

Chemistry Worksheet Class 11 on Chapter 13 Hydrocarbons with Answers - Set 3

Q-1: Which of the following is the catalyst used to reduce an alkyne to alkene?

- a) Raney Nickel
- b) Platinum
- c) Lindlar's catalyst
- d) Iron

Answer: c) Lindlar's catalyst

Explanation: Lindlar's catalyst is palladised charcoal that has been partially deactivated with toxins like sulphur compounds or quinoline. And it is used to reduce an alkyne to an alkene.

Q-2: Geometric isomers differ in

- a) Position of functional group
- b) Position of atoms
- c) Spatial arrangement of atoms
- d) Length of carbon chain

Answer: c) Spatial arrangement of atoms

Explanation: Those isomers which have different arrangements around carbon-carbon double bonds are known as geometrical isomers.

Q-3: The bond length of the connection between the central carbon atom and the other carbon atom is the shortest in

- a) Propene
- b) Propyne
- c) Propane
- d) All of them have the same

Answer: b) Propyne

Explanation: Propene, propyne and propane have double, triple and single bonds, respectively. Less bond length is associated with higher bond orders. We know that the double, triple, and single bond orders are 2, 3, and 1, respectively. Propyne, which has a triple bond and the highest bond order, will have the shortest bond length.

Q-4: Arrange the following in the order of their decreasing acidic character.

Ethyne, Propyne, But-2-yne

Answer: The following table provides the chemical structure of the given compounds:

Compound	Chemical Structure
Ethyne	$\text{CH}\equiv\text{CH}$
Propyne	$\text{CH}_3\text{-C}\equiv\text{CH}$
But-2-yne	$\text{CH}_3\text{-C}\equiv\text{C-CH}_3$

Acidic character depends on how electron deficient the compound is. The more electron deficiency, the more acidic the character. On moving from Ethyne to But-2-yne, the number of alkyl groups increases. An increase in the alkyl group decreases the deficiency of electrons on the sp-hybridised carbon atoms, thus decreasing the acidic character.

Hence, the correct order is Ethyne > Propyne > But-2-yne.

Q-5: Arrange the alkyl halides in the below list in the order of decreasing dehydrohalogenation reaction rate, that is, when heated in the presence of alcoholic KOH.

$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{I}$

Answer: The rate of reaction, or ease of dehydrohalogenation, depends on the nature of the halogen atoms and the alkyl group. The observed rate is in the order:

Iodine > Bromine > Chlorine for different halogen atoms, and for alkyl groups, it is Tertiary > Secondary > Primary.

Since there are only primary alkyl groups in the compounds presented, the rate will be determined by the type of halogen atom. Provided the order above for the nature of halogen atoms, the correct order of dehydrohalogenation becomes: $\text{CH}_3\text{CH}_2\text{CH}_2\text{I} > \text{CH}_3\text{CH}_2\text{CH}_2\text{Br} > \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$.

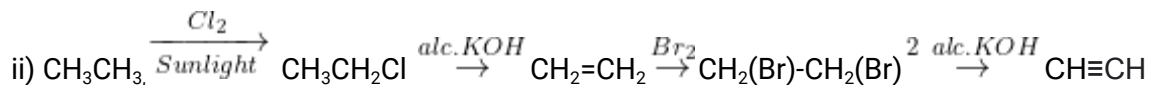
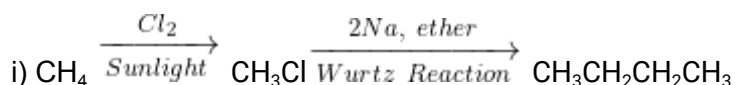
Q-6: Can conformational isomers of ethane be separated? Why?

Answer: No, it is impossible to separate the conformational isomers of ethane because the energy needed for rotation is negligibly small and is obtained in sufficient quantities even at room temperature. Therefore, molecules rotate continuously to create every possible conformation.

Q-7: How will you obtain the following conversions? Give the equations only.

- Ethane from methane
- Ethyne from ethane

Answer:



Q-8: Explain the following:

- Why are alkenes more reactive than alkanes?
- Hex-3-ene shows geometrical isomerism, but hexene does not.

