

**1505E559**  
M.Phil Science Examination  
Paper-II : Physics

Candidate's Seat No : \_\_\_\_\_

**PHY – 602 : Recent Advances in Physics**

Time : 3 Hours]

May-2017

[Max. Marks : 75

- Instructions :**
- 1) Attempt all questions
  - 2) Symbols have their usual meanings

1 (a) Discuss optical properties of Metallic nanoparticles. [07]

**OR**

(a) Discuss electrical and chemical properties of nanomaterials. [07]

(b) Describe working and construction of TEM. List advantages and disadvantages. [07]

**OR**

(b) Discuss principle and working of STM. List limitation and advantages of STM. [07]

2 (a) With neat diagrams, explain the working of rotary pump. [08]

**OR**

(a) Explain RTD temperature transducer. Compare it with thermocouple transducer. [08]

(b) Define transducer. Explain piezoelectric transformer and state its applications. [07]

**OR**

(b) Name different vacuum gauges. Explain pirani gauge. State its merits and demerits. [07]

3 (a) State different PVD methods. Explain e-beam evaporation with necessary diagrams. [08]

**OR**

(a) State different steps to grow thin film and discuss direct evaporation method. [08]

(b) What do you mean by sputtering ? Explain DC & RF sputtering in detail. [07]

**OR**

(b) Explain CVD methods with the steps of process. Also explain classification of CVD reactor in brief. [07]

(P.T.O.)

4 (a) Discuss principle, working and applications of X-ray diffraction. [08]

**OR**

(a) Differentiate between X-ray diffraction and electron diffraction. Explain the LEED technique. [08]

(b) Using schematic diagram explain RHEED technique. State its limitations. [07]

**OR**

(b) Give schematic of interaction of electron beam with matter. Explain scanning electron microscope (SEM) in detail. [07]

**5 Answer the following in brief : [15]**

1. Write Hamiltonian for Mott-Wannier excitation for semiconductor nanoparticles.
2. Write two applications of TEM.
3. Write two disadvantages of SEM.
4. What is the difference between "top-down" and "bottom-up" approaches for synthesis of nano materials?
5. State classification of PVD methods
6. Which is better--flash evaporation or direct evaporation method? Why?
7. Write the ranges of high vacuum.
8. Why four probe resistivity technique is more accurate than two probe?
9. State any two applications of capacitor transducer.
10. Define sensitivity of a transducer.
11. Upto which vacuum range does the Penning gauge is used?
12. Give any three desired characteristics of a transducer.
13. Why X-rays are used for crystallographic diffraction?
14. Why GIXRD is better suited for thin films?
15. Write the full form of ESCA.

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