Dhote Bandhu Science College, Gondia

Department of Chemistry **Question Bank**

B. Sc. Sem-II Paper-I (Organic Chemistry)

Unit-wise

Unit I A) Structure & Bonding

Long answer questions

1. Explain with suitable examples: (i) Inductive effect and (ii) Resonance effect. (S-2005, W-2013, S-2015)
2. Explain the following: (i) Hyperconjugation (ii) Hydrogen bonding. (S-2006, S-2008)
3. Discuss hybridization in Acetylene. (W-2006)
4. Define Hybridization. What are the steps involved in the process of Hybridization? Explain formation of ethane molecule on the basis of sp^3 Hybridization. (S-2007, S-2014, 2017)
5. Define hydrogen bonding. Give different types of hydrogen bonding. Explain effect of hydrogen bonding on boiling point. (W-2007)
6. What is hybridization? Explain the structure of Ethylene molecule on the basis of hybridization. (S-2009, W-2014, S-2019)
7. Explain with suitable examples: (i) Resonance effect & (ii) sp^3 Hybridization. (S-2010, 2016)
8. Define and classify hydrogen bonding. Explain effect of hydrogen bonding on solubility. (S-2011)
9. What is hybridization? Explain structure of acetylene molecule on the basis of hybridization. (W-2012)

Short answer questions

1. Draw orbital diagram of ethylene molecule. (S-2005)
2. Write a note on Hydrogen bonding in organic compounds. (S-2005, 2018, 2019)
3. Draw Orbital diagram of Acetylene molecule. (S-2006)
4. Write a note on electromeric effect. (S-2006)
5. Differentiate between Inductive effect and electromeric effect. (W-2006, S-2010)
6. Write a note on Hyperconjugation. (W-2006, S-2010)
7. What is Hydrogen Bonding? Give its type. (S-2007)
8. Give type of hybridization and bond angle in ethane and acetylene. (W-2007)
9. Explain Inductive effect. (S-2008, 2018, 2019)
10. What is the type of hybridization in acetylene molecule? Discuss it. (S-200S)
11. What is 'no bond resonance'? Explain with suitable example. (S-2009)
12. Explain formation and geometry of methane molecule on the basis of hybridization (S-2015)
13. Write a note on electromeric effect. (S-2011)
14. Write a note on inductive effect. (W-2012, W-2014, S-2017)
15. Explain bond length and bond angle with suitable examples. (W-2012, S-2017)
16. Define (i) bond length (ii) bond angle. (W-2013, S-2017)
17. Explain formation of ethane molecule on the basis of hybridization. (W-2013, S-2018)
18. Discuss hydrogen bonding and its effect on boiling point with reference to alcohols.

Unit I B) Mechanism of Organic Reactions

Long answer questions

1. Explain with example i) Addition reaction ii) Substitution reaction iii) Elimination and iv) Intramolecular rearrangement reaction. (S-2005)
2. Explain with suitable examples i) Aliphatic substitution reaction & ii) Elimination reaction. (S-2006)
3. What are reactive intermediates? Explain formation and stability of carbocation. (W-2006, S-2014, 17)
4. Explain following i) Carbocations ii) Electrophile iii) Free radicals. (S-2007, S-2008)
5. Define and explain: (i) Elimination & (ii) Addition reaction (W-2007)
6. Explain the terms: (i) Carbonium Ion, (ii) Nucleophile, (iii) Carbone and (iv) Activation energy.

(S-2009)

7. Explain giving suitable examples: Homolytic and Heterolytic fission of covalent bond. (S-2010, 2016, 2018, 2019)
8. Explain the following: (i) Substitution reaction & (ii) Elimination reaction. (S-2011, 2018, 2019)
9. What are carbocations and carbonions? Explain formation and stability of carbocations? (W-2012)
10. What are carbocations? Explain formation and stability of carbocations. (W-2013)
11. Explain homolytic and heterolytic fission of covalent bond with examples. Discuss geometry and stability of free radicals. (W-2014)
12. Explain fission of covalent bond. Discuss formation and stability of carbanion ions. (S-2015)

