

CBCS Scheme

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15NT35

Third Semester B.E. Degree Examination, June/July 2017 Physical and Chemical Principles of Nanotechnology

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Write a brief note on the molecular orbital theory and its applications. (08 Marks)
b. What is Quantum mechanics? State and explain uncertainty principle. (05 Marks)
c. State and explain De-Broglie hypothesis (03 Marks)

OR

- 2 a. Write a note on the Valence Bond theory and its applications. (08 Marks)
b. Describe computational chemistry and name few applications. (04 Marks)
c. State and explain Planck's hypothesis. (04 Marks)

Module-2

- 3 a. State and explain second law of thermodynamics and entropy. Illustrate with example. (08 Marks)
b. State and explain the following thermodynamics terms :
i) System and surroundings ii) Internal energy iii) Enthalpy iv) Thermodynamic equilibrium. (08 Marks)

OR

- 4 a. Explain the concept of Heat capacity at constant volume and constant pressure. (06 Marks)
b. State and explain the first law of thermodynamics with mathematical expression. (06 Marks)
c. Explain Spontaneous process. Write the criteria for spontaneity. (04 Marks)

Module-3

- 5 a. Explain Einstein's theory of molar heat capacity and limitations. (08 Marks)
b. Obtain Kronig – Penny model. (08 Marks)

OR

- 6 a. Explain Classical theory of Molar heat capacity and its limitations. (06 Marks)
b. Distinguish between Metal, Insulator and Semi – conductor on the basis of Band theory. (06 Marks)
c. Explain Brillion zones. (04 Marks)

Module-4

- 7 a. Derive the Fermi energy level equations for extrinsic semi conductors. (08 Marks)
b. Explain the concept of tunneling. (04 Marks)
c. Explain Rectification in semi conductors. (04 Marks)

OR

Important Note - 1 On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages so that re-reading or re-communication appear to examiner and all equations written e.g. $E = mc^2$, will be treated as inappropriate.

- 8 a. Explain the construction, working and I – V characteristic of P-N junction diode. (06 Marks)
b. Write about Donor and Acceptor levels in semiconductors. (06 Marks)
c. Explain Classical theory of tunneling versus quantum tunneling. (04 Marks)

Module-5

- 9 a. Explain the dynamic properties of Colloids. (07 Marks)
b. Discuss the classification of Colloids, with examples. (07 Marks)
c. What are Crystalloids and Colloids. (02 Marks)

OR

- 10 a. Explain Visibility, Colour and Tyndale effect, with respect to colloids. (06 Marks)
b. Explain Electrophoresis and Electro – Osmosis, with respect to colloids. (05 Marks)
c. Explain the characteristics and identification of types of emulsions. (05 Marks)

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