D 111214 (Pages : 2) Name..

Reg. No.....................................

THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2024

(CBCSS)

Physics

PHY 3E 05—EXPERIMENTAL TECHNIQUES

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

*Answer **all** questions.*
Each question carries weightage 1.

1. Explain what is meant by oil suck back in a rotary pump.

2. Explain why thin targets are preferred in any nuclear technique for elemental analysis.

3. Draw the diagram of Pirani gauge and labelits parts.

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. Explain laser evaporation technique in thin film deposition.

7. Explain the principle of a cyclic accelerator.

8. Write a short note on PIXE.

$(8 \times 1 = 8$ weightage)

Section B

*Answer any **two** questions.*
Each question carries weightage 5.

9. Describe the powder method for X-ray diffraction. Discuss the formation of diffraction pattern on the photographic film

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. Discuss what are multi-layer optical filters. Describe their structure and applications.

(2 × 5 = 10 weightage)

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

13. Describe the four probe method to find the thickness of thin films. Obtain the expression for thickness in terms of resistivity.

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

15. The utilized reflecting plane of a lithium fluoride crystal has an inter-planar distance of 2.5 A°. Calculate the wavelength of the 2nd order line which has a glancing angle of 60°.

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. A beam of 10 MeV neutrons is incident on a ^{19}F target producing the nuclear reaction ^{19}F (n, p) ^{19}O. If the Q-value of the reaction is – 3.7 MeV, find the energy of the protons that are emitted at 90° to the direction of the incident *n*-beam.

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)