Short answer questions

1. Define carbocation. Discuss its stability. (S-2005)
2. What are Carbenes? (S-2006)
3. Discuss the formation and stability of Free radicals. (S-2006, 2016, 2017)
4. Give one example of each of the following: (i) Elimination Reaction & (ii) Intramolecular Rearrangement Reaction. (W-2006)
5. Define electrophiles and nucleophiles and classify the following accordingly :(i) NH_3 and (ii) $AlCl_3$. (W-2006)
6. Explain Homolysis and Heterolysis. (S-2007)
7. Explain homolytic fission of a covalent bond. (W-2007, S-2011, 2017)
8. Classify following as electrophiles and nucleophiles: BF_3, SO_3, RNH_2 & OH^-, $FeCl_3$, H_2O (W-2007, S-2011, 2018, 2019)
9. Discuss substitution reaction with suitable example. (S-2008, W-2014, S-2015)
10. Define: Electrophiles and Nucleophiles. Classify following accordingly: (i) BF_3 & (ii) NH_3. (S-2008)
11. Discuss with one example each of the following reactions: (i) Elimination and (ii) Intramolecular Rearrangement. (S-2009)
12. What are Singlet and Triplet Carbenes? (S-2009)
13. Define (i) electrophile (ii) nucleophile (W-2012)
14. Explain activation energy by giving suitable example. (S-2014)
15. What are carbenes? Discuss structure of carbenes. (S-2014, 2016)
16. What are electrophiles? Give examples of charged and neutral electrophiles. (W-2014)
17. What are free radicals? Discuss their structure. (S-2015)

Very short answer questions

1. Name the intermediate: CH_3-CH_2:$^-$ (W-2014)
2. Write a reaction representing elimination reaction. (S-2014)
3. What ore electrophiles? Give one example. (S-2015)
4. What is the order of stability of primary, secondary and tertiary carbocation?

Unit II Stereochemistry of Organic Compounds

Long answer questions

1. Explain the terms: (i) Asymmetric carbon atom and (ii) Diastereoisomers. Discuss optical activity of Lactic acid. (S-2005, S-2006)
2. Discuss the conformational analysis of n-Butane giving the energy diagram. (S-2005, 2016)
3. Discuss R - S system of designating configuration of optically active compounds. Explain with examples. (S-2006)
4. What is optical activity? Discuss optical activity of Lactic acid & Tartaric acid. (W-2006, 2014; S-2009, 2019)
5. What is Chirality? Discuss optical activity of Tartaric acid. (S-2007)

6. What is conformation? Discuss conformational analysis of n - butane with energy profile diagram. (S-2007, 2019; W-2007)
7. Define optical activity. Discuss chemical method for resolution of racemic mixture. (W-2007)
8. Explain: (i) Distereo isomers and (ii) Enantiomers. (S-2008, 2016, 2018)
9. What is meant by resolution of optical isomers? Give the following methods of resolution: (i) Chemical (ii) Biological. (S-2008, 2016, 2017)
10. Define and explain the term Geometrical Isomerism. Discuss geometric isomerism exhibited by Fumaric and Maleic acid. (S-2010, 2019)
11. What are Sequence Rules? How are these rules used for assigning R and S configurations? Discuss with suitable examples. (S-2010, W-2012)
12. What is Optical isomerism? Explain with suitable examples. (S-2011)
13. Define the terms: (i) Racemisation & (ii) Resolution of enantiomers. Give biological method for resolution of optical isomers. (S-2011, 2019)
14. Define and explain the term geometrical isomerism. Discuss geometrical isomerism exhibited by fumaric acid and maleic acid. (W-2012, S-2016)
15. Explain the terms (i) chirality (ii) diastereomers. Give chemical method for resolution of recemic mixture. (W-2013, S-2014)
16. Discuss: (i) E-Z system of nomenclature (ii) Conformational analysis of n-butane. (S-2014)
17. Explain the term recemisation. Give chemical method for resolution of recemic mixture. (W-2014)
18. Define optical isomerism. Mention its conditions and how many isomers are possible in lactic acid? (S-2015)

