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THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2014

(CUCSS)

Physics

PHY 3E 07—EXPERIMENTAL TECHNIQUES

(2012 Admission onwards)

Time : Three Hours   Maximum : 36 Weightage

Section A

Answer all questions.
Each question carries 1 weightage.

1. Discuss the variation of pumping speed with pressure for a rotary pump.

2. Explain briefly the principle of operation of a turbo molecules pump.

3. What are gaskets ? Explain its use.

4. Explain Knudsen cosine law.

5. What are multilayer films ? Give their importance.

6. Briefly explain the principle and operation of Dewaro Hydrogen liquefies.

7. What are the main problems in the storage of liquid helium ?

8. What are the advantages of r.f. acceleration over electrostatic acceleration ?

9. How does a synchrotron overcome the difficulties experienced in a cyclotron ?

10. State and explain Bragg's law.

11. Explain the operation of Debye Scherrer Camera.

12. List and explain the different sources of fast neutrons for NAA measurements.

$(12 \times 1 = 12$ weightage)

Section B

Answer any two questions.
Each question carries 6 weightage.

13. Explain the principle and working of Hot flament ionization gauge. Mention the pressure ranges in which these gauges are used.

14. Describe the experimental set up, for the measurement of the electrical conductivity of thin films. Define thermopower and its utility.

Turn over

15. Explain the principle of the adiabatic demagnetization method for obtaining temperature bel
IK. Draw a neat sketch of the apparatus used and discuss the details of the method used.

16. Describe the principle of the PIXE technique. What are its distinctive features ? Give the details
its working and compare it with other methods.

$(2 \times 6 = 12 \text{ weighta}$

Section C

Answer any four questions.
Each question carries 3 weightage.

17. A vacuum pump with speed of 1000 litres per sec is connected to a chamber with an outgass
rate of 10^{-4} Ton litres s. What is the expected ultimate pressure ?

18. The thin film is used in an interferometer for thickness measurement. If the wave length of li
used is 435.8 nm calculate the shift in the fringe. Assume $\mu = 1.5$ and thickness as t μ-m.

19. One mole of O_2 expends at a constant temperature of 310 K from an initial volume of 12 litres
final volume of 19 litres. Calculate the final pressure of the starting value is 2 atmospheres. If
gas were expended adiabatically, calculate the final temperature and pressure achieved, gi
that $\gamma = 1.4$.

20. Alpha particle with K.E. 1.7 MeV are scattered by the coulomb field of a stationary Pb nucle
(A = 208). Calculate the differential cross-section for the scattering through in angle 60°.

21. The calibration constant K for a particular trace element using PIXE set up was 2548 cou
$/\mu$ gm/ μc. For the internal standard element used with a concentration of 100 ppm, the correspond
value is 515. Evaluate the concentration of the trace element considered.

22. Describe briefly how thermomagnetic effect used to produce very low temperature.

$(4 \times 3 = 12 \text{ weight}$