

B.Sc. 6th Semester (Honours) Examination 2020**PHYSICS****(Nanomaterials and applications lab)****Paper: 604/DSE-4/P-7****Course ID: 62427****Time: 1 Hour****Full Marks: 10***The figures in the margin indicate full marks.**Students should write the answers in their own words as much as practicable.**Answer all the questions.*

1. Answer any *five (05)* questions: 2X5=10
- a) Name a metal that can be synthesized in its nano form using chemical route. Name the chemical used for the synthesis. Write the chemical reaction involved in this process. ($\frac{1}{2} + \frac{1}{2} + 1$)
- b) What precautions should be taken for synthesis of metal nanoparticles employing chemical route? 2
- c) Name four methods that can be employed to synthesize semiconductor nanoparticles. ($\frac{1}{2} \times 4$)
- d) Why capping agents are used to synthesize semiconductor nanoparticles? 2
- e) Why the characterization of nanomaterials is necessary? Name two important characterization tools of nanomaterials and mention what type of information we may get using these tools. (1+1)
- f) Mention four important properties of carbon nano tubes (CNT). ($\frac{1}{2} \times 4$)
- g) How the optical absorption data of nanomaterials can be used to estimate their sizes? 2
- h) What do you mean by strong and weak confinement regime of nanomaterials? 2
- i) What do you mean by Surface Plasmon in connection to the optical properties of metal nanoparticles? What is Surface Plasmon Resonance (SPR)? (1+1)
- j) Why Surface Plasmon Resonance (SPR) is not important to the bulk metals but extremely important to the metal nanoparticles? 2

Please Turn Over

- k) How do the changes in (a) size and (b) shape of metal nanoparticles affect its Surface Plasmon Resonance (SPR) characteristics? (1+1)
- l) How structural purity of a nanomaterial can be studied using X-ray diffraction data? 2
- m) Explain the principle of estimating particle size from X-ray diffraction data. 2
- n) What is a thin film capacitor? Why thin film capacitor is important in application of nano science? (1+1)
- o) Draw and explain the V-I characteristic of a PN diode manufactured by diffusing Al over the surface of N-type Si. (1+1)
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