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The NCERT solutions for Class 12 Chemistry Chapter 10 Haloalkanes and Haloarenes here were created according to the latest program of the Central High School Board. Class 12 Haloalkanes and haloarenes pdf consists primarily of the important issues of the NCERT textbook, which is relevant to the CBSE program. The questions and explanations were prepared and resolved by our experts. Chapter 10 Class 12 exercise solutions are available in the form of a PDF that can be downloaded for free on our website and anytime as a resource material. Download NCERT Solutions Class 12 Chemistry Chapter 10 PDF-Download Here Haloalkanes are the halogen derivatives of hydrocarbons and these are of the following types depending on the number of hydrogen atoms present in them. Haloarenes are aromatic compounds in which the halogen atom is directly bound to the carbon atom of the aromatic ring. Chapter 10 solutions also give you exemplary problems, HIGHER Order Thinking Skills (HOTS), MCQ exercises, assignments, and spreadsheets that will help you learn the concept comprehensively, and make haloalkanes and haloarenes grades to help you prepare your exam. Class 12 NCERT Solutions for Haloalkanes and Haloarenes deal with the study of important methods of preparation, physical and chemical properties and uses of organohalogen compounds. After studying this chapter, students will be able to name haloalkanes and haloarenes according to the IUPAC system of nomenclature of their structures. Describe the reactions involved in the preparation of haloalkanes and haloarenes and understand various reactions they suffer; correlate haloalkane and haloarene structures with various types of reactions; use stereochemistry as a tool to understand the reaction mechanism; assess the applications of organometallic compounds and highlight the environmental effects of polyhalogen compounds. Subtopics of Class 12 Chemistry Chapter 10 – Haloalkanes and Haloarenes Classification Nomenclature Nature of The Methods of Preparation Of Physical Properties Of Preparation Compounds Polyhalogen Compound Art 12 Chemical NCERT Solutions (Haloalkanes and Haloarenes) – Important Questions Question 10.1: Name the following halides according to the IUPAC system and classify them as alkyl, benzyl (primary, secondary, tertiary), vinyl or aryl halides : (i) (CH₃)₂CHCH(Cl)CH₃ (ii) CH₃CH₂CH(CH₃)CH(C₂H₅)Cl (iii) CH₃CH₂C(CH₃)₂CH₂Cl (iv) (CH₃)₃CCH₂CH(Br)C₆H₅ (v) CH₃CH(CH₃)CH(Br)CH₃ (vi) CH₃C(C₂H₅)₂CH₂Br (vii) CH₃C(Cl)(C₂H₅)CH₂CH₃ (viii) CH₃CH=C(C₂H₅)CH₂CH₃ (ix) CH₃CH=CHC(Br)(CH₃)₂ (x) p-ClC₆H₄CH₂CH₃ (xi) m-ClCH₂C₆H₄CH₂C(CH₃)₃ (xii) o-Br-C₆H₄CH(CH₃)CH₂CH₃ Soln : (i) 2 – Chlorine – 3 – methylbutane (secondary halide alkyl) (ii) 3 – Chloro – 4 – methylhexane (secondary alkyl halide) (iii) 1 – Iodo – , 2 – dimethylbutane (primary halide alkyl) (iv) 1 – 3, 3 – dimethylene – 1 – phenylbutane (secondary benzyl halide) (v) 2 – Bromine – 3 – methylbutane (secondary alkyl halide) (vi) 1 – Bromine – 2 – ethylgraphy – 2 - methylbutane (primary alkyl halide) (vii) 3 – Chlorine – 3 - methylpentane (Tertiary alkyl hal) (viii) 3 Chloro–5–methylhex–2–ene (Vinyl halide) (ix) 4 – Bromine – 4 – methylpent – 2 – ene (Allyl halide) (x) 1 – Chlorine – 4 – (2 – methylpropyl) benzene (Aryl halide) (xi) 1 – Chloroethyl – 3 – 2 – dimethylpropyl) benzene (Halide benzyl primary) (xii) 1 – Bromine – 2 – (1 – methylpropyl) benzene (Aryl halide) Question 10.2: Give the IUPAC names of the following compounds: (i) CH₃ CH(Cl) CH(Br) CH₃ (ii) CH F₂ CBr Cl Cl CH₂ C ≡ C CH₂ Br (iv) (CCl₃)₃ CCl (v) CH₃ C (p – Cl C₆ H₄)₂ CH(Br) CH₃ (vi) (CH₃)₃ C CH = C Cl C₆ H₄ I – p Soln : (i) 2–Bromo–3–chlorobutane (ii) 1–Bromo–1–chlorine–1, 2, 2–trifluoroethane (iii) 1 – Bromine – 4 – chlorobut – 2 – yne (iv) 2–(Trichloromethyl)–1,1,1,2,3,3,3–heptachloropropane (v) 2–Bromo–3, 3–bis(4 – chlorophenyl) butane (vi) 