



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION

SCH 310: RADIATION AND RADIOCHEMISTRY

DATE: Friday 30th March 2012

TIME: 11.00a.m -1.00p.m

INSTRUCTIONS:

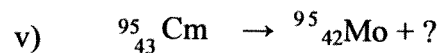
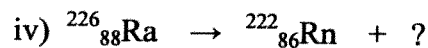
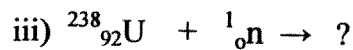
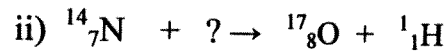
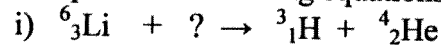
- ☐ Attempt **ALL** questions. Show working where necessary.

Useful information: mass of protons=1.007825; mass of neutrons=1.008665; $1U=931.5$ MeV

1.
 - a) What is spontaneous fission? What types of nucleus tend to decay by spontaneous fission? Give an example. (5 marks)
 - b) State any three radioactive decay and the necessary condition for their occurrence. (3 marks)
 - c) Compare and contrast the interaction of α -particles and γ -radiation with matter. (6 marks)
 - d) The absorption of γ -radiation results in three independent physical processes. Briefly describe any two. (6 marks)
 - e) What factors determine the type of chemical effects observed in materials exposure on exposure to radiation? (2 marks)
2.
 - a) Explain the following terms:
 - i) Mattauch's isobar rule
 - ii) Nuclear isomerism
 - iii) Isotonic nuclides (6 marks)

- b) Determine the binding energy (in MeV) per nucleon (E_B/A) for the nuclides: $^{16}_8\text{O}$ and $^{56}_{26}\text{Fe}$ ($Z: \text{O}=15.9994$ and $\text{Fe}=55.845$) (4 marks)

- c) Complete the following equations:



(5 marks)

- d) What do you understand by RAD? What biological effects are observed in individuals when they exceed recommended RAD? (4 marks)
- e) Briefly explain how you would use a cyclotron to make a transuranium element through transmutation. What do you understand by the terms transuranium and transmutation? (6 marks)

3. a) State three types of gas filled detectors and explain the detector works

(6 marks)

- b) Explain how isotope dilution analysis works and when is this technique most useful?

(5 marks)

- c) Explain three problems encountered when working with radioactive isotopes. (4 marks)

- d) Briefly explain how a fusion nuclear reactor works. (5 marks)

- e) Explain four problems associated with fusion reactors. (4 marks)