



Register Number:

Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
M.Sc. PHYSICS - IV SEMESTER
SEMESTER EXAMINATION: APRIL 2019
PH0115 – EXPERIMENTAL PHYSICS II

Time- 2 1/2 hrs

Max. Marks-70

This paper contains 2 printed pages and 2 parts.

Answer any 7 questions.

Attempting 3 questions from each part is compulsory. Remaining 1 question can be selected from any part. Each question carries 10 mark.

(7X10=70)

Part-A

- a) What are getters? Mention their characteristics.

b) Calculate the change in temperature of Helium gas after expanding by adiabatic throttling if the pressure difference on the two sides is 20 atm. Given $C_p = 5.0$ cal/mol-K and Vander Waals constant $a=0.0341$ litre²-atm/mole² and $b=2.37 \times 10^{-2}$ lit / mole, $R= 8.31$ J/mole-K where 1 cal = 4.18 J, 1 litre = 10^3 cm³ and 1 atm = 1.013×10^5 N/m². (5+5)
- With neat diagram, explain the principle and working of Turbo-molecular pump. (10)
- a) Why is stainless steel preferred as the material in construction of a cryostat?

b) When making a joint of dissimilar materials in the cryostat, how is differential contraction taken care of?

c) Why is Indium widely used in making cryogenic seals? Explain.

d) In two-stage cryo-refrigerator where the temperature of second stage is less than 20K, explain why is Lead preferred over Copper as regenerator material.

e) Why do we need cryocoolers when we have cryogens like Liquid Helium to produce low temperatures? (2+2+2+2+2)
- Explain what is adiabatic demagnetisation and how is it used for cooling substances. Derive an expression to show how the cooling effect is produced with small adiabatic change in the field. Why should the initial temperature of the substance being cooled be less than 1K? (10)
- With diagram explain the principle and working of Pulse-tube cryocooler. State one advantage and disadvantage of this cryocooler. (8+2)

PART - B

6. Describe the principle, constructions and working of Scanning tunneling microscope? (10)
7. (a) Classify different Boats available in Physical vapour deposition. (5)
(b) Explain the working of pirani gauge with a neat diagram. (5)
8. With suitable sketch, explain in detail, the construction and working of cold cathode gauge. Mention the advantages and disadvantages of cold cathode gauge (10)
9. Draw schematic showing basic components of the transmission electron microscope. Briefly explain each component and its working. (10)
10. Discuss the principle and working of magnetron sputtering technique in the deposition of thin film. Mention its advantages and disadvantages. (10)