(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2020-21 ONLY)

N.G.M.COLLEGE (AUTONOMOUS): POLLACHI
END-OF-SEMESTER EXAMINATIONS: JULY-2022

M.Sc., PHYSICS　　　　　　　　　　　　MAXIMUM MARKS: 70

SEMESTER : IV　　　　　　　　　　　　TIME : 3 HOURS

CORE-VIII : NUCLEAR & PARTICLE PHYSICS

SECTION - A　　　　　(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS.　　　　　　　　　　　(K1)

1. According to Yukawa's theory of nuclear forces, the origin of nuclear force between nucleons is due to the exchange of _____
　　a) Mesons　　　　b) Photons　　　　c) Electrons　　　　d) Neutron

2. The semi-empirical mass formula for the binding energy of nucleus contains a surface correction term. This term depends on the mass number A of the nucleus as _____
　　a) $A^{-1/3}$　　　　b) $A^{1/3}$　　　　c) $A^{2/3}$　　　　d) A

3. In radioactive decay which of the following quantity depends on the number of atoms ____
　　a) Half-life　　　　b) Rate of decay　　　　c) Mean life　　　　d) Decay constant

4. A moderator in a nuclear reactor is used to _____
　　a) Accelerate protons　　　　　　b) Produce alpha particles
　　c) Slowdown the neutrons　　　　d) Increase the velocity of beta particles

5. Conservation laws that describe events involving the elementary particles include the conservation of _____
　　a) Energy　　　　　　　　　　b) Linear and angular momentum
　　c) Electric charge　　　　　　d) All of these are correct

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.　　(K2)

6. Define tensor forces
7. What are magic numbers?
8. Is parity conserved in beta decay?
9. Distinguish between compound and direct nuclear reactions.
10. List any two fundamental forces in nature.

SECTION – B　　　　　(5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Write a brief note on scattering length and effective range.
(OR)
　　b) Give an account of neutron proton scattering at low energies.

12. a) Deduce an expression for the prediction of angular momenta of nuclear ground state by shell model.

(OR)

b) Discuss the elementary ideas of unified and superconductivity model.

13. a) Describe the theory of angular correlation of successive radiation.

(OR)

b) Explain the Fermi's theory of beta decay.

14. a) Derive an expression for four factor formula using nuclear fission.

(OR)

b) List the characteristics of nuclear fusion reaction and write a short note on solar fusion.

15. a) Write a short note on Grand unification theory and super symmetry on elementary particles.

(OR)

b) Outline the production and measurement of elementary particles and their properties.

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS
(FROM Qn. No : 17 to 21) (K4 (Or) K5)

16. Deduce Gellmann Okuba mass formula for baryons.

17. Write a short note on nuclear forces and explain the Yukawa theory on nuclear forces.

18. Discuss the vibrational and rotational states of nucleus using collective model.

19. Explain the Gamow's theory of alpha decay and give an account of alpha ray energies and fine structure of a nucleus.

20. What is nuclear fission reaction? Briefly explain the Bohr Wheeler's theory of nuclear fission.

21. Describe the electroweak theory and standard model of elementary particles.

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