. Neutrinos d. Positrons
135. The radioactive isotope used to deliver radiation therapy to cancer patients with metastasis to the bone is
- a. iodine-125 b. technetium-99m c. fluorine-18 d. strontium-89
136. Most isotopes generated by _____ immediately get rid of their excess energy.
- a. electron capture b. annihilation radiation c. beta decay d. metastable decay
137. The most important isotope in positron emission tomography (PET) scanning today is
- a. fluorine-18 b. Technetium-99m c. iodine-123 d. iodine-131
138. The radioactive tracer that is very similar chemically to glucose and will be metabolized by cancerous cells to reveal their locations is
- a. fluorine-18 b. strontium-89 c. iodine -123 d. fluorodeoxyglucose (FDG)
139. After the explosion of a dirty bomb, the individual at the receiving facility who would be available or responsible to assess contamination levels is the
- a. administrator b. chief of staff
c. radiologist d. radiation safety officer (RSO)
140. During an emergency situation, individuals engaged in lifesaving activities have a dose limit of _____ millisieverts (mSv).
- a. 50 b. 100 c. 250 d. 500

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**Answer Sheet for: Unit 44: Radiation Protection in Medical Radiography
by Mary Alice Statkiewicz Sherer, Paula J. Visconti & E. Russell Ritenour**

**Please place your lettered selection for each question in the respective box and return
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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.

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71.	81.	91.	101.	111.	121.	131.
72.	82.	92.	102.	112.	122.	132.
73.	83.	93.	103.	113.	123.	133.
74.	84.	94.	104.	114.	124.	134.
75.	85.	95.	105.	115.	125.	135.
76.	86.	96.	106.	116.	126.	136.
77.	87.	97.	107.	117.	127.	137.
78.	88.	98.	108.	118.	128.	138.
79.	89.	99.	109.	119.	129.	139.
80.	90.	100.	110.	120.	130.	140.