1–chlorine–1–(4–iodophenyl)–3, 3–dimethylbut–1–ene Question 10.3: Write the structures of the following organic halogen compounds. (i) 2-Chlorine-3 - methylpentane (ii) p -Bromochlorobenzene (iii) 1 -Chloro-4-ethylcyclohexane (iv) 2 – (2 -Chlorophenyl) -1 -iodooctane (v) Perorobenzene (vi) 4 – tert – Butyl -3 -iodoheptane (vii) 1 – Bromo – 4 – sec – butyl – 2 – methylbenzene (viii) 1,4 – Dibromobut - 2 - ene Soln: Question 10.4: Which of the following has the highest dipole moment? i CH₂Cl₂ (ii) CHCl₃ (iii) CCl₄ Soln : CCl₄ is a symmetric molecule. Therefore, the dipole moments of all four C-Cl titles are cancelled. Therefore, its resulting dipole moment is zero. As shown in the figure above, in CHCl₃, the result of dipole moments of two C – Cl loops is opposed by the result of dipole moments of a C-H bond and a C – Cl bond. Since the result of a link C - H and a c-cl moments of binding dipole is less than two C-Cl titles, the opposition is to a small extent. As a result, CHCl₃ has a small dipole moment of 1.08 D. On the other hand, in the case of CH₂Cl₂, the result of the dipole moments of two loops C – Cl is strengthened by the result of the dipole moments of two loops C – H, result, CH₂Cl₂ has a dipole moment greater than 1.60 D than CHCl₃ i.e., CH₂Cl₂ has the highest dipole moment. Thus, the given compounds can be organized in the ascending order of their dipole moments such as: CCl₄ < CHCl₃ < CH₂Cl₂ Question 10.5: A C₅H₁₀ hydrocarbon does not react with chlorine in the dark, but gives a single monochlorine compound C₅H₉Cl to bright sunlight. Identify the hydrocarbon. Soln: A hydrocarbon with the molecular formula, C₅H₁₀ belongs to the group with a general molecular formula C_nH_{2n}. Therefore, it can be an alquero or a cycloalkane. Because the hydrocarbon does not react with chlorine in the dark, it cannot be an alquero. So it must be a cycloalkane. In addition, the hydrocarbon gives a single monochlorous compound, chlorine under bright sunlight. Once a single monochlorine compound is formed, the hydrocarbon must contain H atoms that are all equivalent. Moreover, because all H atoms of a cycloalkane are equivalent, the hydrocarbon must be a cycloalkane. Thus, this compound is cyclopentane. The reactions involved in the question are: Question 10.6: Write the isomers of the compound with formula C₄H₉Br. Soln: There are four isomers of the compound having the formula C₄H₉Br. These isomers are given below: 1–Bromobutane (b) 2–Bromobutane (c) 1–Bromo–2–methylpropane (d) 2–Bromogden–2–methylpropane Question 10.7: Write the equations for the preparation of 2 – 1-iodobutane (i) 1-butanol (ii) 1-chlorobutane (iii) but-1-ene Soln: (i) (ii) Question 10.8: What are ambident nucleophiles? Explain with an example. When there are two nucleophilic sites in a nucleophile, they are called ambident nucleophiles. These nucleophilic sites are places through which they can attack. For ex-nitrite nitrate alkyl nitrites are formed when nitrite ions can attack through oxygen. And nitroalkanes are formed when they can attack through nitrogen. Question 10.9: Which compound in each of the following pairs will react faster in the SN₂ reaction with OH⁻? (i) CH₃Br or CH₃I (ii) (CH₃)₃CCl or CH₃Cl Soln: (i) In the SN₂ mechanism, the order in which halides react to some allotment group is constant. This is because the halide ion becomes a better output group when the ion size increases. R-F < R-Cl < R-Br < R-I Therefore, CH₃I reactivity is faster compared to CH₃Br in SN₂ reactions with OH⁻. (ii) In the SN₂ mechanism, the nucleophile attacks the atom with the output group. Nucleophile attack at (CH₃)₃CCl on the carbon atom is hampered as carbon atoms (with the output group) contain bulky substituents. However, CH₃Cl does not consist of bulky substituents in the carbon atom with the output group. Thus, CH₃Cl reactivity is faster compared to (CH₃)₃CCl in the SN₂ reaction