

**D 91608**

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Name.....

Reg. No.....

**THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2015**

(CUCSS)

Physics

**PHY 3E 07—EXPERIMENTAL TECHNIQUES**

(2012 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

**Section A**

*Answer all questions.*

*Each question carries 1 weightage.*

1. Give the applications of a rotary pump.
2. Explain the physical process responsible for the pumping action in a turbo molecular pump.
3. Describe briefly how a liquid sorption trap functions.
4. Explain the advantages of sputtering process.
5. What are interference filters ? Give their uses.
6. Distinguish between Isenthalpic curve and Inversion curve.
7. Briefly explain Linde's air liquefier.
8. What is Betatron ?
9. Give a qualitative ideas of particle smashers.
10. List the limitations of PIXE.
11. List the application of XRD.
12. Give the principle and working of Debye-Scherrer camera.

(12 × 1 = 12 weightage)

**Section B**

*Answer any two questions.*

*Each question carries 6 weightage.*

13. What is meant by traps in a vacuum system ? Describe the liquid nitrogen and sorption traps. How are they useful in obtaining better vacuum ?
14. Describe the four probe method to find the thickness of thin film.
15. Describe the vapour pressure thermometer, giving its principle and working. Compare it with a gas thermometer.

**Turn over**

16. Describe the principle and working of PIXE technique for elemental analysis. Compare its features with other similar technique.

(2 × 6 = 12 weightage)

### Section C

Answer any **four** questions.

Each question carries 3 weightage.

17. What should be the speed of a rotary pump to be used to achieve a vacuum of  $10^{-3}$  Ton, in a chamber of volume 100 litres in 30 minutes ?
18. For an electron and a proton moving along circles in a uniform magnetifield  $B = 10$  kg., determine the orbital periods and radii if K.E. of the particle is 10 MeV.
19. At what values of KE does the period of revolution of electrons, protons and alpha particles in a uniform magnetic field exceeds that at non-relativistic velocity by 10 % ?
20. An alpha particle with a momentum 53 MeV/C is scattered at an angle  $60^\circ$  by the Coulomb field of a stationary uranium nucleus ( $A = 238$ ). Find the impact parameter.
21. Draw a labelled diagram of Kamerlingh-Onner used for the liquefaction of Oxygen.
22. Calculate the change in temperature of Helium at 100 K when throttled at a pressure difference of 50 atm. Given that for the  $a = 0.0341$  litre<sup>2</sup> atmosphere per mole<sup>2</sup> and  $b = 00234$  litre mol<sup>-1</sup> and  $C_p$  for He = 20.75 J mol.<sup>-1</sup> K<sup>-1</sup>.

(4 × 3 = 12 weightage)