Answer:

i) Due to the presence of a weak π -bond between two carbon atoms in alkene, which draws the electrophilic reactant nearer itself via their electron sources, an alkene is more reactive than alkane. When an electrophilic group is present, this π -bond quickly breaks down and forms two new single bonds. On the other hand, alkanes have single bonds that are far stronger than π -bonds and thus cannot be easily broken down, making them less reactive.

ii) Hex-3-ene is represented by $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}_3$, whereas hexene is represented by $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$. Geometrical isomerism requires that the compound have the same groups across the double bond. Hence, the same groups ($-\text{CH}_2\text{CH}_3$) are only found in Hex-3-ene and not in hexene. Geometrical isomerism is thus possible in Hex-3-ene but not in hexene.

Q-9: Which Ethane-1,2-diol conformation is the most stable?

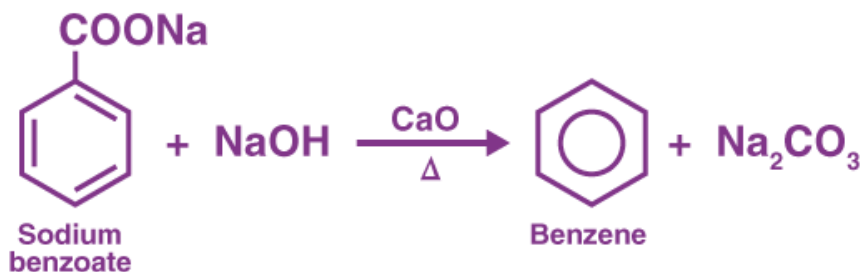
- Gauche
- Skew
- Eclipsed
- Staggered

Answer: b) Skew

Explanation: The skew form of ethane-1,2-diol is the most stable conformation of it due to intramolecular H-bond.

Q-10: How can benzene be prepared from sodium benzoate?

Answer: Sodium salt of benzoic acid, that is, sodium benzoate, on heating with soda lime, gives benzene.



This reaction is called decarboxylation.

Q-11: Which of the ethane molecule's conformations has the greatest and least torsional strain?

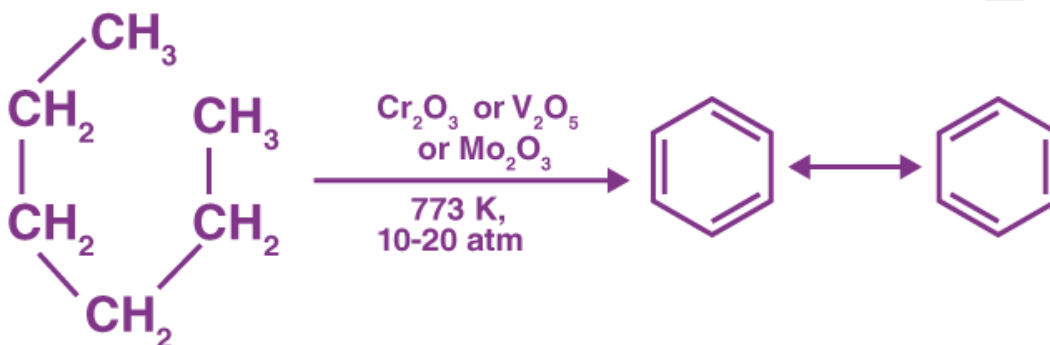
Answer: The staggered form of ethane exhibits the least torsional strain, and the eclipsed form exhibits the greatest torsional strain. Staggered conformation is, therefore, more stable than eclipsed conformation. Therefore, the staggered conformation of the molecule largely persists, or we can say it is the preferred conformation.

Q-12: Which concept did Kekule propose to account for forming just one ortho-disubstituted product?

Answer: Kekule proposed that double bonds in benzene have an oscillating nature by considering the formation of just one ortho-disubstituted product.

Q-13: What do you mean by aromatisation?