Short answer questions

1. Give the sequence rule for determination of configuration by R and S system. (S-2005, 2017)
2. What are axial and equatorial bonds? (S-2005, S-2006, W-2007)
3. Discuss the geometrical isomerism in 2-butene. (S-2005, S-2006, W-2006, W-2013, S-2015, 2017)
4. What do you understand by E and Z system of nomenclature of geometrical isomers? Give one example of each. (S-2005, W-2013)
5. Distinguish between Configuration and Conformation. (S-2006, 2009, 2018; W-2007, 2014)
6. Explain the terms: (i) Enantiomers and (ii) Chirality of a molecule. (S-2006)
7. Write a note on Asymmetric synthesis. (W-2006, S-2008, S-2010, 2016, 2017)
8. What is E - Z system of nomenclature of geometrical isomers. (W-2006, S-2008, S-2010)
9. Give chemical method of resolution of optical isomers. (W-2006, S-2016)
10. Write a note on diastereoisomers. (S-2007, S-2015)
11. Give mechanism of Walden Inversion. (S-2007)
12. Write priority rules related to R - S system of nomenclature. (S-2007)
13. Define: (i) Centre of symmetry (ii) Axis of symmetry. (W-2007)
14. Which of the following shows geometrical isomerism?
    (i) CHCl = CHCl (ii) $CH_2 = CH_2$ (iii) $CH_2 = CCl_2$ (iv) CClBr = CHCl (W-2007)
15. Discuss the Geometrical Isomerism of Maleic acid and Fumaric acid. (S-2008, 2014, 2018)
16. Discuss the conformational analysis of n -Butane. (S-2008, S-2009, 2018)
17. Define the terms: (i) Chirality and (ii) Racemisation. (S-2009)
18. Discuss 'Biological method' for resolution of a racemic mixture. (S-2009, 2018)
19. Give a short account of 'E' & 'Z' system of nomenclature. (S-2010, W-2014, S-2015, 2016)
20. Discuss optical activity of lactic acid. (S-2020, W-2012)
21. Define :(i) Axial bonds and (ii) Equatorial bonds. (S-2010)
22. Explain Walden Inversion. (S-2011)

23. Define the terms: (i) Enantiomers & (ii) Chirality. (S-2011, 2017)
24. Draw and explain Axial bonds & Equatorial bonds in cyclohexane. (S-2011)
25. Define the terms: (i) Stereogenic center and (ii) Diastereomers (W-2012)
26. Write a note on conformation of ethane. (W-2012)
27. Discuss chemical method of resolution of recemic mixture. (W-2012)
28. Discuss optical isomerism in lactic acid. (W-2013, S-2017)
29. Write a note on Walden inversion. (W-2013, S-2014, S-2015, 2018)
30. Discuss optical activity of tartaric acid. (S-2014)
31. What is meant by conformational analysis? Explain conformational analysis of ethane. (S-2014, 2017)
32. Write a note on 'inversion of configuration'. (W-2014)
33. Write a note on Newman's projection and Sawhorse formulae of Ethane. (S-2019)
34. Discuss D and L nomenclature with suitable example. (S-2019)

Very short answer questions

1. Draw structural formulae of two optical isomers of lactic acid. (S-2014)
2. Define the term: Resolution of optical isomers. (S-2014)
3. Define molecular chirality. (S-2014, S-2015)
4. Draw Newman's projection formulae of n-butane. (W-2014)
5. What is meant by 'stereogenic centre'? (W-2014)
6. 1-bromoethene does not exhibit geometrical isomerism. Why? (W-2014)
7. Define "conformation". (S-2015, 2016)
8. Write an example of optically active compound with two stereogenic centres. (S-2015)

