USN ☐☐☐☐☐☐☐☐☐☐

15NT35

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Physical and Chemical Principles of Nano Technology

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1   a.   Define quantum mechanics. State uncertainty principle with an example and add a note on complementarity. **(05 Marks)**
    b.   Give a brief note on the Molecular Orbital (MO) theory and its applications. **(08 Marks)**
    c.   Write a short note on computational chemistry and name few applications. **(03 Marks)**

OR

2   a.   State and explain dual nature of matter by Debroglie. **(03 Marks)**
    b.   Give brief note on the valence bond theory and its applications. **(08 Marks)**
    c.   Enumerate the Planck's hypothesis. **(05 Marks)**

Module-2

3   a.   State and explain the first law of thermodynamics with mathematical expressions. **(06 Marks)**
    b.   What is spontaneous process? Write the criteria for spontaneity. **(04 Marks)**
    c.   What is third law of thermodynamics? Write the illustration. **(06 Marks)**

OR

4   a.   Explain the concept of heat capacity at constant volume and constant pressure and obtain the relation between CV and CP. **(06 Marks)**
    b.   Define and explain the following thermodynamic terms with example :
         i)   System and surroundings
         ii) Internal energy
         iii) Enthalpy. **(06 Marks)**
    c.   State the laws of thermodynamics with necessary equations. **(04 Marks)**

Module-3

5   a.   Explain Debye theory of molar heat capacity and limitations. **(08 Marks)**
    b.   Derive Kronig – Penny model with necessary equations and graphs. **(08 Marks)**

OR

6   a.   Distinguish between metals, insulators and semiconductors. **(06 Marks)**
    b.   Describe about Brillouin zones. **(04 Marks)**
    c.   Explain classical theory of molar heat capacity and limitations. **(06 Marks)**

Module-4

7 a. Describe about the following :
   i) Intrinsic semiconductors
   ii) Extrinsic semiconductors. (08 Marks)
   b. Discuss the concept of tunneling. (04 Marks)
   c. Brief about classical (vs) quantum tunneling. (04 Marks)

OR

8 a. Write a note on tunneling diode. (05 Marks)
   b. Explain about the rectification in semiconductors. (05 Marks)
   c. Write about Donor and acceptor levels in semiconductors. (06 Marks)

Module-5

9 a. Write about classification of colloids with examples. (06 Marks)
   b. Describe about the following electric properties of colloids :
   i) Electrophoresis   ii) Electro–osmosis. (05 Marks)
   c. Explain about the characteristics and identification of types of emulsions. (05 Marks)

OR

10 a. What are colloids? Explain about crystalloids and colloids. (04 Marks)
   b. Discuss the following optical properties of colloids :
   i) Visibility   ii) colour   iii) tyndall effect. (06 Marks)
   c. Describe about types of emulsions formed on mixing of two partly or completely insoluble liquids. (06 Marks)

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