Specialized Topics in Areas of Radiologic Sciences
P.O. Box 2931 Toledo, Ohio 43606 419-471-1973
E-mail: info@xrayhomestudies.com
www.xrayhomestudies.com

Understanding

how Radiation affects Our Patients'

and Our Bodies

Prepared by

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

All post tests must be returned for the designated and Ohio Department of Health approved 4 continuing education credits.

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Dear GXMO/LSO/LSR participant,

Welcome to your selected S.T.A.R.S. developed continuing education home study!

In the spring of 2013, The Ohio Department of Health (ODH) approved ALL of them for GXMO license renewal. Please check with your state licensing agency if you are not a licensed GXMO in Ohio to be sure your state accepts these ce credits for your state license renewal requirement.

This product consists of a text on a desired topic and multiple question, short answer post test(s) pages. The number of Ohio Department of Health approved continuing education (ce) credits is listed on our order form. This home study product was originally developed for radiographers across the country who were registered with the American Registry of Radiologic Technologists (ARRT) and approved by the American Society of Radiologic Technologists (ASRT). Please disregard any reference to the ASRT/ARRT within this product, if any.

You must complete the reading and questions with a **75% or higher score** on the post test(s) to get your approved CE credit!

Please return all the post test pages to the **S.T.A.R.S.** address listed on our letterhead **BEFORE** your license expires. We will forward your certificate of completion on the same day your post test(s) were evaluated (except for holidays and Sundays). If you did NOT receive a 75%, we will send the pages back with the questions needing a new answer selection. Send them back for a **FREE** re-evaluation. No refund will be provided for unsatisfactory personal performance on any ce product.

Plan the return of your post test(s) pages in a timely manner. I cannot accept emailed or faxed copies since I need to retain my **ORIGINAL** records for the ODH for 3 years in case you may be audited.

Remember to get your envelope weighed at the post office whenever submitting more than 4 pages. The post office will return it to you if you have insufficient postage, thereby delaying it for my evaluation and your certificate of completion.

Feel free to contact me by email**: info@xrayhomestudies.com** or telephone: **419 471-1973** if you have any questions. Please share with others in the future.

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

Sincerely,

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

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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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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.

I do NOT accept faxes since faxes fade over time and I need to keep my records for 3 years in case you would get audited by the Ohio Dept. of Health for some reason.

I do NOT accept scanned pages because I do NOT want you putting your private, personal information on the internet. I do NOT open attachments due to the threat of virus contamination that may jeopardize my web site and computerized databases.

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.

FedEx or United Parcel Service UPS:

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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Welcome to your **S.T.A.R.S.** self-learning product that has been approved by the Ohio Department of Health for continuing education credits for licensed gxmos for license renewal. These 3 units are part of a larger series on radiobiology and consist of:

Unit 8: Cellular and Molecular Biology
Unit 9: Acute Effects of Radiation Exposure
Unit 10: Chronic Effects of Radiation Exposure

Instructions:

- Please complete **both sides of this page** with your answer selections for all the units in this product! CE credit will **NOT** be provided for incomplete submissions.
- Do **NOT** send the question pages or return the booklet. It is yours to keep as a resource.
- You can use a standard envelope and postage when you return this page **ONLY** to the **S.T.A.R.S.** office at the address listed above.
- You will receive a signed certificate of completion from an official at **S.T.A.R.S.** upon successful evaluation of all your post test answers.
- Please **print the following information legibly** for record-keeping and accurate certificate completion.

Name_____

Address_____

City, State and Zip Code_____

Desired Number for Certificate i.e. social security number/last 4 digits of social security # or License number:

_____

Date of Submission_____

Thank you very much. I hope you enjoy this educational product!

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

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Unit 8 Cellular & Molecular Biology	Unit 9 Acute Effects	Unit 10 Chronic Effects
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.
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19.	19.	19.
20.	20.	20.

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Unit 8
Title: Cellular and Molecular Biology

1. The portion of the cell that contains DNA is called the
   a. cytoplasm
   b. nucleus
   c. nucleolus
   d. macromolecule

2. The organelle which digests macromolecules for energy production is called the
   a. ribosome
   b. nucleolus
   c. mitochondria
   d. lysosome

3. The process of cellular division for genetic cells in both sexes is called
   a. meiosis
   b. mitosis
   c. cell cycle
   d. cell generation

4. The pre-DNA synthesis stage in a cell cycle is identified as
   a. M phase
   b. G_1
   c. G_2
   d. S

5. The phase of mitosis in which the chromosomes line up at the equator of the parent cell is
   a. anaphase
   b. prophase
   c. telophase
   d. metaphase

