17P314 (Pages: 2) Name……..

Reg. No……..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(CUCSS-PG)

CC17P PHY3 E05 – EXPERIMENTAL TECHNIQUES

(Physics)

(2017 Admission)

Time: Three Hours Maximum: 36 Weightage

Section-A

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

1. Give the properties and functions of the oil in oil sealed rotary vacuum pump.
2. What is meant by traps in vacuum system?
3. What is a capacitance manometer and give its pressure range?
4. Explain the term sputtering yield.
5. What are the advantages of laser evaporation technique?
6. What are Multi layer optical filters?
7. How does a synchrotron overcome the difficulties experienced by a cyclotron?
8. Explain the principles of phase stability in a synchro cyclotron.
9. What are the various factors to be considered in choosing a particular nuclear technique for the elemental analysis?
10. What is meant by energy straggling? How does it affect the spectrum of ion scattered from a target?
11. Explain the term kinematical factor and give its importance.
12. How to calculate the grain size from XRD pattern?

(12 x 1 = 12 Weightage)

Section-B

Answer any ***two*** questions. Each question carries 6 weightage.

13. With the help of a diagram explain the various parts and working of Turbo molecular pump. Compare it with an oil diffusion pump.
14. Discuss the glow discharge technique for thin film preparation. Also explain the quartz crystal method to find the thickness of thin films.
15. Discuss the basic principles of operation of cyclotrons, synchro-cyclotron and synchrotron. What are the essential differences among them? What are the factors that limit the maximum energy obtainable from each?

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

(2 x 6 = 12 Weightage)

Section-C

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

17. A fifteen stage turbo molecular pump with blade tip velocity of 500 m/s has a compression ratio at $25^{o}C$ for N_2 of $7.7x10^{8}$. What is the compression ratio of the pump when it is pumping hydrogen?
18. A quartz crystal monitor indicates a change in frequency of 1600Hz when an aluminium film of density $2.7gm/cm^3$ is deposited on its face. Determine the film thickness if the quartz crystal is 0.2mm is thick and the density of quartz is $2.3gm/cm^3$. Estimate the starting frequency of the crystal.
19. Proton of energy 0.5MeV is injected in to a 50 MeV linear accelerator powered by a 200 MHz RF supply. Find the approximate length of the first and last drift tubes.
20. Explain how the X-ray diffraction pattern shows structure of the crystal.
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. An alpha particle with a momentum 53 MeV/C is scattered at an angle 60o by the coulomb field of a stationary uranium nucleus (A=238). Find the impact parameter.

(4 x 3 = 12 Weightage)

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