D 132066 **(Pages : 2)** **Name.....**

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY] EXAMINATION, NOVEMBER 2025

(CBCSS)

Physics

PHY 3E 05—EXPERIMENTAL TECHNIQUES

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions, each carries weightage* 1.

1. Discuss the functions of the oil in a rotary vacuum pump.
2. Explain why thin targets are preferred in any nuclear technique for elemental analysis.
3. What are the major applications of the pirani gauge ?
4. What is the principle of thin film preparation by the sputtering technique ?
5. Illustrate the amorphous and channeling peaks in ion implantation technique.
6. What are the disadvantages of resistive heating technique for thin film preparation ?
7. Explain the principle of a cyclic accelerator.
8. What are the advantages of ion implantation technique ?

(8 × 1 = 8 weightage)

Section B

Answer any **two** *questions, each carries weightage* 5.

9. State and Explain Bragg's law of diffraction ? Explain the instrumentation for powder X-ray diffraction technique ?
10. How does the Cryogenic pumps work ? Explain with the help of neat diagram.

Turn over

11. Explain the principle of linear accelerators. With the help of neat diagram explain the working of Van de Graaff accelerator.

12. Describe the glow discharge technique for thin film preparation. How do you measure thin film thickness by electric resistivity measurement ?

(2 × 5 = 10 weightage)

Section C

Answer any **four** *questions, each carries weightage* 3.

13. Explain the method of thickness measurement using quartz crystal monitor.

14. Describe the sorption pump using a neat diagram. What are the advantages and disadvantages ?

15. If the potential difference across an X-ray tube is 6000 Volt and the current through it is 2.5 mA, calculate the number of electrons striking the target per second and the speed at which they strike. Also calculate the shortest wavelength of X-rays produced.

16. A fifteen stage turbo molecular pump with a blade tip velocity of 500 m/s has a compression ratio at 25 °C for N_2 of 7.7×10^8. What is the compression ratio of the pump when it is pumping hydrogen ?

17. Describe the method for element determination by neutron activation analysis.

18. An alpha particle with a momentum 53 MeV/c is scattered at an angle 60° by the Coulomb field of a stationary uranium nucleus (A = 238). Find the impact parameter.

19. Using the principles of energy and momentum, deduce an expression relevant to the qualitative analysis of the sample for X in a nuclear reaction, X (a, b) Y. The q-value is taken 'Q' and the outgoing particle b, makes 0 angle with the incident beam direction.

(4 × 3 = 12 weightage)