with OH⁻. Question 10.10: Predict all alques that would be formed by the dehydrogenhalogenation of the following halides with sodium ethoxide in ethanol and identify the main alquenic: (i) 1-Bromo-1-methylcyclohexane (ii) 2-Chloro-2-methylbutane (iii) 2,2,3-Trimethyl-3-bromide. Soln: (i) 1-bromo–1–methylcyclohexane All β-hydrogen are equal in the given compound. Thus, the dehydrogenhalogenation of the given compound gives only one alkene. (ii) a and b are different sets of equivalent β-hydrogen atoms. The dehydration of this compound gives two alkenes. The alqued with the most number of alkyl groups attached to a double-bound carbon atom is preferable produces, according to saytzeff rule in dehydrogenhalogenation reactions. Therefore, the main product in this reaction is 2-methylbut-2-ene. (iii) 2,2,3-Trimethyl-3-bromopentane a and b are different sets of β-hydrogen atoms. The dehydration of this gives two alkenes. The alkene with more number of linked alkyl groups linked a double bound carbon atom is preferable produces, according to saytzeff rule in dehydrogenhalogenation reactions. Thus, 3,4,4 trimethylpent-2-ene is the main product. Question 10.11: How will you bring the following conversions? (i) Ethanol for but-1-yne (ii) Ethane for bromoene (iii) Propane to 1-nitropropane (iv) Toluene to benzyl alcohol (v) Propane à propyne (vi) Ethanol bromomethane (vii) bromomethane influenza for propanone (viii) But-1-ene for but-2-ene (ix) 1-Chlorobutane for n-octane (x) Benzene for biphenyl. Soln: Question 10.12: Explain why (i) is the time of chlorobenzene dipole lower than that of cyclohexyl chloride? (ii) alkyl halides, although polar, are immiscible with water? (iii) Should grignard reagents be prepared under anhydrous conditions? Soln: (i) The chlorobenzene cl-in atom is bound to the hybridized carbon atom sp², while in cyclohexyl chloride it is bound to the hybridized carbon atom sp³. Now, because hybridized carbon sp² has more s-character, it is more electronegative than the hybridized carbon atom sp³. Thus, the density of C-Cl bond electrons near the cl atom is less in chlorobenzene than in cycloxy chloride. In addition, the electronic density is reduced by the -R effect of the benzene ring of chlorobenzene. Thus, chlorobenzene has a decrease in the polarity of the C-Cl bond, also the moment of dipole is lower than that of cyclohexyl chloride. (ii) When the solute water force the attraction is stronger than the solute-solute force and water-water of the attraction, it detains the miscibility with water. Dipole – dipole interactions keep the polar alkyl halide molecules together. Now, halide alkyl-alkyl halide and water-water attraction forces are stronger than the new attraction force between alkyl halides and water molecules. As a result, allottus halides (although polar) are immiscible with water. (iii) Grignard reagents are very reactive. In the presence of moisture, they react to give alkanes. Therefore, Grignard reagents should be prepared under anhydrous conditions. Question 10.13: Give the uses of freon 12, DDT, carbon tetrachloride and iodoforn. Soln: Freon use -12 Common name given to Freon-12 (dichlorodifluoromethane, CF₂Cl₂) is CFC. It is used in aerosol spray propellants such as deodorants, hair sprays etc. It is also used in refrigerators and air conditioners as a soda. Its manufacture was banned in the United States and many other countries in 1994 because it was severely damaging the ozone layer. Use of DDT The most commonly used insecticide is DDT (p, p-dichlorodiflylchloroethane). It has several harmful effects due to which it was banned in the United States in 1973, although mosquitoes and lice are very effective. The uses of carbon tetrachloride (CCl₄) (i) refrigerants and propellant for aerosol cans are manufactured using CCl₄. (ii) Chlorofluorocarbons and other chemicals are synthesized. (iii) Used as a solvent