

15P308

(Pages:2)

Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(CUCSS - PG)

(Physics)

CC15P PHY3 E07 – Experimental Techniques

(2015 Admission)

Time : Three Hours

Maximum : 36 Weightage

**SECTION A**

*(Answer all questions, Each question carries a weight of 1)*

1. What is meant by throughput of a Pump?
2. With a neat diagram explain the working of Penning gauge.
3. What is meant by Liquid nitrogen trap.
4. What are the disadvantages of resistive heating technique
5. Write a short note on Wheatstone bridge method for thickness measurement.
6. What are interference filters ? Give their uses.
7. What is the principle behind liquefaction of gases.
8. Write a short note on Kammerlingh Onne's Helium liquefier
9. Explain the working of Nuclear refrigerator
10. Explain the working of linear accelerators
11. What is duoplasmatron
12. List the applications of XRD

*(12 x 1 = 12 Weightage)*

**SECTION B**

*(Answer any two questions, Each question carries a weight of 6)*

13. Draw the diagram of a complete High vacuum system. Explain the working of diffusion pump and rotary pump.
14. Explain Electron Beam Evaporation with the help of a neat diagram.  
What are the advantages of E-beam evaporation.
15. Discuss the basic principles of operation of cyclotrons, synchrocyclotrons and synchrotrons. What are the essential differences among them.
16. Explain the principle behind PIXE technique. Discuss the instrumentation of PIXE. Explain the merits and limitation of this technique.

*(2 x 6 = 12 Weightage)*

**SECTION C**

*(Answer any four questions, Each question carries a weight of 3)*

17. A glass bulb having a fixed volume of 100 ml is evacuated using a pump so that the pressure inside reduces from standard atmosphere to 1 torr. If it took 10 minutes for the process, calculate the speed of the pump

18. The maximum magnetic field in a betatron is  $0.4 \text{ wb/m}^2$  operating at  $50 \text{ Hz}$  with stable orbit of  $0.236 \text{ meters}$  in diameter. Find the final energy of electrons and the average energy gained per electron.
19. Determine the mean free paths at pressures of  $10^{-1} \text{ torr}$ ,  $10^{-3} \text{ torr}$ ,  $10^{-10} \text{ torr}$  for a gas with diameter of  $10^{-8} \text{ cm}$ .
20. A thin film of thickness  $500 \text{ nm}$ , is used in an interferometer for thickness measurement. If the wavelength of the light used is  $4358 \text{ \AA}$ , calculate the shift in the fringes. Assume  $\mu = 1.5$
21. Two gram ions of Gadolinium sulphate obeying Curie law are in a magnetic field of  $2\text{T}$  and temperature of  $15 \text{ K}$ . The field is reduced reversibly, but adiabatically to zero. What would be the final temperature ? Given the Curie constant for the material as  $0.125 \text{ JKTesla}^{-2}$  and the specific heat at constant magnetic field as  $0.1 \text{ KJKg}^{-1}$ .
22. A narrow beam of protons with kinetic energy  $1 \text{ MeV}$  per second falls normally on a brass foil whose thickness is  $1.5 \text{ mg/cm}^2$ . Find the number of protons scattered through  $30^\circ$  if the weight ratio of copper ( $A=63.5$ ) to zinc ( $65.4$ ) in the foil is  $7:3$ .

*(4 x 3 = 12 Weightage)*

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