

**B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2019****SEMESTER – 6: PHYSICS (CORE COURSE)****COURSE: 15U6CRPHY10: NUCLEAR AND PARTICLE PHYSICS**

*(Common for Regular - 2016 Admission / Supplementary-Improvement 2015  
& Supplementary 2014 admissions)*

Time: Three Hours

Max. Marks: 60

**Part A (Very short answer questions)**

(Answer **all** questions) Each question carries 1 mark

1. What are isotones?
2. What is mass defect?
3. Give the working principle of Ionization chamber.
4. What is neutrino?
5. Give any two properties of gamma rays
6. Define  $\alpha$ -particle disintegration energy.
7. What do you mean by critical size of a chain reaction
8. What is the purpose of heavy water in a nuclear reactor
9. What are gauge bosons?
10. Which are the particles found in secondary cosmic rays? (1 x 10 = 10)

**Part B (Short Answer Questions)**

Answer **any seven** questions .Each question carries 2 marks

11. What are magnetic numbers? Why are they called so?
12. Explain electric quadrupole moment of nucleus
13. Give the sketch of a G.M counter
14. What is carbon dating?
15. Give any four properties of  $\alpha$ - rays.
16. What is range of alpha particle? Give range-energy relation.
17. When a  $\mu^-$  meson collides with a proton, a neutron plus another particle are created. Give the name and properties of the other particle created.
18. Write the proton – proton chain reaction in stars
19. Explain primary and secondary cosmic rays. (2 x 7 = 14)

**Part C (Problem/Derivations)**

Answer **any four** questions .Each question carries 4 marks

20. Calculate the B.E of an alpha particle and express the result both in MeV and Joules  
Given the mass of alpha particle = 4.001506 u

21. The radius of  $\text{Ho}^{165}$  is 7.731 fermi. Deduce radius of  $\text{He}^4$ .
22. 1 gram of a radioactive substance disintegrates at the rate of  $3.7 \times 10^{10}$  disintegration per second. The atomic weight of the substance is 226. Calculate its mean life.
23. Give an account of pair production and electron positron annihilation.
24. A carbon specimen found in a cave contained  $1/8$  as much C-14 as an equal amount of carbon in a living matter. Calculate the approximate age of the specimen. Half-life period of C-14 is 5568 years.
25. Give the latitude and altitude effect of cosmic rays. (4 x 4 = 16)

### Part D (Long answer questions)

Answer **any two** questions .Each question carries 10 marks

26. Write down the features of nuclear forces. Discuss the meson theory of nuclear forces.
27. Explain radioactive disintegration law. Deduce expressions for half-life and mean life of a radioactive sample.
28. Briefly discuss nuclear fission and chain reaction. Describe the construction and working of a nuclear reactor.
29. Which are the elementary particle quantum numbers? Also explain the conservation laws and symmetry operations.

(10 x 2 = 20)

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