Unit III A) Alkane & Cycloalkane

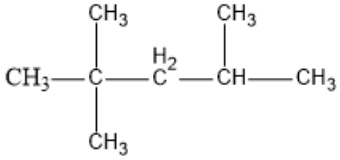
Long answer questions

1. Discuss free radical mechanism of chlorination of Methane. (S-2005, 2018)
2. What are Cycloalkanes? Discuss their stability in light of Baeyer's strain theory. (S-2006, S-2010)
3. How is ethane prepared by :(i) Decarboxylation of carboxylic acid and (ii) Wurt'z reaction? Discuss the mechanism of free radical halogenation of methane. (W-2006, S-2009, 2016)
4. What are limitations of Baeyer strain theory? Give account of theory of strainless ring. (W-2007, 2016)
5. Discuss the theory of stainless ring. (S-2007)
6. Why are alkanes less reactive towards majority of the organic reagents? Discuss the mechanism of free radical chlorination of methane. (W-2007)
7. Discuss stability of Cycloalkanes in light of Baeyer Strain Theory. Write its limitations. (S-2008, S-2014, 2017, 2019)
8. What are cycloalkanes? Discuss Baeyer strain theory and its limitation. (W-2012)
9. How does Baeyer strain theory account stability of cycloalkane? What are limitations. (W-2013, S-2014, S-2015)
10. How is methane obtained from acetic acid? Discuss the mechanism of chlorination of methane. (W-2014)
11. Discuss the conformations of cyclohexane. What are axial and equatorial bonds? (S-2009,2018; W-2013)
12. Discuss conformations of cyclohexane. Giving reason explain, stability of its conformers. (W-2006)

Short answer questions

1. Write a short note on L.P.G. (S-2005, S-2006, S-2010, S-2011, W-2012, S-2015, 2017)
2. Explain the terms: (i) Octane number and (ii) L. P. G. (W-2006)

3. What is composition of LPG? What is calorific value of fuel? (S-2007, S-2014)
4. Define: (i) Calorific value & (ii) Octane number. (S-2008)
5. What arc merits and demerits of Baeyer's Strain theory? (S-2009)
6. Write a note on composition and uses of L.P.G. (S-2009)
7. Discuss the mechanism of free radical halogenation of methane. (S-2010, W-2013)
8. Discuss free radical mechanism of chlorination of methane. (W-2012, S-2017, 2019)
9. Write note on pyrolysis. (W-2013, S-2014)
10. What is LPG? What is its composition? What is calorific value of fuel? (S-2014, 2018, 2019)
11. Discuss 'pyrolysis''. (S-2014)
12. Write common and IUPAC name of following alkane. What is its arbitrarily decided octane number? (W-2014)



13. Calculate angular strain in cyclopropane and cyclobutane rings and compare their stabilities on the basis of Baeyer's strain theory. (W-2014)
14. Explain following reactions in alkanes: (i) halogenation (ii) pyrolysis. (S-2015)
15. Explain the following reactions of alkanes: (i) Cyclization, and (ii) Aromatization. (S-2016)
16. Discuss conformations of cyclohexane molecule. (S-2007)

Very short answer questions

1. Calculate angle strain in cyclopropane. (S-2014)
2. What is octane number? (S-2014, S-2015, 2016)
3. Give any one example of Wurtz reaction. (W-2014)
4. Draw axial and equatorial bonds of cyclohexane. (W-2014)
5. Write mathematical expression for angle strain.
6. Define 'calorific value' and give its unit.

Unit III B) Alkenes

Long answer questions

1. How will you prepare propylene from the following (i) isopropyl bromide & (ii) 2-Propanol? Discuss free radical mechanism of addition of Br_2 to ethylene. (S-2006)
2. What is peroxide effect? Give free radical mechanism of addition of HBr to propylene molecule. (S-2007, S-2008, S-2011, *W-2014, S-2015, 2016, 2018, 2019)*
3. State Markownikoff's rule. Explain ionic mechanism of addition of HBr to propene. *(W-2012, S-2010. 2017, 2018)*
4. Explain with examples: Ozonolysis *(S-2014).*

Short answer questions

1. State Markownikoff s rule. Explain with example. (S-2005, *S-2014)*
2. What happens when HBr reacts with propylene :(i) in presence of peroxide and (ii) in absence of peroxide? (S-2006)
3. How does propylene react with: (i) Alk.$KMnO_4$ and (ii) HBr in presence of peroxide? *(W-2006)*
4. Write note on: elimination reaction. (S-2007, 2008, 2011, *S-2014)*
5. Define: (i) Epoxidation and (ii) Ozonolysis. (S-2007)
6. How is ethylene obtained from: (i) Ethylene Bromide and (ii) Ethylene Glycol? (S-2007)
7. What is effect of peroxide on addition of HBr to propylene? (W-2007)
8. What happens when Ethylene reacts with: (i) Acidic $KMnO_4$ solution (ii) HIO_4. *(W-2007, S-2017)*
9. What is action of following on ethylene: (i) Alkaline $KMnO_4$, (ii) Ozone in presence of

