MALAPPURAM DISTRICT HIGHER SECONDARY CHEMISTRY TEACHERS ASSOCIATION

OXY CHEMISTRY 3.0

FIRST YEAR CHEMISTRY MODEL EXAMINATION 3.2

Time : 2 Hours | Cool off time : 20 Minutes | Maximum Score: 60

- There is a cool off time of 20 minutes in addition to the writing time.
- Read questions carefully before answering.
- Calculation, figures and graph should be shown in the answer sheet itself.

Answer any 6 questions from 1 - 12. Each carries 2 score (6 x 2 = 12)

1. Washing soda and baking soda are important compounds of sodium.
   (a) Name the method of preparation of Na_2CO_3. (1)
   (b) The formula of baking soda is ..... (1)

   Answer:- (a) Solvay process
   (b) $NaHCO_3$

2. The terms *"lime water"* and *"milk of lime"* are related to calcium hydroxide. Differentiate lime water and milk of lime. (2)

   Answer:- The aqueous solution of $Ca(OH)_2$ is called lime water. The suspension of slaked lime in water is called milk of lime.

3. Carbon exist in many allotropic forms.
   (a) Which is the thermodyanmically most stable allotropes of carbon? (1)
   (b) Which allotrope of carbon is used for making crucible? (1)

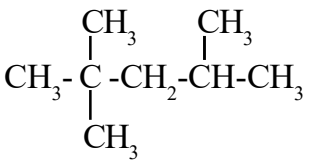
   Answer:- (a) Graphite
   (b) Graphite

4. Explain the reaction of diborane with ammonia? (2)

   Answer:- Diborane heating with ammonia gives borazine ($B_3N_3H_6$). This compound is also called inorganic benzenes.

5. Give the IUPAC names of the following compounds.

   (a) 

   (b) 

   (2)

Answer:- (a) But-2-ene
(b) 2,2,4- Trimethyl pentane

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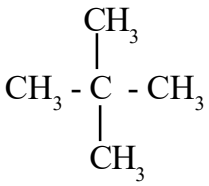
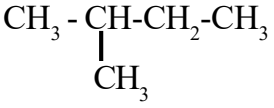
6. Write two possible chain isomers of the compound with molecular formula C_5H_{12} (2)

Answer:-

$CH_3 - CH_2-CH_2-CH_2-CH_3$





Any two

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7. H_2O_2 stored in wax-lined glass or plastic vessels in dark. Why? (2)

Answer:- Hydrogen peroxide decomposes slowly on exposure to light.

$$2H_2O_2 \rightarrow 2\,H_2O + O_2$$

The above process is catalysed by metals or alkali. Therefore H_2O_2 stored in wax-lined glass or plastic vessels in dark.

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8. What you mean by coal gasification? (2)

Answer:- The process of production of water gas from coal in the presence of steam at 1270K is called ***coal gasification.***

$$C + H_2O \rightarrow CO + H_2$$

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9. Find out the oxidation number of Cr in the following compounds. (2)

(a) $K_2Cr_2O_7$ (b) Cr_2O_3

Answer:- (a) +6 (b) +3

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10. Explain disproportionation reaction with example. (2)

Answer:- An element in one oxidation state is simultaneously oxidised and reduced is called disproportionation reaction.

Eg:- Decomposition of hydrogen peroxide.

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11. Write the product and name the reaction. (2)

$$2\,CH_3\text{-}CH_2\text{-}Cl + 2\,Na \xrightarrow{\text{ether}} \ldots\ldots\ldots\ldots + 2\,NaCl$$

Answer:- Butane.

Wurtz reaction.

