BASIC RADIOLOGICAL PHYSICS COURSE

CLASS GROUP: _____
(Radiation Therapy, Radiation Oncology Resident, Post Doctoral..)

YEAR: _____
(2004, 2005 …)

Objective:

After completing this Study Guide #4, the students should be able to understand (1) equivalent dose, (2) environmental radiation, (3) scientific board, and (4) regulatory agencies. The use of radiation is regulated by state and federal agencies in particular NRC.

Study Guide #4:	Health Protection I (Part 1 of 2)
Read Sections:	Foundation of Radiological Physics (C B Saw) Chapter 13 – Health Physics I **Sections 13.1 to 13.4**
Suggested Reference:	Faiz Khan's text – Chapter 16
Assignments:	Answer all questions as directed in this handout
Clinical Rotation Assignment:	What is the typical MU rate on a linac? Identify two safety mechanisms installed on a linac?

Study Guide

13.1 In your own words, define the following terms:

(a) equivalent dose	(b) radiation weighting factor (w_R)
(c) background radiation	(d) NCRP
(e) NRC	(f) ALARA
(g) effective dose limit	(h) MPD
(i) agreement states	(j) tissue or organ weighting factor
(k) byproduct materials	

13.2 Identify the rationale for the introduction of the equivalent dose concept.

13.3 List the radiation weighting factors for x-rays, gamma rays, and beta rays.

13.4 List the three sources of background radiation.

13.5 Excluding radon, what is the annual background radiation? Express your answer in rems.

13.6 What is the estimated annual exposure to the population from (a) medically used man-made sources and (b) radon?

13.7 What are the roles of NCRP, ICRP, and NRC in the medical use of radiation?

13.8 Identify any three agreement states. Is your state an agreement state?

13.9 Which agencies regulate the safe use of (a) cobalt-60, (b) iodine-131, (c) medical linear accelerators, (d) x-ray equipment, and (e) particle accelerators?

13.10 Give various situations where the ALARA principles may be implemented.

13.11 List the effective dose limits recommended by NCRP for (a) occupational worker, (b) the public, (c) a pregnant worker, (d) the eyes, and (e) the extremities of a radiation worker.

13.12 A person receives iodine-131 thyroid therapy and is then released. Should the exposure from this medical procedure be included in the dose limit set for the general public?

13.13 Explain maximum permissible dose. On what basis was it derived?

Problems

13.1 What is the total equivalent dose if a person is exposed to 1000 rads of thermal neutrons and 500 rads of electrons? Express the result in Sv.

13.2 Background radiation exposure is about 1 mSv per year. Express this value in units of (a) rem and (b) mrem.

13.3 Express 1 mrem in μSv.

13.4 The exposure limit to a declared pregnant worker is 5 mSv. Convert this value to mrem.

13.5 What is the total effective dose received by a 40 year old worker who is exposed to the dose limit annually since the age of 27? How does this dose compare to the cumulative dose according to NCRP Report No. 91?

Multiple Choice Questions
Choose one correct answer.

13.1 The dose equivalent is ___ times greater than the absorbed dose for 10 MeV neutrons.
a) 1
b) 5
c) 10
d) 20
e) none of the above

13.2 Which of the following is NOT TRUE of the radiation weighting factors?
a) The radiation weighting factors for x-rays, gamma rays, and electrons are identical.
b) The radiation weighting factor is 1 for x-rays.
c) The radiation weighting factor is a dimensionless quantity.
d) The radiation weighting factor accounts for the destructiveness of different radiation types.
e) none of the above.

13.3 Excluding radon, the average annual background radiations is
a) 1 mSv.
b) 2 mSv.
c) 3 mSv.
d) 4 mSv.
e) none of the above.

13.4 The effective dose limit for a radiation oncologist is
a) 1 mSv/y.
b) 5 mSv/y.
c) 15 mSv/y.
d) 50 mSv/y.
e) none of the above.

13.5 The maximum allowable radiation exposure to an unbadged radiation therapy employee is
a) 100 mrem per year.
b) 10 mrem per week.
c) 1 Sv per year.
d) 10 mSv per year.
e) none of the above.

13.6 Which of the following is NOT TRUE of the NRC?
a) The NRC regulates the use of radium.
b) The NRC regulates all reactor-produced byproducts.
c) The NRC is formerly called the atomic energy commission.
d) Agreement states also assume the role of the NRC.
e) none of the above.

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