chloroform? (S-2008)
10. Discuss the mechanism of addition of Br_2 molecule to ethylene. (S-2008, 2019)
11. Explain hydroboration of ethylene. (S-2009)
12. How propylene react with (i) Alk. KMnO4 (ii) HBr in presence of peroxide? (S-2009, 2010)
13. What is the action of (i) Ozone followed by hydrolysis & (ii) HIO_4 on ethylene? (S-2011)
14. What happens when (i) ozone is treated with ethylene in inert solvent and (ii) ethylene is treated with acidified $K_2Cr_2O_7$. (W-2012)
15. State and explain Markonikoff's rule. (W-2013)
16. Give preparation of propylene from (i) 2-bromopropane (ii) 1-propanol. (W-2013, S-2017)
17. How is ethylene obtained from ethyl bromide? What is action of alk. $KMnO_4$ on ethylene? Name the reaction. *(W-2014)*
18. What is the action of following on ethylene; (i) HIO_4 (ii) Ozone *(S-2015)*
19. How will you prepare ethylene from: (i) Ethyl alcohol and (ii) Ethyl bromide? (S-2019)
20. Give a method of preparation of propylene from 2-bromopropane. Explain the reaction of ozone on propylene. (S-2016)

Very short answer questions

1. What happens with ethylene is treated with alkaline $KMnO_4$ solution? *(S-2014, 2017)*
2. State 'Markownikoff rule'. *(S-2015)*
3. What is allylic substitution.
4. What is the utility of elimination reaction?
5. What is meant by ozonolysis of alkenes?

Unit IV A) Dienes

Long answer questions

1. What arc dienes? Give their classification with one example of each. Discuss Diel's-Alder reaction. (S-2005)
2. How will you prepare 1, 3-butadiene from the followings: (i) Butane-1,4-diol & (ii) l, 4 Dichlorobutane? Write two Diels -Alder reactions exhibited by 1,3-butadiene. *(S-2006)*
3. What are dienes? Give their classification with one example of each. (W-2006, S-2019)
4. What are dienes? How are they classified? Give any two methods of preparation of 1,3-butadiene. *(S-2007)*
5. What are dienes? How are they classified? How is 1, 3-butadiene prepared from: (i) 1, 4-butandiol & (ii) n - butane? (S-2008)
6. What are alkadienes? How are they classified? How will you prepare 1,3-butadiene from the followings: (i) Butane-1,4-diol and (ii) 1,4-Dichlorobutane? *(S-2010, S-2011, W-2012)*
7. What are dienes? How are they classified? How will you prepare 1,3-butadiene from 1,4-dichlorobutane? How does 1,3-butadiene react with HBr. (S-2014, 2017)
8. Give a method of preparation of 1,3-butadiene from butane. How does it react with (i) HBr (ii) Malic anhydride and (ii) hydrogen in the presence of Ni catalyst? (W-2014)
9. What are alkadienes? How are classified? Discuss 1,2 and 1,4 addition in 1,3 butadiene. (S-2015, 2016, 2018)

Short *answer questions*

1. Discuss Diels - Alder reaction. (W-2007, 2013; *S-2014, 2017, 2018, 2019)*
2. How is 1,3- butadiene prepared from butane-1,4-diol? What happens when bromine is added to 1,3-butadiene? (S-2009)
3. What are alkadienes? How are they classified? (W-2013, W-2014, S-2017)
4. What is the action of : (i) Bromine and (ii) HBr on 1, 3-butadiene? (S-2019)

Very short answer questions

1. How is cyclohexene converted into 1,3 butadiene? *(S-2014)*
2. What is Diel's-Alder reaction?
3. Give examples of conjugated and isolated dienes.

