

**18P314**

(Pages: 2)

Name.....

Reg. No.....

**THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2019**

(Regular/Supplementary/Improvement)

(CUCSS-PG)

**CC17P PHY3 E05 – EXPERIMENTAL TECHNIQUES**

(Physics)

(2017 Admission onwards)

Time: Three Hours

Maximum: 36 Weightage

**Section-A**

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

1. What is meant by pumping speed of a rotary pump?
2. Explain liquid nitrogen trap and its use.
3. Explain Knudsen cosine law.
4. Explain the principle of operation of a Pirani gauge.
5. What are the advantages of electron beam evaporation over conventional thermal (resistive heating) evaporation?
6. Explain 'optical interference method' to measure thin film thickness.
7. What is the difference between Unit cell and Primitive cell?
8. With a neat diagram explain the working of a Linear Accelerator?
9. What are the applications of Ion implantation?
10. Explain the principle of neutron activation analysis.
11. Explain briefly Powder (Debye Scherrer) method of diffraction.
12. What is the use of Cascade generator?

**(12 x 1 = 12 Weightage)**

**Section-B**

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

13. Explain the working of a Diffusion pump with a schematic drawing. Why a rotary pump is necessary with a diffusion pump?
14. Describe the principle and experimental setup of PIXE. What is its application?
15. What is X-ray diffraction? How it is useful in material characterization? Explain briefly Laue method of diffraction. What are the advantages and disadvantages of Laue method?
16. Discuss how phase stable orbits are achieved in a synchrocyclotron. Describe with the help of a diagram, the working of a electron synchrotron.

**(2 x 6 = 12 Weightage)**

### Section-C

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

17. Determine the mean free paths at pressures of  $10^{-3}$  Torr,  $10^{-5}$  Torr,  $10^{-7}$  Torr for a gas with a diameter of  $10^{-8}$  cm.
18. A quartz crystal monitor indicates a change in frequency of 1200 Hz when an aluminum film of density  $2.7 \text{ gm/cm}^3$  is deposited on its face. Determine the film thickness. If the quartz crystal is 0.2 mm and the density of quartz is  $2.3 \text{ gm/cm}^3$ , estimate the starting frequency of the crystal.
19. In a linear accelerator, proton accelerated thrice by a potential of 40 kV leaves a tube and enters an accelerating space length of 30 cm before entering the next tube. Calculate the frequency of r. f. voltage.
20. The electric field in a cyclotron is reversed in every  $9.372 \times 10^{-8}$  s. It is used to accelerate deuterons, each of mass  $3.34 \times 10^{-27}$  kg and charge  $1.6 \times 10^{-19}$  C. Calculate the flux density of the magnetic field.
21. An alpha particle is accelerated by a potential difference of  $10^4$  V. Find the change in its direction of motion if it enters normally in a region of thickness 0.1m having transverse magnetic induction of 0.1 T. Mass of alpha particle is  $6.4 \times 10^{-27}$  kg.
22. An alpha particle with a momentum 33 MeV/c is scattered at an angle  $60^\circ$  by the coulomb field of a stationary Pb nucleus ( $Z = 82$ ,  $A = 208$ ). Find the impact factor.

**(4 x 3 = 12 Weightage)**

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