Answer: When n-alkanes with six or more carbon atoms are heated to 773K at 10-20 atmospheric pressure with oxides of molybdenum, vanadium, or chromium supported over alumina, they dehydrogenate and cycle to create benzene and its analogues. This is termed aromatisation or reforming.



Q-14: Why don't alkyl fluorides produce alkanes in a reduction reaction with zinc and hydrochloric acid?

Answer: This is because the C-F bond in alkyl fluoride has low dissociation energy and is very strong. Its greater strength prevents it from being easily broken and prevents a reduction reaction with zinc and hydrochloric acid that would produce alkanes.

Q-15: Which of the following alkanes is liquid?

- a) Ethane
- b) Propane
- c) Hexane
- d) Methane

Answer: c) Hexane

Explanation: The liquid state applies to alkanes with carbon atoms from C₅ to C₁₇. Hexane is liquid because there are six carbon atoms in it.

Q-16: What mechanism does the reaction between HBr and asymmetrical alkenes use?

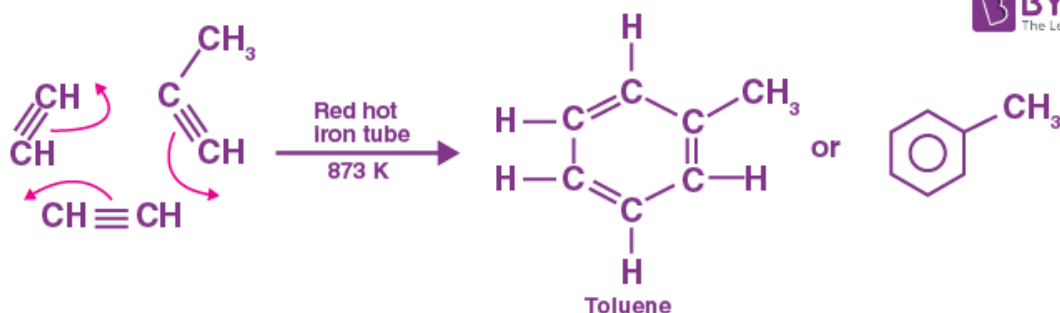
Answer: When HBr and asymmetrical alkenes react, the Markovnikov Rule is applied.

Q-17: Which is the first member of the alkyne series? What's its common name? Describe how it is used.

Answer: Ethyne is the first stable member of the alkyne family. It is frequently referred to as acetylene. When combined with oxygen gas, acetylene can be used for welding as an oxyacetylene flame.

Q-18: What results from the cyclic polymerisation of two ethyne molecules and one propyne molecule when the mixture is passed through a hot iron tube?

Answer: The reaction results in the formation of toluene and is stated below:



Q-19: a) Which of the following are meta directors?

-NO₂, -SO₃H, -Cl, -OH, -NH₂, -CHO

b) Name an ortho-and para-directing deactivating group.

Answer:

a) $-\text{NO}_2$, $-\text{SO}_3\text{H}$, $-\text{CHO}$

b) $-\text{Cl}$

Q-20: How would you carry out the following conversions?

a) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

b) $\text{CH}_3\text{CH}_2-\text{CH}=\text{CH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$

c) $\text{Br}_2\text{CHCHBr}_2 \rightarrow \text{CH}\equiv\text{CH}$

d) $\text{CH}_3\text{C}\equiv\text{CH} \rightarrow \text{CH}_3\text{COCH}_3$

Answer:

a) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2 \xrightarrow{\text{B}_2\text{H}_6, \text{H}_2\text{O}_2, \text{OH}^-} \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

b) $\text{CH}_3\text{CH}_2-\text{CH}=\text{CH}_2 \xrightarrow{\text{Alk. KMnO}_4} \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$

c) $\text{Br}_2\text{CHCHBr}_2 \xrightarrow{\text{Zn}} \text{CH}\equiv\text{CH}$

d) $\text{CH}_3\text{C}\equiv\text{CH} \xrightarrow{\text{H}_2\text{SO}_4, \text{Hg}^{2+}} \text{CH}_3\text{CH}(\text{OH})=\text{CH}_2 \xrightarrow{\text{Rearrangement}} \text{CH}_3\text{COCH}_3$