

B.Sc.(Honours)Examination, 2018

Semester-I

Chemistry (Honours)

Course: BCHC-12



(Organic Chemistry)

Time: Three Hours

Full Marks: 30

Questions are of value as indicated in the margin.

Answer *any three* questions.

- Define bond order and hence calculate the bond order of nitrogen molecule. 2
 - What are the bonding and antibonding orbitals of C-Cl bond? 2
 - Depict the π -system of 1,3-butadiene and show its HOMO and LUMO. 2
 - Draw the molecular orbitals of He_2 molecule and comment on its stability. 2
 - How do you differentiate ionic bond from a covalent bond using MO theory? 2
- Draw the molecular orbitals of a carbonyl group and predict its nucleophilic and electrophilic properties. 2
 - What is "Bürgi-Dunitz" angle? 2
 - Outline the mechanism of the following reaction: 3
 $\text{R}-\text{CHO} + \text{HCN} \rightarrow \text{R}-\text{CH}(\text{OH})-\text{CN}$
 $\text{R}_2\text{CO} + \text{NaHSO}_3 \rightarrow \text{R}_2\text{C}(\text{OH})\text{SO}_3\text{Na}$
 - Comments on the reactivity of amide functional group with respect to other acid derivatives. 3
- Draw the structure of the products and suggest a plausible mechanism for each of the following: 5x2
 - $\text{>C}=\text{O} +$  $\longrightarrow ?$
 - $(\text{CH}_3)_2\text{C}=\text{CH}_2 + \text{HBr} \longrightarrow ?$
 - $\text{tBu-OH} + \text{HBr} \longrightarrow ?$
 -  $+ \text{Br}_2 \longrightarrow ?$
 - $\text{tBu-OH} + \text{H}_2\text{SO}_4 \longrightarrow ?$
- Comment on the optical activity of a molecule. 2
 - Draw a molecule that would show optical activity, although it contains a simple axis of symmetry. 2
 - Draw the stable conformation of butane-2,3-diol and justify your answer. 2
 - What do you mean by alternating axis of symmetry? 2
 - Draw the structure of several isomers of tartaric acid in Fischer projection. 2
- Draw the energy profile diagram of n-butane as a function of its C_2-C_3 dihedral angle. 3
 - Draw the possible stereoisomers of the following compound: 2
 $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}(\text{Me})\text{COOH}$
 - Define atrop isomerism. Show example. 3
 - Draw the possible stereoisomers of the following molecule: 2
 $\text{CH}_3-\text{CH}=\text{C}=\text{CHCH}_3$