



DSC – 210

Final Year B.Sc. Degree Examination, November 2008  
(Directorate of Distance Education Course)

PHYSICS

Paper – III : Modern Physics – I

Spectroscopy, Wave Mechanics, Statistical Mechanics, Relativity and  
Astrophysics

Time : 3 Hours

Max. Marks : 75

- Instructions :*
- 1) Answer Section A in the first two pages of the main answer book.
  - 2) Answer all questions in Section A, FIVE questions in Section B, FIVE questions in Section C and TWO questions in Section D.
  - 3) Draw neat and labelled diagrams wherever necessary.
  - 4) Take necessary data from the tables.

SECTION – A

EXAM

2008

I. Answer all questions :

(10×1=10)

- 1) State Moseley's law.
- 2) State Pauli's exclusion principle.
- 3) What is Rayleigh scattering ?
- 4) What is population inversion ?
- 5) What are deBroglie waves ?
- 6) Write an expression for allowed energy values of rigid rotator.
- 7) What is world line in Minkowski space time co-ordinates ?
- 8) Is velocity of light constant under Galilean transformation ?
- 9) Write the mass-luminosity relation for a star.
- 10) What is stimulated emission ?

P.T.O.

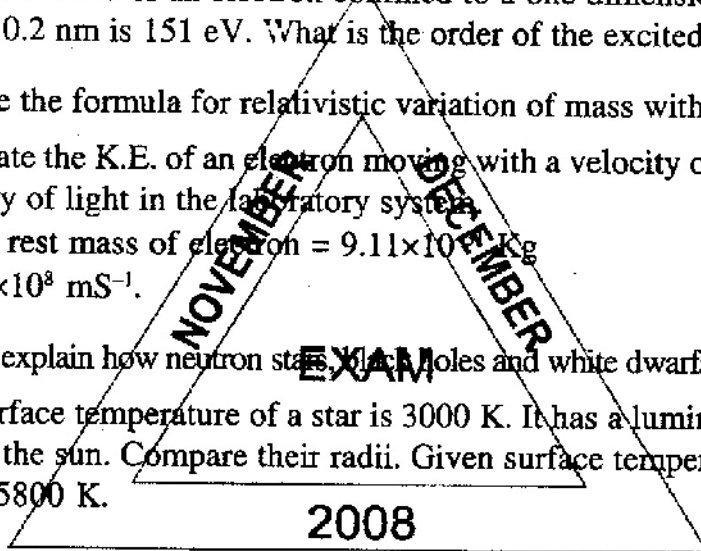




SECTION - D

IV. Answer any TWO questions : (10×2=20)

- 25) a) What are continuous and characteristics X-rays ? Derive Bragg's law for X-rays. 6
- b) The anode voltage in X-ray tube is 80 kV and the wave length of X-ray produced is  $0.15 \text{ \AA}$ . Calculate Planck's constant. 4
  
- 26) a) Obtain an expression for eigen values of a particle in one dimensional box. 6
- b) An eigen value of an electron confined to a one dimensional box of length 0.2 nm is 151 eV. What is the order of the excited state ? 4
  
- 27) a) Deduce the formula for relativistic variation of mass with velocity. 6
- b) Calculate the K.E. of an electron moving with a velocity of 0.98 times the velocity of light in the laboratory system.  
    Given, rest mass of electron =  $9.11 \times 10^{-31} \text{ Kg}$   
     $C = 3 \times 10^8 \text{ mS}^{-1}$ . 4
  
- 28) a) Briefly explain how neutron stars, black holes and white dwarfs are formed. 6
- b) The surface temperature of a star is 3000 K. It has a luminosity  $10^4$  times that of the sun. Compare their radii. Given surface temperature of sun = 5800 K. 4



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