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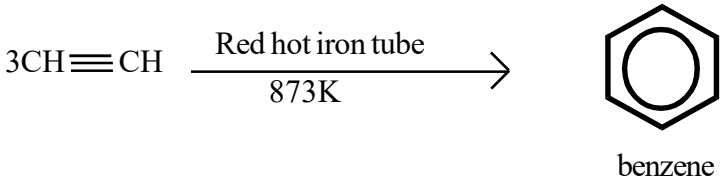
12. How will you convert ethyne in to benzene? (2)

Answer:- Ethyne is passed through red hot iron tube at 873K to form benzene.



benzene

Answer any 8 questions from 13 - 28. Each carries 3 score (8 x 3 = 24)

13. A compound of sodium which is used in fire extinguishers and is a mild antiseptic for skin infections.
    (a) Write the formula of that compound? (1)
    (b) Give its preparation (2)

Answer:- (a) $NaHCO_3$

(b) It is prepared by saturating a solution of sodium carbonate with carbon dioxide.

$$Na_2CO_3 + H_2O + CO_2 \longrightarrow 2NaHCO_3$$

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14. (a) What is plaster of paris? (1)
    (b) Give its preparation. (2)

Answer:- (a) It is the hemi hydrate of calcium sulphate.

(b) It is prepared by heating gypsum ($CaSO_4.2H_2O$) at 393K.

$$\underset{\text{gypsum}}{2(CaSO_4.2H_2O)} \xrightarrow{393K.} \underset{\text{plaster of paris}}{(2CaSO_4.H_2O)} + 3H_2O$$

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15. Diamond, graphite and fullerenes are allotropes of carbon.
    (a) Differentiate diamond and graphite. (2)
    (b) What are the different types of rings present in a buckminster fullerene? (1)

Answer:-

(a)

Diamond	Graphite
1. Hard	1. Soft.
2. Insulator	2. Conductor.
3. C -atom is sp^3 hybridised.	3. C -atom is sp^2 hybridised.
4. Cannot used as lubricant.	4. Can be used as dry lubricant.
5. No layered structure.	5. It have layered structure.

(b) It contains 20 six membered rings and 12 five membered rings.

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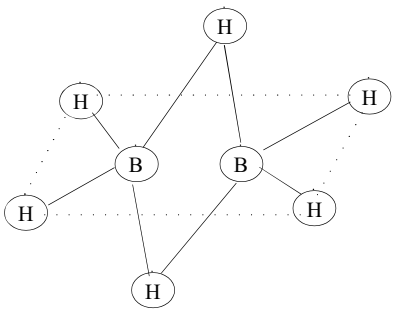
16. (a) Explain the structure of diborane. (3)

Answer:- (a) In this compound each B atom is sp^3 hybridised. This compound having four terminal Hydrogen atoms and two bridged H-atoms. The two B atoms lie in one plane. The terminal B-H bonds are normal 2-centre-2-electron bonds but the two bridged bonds (B-H-B bond) are 3- centre-2- electron bonds. It is also called as ***banana bond***.



17. How can we detect carbon and hydrogen in anorganic compound? (3)

Answer:- (a)A small amount of organic compound is heated with copper(II) oxide, the C present in the compound get oxidised to CO_2 (which turns lime water milky) and H to H_2O (which turns anhydrous $CuSO_4$ blue).

$$C + 2CuO \rightarrow CO_2 + 2Cu$$

$$2H + CuO \rightarrow H_2O + Cu$$

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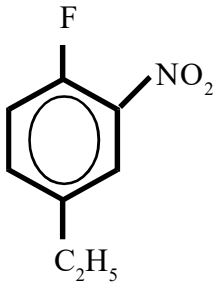
18. Write the structural formula of the following.
    (a) 3-Hydroxy pentanal (1)
    (b) 4-Ethyl-1-fluoro-2-nitrobenzene (1)
    (c) Nitro cyclohexane (1)

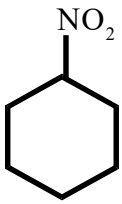
Answer:-

(a) $CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CHO$

(b)



(c)



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19. (a) Explain green house effect. (1)
    (b) Explain global warming (1)
    (c) Write examples for green house gases. (1)

Answer:- (a) Greenhouse effect is the phenomenon in which earth's atmosphere traps the heat (IR radiation) from the sun and prevents it from escaping into the outer space.

(b) The man made CO_2 produces enhanced green house effect , leading to the over warming of the earth. This extra warming is called global warming.