6. The most abundant macromolecule in the human body is
   a. saccharides
   b. lipids
   c. water
   d. protein

7. The macromolecule that controls cell function and heredity is
   a. DNA
   b. lipids
   c. RNA
   d. carbohydrates

8. Radiation biologists have determined that ionizing radiation can produce
   a. no effects in living tissue
   b. observable effects in dead tissue
   c. no change in chromosomes
   d. genetic change

9. The physical factor which uses a formula to compare biologic effects of various forms of radiation is called
   a. OER
   b. RBE
   c. LET
   d. REM

10. The biological factor which indicates cell radiosensitivity increases with oxygen saturation is called
    a. LET
    b. RBE
    c. OER
    d. REM

11. In the target theory, one initial ionizing event may "hit" a critical target and the cell will
    a. die
    b. recover
    c. multiply
    d. sustain no effect

12. The radiolysis of water is considered to be a (an)
    a. critical target
    b. direct effect
    c. indirect effect
    d. minimal effect

13. The term "radiation sickness" refers to the conversion of water into a toxic compound called
    a. tritium
    b. hydrogen peroxide
    c. carbon monoxide
    d. hydrochloric acid

14. Dose-response relationships are graphic mathematical displays of
    a. how radiation affects radiation workers
    b. how the percentage of death is calculated to an exposed group
    c. how different doses of radiation affect mice and flies
    d. how different cells are affected by radiation exposure

15. The law which describes the fundamental principles of cell radiosensitivity was developed by
    a. Marie and Pierre Curie
    b. Bergonie and Tribondeau
    c. Albert Einstein
    d. Wilhelm Roentgen

16. One explanation for high fetal radiosensitivity is
    a. the small number of reproducing cells
    b. the dependence on maternal blood flow
    c. the type and rate at which cells mature
    d. the amount of amniotic fluid

17. The human cell type ***most*** sensitive to radiation insult is
    a. brain and spinal cord
    b. lymphocytes
    c. bone
    d. erythroblasts

18. The human cell type ***least*** sensitive to radiation insult is
    a. brain and spinal cord
    b. lymphocytes
    c. bone
    d. erythroblasts

19. The term used to identify the loss or change in the sequence of nitrogenous bases in DNA is
    a. point lesion
    b. cross-linking
    c. point mutation
    d. main-chain scission

20. The ***most*** radiosensitive period in the aging process of human beings occurs during
    a. childhood
    b. adolescence
    c. adulthood
    d. fetal development in utero

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Unit 9
Title: Biological Effects of Radiation Exposure - Acute

1. In diagnostic radiographic installations, the probability of an accident involving acute radiation lethality is
   a. 80%
   b. less than 50%
   c. 60%
   d. impossible

2. Thirty people died from acute radiation exposure at
   a. Three Mile Island
   b. Chernobyl
   c. Davis Besse
   d. Nagasaki

3. "Immediate radiation sickness" occurs in the
   a. prodromal stage
   b. latent stage
   c. G.I. stage
   d. CNS stage

4. Manifest illnesses occur in a specific order based on increasing dose as
   a. prodromal, GI and hematologic
   b. CNS, G.I. hematologic
   c. hematologic, G.I., CNS
   d. latent, hematologic, CNS

5. The stage of acute radiation lethality in which the victim feels he is "recovering" is
   a. prodromal
   b. latent
   c. hematologic
   d. G.I.

6. The manifest illness that is produced by radiation doses of 200-1,000 Grays is
   a. G.I.
   b. prodromal
   c. CNS
   d. hematologic

7. The manifest illness, which occurs within 4 to 10 days after a radiation dose of 5000 Grays, is
   a. G.I.
   b. hematologic
   c. CNS
   d. G.U.

8. The chart containing information about the percent of deaths in a certain time frame is
   a. acuity chart
   b. survival curve
   c. latent dose
   d. lethal dose chart

9. The unit of radiation measured for acute radiation lethality is
   a. Roentgen
   b. Rads
   c. REM
   d. Becqueral

10. The shortest survival period for victims of radiation doses in excess of 5,000 Grays is
    a. CNS
    b. G.I.
    c. hematologic
    d. G. U.

11. The most notorious nuclear power plant accident in the United States was
    a. Davis Besse
    b. Enrico Fermi
    c. Three Mile Island
    d. San Francisco

12. The city of Hiroshima was selected for the first atomic bombing because it
    a. had no military armament factories
    b. was the home of all military officials
    c. was located in the mountains
    d. had not been previously bombed

13. The temperature at the central core of the atomic bomb's fireball was
    a. 100,000 ^{o} F
    b. 300,000 ^{o}C
    c. 1 million ^{o}C
    d. less than 100,000 ^{o}C

14. The rationale in dropping the Atomic Bomb was to
    a. spare further American lives
    b. gain another Presidential term for H. Truman
    c. maintain confidence with U.S. allies
    d. demonstrate Albert Einstein's research

15. The atomic bomb is often described and pictured as a
    a. red fireball
    b. black fireball
    c. "mushroom" cloud
    d. cumulus cloud

16. The second Japanese city to be bombed on August 9, 1945 was
    a. Hiroshima
    b. Tokyo
    c. Nagano
    d. Nagasaki

17. The manifest illness in which a full recovery can occur within six months is
    a. CNS
    b. hematologic
    c. G.I.
    d. G.U.

