

D 52347

(Pages : 2)

Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2018

(CUCSS—PG)

Physics

PHY 3E 05—EXPERIMENTAL TECHNIQUES

(2017 Syllabus Year)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries a weightage of 1.

1. Explain what is meant by oil suck back in a rotary pump.
2. What is a sorbent material ? Give examples.
3. Explain Knudsen cosine law.
4. Explain why vacuum is required for thin film preparation by thermal evaporation technique ?
5. Give a brief account of thin film thickness measurement by optical interference method.
6. Explain the important principle used in Van de Graaff accelerator.
7. What are the factors that enforce an upper limit to the ion energies available from cyclotrons ?
8. Explain why cyclic accelerators in general yield ion beam bursts and not continuous beams ?
9. What is meant by energy straggling? How does it affect the spectrum of ions scattered from a target ?
10. Explain any two applications of PIXE analysis technique.
11. Give a brief account of instrumentation of diffractometer.
12. What is structure factor ?

(12 × 1 = 12 weightage)

Section B

Answer any two questions.

Each question carries a weightage of 6.

13. With the help of a neat diagram explain the various parts and working of a turbo molecular pump.

Turn over

14. Describe the experimental methods for the measurement of electrical conductivity of thin films. Define thermo electric power and its utility.
15. What is ion implantation ? Discuss how this process helps in obtaining a desired doping profile for a semiconductor. What are the main advantages and applications of ion implantation ?
16. Explain the principle of RBS technique. Draw and explain the experimental setup for the elemental analysis using this technique. What are the important applications of this method ?

(2 × 6 = 12 weightage)

Section C

Answer any four questions.

Each question carries a weightage of 3.

17. In a pumping system, a diffusion pump with a pumping speed of 100 Torr litres s⁻¹ is backed by a rotary pump. The ultimate pressure achieved in the pumped chamber is 2.5×10^{-5} Torr. Calculate the pumping speed of the rotary pump.
18. A diamond tipped four point probe of in-line-type with probe spacing 0.5 mm is placed over a thin film sample deposited over an insulating substrate. A potential of IV is applied and the current was 0.5 mA. If the film thickness is 1 μm, calculate the sheet resistance of the sample.
19. A cyclotron, operating at 5kV and a magnetic flux density of 0.8 Weber/m² accelerates alpha-particles to 2MeV. How long does it take to accelerate the particles from rest to this energy ?
20. The calibration constant for a particular trace element using PIXE setup was 2548 counts/μg/μC. For the internal standard element used with a concentration of 100 ppm, the corresponding value is 515. Evaluate the concentration of the trace element considered.
21. X-rays with wavelength 154.2pm produce reflections from the (110) and (200) planes of FCC Cu of density 8.935 g/cm³. At what angles will these reflections appear ?
22. Derive the Scherrer equation.

(4 × 3 = 12 weightage)