Department of Chemistry

Question Bank [4/6/8/10/12 marks]

Module I

1. Derive time independent Schrodinger wave equation.
2. Derive Schrodinger equation for one dimensional box and obtain the Eigen value and Eigen function by solving the equation.
3. Discuss briefly the plots of radial and angular wave functions for hydrogen atom.
4. What is Linear Combination of Atomic Orbitals (LCAO)? Give the wave function equations for the formation of molecular orbitals by the combination of atomic orbitals?
5. Discuss in detail the features of MO theory with energy level diagram.
6. Differentiate bonding and anti-bonding molecular orbital.
7. Write notes on bonding, anti-bonding and non- bonding molecular orbitals.
8. Differentiate between atomic and molecular orbitals.
9. Describe the combination of **s-s** orbitals to give bonding and anti-bonding molecular orbitals with an example.
10. CO is diamagnetic. Justify it with MO concept.
11. Explain Heisenberg uncertainty principle.
12. Draw the shape of Molecular Orbitals obtained by overlap of **s-p** orbitals.
13. Describe the overlapping of **p-p** orbitals with orbital diagram.
14. Draw and explain the molecular orbital energy level diagram for **hydrogen molecule (H_2)** and calculate the bond order.
15. Draw and explain the molecular orbital energy level diagram for **CO molecule** and calculate the bond order.
16. Give the salient features of crystal field theory.
17. Discuss the crystal field splitting in octahedral complexes.

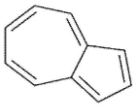
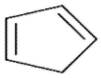
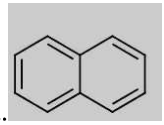
    (OR)

    Draw and discuss the energy level diagramfor splitting of dorbitals in an octahedral ligand field taking an example.

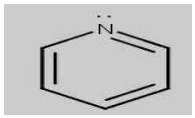
18. Explain Huckel's rule on aromatic, Non-aromatic and Anti-aromatic compounds with examples.

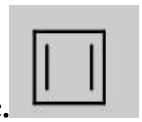
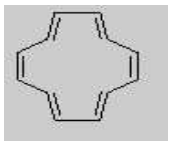
19. Explain in detail pi molecular orbitals of Benzene.
20. Explain in detail pi molecular orbitals of Butadiene.
21. CalculateCFSE for d^1-d^8configurationsfor octahedral complexes.
22. What is meant by a nodal plane? Explain with an example.
23. Identify aromatic, non-aromatic and anti-aromatic compounds using Huckel's rule from the following:

a. 

b. 
c. 
d. 

24. Based on Huckel's rule, justify which of the following are aromatic, non aromatic and anti-aromatic.

a. 
b. 

c. 
d. 

25. Calculate CFSE for $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$ ions.
26. Explain the factors influencing crystal field splitting in octahedral complexes.
27. What is Pairing energy (P)? Give the relation between crystal field splitting in octahedral complexes (Δo) and pairing energy (P).