
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	DEPARTMENT: SCIENCE 2022-23 SUBJECT: CHEMISTRY	Date of completion: 19.01.2023
Worksheet No: 7 with answers	TOPIC: Hydrocarbons	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

Objective Type Questions

- A compound having a bond angle 180° is
(a) alkyne (b) alkane (c) alkene (d) cycloalkane
- Benzene molecule has
(a) 6 σ and 6 π bonds
(b) 16 σ and 6 π bonds
(c) 12 σ and 3 π bonds
(d) 6 σ and 3 π bonds
- C-Cl bond of chlorobenzene in comparison to C-Cl bond in methyl chloride is
(a) Longer and weaker (b) Shorter and weaker (c) Shorter and stronger (d) Longer and stronger
- Benzene reacts with Acetyl chloride in the presence of $AlCl_3$ to give
(a) Acetophenone
(b) Toluene
(c) Benzophenone
(d) Ethylbenzene
- Heating a mixture of sodium benzoate and soda lime gives
(a) calcium benzoate (b) benzene (c) sodium benzoate (d) Methane

Short Answer Type Questions

- Out of 2-methylpentane and 2,2-dimethylbutane, which one has a greater boiling point? Why?
- Suggest a route for the preparation of Nitrobenzene from Ethyne.
- Give the structure of Alkyl halide which when treated with Na metal in the presence of ether gives $(CH_3)_2CHCH(CH_3)_2$. Give the chemical equation.
- Give the structure of the alkene (C_4H_8) which adds on HBr in the presence and in the absence of peroxide to give the same product C_4H_9Br .

10 Give reason:

- (a) Staggered form of Ethane is more stable than eclipsed form
- (b) Wurtz reaction is carried out in dry ether

Assertion Reason type questions

Choose the options given below for the Assertion Reason statements

- a. If both *Assertion* and *Reason* are correct and *Reason* is the correct explanation of *Assertion*.
- b. If both *Assertion* and *Reason* are correct but *Reason* is not the correct explanation of *Assertion*.
- c. If *Assertion* is correct and *Reason* is wrong.
- d. If *Assertion* is wrong and *Reason* is correct.

11. Assertion: Ethyne is acidic in nature.

Reason: Ethyne is sp hybridised.

12. Assertion (A): Toluene on Friedel Crafts methylation gives o- and p-xylene.

Reason (R): CH₃-group bonded to benzene ring increases electron density at o- and p- position.

13. Assertion: Boiling point of alkanes increases with increase in molecular weight.

Reason: Intermolecular forces increase with increase in molecular weight.

Case study-based Questions

14. Arenes are the aromatic hydrocarbons which contain one or more Benzene rings. Benzene is a Six- membered Carbon ring with alternate single and double bonds. Arenes contain high proportion of Carbon compared to aliphatic hydrocarbons. Aromatic hydrocarbons are less reactive than Alkenes and Alkynes because their π bonds are involved in delocalisation and are not available for addition reactions. But Benzene being electron rich the electrophiles replace the Hydrogen atom of Benzene and undergo electrophilic substitution reactions.

- A. Explain why Benzene is extraordinarily stable even though it contains three double bonds.
- B. Name an ortho and para directing deactivating group
- C. OH group attached to Benzene is ortho, para directing and activating group. Explain with the help of resonating structures
- D. What are meta directing groups? Give example.

15. Alkanes contain carbon-carbon sigma (σ) bonds. Electron distribution of the sigma molecular orbital is symmetrical around the internuclear axis of the C-C bond which is not disturbed due to rotation about its axis. This permits free rotation about C-C single bond. Rotation around a C-C single bond is not completely free. It is hindered by a small energy barrier due to weak repulsive interaction between the adjacent bonds. Such a type of repulsive interaction is called torsional strain. This rotation results into different spatial arrangements of atoms in space which can change into one another. Such spatial arrangements of atoms which can be converted into one another by rotation around a C-C single bond are called conformations or conformers or rotamers

- A. What are skew conformations?
- B. Draw Newman projections of eclipsed and staggered conformations of Ethane.
- C. What do you mean by torsional strain?

Long Answer Questions

16. How would you convert

- Ethane to Ethene
- Propene to 1-propanol
- Acetic acid to methane
- Ethyne to cyclohexane
- Ethene to Benzene

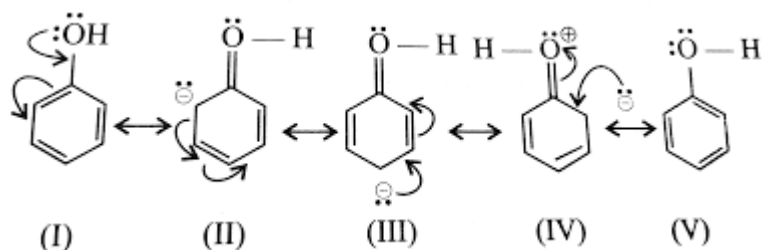
17. An alkyl halide $C_5H_{11}Br$ (A) reacts with ethanolic KOH to give an alkene 'B', which reacts with Br_2 to give a compound 'C', which on dehydrobromination gives an alkyne 'D'. On treatment with sodium metal in liquid ammonia one mole of 'D' gives one mole of the sodium salt of 'D' and half a mole of hydrogen gas. Identify A, B, C and D. Give the reactions involved.

