K23P 0216

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (CBSS – Reg./Supple./Imp.)
Examination, April 2023
(2019 Admission Onwards)
PHYSICS
PHY 4E12 : Experimental Techniques

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **both** the questions (Either **a** or **b**).

1. a) Explain the differences between thermal evaporation and sputtering techniques for the fabrication of thin films. Explain three different methods of thermal evaporation.

   OR

   b) What are kinetic vacuum pumps ? With the help of a neat diagram explain the working of a three-stage oil diffusion pump. Give the merits of turbo molecular pump over diffusion pump.

2. a) Explain how magnetic refrigerator and adiabatic demagnetization are used to achieve temperatures below 1 K.

   OR

   b) What is the principle of working of linear electrostatic accelerators ? Explain the working of Van de Graaff accelerator and pelletron. **(2×12=24)**

SECTION – B

Answer **any four** questions (**One** mark for Part **a**, **3** marks for Part **b**, **5** marks for Part **c**).

3. a) What are interference filters ?
   b) Differentiate between band and cutoff filters.
   c) Give details of multilayer optical filters.

4. a) What are vacuum gauges ?
   b) Explain direct reading and indirect reading vacuum gauges with examples for each.
   c) With a neat diagram, explain working of a Pirani gauge.

5. a) What is a thermometer ?
   b) Explain primary and secondary thermometers. Give examples for each.
   c) Explain the theory behind working of a gas thermometer.

6. a) What is sputtering ?
   b) List some applications of ion beam sputtering.
   c) Explain the principle of ion beam sputtering.

7. a) What are cyclic accelerators ?
   b) In a magnetic chamber with a magnetic field of 8 G, an electron is shot with a speed of 5×10^6 ms^{-1} normal to the field. Explain why the path of the electron is circular. Determine radius of circular orbit and the frequency of revolution.
   c) Briefly explain the working of a cyclotron.

8. a) Give two applications of Proton Induced X-ray Emission (PIXE) technique.
   b) What are the unique features of PIXE technique which distinguish it from other methods of trace elemental techniques ?
   c) Find the effective cross section of a gold nucleus corresponding to the scattering of alpha particles with kinetic energy T = 1.5 MeV through angles exceeding $\theta = 60°$. **(4×9=36)**

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