



**JAY-003-1203002**

Seat No. \_\_\_\_\_

**M. Sc. (Sem. III) (CBCS) Examination**

**December - 2019**

**Physics : CT-10**

*(Physics & Chemistry of Nanomaterials)*

**Faculty Code : 003**

**Subject Code : 1203002**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) Attempt all questions.  
(2) All questions carry equal marks.  
(3) Mathematical symbols have equal meanings.

- 1** Answer in brief any seven : **14**
- (a) Define nanoscience and nanomaterials. **2**
  - (b) Draw the energy bands for metal, semiconductor and insulator. **2**
  - (c) Discuss in brief the classification of nanomaterials based on their dimensionality. **2**
  - (d) List various forms of carbon. **2**
  - (e) Write some applications of composite nanomaterials. **2**
  - (f) Discuss in brief the use of Scherer's formula. **2**
  - (g) Give the principle of working of AFM. **2**
  - (h) Why SAXS is better than XRD? **2**
  - (i) What is the use of RBS? **2**
  - (j) Discuss in brief the difference between the optical properties of micron sized and nano sized materials. **2**
- 2** Answer any two of following questions : **14**
- (a) Write notes on fullerene and graphene. **7**
  - (b) Describe carbon nanotubes with their synthesis processes. **7**
  - (c) Define nanomedicine and discuss various approaches in developing nanomedicines. **7**

- 3 (a) Discuss in detail various metal (Ag, Au, Fe and Cu) nanoparticles and their practical applications. 7
- (b) Describe natural and man-made nanomaterials. Discuss in depth polymers and composite nanomaterials. 7

OR

- (a) Discuss how XRD and SAXS techniques can be useful for structural properties of nanomaterials. 7
- (b) Write notes on SPM and AFM techniques. 7
- 4 Answer any two of following questions : 14
- (a) Describe : (i) electron, (ii) photoelectron and (iii) vibrational spectroscopic techniques. 7
- (b) Describe various ionic spectroscopic techniques for characterization of nanomaterials. 7
- (c) Discuss in detail various physical properties of nanomaterials. 7
- 5 Answer any two of following questions : 14
- (a) Write a note on MBE technique for high quality growth of two dimensional nanomaterials. 7
- (b) Discuss and explain CVD method with proper chamber diagram. 7
- (c) Describe in depth hydrothermal and microwave synthesis methods for nanomaterials. 7
- (d) Note on nanosensors based on the quantum size effects. 7