Answers

1.	(a)
2.	(c)
3.	(c)
4.	(c)
5.	(b)
6.	2-methylpentane. As the branching increases, the surface area decreases. As a result, the magnitude of van der Waal's forces of attraction decreases and hence the boiling decreases.
7.	<p>$2,2,3,3\text{-tetramethylbutane} \xrightarrow[873\text{ K}]{\text{Red hot iron tube}} \text{Benzene}$ $\text{Benzene} + \text{Conc. HNO}_3 + \text{Conc. H}_2\text{SO}_4 \xrightarrow{323-333\text{ K}} \text{Nitrobenzene} + \text{H}_2\text{O}$</p>
8.	$2(\text{CH}_3)_2\text{CHBr} + 2\text{Na} \xrightarrow{\text{Ether}} (\text{CH}_3)_2\text{CHCH}(\text{CH}_3)_2 + 2\text{NaBr}$
9.	<p>$\begin{array}{c} \text{CH}_3 \quad \quad \text{CH}_3 \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \quad \quad \text{H} \end{array}$</p>
10.	<ol style="list-style-type: none">The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strainWurtz reaction is carried out with sodium metal which is highly reactive, hence, a solvent which will not react with the sodium metal needs to be chosen. It requires an aprotic solvent as the medium of the reaction. Dry ether proves to be a very good non-polar, aprotic solvent for this purpose.
11.	a
12.	a
13.	a
Case study based Questions Answers	
14.	A. The stability in benzene is due to delocalization of electrons due to its resonance effect.

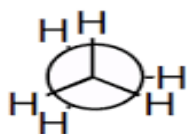
B. Halogens

C. The hydroxyl group attached to the aromatic ring in phenol facilitates the effective delocalization of the charge in the aromatic ring.

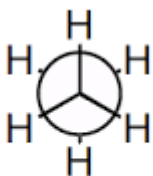


D The groups which direct the incoming groups to the meta position are called meta directing groups. Example: NO₂, CN, COOH etc

15 A. Any intermediate conformations other than eclipsed and staggered are called skew conformations.



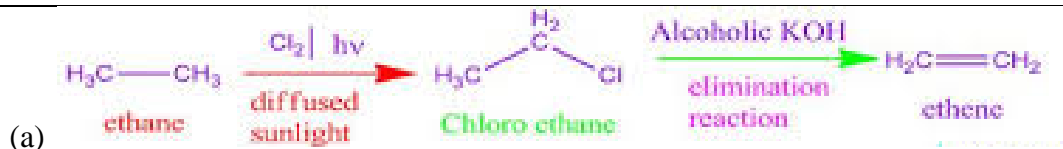
eclipsed



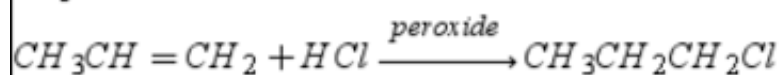
staggered

C Rotation around a C-C single bond is not completely free. It is hindered by a small energy barrier due to weak repulsive interaction between the adjacent bonds. Such a type of repulsive interaction is called torsional strain.

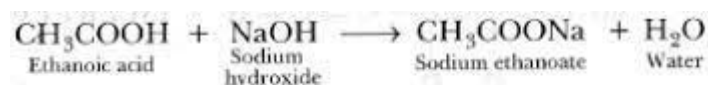
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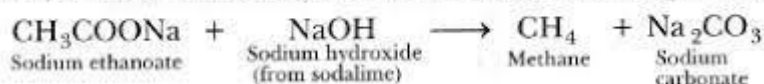
Step. 1



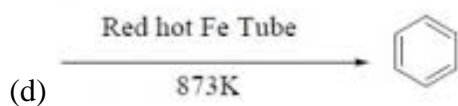
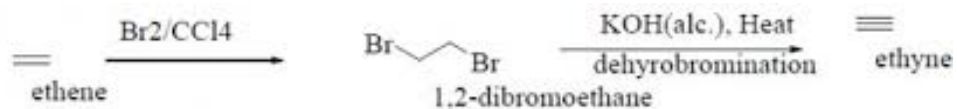
Step. 2



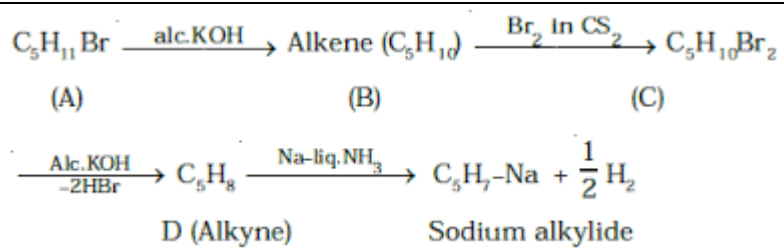
Then, sodium ethanoate is heated with sodalime to get methane.



(c)



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