CBSE TEST PAPER 01

CLASS XI CHEMISTRY (Hydrocarbons)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

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1. Classify the hydrocarbons according to the carbon – carbon bond. [1]
2. What are cycloalkanes? [1]
3. The boiling point of hydrocarbons decreases with increase in branching. Give reason. [2]
4. Unsaturated compounds undergo addition reactions. Why? [2]
5. Why does carbon have a larger tendency of catenation than silicon although they have same number of electrons? [1]
6. To which category of compounds does cyclohexane belong? [1]
7. Draw the structure of the following compounds all showing C and H atoms.

(a) 2-methyl -3-iso propyl heptanes

(b) Dicyclopropyl methane. [2]

8. Draw all the possible structural isomers with the molecular formula C_6H_{14}, Name them. [2.5]
9. Write IVPAC names of the following

$CH_3\ (CH_2)_4\ CH\ (CH_2)_3\ CH_{3\ -CH2} - CH\ (CH_3)_2$. [1]

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[ANSWERS]

Ans 01. Hydrocarbons are categorized into three categories according to the carbon – carbon bond that exists between then-

(a) saturated hydrocarbon (b) Unsaturated hydrocarbon (c) Aromatic hydrocarbon.

Ans 02. When carbon atoms form a closed chain or a ring, they are termed as cycloalkanes.

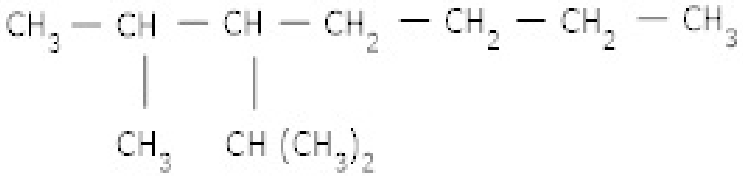
Ans 03. Branching result into a more compact (nearly spherical) structure. This reduces the effective surface area and hence the strength of the Vander wall's forces, thereby leading to a decrease in the boiling point.

Ans 04. Unsaturated hydrocarbon compounds contain carbon – carbon double or triple bonds. The π-bond is multiple bond and is unstable and therefore addition takes place across the multiple bonds.

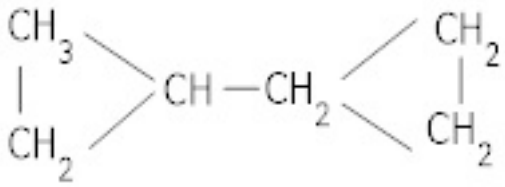
Ans 05. It is due to the smaller size of C than Si which catenates with stronger C-C bond (335 KJ mol^{-1}) than Si-Si bond (225.7 KJ mol^{-1}).

Ans 06. Saturated alicyclic hydrocarbons.

Ans 07. (a)



(b)

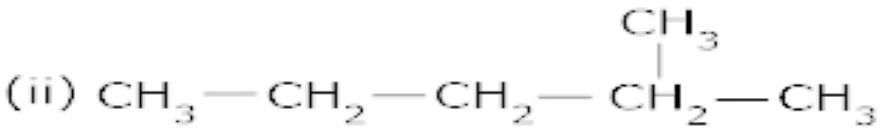


(dicyclopropyle methane)

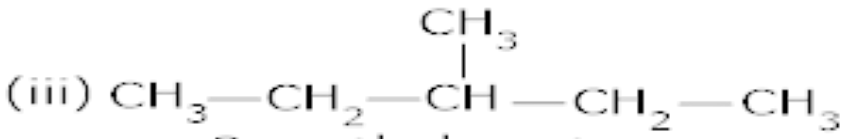
Ans 08. (i)

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

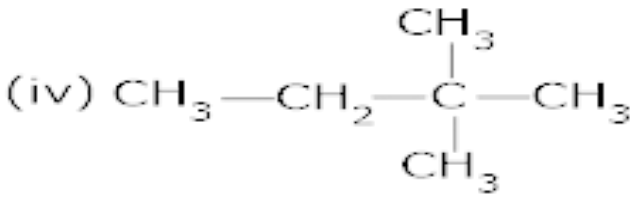
(n – hexane)

(ii) 

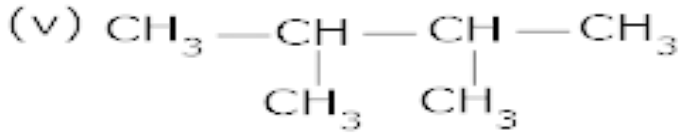
2-methyl pentane

(iii) 

3-methyl pentane

(iv) 

2,2-dimethyl butane

(v) 

2,3-dimethyl butane

Ans 09. 5-(2 – Methyl propyl) – decane.

