



K16P 0213

Reg. No. : .....

Name : .....

**Fourth Semester M.Sc. Degree (Regular/Supplementary/Improvement)  
Examination, March 2016  
PHYSICS (2014 Admn.)  
PHY4E12 : Experimental Techniques**

Time : 3 Hours

Max. Marks : 60

**SECTION – A**

Answer both questions (Either a or b)

1. a) With the help of a diagram, explain the various parts and working of a Turbo molecular pump. What are its advantages ?

OR

- b) What is meant by sputtering ? Describe the different sputtering techniques useful for thin film preparation. Explain one such technique in detail with a neat diagram.

2. a) What are permanent gases ? Describe with the help of a neat diagram, the principle and working of helium liquefier (Kammerlingh Onne's method).

OR

- b) Explain the tandem principle for accelerating charged particles. With the help of a diagram, explain the principle and working of a Tandem Van de Graff accelerator. **(2x12=24 Marks)**

**SECTION – B**

Answer any **four**.

**(One mark for part a, 3 marks for part b, 5 marks for part c)**

3. a) Name the classification of vacuum gauges.  
b) What do you mean by baffle valve ? What is its use ?  
c) Write a note on Pirani gauge.

P.T.O.



4. a) What are interference filters ?  
b) A quartz crystal monitor indicates a change in frequency of 1600 Hz when an aluminium film of density  $2.7 \text{ g/cm}^3$  is deposited on its face. Determine the film thickness.  
c) Draw the diagram of a Fizeau interferometer and explain its principle of determination of film thickness.
5. a) Explain superfluidity.  
b) Distinguish between primary and secondary thermometers.  
c) Briefly explain magnetic thermometer.
6. a) What is magnetic focusing in a cyclotron ?  
b) Give the principle of ion beam sputtering.  
c) For an electron and proton moving along circles in a uniform magnetic field  $B = 10 \text{ KG}$  determine the orbital periods and radii if the kinetic energy of the particles is 10 MeV (pp).
7. a) What is meant by depth profiling ?  
b) Explain how a resonance nuclear reaction is useful for depth profiling.  
c) List the nuclear reactions useful for the analysis of C/He/B.
8. a) Define calibration in elemental analysis.  
b) Give the basic requirement for any technique for elemental analysis.  
c) Alpha particles with kinetic energy 1.7 MeV are scattered by the Coulomb field of a stationary Pb nucleus ( $A = 208$ ). Calculate the differential cross section for the scattering through an angle  $60^\circ$ . **(4×9=36 Marks)**