

BASIC RADIOLOGICAL PHYSICS COURSE

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

YEAR: _____
(2004, 2005 ...)

Objective:

After completing this Study Guide #10, the students should be able to understand (a) nuclear nomenclature, (b) nuclear force, (c) nuclear stability, and (d) trilinear chart of nuclides.

Study Guide #10: Nuclear Structure (Part 1 or 2)

Read Sections: Foundation of Radiological Physics (CBSaw)
Sections 7.1 to 7.4

Suggested Reference: Faiz Khan's text – Section 1-2, 1-3, 1-6, and 1-7

Assignments: Answer all questions as directed in this handout

Clinical Rotation
Assignment:

Study Guide

- 7.1 In your own words, define the following terms:
- | | |
|-----------------|-------------------|
| (a) nuclide | (b) nucleon |
| (c) mass number | (d) atomic number |
| (e) isotope | (f) isotone |
| (g) isobar | (h) isomer |
- 7.2 Write the nuclear nomenclature of sodium-22, cesium-137, and iodine-131.
- 7.3 Determine the number of neutrons in cobalt-59 and lead-207.
- 7.4 Identify an example of isotopes and isotones.
- 7.5 Identify an example of isobars and isomers.
- 7.6 Which of the properties, (a) chemical properties, (b) nuclear charge, (c) number of protons, (d) number of neutrons, are common to both carbon-12 and carbon-14?
- 7.7 List the four types of known forces that exist in nature and their relative strengths.
- 7.8 List three properties of nuclear forces.

- 7.9 Identify the pattern of nuclear stability for light and heavy mass nuclei based on the plot of Z versus N.
- 7.10 Describe the arrangement of nuclides in the trilinear chart of the nuclides. Identify the representations of vertical, diagonal, and the color of nuclides.

Multiple Choice Questions

Select the one correct answer.

- 7.1 Which statement is true?
- a) The neutron has a unit positive charge.
 - b) The mass of a nucleon is about 1836 times more massive than an electron.
 - c) The proton has no charge.
 - d) The nucleons are held together by a weak force.
 - e) none of the above.
- 7.2 Which of the following isobar is most stable?
- a) ^{16}C
 - b) ^{16}N
 - c) ^{16}O
 - d) ^{16}F
 - e) none of the above
- 7.3 Which is NOT a property of nuclear force?
- a) short range force
 - b) strongest force found in nature
 - c) independent of charge
 - d) readily saturated by the surrounding nucleons
 - e) none of the above
- 7.4 Which of the following is TRUE about nuclear stability?
- a) Heavy nuclides having more neutrons than protons are stable.
 - b) Heavy nuclides having more protons than neutrons are stable.
 - c) Light nuclides having more neutrons than protons are stable.
 - d) Light nuclides having more protons than neutrons are stable.
 - e) none of the above.
- 7.5 Which of the following is NOT a feature of the trilinear chart of nuclide arrangement?
- a) degree of background darkness represents the degree of nuclear stability
 - b) diagonally adjacent nuclei can be isotones
 - c) diagonally adjacent nuclei can be isotopes
 - d) vertically adjacent nuclei are isobars
 - e) none of the above

- 7.6 Which of the following is NOT an isobar?
- a) ^{192}Os
 - b) ^{192}Ir
 - c) ^{192}Pt
 - d) ^{192}Au
 - e) none of the above
- 7.7 Radon is an inert gas but considered radioactive because
- a) radon nucleus undergoes nuclear transformation.
 - b) radon atoms have completely filled shells.
 - c) radon electrons are being emitted.
 - d) radon decays from radium which is a radioactive substance.
 - e) none of the above.
- 7.8 Which of the following are isotopes?
- a) $^{99\text{m}}_{43}\text{Tc}$ and $^{99}_{43}\text{Tc}$
 - b) $^{11}_6\text{C}$ and $^{12}_6\text{C}$
 - c) $^{12}_6\text{C}$ and $^{12}_7\text{N}$
 - d) $^{12}_6\text{C}$ and $^{13}_7\text{N}$
 - e) none of the above

CBS: 3/97

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