(c) CO_2, methane, ozone, nitrous oxide, CFCs, and water vapour.

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20. Acid rain is said to be a threat to Taj Mahal.
    (a) How acid rain formed? (2)
    (b) Give its consequence. (1)

Answer:- (a) Acid rain occurs due to the presence of oxides of sulphur and nitrogen in the atmosphere. These gases after oxidation and dissolution in water to form acids.

$$2SO_2 + O_2 + 2H_2O \longrightarrow 2H_2SO_4$$

$$4NO_2 + O_2 + 2H_2O \longrightarrow 4HNO_3$$

(b) Acid rain is highly toxic to vegetation and aquatic life. It damages buildings and statues and dissolves heavy metals from soils, rocks, and sediments. The heavy metals like copper, lead, mercury, aluminium etc., leached from the soil and enters to the well water and produce a variety of toxic effects.

21. Balance the following reaction using half reaction method. (3)

$Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) \rightarrow Fe^{3+}(aq) + Cr^{3+}$ in acidic medium.

Answer:- $6Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) + 14H^+ \rightarrow 6\,Fe^{3+}(aq) + 2Cr^{3+}(aq) + 7H_2O$

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22. Write examples for the following redox reactions. (3)

(a) Combination reactions

(b) Decompostion reactions

(c) Displacement reactions

Answer:-

(a) $C + O_2 \rightarrow CO_2$

(b) $2H_2O \rightarrow 2H_2 + O_2$

(c) $CuSO_4 + Zn \rightarrow Cu + ZnSO_4$

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23. What are different types of molecular hydrides? Give one expample for each. (3)

Answer:- Molecular hydrides are further classified in to three.

(a) electron deficient. Eg:- B_2H_6

(b) electron precise Eg:- CH_4

(c) electron rich Eg: H_2O or NH_3 or HF

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24. (a) What is water gas? (1)

(b) How will you prepare water gas? (2)

Answer:- (a) Mixture of CO and H_2 is called water gas.

(b) Reaction of steam on hydrocarbons or coke at high temperatures in the presence of catalyst gives water gas.

$$CH_4 + H_2O \xrightarrow[Ni]{1270K} CO + 3H_2$$

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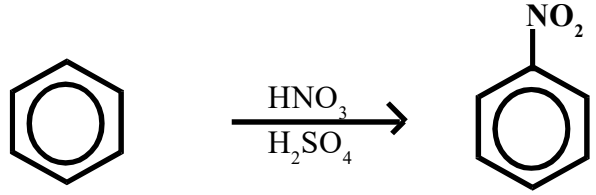
25. Write chemical equations for the following conversion (3)

