

Reg. No..... Name.....

BSc DEGREE END SEMESTER EXAMINATION MARCH 2017**SEMESTER - 6: PHYSICS (CORE COURSE)****COURSE: U6CRPHY10 -: NUCLEAR AND PARTICLE PHYSICS***(Regular 2014 Admission.)*

Time: Three Hours

Max. Marks: 60

PART A (Very short answer questions)(Answer **all** questions. Each question carries 1 Mark)

1. Give the relation between radius of nuclei and its mass.
2. What are mirror nuclei?
3. Explain the term mass defect.
4. What is the principle used in Ionisation chamber?
5. What is meant by activity of a radioactive sample?
6. State Geiger - Nuttal law.
7. What is meant by artificial radioactivity?
8. What is a breeder nuclear reactor?
9. What are secondary cosmic rays?
10. Write the composition of proton and neutron in terms of quark model.

(1 x 10 = 10)

PART B (Short answer questions)(Answer **any seven** questions. Each question carries 2 Marks)

11. Discuss any two properties of nucleus.
12. Explain meson theory of nuclear forces
13. Explain the origin of continuous β ray spectrum.
14. Write a short note on transuranic elements.
15. Explain orbital electron capture.
16. Distinguish between carbon and uranium dating.
17. Differentiate between proton-proton and carbon-nitrogen cycle.
18. What is Tokomak confinement? Give its uses.
19. Explain any two conservation laws followed in elementary particle interactions.

(2 x 7 = 14)

PART C (Problem/Derivations)

(Answer **any four** question. Each question carries 4 Marks)

20. The binding energy of the Neon isotope $^{20}\text{Ne}_{10}$ is 160.6 MeV. Determine its atomic mass.
21. Compute approximate radii of ^{12}C and ^{14}C . By what % is the radius of ^{14}C greater than that of ^{12}C ?
22. Find the energy release if two $^1_1\text{H}^2$ nuclei can fuse together to form $^2_2\text{He}^4$ nucleus. The binding energy per nucleon of H^2 and He^4 is 1.1 MeV and 7.0 MeV respectively.
23. Calculate the activity of 1 mg of radon ^{222}Rn , whose half life is 3.8 days.
24. 0.5 g of a radioactive element disintegrates at the rate of 3.7×10^{10} disintegrations per second. Calculate its half life and mean life. Given the atomic weight of the element is 226 g.
25. Show that pion decay and muon decay conserve the lepton numbers L_e and L_μ .

(4 x 4 = 16)

PART D (Long answer questions)

Answer **any two** question. Each question carries 10 Marks

26. Describe the working and function of a Bainbridge's mass spectrometer.
27. Give the Gamow's theory of alpha decay and explain it in detail.
28. Distinguish between nuclear fission and fusion. Explain the principle of a nuclear reactor. Mention some of its uses.
29. Distinguish between hadrons and leptons. Hence discuss how quark model is used to describe the hadrons.

(10 x 2 = 20)
