LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

SIXTH SEMESTER – **APRIL 2019**

16UPH6MC01– ATOMIC AND NUCLEAR PHYSICS

Date: 04-04-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART - A (10 × 2 = 20 MARKS)
ANSWER ALL QUESTIONS.

1. What are the limitations of the Thomson's parabola method?
2. State Larmor's theorem.
3. Which are the factors affecting intensity of molecular spectra.
4. Give the differences between Raman spectra and IR spectra.
5. List the methods to investigate the size of the nucleus.
6. Define the units of radioactivity.
7. Write Weizsacker semi-empirical mass formula.
8. What do you mean by tokamak?
9. List the fundamental interactions in nature.
10. Write the formula for electric charge of meson or baryon.

PART - B (4 × 7.5 = 30 MARKS)
ANSWER ANY FOUR QUESTIONS.

11. Describe the construction, working and theory of a mass spectrograph.
12. Discuss the theory Raman effect and explain the experimental arrangement for studying it.
13. Explain the stability of nucleus, binding energy and packing fraction.
14. Explain the salient features of nuclear shell model.
15. Draw a neat diagram of a nuclear reactor and explain its working.
16. Write a detailed note on particles and antiparticles.

PART - C (4 × 12.5 = 50 MARKS)
ANSWER ANY FOUR QUESTIONS

17. Describe Stern-Gerlach experiment principle, theory and working for the existence of space quantization.

18. (a) Explain the coupling schemes: L-S coupling and j-j coupling and (b) State and explain Hund's rule.

19. Derive an expression for Lande's splitting factor and explain the anomalous Zeeman effect of sodium

doublet lines D_1 and D_2 with its help.

20. Derive Rutherford's scattering formula. How do you estimate the nuclear dimensions from Ruthorford

scattering?

21. What are thermonuclear reactions? Explain carbon-nitrogen cycle and proton-proton cycle as source of stellar energy.

22. (a) What are quarks? Discuss the kinds and properties of quarks.

(b) Check whether the following reaction is allowed on the basis of conservation laws.

$$p + \bar{p} \rightarrow 2\pi^+ + 2\pi^- + 2\pi^0$$

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