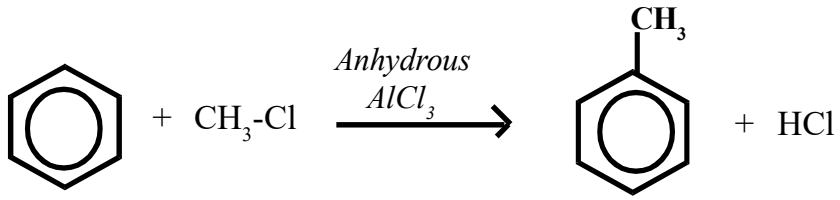
(a) Benzene into nitrobenzene

(b) Benzene into toluene

Answer:- (a) Nitration of benzene



(b) Friedel Craft alkylation



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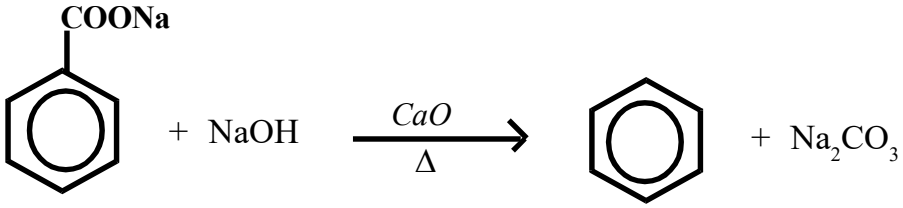
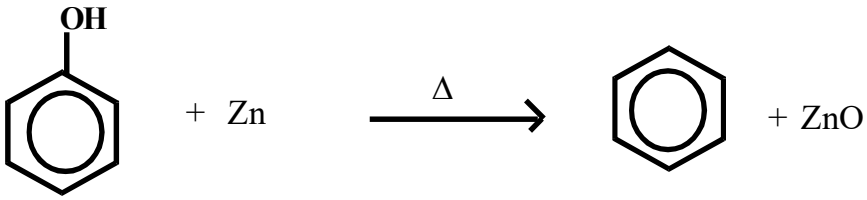
26. How will you prepare benzene form (a) benzoic acid and (b) phenol (3)

Answer:- (a) Sodium salt of benzoic acid on heating with sodalime gives benzene.



(b) Phenol is reduced to benzene by passing its vapour over heated zinc dust.



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27. Complete the following reaction. (3)

(a) CaC_2 + $2H_2O$ → ..... + $Ca(OH)_2$

(b) CH_3- C≡ CH + H_2O $\xrightarrow{Hg^{2+}/\ H^+}$ .....

(c) CH_3- CH_2 -Br + H_2 $\xrightarrow{Zn,\ H^+}$ ..... + HBr

Answer:-

(a) C_2H_2 (ethyne)
(b) CH_3-CO-CH_3 (propanone)
(c) CH_3- CH_3 (ethane)

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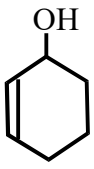
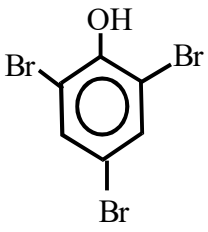
28. Write the IUPAC name of the following compound.

(a) 

(b) 

(c) CH_3-CH_2-CH=CH-CH_2-COOH

Answer:- (a) Cyclohex-2-en-1-ol
(b) 2,4,6-Tribromo phenol
(c) Hex-3-enoic acid

Answer any 6 questions from 29 - 40. Each carries 4 score (6 x 4 = 24)

29. (i) Explain the preparation of the following.
(a) CaO (b) $Ca(OH)_2$ (c) $CaCO_3$ (3)
(ii) Solvay process is not suitable for the prepartion of K_2CO_3. Give reason. (1)

Answer:-

(i) (a) It is prepared by heating lime stone ($CaCO_3$) in rotatory kiln at 1070-1270K

$$CaCO_3 \longrightarrow CaO + CO_2$$

(b) It is prepared by adding water to quick lime

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

(c) It is prepared by treating calcium hydroxide with CO_2.

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

(ii) Addition of Ammonium hydrogen carbonate to a saturated solution of KCl to form $KHCO_3$. The solubility of $KHCO_3$ is very high. Therefore it cannot be precipitated. Therefore Solvay process is not suitable for the prepartion of K_2CO_3.

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30. (a) What is the purpose of adding gypsum in cement? (1)
(b) What you mean by the settting of the cement? Give its reason? (3)

Answer:- (a) The function of gypsum is to slow down the setting of cement.
(b) When cement is mixed with water, it becomes hard mass. This process is called setting of cement. This is due to the hydration of the molecules of the constituents and their rearrangement.

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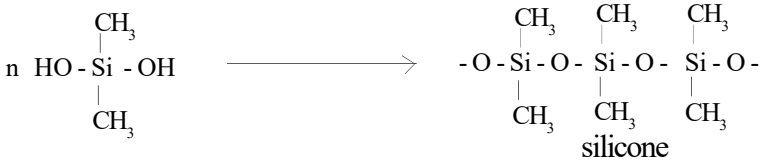
31. (a) What are silicones? (1)
(b) How will you prepare silicone? (2)
(c) Give one use of silicone? (1)

Answer:- (a) It is an organo silicon polymer containing R_2SiO as repeating unit.
(b) Methyl chloride react with Si in t he presence of Cu powder to form dichloro dimethyl silane. This compound on hydrolysis and followed by polymerisation to form silicone.

$$2CH_3Cl + Si \xrightarrow{Cu} (CH_3)_2SiCl_2$$

$$(CH_3)_2SiCl_2 + 2H_2O \longrightarrow (CH_3)_2Si(OH)_2 + 2HCl$$



silicone

(c) It is used as sealant, greases , electrical insulators and for water proofing of fabrics.

