

Final Year B.Sc., Degree Examination**Directorate of Distance Education****July / August 2011****PHYSICS****Paper III : Spectroscopy, Wave Mechanics Statistical Mechanics Relativity
and Astrophysics**

Time: 3 hrs.]

[Max.Marks: 75/85

Instructions to candidates:-

1. Students who have attended 25 Marks IA Scheme will have to answer for total of 75 Marks.
2. Students who have attended 15 Marks IA Scheme will have to answer for total of 85 Marks.
3. Section E is compulsory for 85 marks scheme only.

SECTION – A**I. Answer All questions.**

10 x 1 = 10 Marks

1. What is the value of specific charge of an electron?
2. Write the expression for reduced mass of an electron.
3. Write the expression for Bohr Magneton.
4. What is Anamolous Zeeman effect?
5. State Duane – Hunt law.
6. What is Rayleigh scattering.
7. What is the principle of Laser action.
8. Define Light year.
9. State Heidezberg's uncertainty principle.
10. State Hubble's law.

Contd....2

SECTION – B

II. Answer any FIVE questions.

5 x 3 = 15 Marks

11. Starting from Pauli's exclusion principle derive the expression for maximum number of electrons in a shell.
12. Write a note on characteristic x – rays.
13. Write the characteristic properties of Laser beam.
14. What are matter waves? Obtain the de-Broglie wave length of a particle moving with kinetic energy E.
15. Distinguish between M.B, B.E and F D statistics.
16. Arrive at time dilation equation.
17. Write a note on neutron stars.

SECTION – C

III. Answer any FIVE questions.

5 x 6 = 30 Marks

18. Describe the Thomsons method of determining e/m of an electron and what is the significance of the experiment.
19. What is normal Zeeman effect? Give the quantum theory of normal Zeeman effect.
20. What is Raman effect? Name the Raman lines Describe the experimental setup used to study Raman effect.
21. Describe construction and working of Ruby Laser write the applications of Laser beam.
22. Derive Time – dependent Schrodinger wave equation.
23. Describe with a neat figure Michelson- Morley experiment. What is the significance of –ve result?
24. With a neat diagram explain H.R diagram. When does a star end up as white dwarf?

Contd....3

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SECTION - D

IV. Answer any TWO questions.

2 x 10 = 20 Marks

25. (a) Write the expression for Rydberg constant for an atom of infinite mass. Arrive at the ratio of mass of electron to that of a proton.
- (b) Write the three salient features of Stark effect (7 + 3 Marks)
26. (a) Describe Davisson and Germer experiment with observations.
- (b) An electron of mass 9.1×10^{-31} kg has a speed of 350 m/s with an accuracy of 0.015% . Calculate the uncertainty with which position of electron can be located. (7 + 3 Marks)
27. (a) Arrive at Einstein mass energy relation.
- (b) Find the velocity of a particle for its mass to be four times its rest mass. (7 + 3 Marks)
28. (a) Write the postulates of general theory of relativity. Mention the experimental observations in support of Einstein's theory and explain Advance of perihelion of Mercury.
- (b) If the apparent and absolute magnitudes of a star are -2 and -1.5 , find the distance of the star in par sec. (7 + 3 Marks)

SECTION - E

V. Answer any one of the following questions.

1 x 10 = 10 Marks

(Compulsory question for 85 marks scheme only)

29. (a) Obtain time - independent Schreddinger's equation .
- (b) Write a note on (1) Electron microscope.
(2) Hermition operator (6 + 4 Marks)
30. (a) Give the brief account of Einstein's theory of gravition.
- (b) Write a note on Inertial and gravitational mass. (5 + 5 Marks)