Unit IV A) Alkynes

Long answer questions

1. How is acetylene prepared from Calcium carbide? How does it react with?
   (i) Ammoniacal solution of cuprous chloride,
   (ii) Acidified $K_2Cr_2O_7$ solution
   (iii) Hydrogen in presence of Li in liquid NH_3. (W-2007)
2. How will you explain acidic nature of C-H bond in acetylene? Discuss polymerization reactions of acetylene. (S-2009)
3. How will you prepare acetylene from: (i) calcium carbide (ii) 1,2-dibromoethane? What happens when: (i) Acetylene is passed through red hot iron tube and (ii) acetylene is treated with dil. H_2S0_4 in the presence of $HgS0_4$ at 75°C? (W-2013)

Short answer questions

1. Explain the acidic nature of acetylene. (S-2005, 2007, 2009, 2010, 2015,2017,2018, 2019; W-2014)
2. Write a note on oxyacetylene flame. (S-2005, W-2006, S-2010, S-2011, S-2015)
3. What happens when acetylene is passed through: (i) Ammoniacal Cuprous chloride solution & (ii) Red hot tube? (S-2006)
4. Explain acidify of acetylene. Give one reaction showing acidic nature of acetylene. (W-2006, S-2014)
5. What happens when: (i) Acetylene gas is passed through Iron tube at 773 K. (ii) Acetylene is passed into methanol at 473 K in the presence of 2% potassium methoxide under pressure. (W-2007)
6. What happens when acetylene reacts with: (i) Ammoniacal silver nitrate and (ii) Copper chloride solution in ammonia? (S-2008)
7. How is ethyne prepared starling from: (i) 1,2-dibromoethane and (ii) calcium earbide. (S-2011)
8. What happens when: (i) Acetylene gas passes through ammoniacal silver nitrate solution (ii) acetylene is treated with dil. H_2SO_4 in the presence of $HgSO_4$ at 75°C? (W-2012)
9. Write note on polymerization of acetylene under different conditions. (W-2012, W-2014)
10. How is acetylene prepared from calcium carbide? What happens when acetylene gas is passed through cuprous chloride solution in presence of ammonium chloride? (S-2016)
11. What is the action of following reagents on acetylene: (i) Acidic KMnO4 solution, and (ii) Diborane followed by the action of H_2O_2? (S-2016)

Very short answer questions

1. What is oxyacetylene flame? (S-2014)
2. Give method of formation of acetylene from calcium carbide. (W-2014)
3. What is the action of water on calcium carbide? (S-2015)

Unit IV B) Aromatic compounds and Aromaticity

Long answer questions

1. Explain general mechanism of Electrophilic substitution reaction in Benzene. Draw energy profile diagram for it. (S-2005, W-2005, S-2015)
2. Discuss the structure of Benzene on the basis of: (i) Resonance and (ii) M. O. picture. (W-2006, S-2010, W-2014, S-2017)
3. Discuss the mechanism of sulphonation of benzene with respect to energy profile diagram. (W-

2007, S-2008, S-2009, 2018)

4. Discuss structure of benzene in light of molecular orbital picture. Explain mechanism of nitration in aromatic nucleus with energy profile diagram. (S-2014, 2016, 2017, 2019)

Short answer questions

1. Draw orbital diagram of Benzene molecule. (S-2005, S-2008)
2. Discuss resonance in benzene. (S-2006)
3. Discuss the mechanism of Nitration of Benzene. (W-2006)
4. State and explain Huckels Rule of Aromaticity. (W-2007)
5. Discuss nomenclature of benzene derivatives. (S-2014)
6. What is Huckel's rule? Discuss aromaticity of cycloheptatrienyl cation. (S-2014, 2018, 2019)
7. Explain mechanism of sulphonation of benzene. (W-2014)
8. State Huckel's rule for aromaticity. How does it explain aromaticity of benzene? (S-2015)
9. Discuss molecular orbital picture of benzene. (S-2017, 2018, 2019)
10. Discuss Kekule's structure of benzene. (S-2016)
11. What is Huckel's rule of aromaticity? Explain aromaticity of cyclopentadienyl anion. (S-2016)

Very short answer questions

1. Draw energy profile diagram of sulphonation of benzene. (S-2014)
2. Stale Huckel's rule for aromaticity. (W-2014)
3. Name three possible isomers of disubstituted benzene. (S-2015)
4. What is the action of nitrating mixture on benzene at 50°C? (S-2015)
5. Draw resonating structures of cycloheplatrienvl cation.
6. Give any two limitations of Kekule structure of benzene.
7. Give conditions for aromaticity of a compound.