in the pharmaceutical products. (iv) Used as cleaning fluid, a ream of stains in the houses fire extinguisher during the mid-1960s. The use of iodoforn (CHI₃) Iodoforn was previously used as an antiseptic, but has now been replaced by other formulations containing iodom due to its objectionable smell. Question 10.14: Write the structure of the main organic product in each of the following reactions: Soln: Question 10.15 : What will be the mechanism for the following reaction? The reaction given is CN⁻ it acts as a nucleophile and attacks the carbon atom in which Br is bound. CN⁻ ion is an ambident nucleophile and can attack through positions C and N. It attacks through atom C in this case. Question 10.16: Arrange the compounds of each set in order of reactivity for the displacement of SN₂: (i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane (ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2-methylbutane, 1-Bromo-3-methylbutane. Soln: (i) An SN₂ reaction involves the approximation of the nucleophile to the carbon atom to which the output group is bound. When the nucleophile is sically hampered, then the reactivity to the displacement of SN₂ decreases. Due to the presence of substituents, the obstacle to nucleophilic approximation increases in the following order. 1-Bromopentane < 2-bromopentane < 2-Bromo-2-methylbutane Hence, the increasing order of reactivity for the sn₂ displacement is: 2-Bromine-2-methylbutane < 2-Bromopentane < 1-Bromopentane (ii) Since the steric obstacle in halides alkyl increases in the order of 1° < 2° < 3°, the increasing order of reactivity for sn₂ displacement is 3° < 2° < 1°. Thus, the given set of compounds can be organized in the increasing order of its reactivity for the displacement of SN₂ such as: 2-Bromo-2-methylbutane < 2-Bromo-3-methylbutane < 1-Bromo-3-methylbutane (iii) The steric obstacle to the nucleophile in the SN₂ mechanism increases with a decrease in the distance of the atom substituents containing the output group. In addition, the steric obstacle increases with increasing number of substituents. Therefore, the increasing order of steric obstacles in the compounds given is as follows: 1-Bromobutane < 1-Bromo-3-methylbutane < 1-Bromo-2-methylbutane < 1-Bromo-2, 2-dimethylpropane Therefore, the increasing order of reactivity of compounds given for sn₂ displacement is: 1-Bromo-2, 2-dimethylpropane < 1-Bromo-2-methylbutane < 1-Bromo-3-methylbutane < 1-Bromobutane Question 10.17: Out of C₆H₅CH₂Cl and C₆H₅CHClC₆H₅, which is more easily hydrolyzed by aqueous koh? Hydrolysis by aqueous koh proceeds through the formation of the carbocation. If the carbocation is stable, then the compound is easily hydrolyzed by aqueous KOH. Now, C₆H₅CH₂Cl forms 1st-carbocation, while C₆H₅CHClC₆H₅ forms 2o-carbocation, which is more stable than 1st-carnation. Thus, C₆H₅CHClC₆H₅ is hydrolyzed more easily than C₆H₅CH₂Cl by aqueous KOH. Question 10.18: p-Dichlorobenzene has higher m.p. and lower than those of o-and-m-isomers. Discuss. P-Dichlorobenzene is more symmetrical than o-and-m-isomers. For this reason, it fits more closely than the-and-m-isomers in the crystal network. Therefore, more energy is needed to break the crystalline network of p-dichlorobenzene. As a result, p-dichlorobenzene has a higher melting point and lower solubility than o-and-m-isomers. Question 10.19: How can the following conversions be performed? (i) Propan-1-ol (ii) Ethanol for but-1-yne (iii) 1-Bromopropane to 2-bromopropane (iv) Toluene for benzyl alcohol (v) Benzene 4-bromonitrobenzene (vi) 2-chinletonic acid (vii) Ethanol for propanenitrile (viii) Ailine for chlorobenzene (ix) 2-Chlorobutane to 3, 4-dimethylhexane (x) 2-Methyl-1-propane to 2-chlorine-2-methylpropane (xi) Ethyl chloride for propanoic acid (xii) But-1-en e-n-mas ioliodete (xiii) 2-Chloropropane to 1-propanol (xiv) isopropyl alcohol for iodoforn (xv) Chlorobenzene