32. (a) CO is highly poisonous. Why? (2)
(b) CO is used in the extraction of many metals. Why? (1)
(c) The mixture of CO and N_2 is known as ..... (1)

Answer:- (a) CO is highly poisonous because it react with haemoglobin to form carboxy haemoglobin complex. It is highly stable than oxygen haemoglobin complex. Formation of that complex prevent the carrying of oxygen round the body and ultimately resulting in death.

(b) Ans: CO is a powerful reducing agent. It reduces metal oxides to metals. Therefore it is used in the extraction of many metals.

eg:- $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

$ZnO + CO \rightarrow Zn + CO_2$

(c) Producer gas

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33. (a) What is sodium fusion extract? (2)
(b) How can you detect the presence of nitrogen in an organic compound by using the sodium fusion extract? (2)

Answer:- (a) Lassaigne's test is conducted by using ***sodium fusion extract***.

This extract is prepared by fusing the organic substance with sodium and then it is distilled with water. During this process, the element present in the compound are converted from covalent form in to ionic form.

(b) The sodium fusion extract is boiled with ferrous sulphate solution and then acidified with conc H_2SO_4. The formation of ***Prussian blue*** colour indicates the presence of nitrogen.

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34. Briefly explain the different types of structural isomers shown by organic compound with suitable examples. (4)

Answer:-

Chain isomerism:-

Compounds with same molecular formula but different carbon skeleton.

Eg:- Butane and 2-methyl propane

Position isomerim:-

Compund with same molecular formula but differ in position of functional group, double bond or tripple bond.

Eg:- Pentan-1-ol and petan-2-ol

Functional isomerism:-

Compounds with same molecular formula but differ in functional group

Eg:- propanone and propanal

Metamerism:-

It arises due to difference in alkyl chain on either side of functional group

Eg:- methoxy propane and ethoxy ethane.

35. (a) Powder of kernel of tamarind seeds has a role in green chemistry. Explain. (2)
(b) Explain the term BOD. (1)
(c) What is the role of green chemistry in bleaching of paper. (1)

Answer:- (a) Powder of kernel of tamarind seeds has been found to be an effective material to make municipal and industrial waste water clean.It is non-toxic, biodegradable and cost effective material.

(b) It is defined as the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water.

(c) Chlorine gas was used earlier for bleaching of paper. Now a days hydrogen peroxide with suitable catalyst is used.

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36. Classify the following hydrides to ionic, covalent and metallic. (4)
CrH, $VH_{0.56}$ MgH_2, HF, NH_3 ,NaH, PH_3, H_2O,

Answer:-

Ionic	***Covalent***	***Metallic***
MgH_2	H_2O	CrH
NaH	HF	$VH_{0.56}$
	NH_3	
	PH_3	

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37. Explain reason for the follwing
(a) Water gas is also known as syn gas. (1)
(b) Hard water is harmful for boilers. (1)
(c) Phophorous cannot form penta hydrides. (2)

Answer:- (a) Water gas is used for the synthesis of methanol and number of hydrocarbons. Therefore this mixture is also known as synthesis gas or syngas.

(b) Usage of hard water results in the formation of deposits inside of the boilers. This hard deposit is called scale. Due to the formation of scale, the efficiency of boiler decreases.

(c) High enthalpy of atomisation ($\Delta_a H$) and high electron gain enthalpy ($\Delta_{eg} H$) of hydrogen do not favaour to exhibit +5 oxidation state of P.

