

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, MARCH 2021

FIRST YEAR [BATCH 2020-23]

CHEMISTRY [GENERAL]

Date : 30/03/2021

Time : 11 am – 1 pm

Paper : I

Full Marks : 50

Group - A

Unit – I

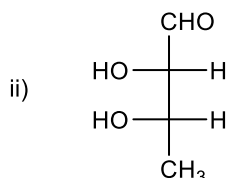
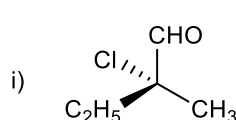
[1×10]

Answer **any one** from **Question Nos: 1 & 2**

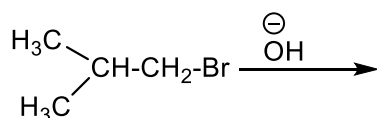
1. a) Write down short note on the following topics: [3×2]

- i) meso-compounds
- ii) plane of symmetry
- iii) Elimination reaction

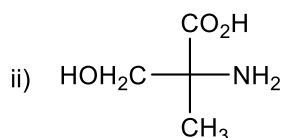
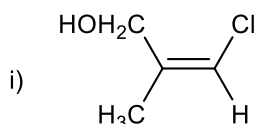
b) Assign the following molecules as R/S : [2]



c) Identify the possible product(s) of the following reaction: [2]



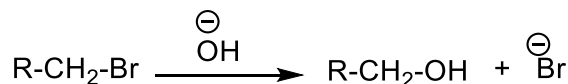
2. a) Assign the following molecules as E/Z isomer and D/L isomer: [2]



b) Write down short note on the following topics: [1.5×2]

- i) Tautomerism
- ii) Conformational isomerism

c) Write down the two possible mechanisms for the following reaction: [3+2]



In case of when R=H which of the two mechanism would be favored and why?

Unit – II

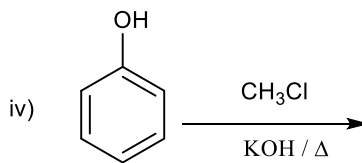
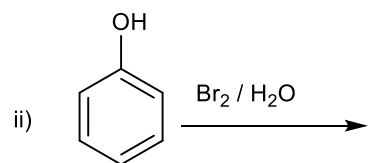
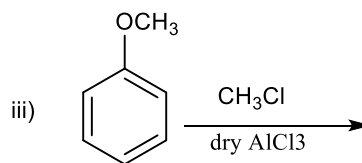
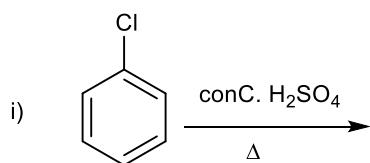
[1×10]

Answer **any one** from **Question Nos: 3 & 4**

3. a) Explain the following reactions: [5×2]

- i) Aromatic electrophilic reaction (nitration) with mechanism
- ii) Limitation for Friedel-Craft's alkylation reaction

- iii) Sandmeyer reaction with example
 - iv) Kolbe reaction with example
 - v) Fries rearrangement
4. a) Predict the products for the following reactions (no mechanism needed): [4×1]



- b) In Friedel-Craft's alkylation reaction nitro-benzene used as solvent: Justify the above statement. [2]
- c) Complete the following conversions: [2×2]
 - i) Benzene to Ethyl Benzene
 - ii) Nitrobenzene to phenol

Group - B

Unit – III

[1×10]

Answer **any one** from **Question Nos: 5 & 6 :**

5. a) Define lattice energy. Establish Born-Haber cycle for the formation of sodium chloride crystal from metallic sodium and gaseous chlorine. [1+3]
- b) Explain with reasons: (i) LiClO_4 is hydrated (ii) MgSO_4 is fairly soluble in H_2O but BaSO_4 is insoluble in H_2O . [2×2]
- c) Determine the limiting radius ratio for tetrahedral geometry. [2]
6. a) According to the VSEPR theory determine the shape of the following species: XeF_4 , NH_4^+ , XeO_2F_2 and BrF_4^- . [4×1]
- b) Arrange the following compounds in the order of their increasing melting points: [2×2]
- i) LiF , LiCl , LiBr , LiI
 - ii) LiCl , NaCl , KCl , RbCl , CsCl , Give reasons
- c) What is radius ratio rule? Mention its limitations. [2]

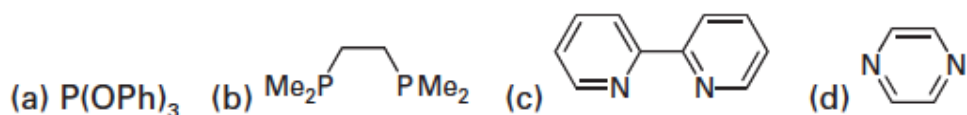
Unit – IV

[1×10]

Answer **any one** from **Question Nos: 7 & 8 :**

7. a) With rough sketches show the formation of σ , π , π^* orbitals by overlap of appropriate p orbitals. [3]
- b) Draw the qualitative molecular orbital diagram of N_2 molecule. Calculate its bond order. [3]
- c) Sketch the two structures that describe most four-coordinate complexes. In which structure are isomers possible for complexes of formula MA_2B_2 ? [2]

- d) Why chelating complexes have higher stability constant compared to their equivalent non-chelating complexes? [2]
8. a) From the molecular orbital diagram of O_2 , explain its paramagnetic behaviour. [2.5]
 b) He_2 does not exist but He_2^+ exist. Justify. [2]
 c) What do you mean by 'inner metallic complexes'? [1.5]
 d) From MO diagram determine the bond order in O_2^+ . [2]
 e) Which of the following molecules could act as bidentate ligands? Which could act as chelating ligands? [2]



Unit – V

[1×10]

Answer **any one** from **Question Nos: 9 & 10:**

9. a) How can you prepare diborane and explain the structure and bonding of the diborane. [2+4]
 b) Write short note on caros acid and marshal acid. [2×2]
10. a) Dithionic acid is not a polythionic acid, explain. [2]
 b) CN^- and N_3^- are pseudo halide, give explanation. [3]
 c) Hydrolysis product of NCl_3 and PCl_3 are different, comment. [2]
 d) Write short note on phosphonitrilic compound. [3]

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