BASIC RADIOLOGICAL PHYSICS COURSE

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

YEAR: _____
(2004, 2005 …)

Objective:

After completing this Study Guide #2, the students should be able to differentiate between the different types of radiation, use of radiological quantities and units, understand the effects and safe use of ionizing radiation, and the historical development of radiological physics.

Study Guide #2:	Radiation (Part 2 of 2)
Read Sections:	Foundation of Radiological Physics Textbook (Author – C.B. Saw) Chapter 1 – Radiation **Sections 1.5 to 1.12**
Suggested Reference:	Faiz Khan's text – Chapter 1
Assignments:	Answer all questions as directed in this handout.
Clinical Rotation Assignment:	A patient said that he saw a purple thing moving inside the tubes while having high-dose rate brachytherapy for the treatment of sarcoma in his arm. What is the purple thing?

Study Guide

1.1 In your own words, define the following terms:

(q) neutrinos	(r) mu mesons
(s) negatron	(t) positron
(u) equivalent dose	(v) absorbed dose
(w) radiation exposure	(x) radioactivity

1.12 Compare the radiation properties with respect to mass, charge, and composition (protons, neutrons, electrons) of alpha particle, beta particle, gamma ray, proton, neutron, electron, and positron.

1.13 What is the difference between electron, negatron, positron, and beta particle?

1.14 What is the mass in kilogram of an electron and a proton?

1.15 Explain how one would identify the types of radiation based on their charge and penetrability properties.

1.16 Identify the SI units of (a) exposure, (b) absorbed dose, (c) equivalent dose, and (d) radioactivity.

1.17 Radiation exposure rate (R/s) is being replaced with air kerma rate, which is the absorbed dose in air (cGy/s). Which unit has a lower numerical value?

1.18 List three effects of ionizing radiation.

1.19 List three methods of minimizing radiation exposure to a person in a radiation environment.

1.20 Understand the historical development leading to their discoveries by Roentgen, Becquerel, and Madame Curie.

1.21 Does bremsstrahlung radiation have a continuous or discrete energy spectrum?

Problems

1.9 Express the dose of 0.05 Gy in rads.

1.10 Express 550 rads in terms of Gy.

1.11 During a radiation treatment 200 rad was delivered to 100 gm of tissue. What dose would 1 gm of tissue have received?

1.12 During a calorimetric investigation, 10 joules of energy were imparted onto a kilogram of water. Compute the radiation dose in cGy.

1.13 Express the radiation exposure of 2 R/min in SI unit (C/kg·min).

1.14 Express the radioactivity of 15 mCi in SI unit (Bq).

1.15 A radioactive sample has a disintegration rate of 8.3×10^6 Bq. Express this activity in microCuries (μCi).

Multiple Choice Questions
Choose one correct answer.

1.8 All these particles have the same mass except the
a) positron
b) negatron
c) electron
d) neutron
e) beta particle

1.9 Which of the following is not true of β particles?
a) Negatron and positron are alike except for the charge
b) The charge of a negatron is $+1.60 \times 10^{-19}$ C
c) Except for their origins, negatron and electron are identical
d) Positron is unstable or short lived
e) none of the above

1.10 Which of the following radiation has the shortest range in tissue?
a) alpha
b) beta
c) positron
d) neutrino
e) gamma

1.11 Which of the following is INCORRECT about Roentgen?
a) it is a unit of exposure and not a unit of absorbed dose
b) it is applicable to both particulate and electromagnetic radiation
c) it is applicable to photons with energies less than 3 MeV
d) it is applicable only in air
e) none of the above

1.12 Spontaneous activity was discovered by
a) W.C. Roentgen
b) H.A. Becquerel
c) Marie Curie
d) E. Rutherford
e) none of the above

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