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Reg. No.....

THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Physics

PHY 3C 10—NUCLEAR AND PARTICLE PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer **all** *questions.*
Each question carries weightage 1.

1. Give the theory of force between a proton and neutron in deuterium for the ground state.
2. What is the basic assumption of a single particle shell model ?
3. What is the concept of fission to explain the stability of nucleus ?
4. What are allowed and forbidden beta decay ?
5. What is the kinetic energy of alpha particles in terms of Q value ?
6. What was the necessity of introducing color quantum number ?
7. Write a note on semiconductor detectors.
8. Explain about the four fundamental forces in nature.

(8 × 1 = 8 weightage)

Section B

Answer any **two** *questions.*
Each question carries weightage 5.

9. Explain the term mass and binding energy of a nucleus. Give two method for determi mass and binding energy of nucleus.

10. Explain the quark model for hadrons. What are the experimental evidences for confine

11. Give a brief description of Nuclear Model Explain the single particle shell model with o application.

12. Explain the theory of alpha particle emission. Also discuss the angular momentum an selection rule for alpha decay.

(2 × 5 = 10 we

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

13. From the known masses of ^{15}O and ^{15}N, compute the difference in binding energy. Assum difference to arise from the difference in coulomb energy, Compute the nuclear radius of ^{15}N. (Mass of proton = 1.00727647 a.m.u., Mass of neutron = 1.0086654 a.m.u., ^{15}O = 15.0030654 a.m.u. Mass of ^{15}N = 15.004890a.m.u)

14. Show that the mixing of S and D states accounts for the magnetic moment of the deuter

15. Discuss about the classical electromagnetic radiation.

16. Discuss the theory of controlled fission reactions.

17. Explain what are single channel and multichannel analyser.

18. Illustrate with an example the conservation laws obeyed in elementary particle reaction

19. Distinguish between Leptons and Hadrons.

(4 × 3 = 12 we