CBSE TEST PAPER 02

CLASS XI CHEMISTRY (Hydrocarbons)

General Instruction:

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1. What is hydrogenation? [1]

2. How would you convert ethene to ethane molecule? [1]

3. Give the IUPAC name of the lowest molecular weight alkane that contains a quaternary carbon. [1]

4. Methane does not react with chlorine in dark. Why? [1]

5. Sodium salt of which acid will be needed for the preparation of propane? Write chemical equation for the reaction. [2]

6. Cyclobutane is less reactive than cyclopropane. Justify. [2]

7. How will you prepare isobutane? [2]

8. N – pentane has higher boiling point than neopentane but the melting point of neopentane is higher than that of n – pentane. [3]

CBSE TEST PAPER 02

CLASS XI CHEMISTRY (Hydrocarbons)

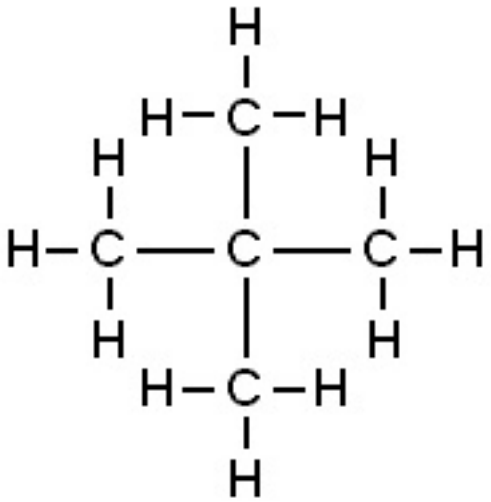
[ANSWERS]

Ans 01. Dihydrogen gas is added to alkenes and alkynes in the presence of finely divided catalysts like Pt, Pd or Ni to form alkanes. This process is called hydrogenation.

Ans 02 . Conversion of ethene to ethane can be done as follows-

$$\underset{ethene}{CH_2=CH_2} + H_2 \xrightarrow[hydrogenation]{Pt/Pd/Ni} \underset{ethane}{CH_3-CH_3}$$

Ans 03. 2, 2-dimethyl propane (Neopentane).

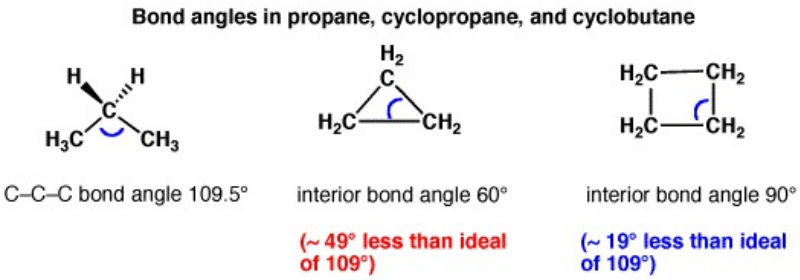


Ans 04. Chlorination of methane is a free radical substitution reaction. In dark, chlorine does not gives free radicals, hence the reaction does not occur.

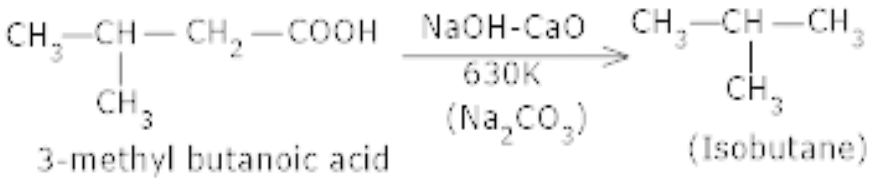
Ans 05. Sodium salt of Butanoic acid is needed to prepare propane as-

$CH_3CH_2CH_2COO\text{-}Na + NaOH \xrightarrow{Cao} CH_3CH_2CH_3 + Na_2CO_3$.

Ans 06. In cyclobutane molecule, the C-C-C bond angle is 90^0 while it is 60^0 in cyclopropane. This shows that the deviation from the tetrahedral bond angle ($109^0\ 28'$) in cyclobutane is less than in cyclopropane. In other words, cyclopropane is under great strain as compared with cyclobutane and is therefore more reactive.



Ans 07. Isobutane is obtained by decarboxylation of 3-methyl butanoic acid with soda lime at 630K.



Ans 08. Because of the presence of branches in neo-pentane the surface area and van der walls forces of attraction are very weak in neopentane than in n-pentane. Therefore the b.p of neopentane is lower than that of n-pentane.

