



বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

M.Sc. Examinations 2020

Semester IV

Subject: CHEMISTRY

Paper: CEM – 402

(Organic, Inorganic and Physical Special)
(Theory)

Full Marks:40

Time: 2hrs.

Candidates are required to give their answers in their own words as far as practicable.

Paper: CEM 402

(Organic Special)

Answer any one of the following questions:

The questions are of equal value. Candidates are requested to give their answer in their own words (limit: 250 words) as far as practicable.

1. Write down the salient features of A-form DNA.
2. Write short notes on ANRORC mechanism.
3. What do you mean by di- π -methane rearrangement? Give suitable examples to illustrate your answer.
4. What is Norrish type-II reaction? Give examples.
5. Write short notes on Paterno-Büchi reaction.
6. Discuss the structural features of penicillin-G.
7. Write short notes on Transfer RNA and Messenger RNA.
8. Give an account on Cis-Trans isomerisation of alkenes.
9. Outline the synthetic procedure and state the functions of the nitrogenous bases present in RNA.
10. What are co-enzymes? Write short notes on NAD and FAD.
11. What is Barton reaction? Discuss the main features of this reaction along with suitable examples.
12. Write down the structure, function and synthesis of Vitamin B1.



Paper: CEM 402
(Inorganic Special)

Answer any one of the following questions:

The questions are of equal value. Candidates are requested to give their answer in their own words (limit: 250 words) as far as practicable.

1. Critically comment on “Lande interval rule”.
2. Write a short note on “bonding in metal-carbonyl complexes”.
3. Establish “Curie equation” for paramagnetic substance and explain the significance of this equation.
4. Critically comment on the “stretching frequency in metal carbonyl complexes”.
5. Discuss on “magnetic properties of $4f$ metal ions”.
6. Give an account on “metal carbonyl anions”.
7. Establish “volume susceptibility” equation for diamagnetism.
8. Write a short note on “tetranuclear cluster” with respect to the bonding, synthesis and structure.
9. Establish magnetic moment equation for a system which has “multiplet width large as compared to kT ”.
10. Give an account on “spin-orbit interaction”.
11. Discuss “Polyhedral Skeletal Electron Pair” Theory.
12. Give an account on “various binding modes of carbonyl as ligand”.

Paper: CEM 402
(Physical Special)

Answer any one of the following questions:

The questions are of equal value. Candidates are requested to give their answer in their own words (limit: 250 words) as far as practicable.

1. Use first order perturbation theory to obtain the energies of each states up to first order correction for A-X spin system.
2. Deduce the pure spin states and indicate their spin multiplicities for a system of three non-equivalent electrons with $M_S = 1$.
3. Deduce Hartree Fock equation for N-electron system. Hartree Fock theory is called self-consistent field theory-Explain.
4. Write down all possible Slater determinant form of wavefunctions of two electron system of pure spin state. Deduce the energy expectation value of each state.
5. What is meant by Coulomb and exchange integral? Hartree Fock equation is called integro-differential equation-Explain.
6. State Koopman theorem. Use Koopman theorem to obtain orbital energy.
7. Deduce HF-Roothaan equation for closed shell system.
8. Deduce the expression of Lande’s interval rule. Calculate the spin-orbit interaction energy in the 3F_2 , 3F_3 and 3F_4 levels in terms of spin-orbit coupling constant.



9. Use J-J coupling scheme to obtain the possible term symbols for d^2 and f^2 configurations.
10. Write a note on how an external magnetic field influence the energy state of electron in atom.
11. Use first order perturbation theory to obtain the energies of each states up to first order correction for A_2 spin system.
12. Write down non-relativistic Hamiltonian of N-electron system. How do you incorporate Pauli's Antisymmetric principle while writing the electronic wavefunction of N-electronic system? How do you obtain the energy expectation value of N-electron system describing pure spin state?

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