18. The element(s) first used for fission in the atomic bomb production was
    a. uranium
    b. radium and uranium
    c. radon and plutonium
    d. plutonium and uranium

19. The most notorious nuclear power plant accident in the World was
    a. Davis Besse
    b. Enrico Fermi
    c. Three Mile Island
    d. Chernobyl

20. Cities that began the world wide ban of nuclear weapons after World War II were
    a. Hiroshima and Nagasaki
    b. Washington, D.C. and Tokyo
    c. Hiroshima and Washington, D.C.
    d. Berlin and Tokyo

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Unit 10
Title: Biological Effects of Radiation Exposure — Chronic

1. The consequence of local tissue damage to high doses of radiation is
   a. no recovery
   b. cell proliferation
   c. sterility
   d. total non-function of the tissue or organ

2. Radiation effects on the skin include
   a. erythema & birth marks
   b. premature aging
   c. excessive wrinkles & creases
   d. desquamation & erythemia

3. Wilhelm Konrad Roentgen died in 1921 from
   a. colon cancer
   b. melanoma
   c. leukemia
   d. pernicious anemia

4. The only woman to have won two Nobel prizes in the entire history of the award is
   a. Amelia Earhart
   b. Florence Nightingale
   c. Marie Curie
   d. Sarah Bernhart

5. The individual who is considered the first fatality from the effects of prolonged exposure to man-made radiation is
   a. Pierre Curie
   b. Clarence Dally
   c. Bertha Roentgen
   d. Thomas Edison

6. The dose-response relationship characteristic that demonstrates a directly proportional effect to dose is
   a. linear
   b. semi-log
   c. non-linear
   d. quadratic

7. The dose-response relationship characteristic that demonstrates any amount of radiation will produce an effect is
   a. threshold
   b. non-linear
   c. non-threshold
   d. linear

8. Current radiation protection guidelines support the dose-response relationship identified as
   a. threshold, non-linear
   b. non-threshold, linear
   c. non-linear, non-threshold
   d. linear, threshold

9. The population of scientists who experienced and reported Cataracts were
   a. cyclotron physicists
   b. Atomic Bomb survivors
   c. German mine workers
   d. radium watch painters

10. Elevated incidence of radiation-induced leukemia was demonstrated in
    a. nuclear power plant accident survivors
    b. British radiologists
    c. pregnant women
    d. children irradiated in utero

11. Liver cancer was induced by a contrast medium used in angiography called
    a. Pantopaque
    b. Dionosil oily
    c. Thoratrast
    d. Ethiodol

12. Radium salts were used in the early half of this century to treat patients with
    a. TB and arthritis
    b. pneumonia and meningitis
    c. black lung disease and polio
    d. smallpox and TB

13. In the U.S., we historically treated children with enlarged thymus glands who later manifested
    a. bone cancer
    b. thyroid cancer
    c. brain cancer
    d. melanoma

14. Historically occupationally-induced malignancies have been documented in the
    a. brain and kidney
    b. skin and bowel
    c. liver and lymph
    d. bone and lung

15. After prolonged high-dose fluoroscopic procedures, chromosomal alterations have been identified such as
    a. rung addition
    b. chromatid addition
    c. reciprocal relocation
    d. ring formation

16. Irradiation to the gonads in adults of 200 Rads (2 Gy) produces
    a. suspension of menses
    b. permanent sterility
    c. temporary sterility
    d. impotence

17. The most sensitive period for fetal radiation is
    a. 1st 2 weeks of 1st trimester
    b. 1st 2 weeks of 2nd trimester
    c. 1st 2 weeks of last trimester
    d. anytime

18. Life-span shortening based on chronic doses of low level radiation is
    a. considerable
    b. controversial
    c. well-documented
    d. definitely well established

19. The most difficult risk estimate to calculate is
    a. relative
    b. statistical
    c. excess
    d. absolute

20. A current study involving thousands of U.S. Medical Radiographers who have been employed under low level radiation risks indicates
    a. an excess risk for leukemia
    b. an excess risk for all cancers
    c. no effects have been identified at this time
    d. an absolute risk for melanoma