

D 70990

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Name.....

Reg. No.....

**THIRD SEMESTER M.Sc. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2019**

Physics

PHY 3E 05—EXPERIMENTAL TECHNIQUES

(2017 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries a weightage of 1.

1. Explain briefly the principle of operation of turbo molecular pump.
2. What are O rings and gaskets ? Give their uses.
3. What is back streaming in a diffusion pump ? How is it prevented in practice ?
4. Distinguish between thermal evaporation and sputtering techniques for thin film deposition.
5. What are multilayered films ? Explain their applications.
6. Explain the principle of linear electrostatic accelerator.
7. Explain what is ion plasma source.
8. Explain what is meant by kinematic factor? Obtain an expression for the same.
9. What is ion channeling ? How can one avoid the channeling peak in ion implantation ?
10. Explain why radiochemical separation becomes necessary very often in NAA measurements.
11. Derive Bragg's law of diffraction.
12. What are the applications of X-ray diffraction analysis ?

(12 × 1 = 12 weightage)

Section B

Answer any two questions.

Each question carries a weightage of 6.

13. Draw a neat diagram of oil sealed rotary vacuum pump. Explain the principle and working and the function of oil.

Turn over

14. Explain the principle of thermal evaporation technique for thin film deposition. What are the different methods employed in this technique? With a neat sketch explain in detail any one of the methods.
15. Explain the tandem principle for accelerating charged particles. With the help of a diagram, explain the principle and working of a Tandem Van de Graaff accelerator.
16. Explain the principle of the PIXE technique for elemental analysis. Draw and explain the experimental setup for the same.

(2 × 6 = 12 weightage)

Section C

Answer any four questions.

Each question carries a weightage of 3.

17. What should be the speed of UHV pump to be used to achieve a vacuum of 10^{-10} Torr, if the outgassing load on the chamber is 10^{-9} Torr litres s^{-1} ?
18. A quartz crystal monitor indicates a change in frequency of 1600Hz when an aluminium film of density 2.7gcm^{-3} is deposited on its face. Determine the film thickness. If the quartz crystal is 0.2mm thick and the density of quartz is 2.7gcm^{-3} , estimate the starting frequency of the crystal.
19. In a cyclotron driven at a frequency of 10MHz, alpha particles are accelerated up to a maximum radius of curvature of 50cm. The effective voltage applied to the dees is 50kV. Neglecting the gap between dees, calculate the total acceleration time of the particle and the total distance covered by the particles during the complete cycle of acceleration.
20. An alpha particle with a momentum 53MeV/c is scattered at an angle 60° by the Coulomb field of stationary uranium nucleus ($A = 238$). Find the impact parameter.
21. A beam of X-rays of wavelength 0.071 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28 nm. Find the glancing angle for the second-order diffraction.
22. Give a brief account of diffractometer instrumentation.

(4 × 3 = 12 weightage)