Roll No. 2818394 Total Pages : 00

BT-2/M-19 32035

# CHEMISTRY

## BS-101A

Time : Three Hours] [Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

### Unit I

1. (a) Differentiate between atomic and molecular orbitals. Draw molecular orbital diagram of $N_2$ and $O_2$.

   (b) Draw the energy level diagram of the following :

   (i) $[Ni(CO)_4]$ (ii) $[PtCl_2(NH_3)_2]$ 8,7

2. (a) Discuss band structures of solids. What is the role of doping on band structures ?

   (b) Write a short note on Pi-molecular orbital of benzene.

   (c) What are the postulates of crystal field theory ?

   8,4,3

## Unit II

3. (a) Describe the principle of NMR. What do you understand by the term; shielding and deshielding.
   (b) Discuss the applications of fluorescence spectroscopy.
   (c) Discuss the applications of different spectroscopic techniques. **6,4,5**

4. Write notes on the following (any *two*) :
   (i) Vibrational spectroscopy of diatomic molecules
   (ii) Magnetic resonance imaging
   (iii) Diffraction and scattering. **7½,7½**

## Unit III

5. (a) Discuss the molecular geometry of $PCl_5$, $SF_6$ and $CCl_4$.
   (b) Differentiate between electron affinity and electronegativity.
   (c) Discuss the concept of hard soft acids and bases. **8,4,3**

6. (a) Discuss the significance of Nernst equation.
   (b) Define entropy and free energy. How can their estimation be made.
   (c) Obtain an expression for free energy and emf of cell. **6,6,3**

## Unit IV

7. (a) Explain the following :

(i) Chirality (ii) Enantiomers

(iii) Diasteromers.

(b) Give structure and synthesis of the following :

(i) Paracetamol (ii) Aspirin. **9,6**

8. (a) Giving example explain the following reactions :

(i) Substitution (ii) Elimination.

(b) Define structural isomers and stereoisomers with suitable examples.

(c) What are optically active compounds ? What are the condition for a substance to exist as optical active ? **6,6,3**