3rd Semester Examination, 2021

Time : 3 hours

Full Marks : 60

Answer from **all** the Parts as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(MODEL CBCS)

(ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY AND ALIPHATIC HYDROCARBONS)

PART – I

1. Answer *all* the questions : 1 × 8

(*i*) The maximum number of electrons that can be accomodated in 'N' Shell of an atom is_____ .

(*ii*) The designation assigned to an orbital having $n = 4$ and $l = 1$ is _____ .

(*iii*) The solubility of an ionic solid decreases if lattice energy is _____ than solvation energy.

(*iv*) The bond angel of a molecule having trigonal planar geometry is _____

(*v*) Which type of resonance effect is exhibited by $-NO_2$ in nitrobenzene ?

(*vi*) Which is less stable between eclipsed and staggered conformations of ethane ?

(*vii*) Can methane be prepared by Wurtz reaction ?

(*viii*) Name the compound formed by oxidation of C_2H_2 with hot alkaline $KMnO_4$ solution.

PART – II

2. Answer any *eight* of the following questions within *two* or *three* sentences each : $1\frac{1}{2} \times 8$

(*a*) What is the meaning of quantization of energy ?

(*b*) How many number of nodes are present in radial wave functions of 2s, 2p and 3d atomic orbitals ?

(*c*) Write the electronic configuration of Mn atom, Fe^{+2} ion and Cl^- ion.

(*d*) Write any three important characteristics of ionic compounds.

(*e*) Predict the bond angles in following molecules.
CO_2, H_2O and NH_3

(*f*) Name three electron displacement effects which are very common in organic compounds.

(*g*) What is Huckel's rule ? Explain what is aromatic character of a compound.

(*h*) What happens when C_2H_5MgCl reacts with water ?

(*i*) What happens when C_2H_4 reacts with alkaline potassium per manganate solution ?

(*j*) What happens when C_2H_2 gas is passed through dilute sulphuric acid solution containing . $HgSO_4$ at 333K temperature ?

PART – III

3 . Answer any *eight* of the following within 75 words each : 2 × 8

(*a*) What are the limitations of Bohr's theory of atoms ?

(*b*) Explain Hund's rule.

(*c*) Derive de-Broglie equation.

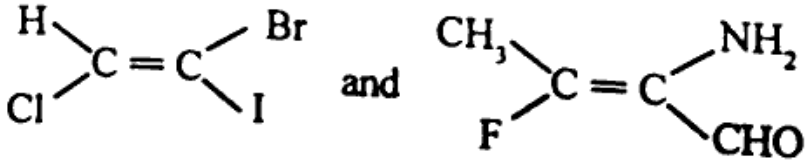
(*d*) What are the important postulates of VSEPR theory ?

(*e*) Write the rules of LCAO.

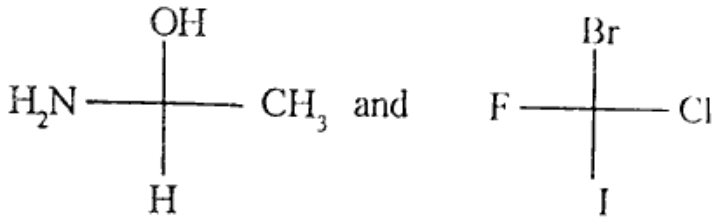
(*f*) Which is stronger acid between CH_3-COOH and C_6H_5-COOH and why ?

(*g*) Which is a weaker base between $C_2H_5NH_2$ and $C_6H_5-NH_2$ and why ?

(*h*) Assign E or Z notation to the following.



(*i*) Assign R or S notation to the following :



(*j*) State Markownikov's rule and Saytzeff's rule.

PART – IV

Answer **all** questions : 6 × 4

4. (*a*) Write a short note on quantum numbers. 6

Or

(*b*) Write notes on : 3 + 3

(*i*) Pauli's exclusion principle

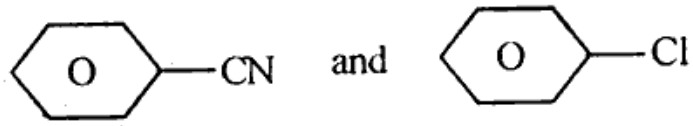
(*ii*) Aufbau's rule.

5. (*a*) Draw MO diagram for N_2 molecule and predict its bond order and magnetic nature. 4 + 1 + 1

Or

(*b*) Frame Born-Haber cycle for the formation NaCl solid using solid sodium and gaseous chlorine. Write the expression for lattice energy. 5 + 1

6. (*a*) What is resonance ? Write the resonating structures of 3



(*b*) What is hyper conjugation ? Show that hyperconjugation of $CH_3 - CH = CH_2$ and $CH_3 - CH_2^+$ belong to two different types. 1 + 2

Or

(*c*) Explain optical isomerism shown by tartaric acid. 3

(*d*) Distinguish between enartiomers and diastereomers. 3

7. (*a*) Write short note on Wurtz reaction. 2

(*b*) Explain Chlorination of methane. 4

Or

(*c*) Explain Ozonolysis of $CH_3-CH=CH_2$. 3

(*d*) Explain why acetylenic hydrogens are acidic in nature ? 3