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38. (a) Which is the major product obtained when HBr is added to propene . (1)
(b) Write chemical equation for the above reaction. (1)
(c) Name and state the rule which justify your answer (2)

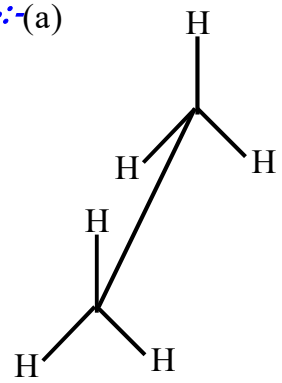
Answer:- (a) 2- bromopropane (CH_3-CHBr-CH_3)

(b) CH_3-CH=CH_2 + HBr $\rightarrow$ CH_3-CHBr-CH_3

(c) Markovnikov's rule - It state that when an unsymmetrical reagent adds to an unsymmetrical alkene, the negative part of the reagent is attached to that carbon atom which contains less number of hydrogen atom.

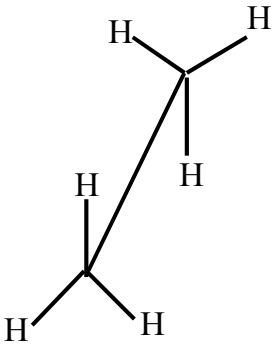
39. (a) Draw Newman and Sawhorse projection of staggered and eclipsed conformations of ethane. (3)
(b) Which one is more stable staggered or eclipsed? (1)

Answer:- (a)

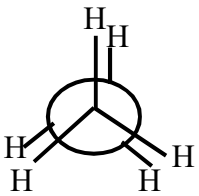


Eclipsed

Sawhorse projection of ethane

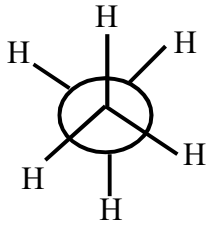


Staggered



Eclipsed

Newman projection of ethane



Staggered

(b) Staggered is more stable

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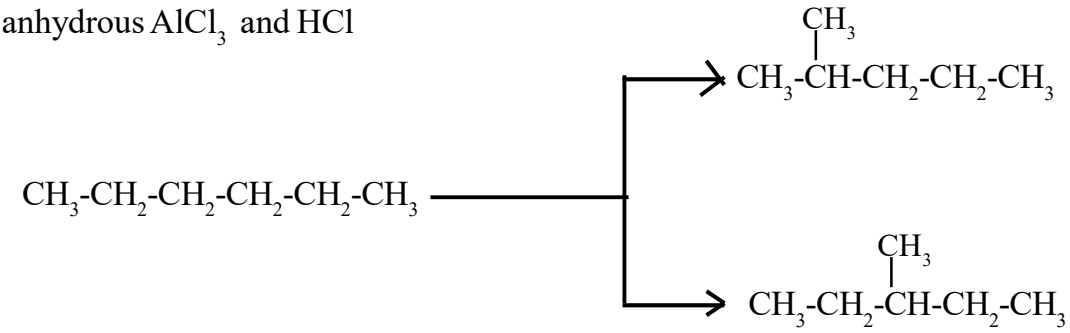
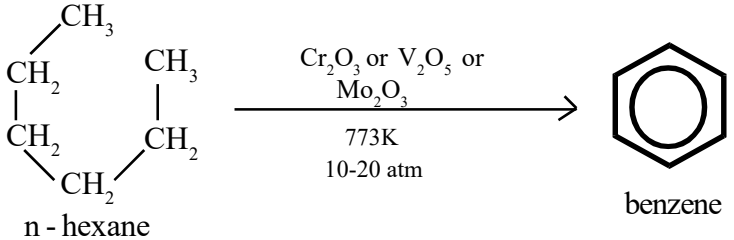
40. Explain with examples
(a) Isomerisation (2)
(b) Aromatisation (2)

Answer:-

(a) Straight chain alkanes are converted to their branched chain isomers on heating with anhydrous $AlCl_3$ and HCl



(b) Aromatisation - Alkanes containing six or more carbon atoms when heated under pressure in the presence of catalysts like Cr_2O_3, V_2O_5 etc, get converted to aromatic hydrocarbons.



n - hexane benzene