for p-nitrophenol (xvi) 2-Bromopropane for 1-bromopropane (xvii) Chloroethane for butane (xviii) Benzene for diphenyl (xix) tert-Butyl bromide for isobutyl bromide (xx) Aniline for phenylfiancyne Soln: Question 10.20: Treatment of alkyl chlorides with aqueous koh leads to the formation of alcohol, but in the presence of alcoholic KOH, alkenes are important products. Explain. Soln: In an aqueous solution, KOH almost completely ionizes to give oh⁻ ion ions is a strong nucleophile, which causes alkyl chloride to undergo a replacement reaction to form alcohol. On the other hand, an alcoholic solution of KOH contains alkoxida ion (RO⁻), which is a strong base. Thus, it can abstract a hydrogen from the β-carbon of alkyl chloride and form an alquero by eliminating an ion-ion molecule HCl. OH⁻ is a much weaker base than ro⁻ ion. In addition, oh⁻ ion is highly solvated in an aqueous solution and, as a result, the basic character of OH⁻ ion decreases. Therefore, it cannot abstract a hydrogen from the β carbon. Question 10.21: Halide primary alkyl C₄H₉Br (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) it is reacted with sodium metal gives compound (d). C₈H₁₈ which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula (a) and write the equations for all reactions. Soln: There are two primary alkyl halides having the formula, C₄H₉Br. São n – butyl bromide and isobutyl bromide. Therefore, compound (a) is n-butyl bromide or isobutyl bromide. Now, compound (a) reacts with in metal to give compound (b) of molecular formula, C₈H₁₈, which is different from the compound formed when n-butyl bromide reacts with in metal. Therefore, compound (a) should be isobutyl bromide. Thus, compound (d) is 2, 5-dimethylhexane. It is given that the compound (a) reacts with alcoholic KOH to give compound (b). Thus, compound (b) is 2-methylpropane. In addition, compound (b) reacts with HBr compound (c) which is an isomer of (a). Thus, compound (c) is 2-bromine–2–methylpropane. Question 10.22: What happens when (i) n-butyl chloride is treated with alcoholic KOH, (ii) bromobenzene is treated with Mg in the presence of dry ether, (iii) chlorobenzene is subjected to hydrolysis, (iv) ethyl chloride is treated with aqueous KOH, (v) methyl bromide is treated with sodium in the presence of dry ether, (vi) methylchlorid is treated with KCN. Soln: (i) When n-butyl chloride is treated with alcoholic KOH, but–ene formation occurs. This reaction is a dehydrogenhalogenation reaction. (ii) When bromobenzene is treated with Mg in the presence of dry ether, phenylthium bromide is formed. (iii) Chlorobenzene does not undergo hydrolysis under normal conditions. However, it undergoes hydrolysis when heated in an aqueous sodium hydroxide solution at a temperature of 623 K and a pressure of 300 atm to form phenol. (iv) When ethyl chloride is treated with aqueous KOH, it undergoes hydrolysis to form ethanol. (v) When methyl bromide is treated with sodium in the presence of dry ether, ethane is formed. This reaction is known as the Wurtz reaction. (vi) When methyl chloride is treated with KCN, it undergoes a replacement reaction to give methyl cyanide. Why opt for BYJU? We at BYJU's design and prepare NCERT solutions for the sole purpose of helping students clean their exams with flying colors. The solutions we are providing contain selected exercises and important issues that have been resolved with explanations, which are very clear and easy to understand. Students in Class 12 will have the study material in their hands and do not need to refer to any other material. Class 12 NCERT solutions have been systematically defined to further help students learn quickly and remember content for longer. Most of the topics in this chapter have been comprehensively explained to give students a clear understanding and deep knowledge of the topic. 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