M.P depends upon the packing of the molecules in the crystal lattice. Since neopentane are more symmetrical than n-pentane therefore, it packs much more closely in the crystal lattice than n-pentane and hence neopentane has much higher m.p than n-pentane.

CBSE TEST PAPER 03
CLASS XI CHEMISTRY
(Hydrocarbons)

General Instruction:

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1. The boiling point of alkanes shows a steady increase with increase in molecular mass. Why? [2]

2. Pentane has three isomers i.e; pentane, 2-methyl butane and 2,2-dimethyl propane . The b.p of pentane is 309.1K whereas 2,2-dimethyl propane shows a b.p of 282.5k. Why? [2]

3. Which conformation of ethane is more stable? [1]

4. Draw the New man's projection formula of the staggered form of 1,2-dichloro ethane. [2]

5. The dipole moment of trans 1,2-dichloroethane is less than the **cis** – isomer. Explain. [3]

6. All the four C-H bonds in methane are identical. Give reasons. [2]

7. When alkanes are heated, the C-C bonds rather than the C-H bonds break. Give reason. [2]

8. Explain wurtz reaction with an example. [3]

9. How would you convert cyclohexane to benzene? [2]

10. OEHow is iso-butane prepared? [2]

CBSE TEST PAPER 03

CLASS XI CHEMISTRY (Hydrocarbons)

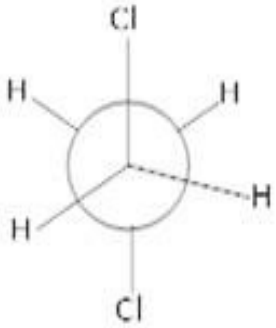
[ANSWERS]

Ans 01. This is due to the fact that the intermolecular van der walls forces increase with increase in the molecular size or the surface area of the molecule.

Ans 02. With the increase in number of branched chains, the molecule attains the shape of a sphere. This results in smaller area of contact and therefore weak inter molecular forces between spherical molecules, which can be overcome at relatively lower temperatures.

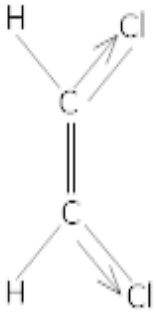
Ans 03. Staggered conformation.

Ans 04.

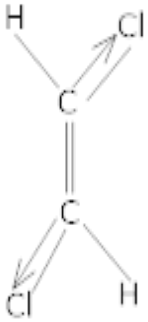


staggared form of 1,2-dichloro ethane.

Ans 05. The structure of trans isomer is more symmetrical as compared to the cis – isomer. In the trans – isomer, the dipole moments of the polar C-Cl bonds are likely to cancel effect of each other and the resultant dipole moment of the molecule is nearly zero. But in the cis – isomer, these do not cancel. Therefore, the cis isomer has a specific moment but is zero in case of trans isomer.



cis-1,2-dichloro ethane



trans -1,2-dichloro ethane

Ans 06. The four C-H bonds of methane are identical because all of these are formed by the overlapping of the same type of orbital's i.e; hybrid orbital's of carbon and s-orbital of

hydrogen.

Ans 07. When alkanes are heated, the C-C bonds rather than the C-H bonds breaks because the C-C bond has a lower bond energy (ΔH=83K Cal/mole) than the C-H bond (ΔH=99 K Cal / mole).

Ans 08. Wurtz reaction – This reaction is employed to obtain higher alkanes from the halides of lower alkanes. The halides of lower alkanes are treated with sodium metal in ether:

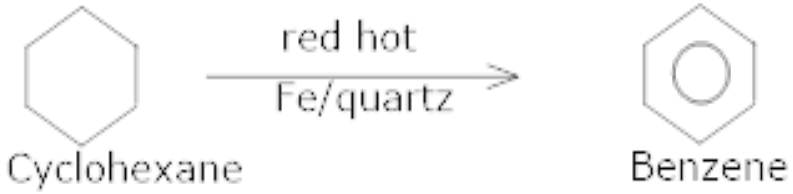
$$RX + 2Na + XR^1 \xrightarrow{ether} R - R^1 + 2Na - X$$

alkyl halide alkyl halide

$$CH_3I + 2Na + CH_3I \xrightarrow{ether} CH_3 - CH_3 + 2NaI$$

(methyl iodide) (ethane)

Ans 09. Cyclohexane when treated with iron or quartz in a red hot tube undergoes oxidation to form benzene.



Ans 10. By decarboxylation of 3 – methyl butanoic acid with soda lime at 630 K.