

QB365
Important Questions - Hydrocarbons
11th Standard CBSE

Chemistry

Reg.No. :

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Time : 01:00:00 Hrs

Total Marks : 50

Section-A

- 1) What happen when iodoethane is reduced with hydroiodic acid and red phosphorus? 1
- 2) Convert propane to propene. 1
- 3) Arrange the following in order of increasing ease of dehydrohalogenation C_2H_5I , C_2H_5Br , C_2H_5Cl . 1
- 4) Write chemical equation for the combustion of hexyne. 1
- 5) How will you separate propane from propyne? 1
- 6) How does the density of alkane changes with increase in the length of the carbon chain? 1
- 7) What is sodalime? 1
- 8) How will you demonstrate that double bonds of benze are somewhat different from that of olefins? 1
- 9) Suggest the name of a Lewis acid other than anhydrous aluminium chloride which can be used during ethylation of benzene. 1
- 10) Why does benzene undergo electrophilic substitution reactions easily and nucleophilic substitutions with difficulty? 1

Section-B

- 11) Write chemical equation for combustion reaction of toluene. 2
- 12) Sodium salt of which acid will be needed for the preparation of propane? Write chemical equation for the reaction. 2
- 13) Identify the structure of A and B 2
$$CH_3 - CH_2COOH \xrightarrow{KOH} A \xrightarrow{\text{Kolbe's electrolysis}} B$$
$$CH_3 - CH_2COOH \xrightarrow{KOH} CH_3CH_2COO^- K^+ \xrightarrow{\text{Kolbe's electrolysis}} CH_3CH_2CH_2CH_3$$

A B
- 14) Convert methane into ethane 2
- 15) n-propylmagnesium bromide on hydrolysis gives propane. Is there any other Grignard reagent which also gives propane? If so, give its name, structure and equation for the reaction 2
- 16) Rotation around carbon-carbon single bond of ethane is not completely free. Justify the statement. 2
- 17) On converting benzene to toluene, state whether there will be a rise or fall in the melting point. 2
- 18) Why do you alkenes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions? Explain 2

- 19) Out of benzene, m-dinitrobenzene and toluene which will undergo nitration most easily and why? 2
 Nitration is an electrophilic substitution reaction and reactivity of benzene nucleus towards E⁺ decreases in the presence of electron withdrawing group while increases in the presence of electron releasing group.
- 20) An alkane has a molecule mass of 72. Give all the possible structural isomers along with their IUPAC names. 2

Section-C

- 21) In the presence of peroxide, addition of HBr to propene takes place according to anti-Markownikoff's rule but peroxide effect is not seen in the case of HCl and HI. Explain. 5
- 22) Which of the following compounds will show cis-trans isomerism? 5
 $(CH_3)_2C=CH-C_2H_5$
- 23) Which of the following compounds will show cis-trans isomerism? 5
 $CH_2=CBr_2$
- 24) Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile, E⁺. 5
 (i) Chlorobenzene, 2, 4-dinitrochlorobenzene, p-nitrochlorobenzene
 (ii) Toluene, $p-H_3C-C_6H_4-NO_2$,
 $p-O_2N-C_6H_4-NO_2$
 Also explain ur answer.

Section-A

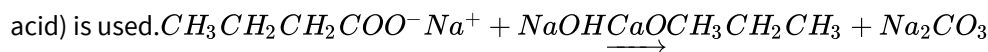
- 1) 1
- 2) 1
- 3) 1
- 4) $C_6H_{10}(g) + \frac{17}{2}O_2(g) \xrightarrow{Heat} 6CO_2(g) + 5H_2O(g)$ 1
- 5) 1
 On passing the mixture through ammoniacal AgNO₃ solution or ammoniacal CuCl₂ solution when propyne reacts while propene passes over.
- 6) 1
- 7) 1
- 8) 1
 The double bonds of olefines decolourise Br₂ in CCl₄ and discharge the pink colour of Baeyer's reagent with simultaneous formation of a brown ppt. of MnO₂ while those of benzene do not.
- 9) In this reaction, anhydrous FeCl₃ or SnCl₄ can be used in place of anhydrous AlCl₃ as a catalyst. 1
- 10) 1
 Due to the presence of delocalised 6π–electrons, benzene acts as a rich source of electrons. So, it attracts the electrophilic reagent (electron deficient species) towards itself but repels the nucleophilic reagents. That's why benzene gives electrophilic substitution reactions easily and nucleophilic substitution reaction with difficulty.

Section-B



12) 2

Since, decarbonylation of the salt gives such alkane which has one carbon atom less than that present in the acid. Thus, to prepare propane (C_3H_8), a four carbon containing acid salt, (i.e. sodium salt of butanoic acid) is used.



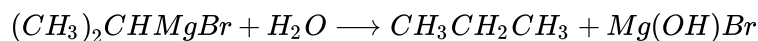
Butane



Ethane

15) 2

Iso - propylmagnesium bromide $(CH_3)_2CHMgBr$,



16) 2

Rotation around C-C single bond is not completely free and it is restricted due to repulsions between the electron clouds of C-H bonds in the adjacent carbon atoms. Therefore, ethane exists in infinite number of conformations. Out of these, two extreme conformations are staggered and eclipsed

17) 2

On converting benzene to toluene, there is a fall in the melting point although toluene has the higher molecular mass. This is because the planar molecules of benzene can pack more closely in the crystal lattice and the cohesive forces are strong, whereas the methyl group in toluene prevents such close packing.

18) 2

Alkenes are rich source of loosely held π electrons, due to which they show electrophilic addition reaction. Electrophilic addition reactions of alkenes are accompanied by large energy changes so these are energetically favourable than that of Electrophilic substitution reactions.

In special conditions alkenes also undergo free radical substitution reactions.

In arenes during electrophilic addition reactions aromatic character of benzene ring is destroyed while during electrophilic substitution reactions of arenes are energetically more favourable than that of electrophilic addition reaction.

That's why alkenes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions.

19) 2

Nitration of benzene is an electrophilic substitution reaction. Presence of electron releasing group such as $-CH_3$ activates the benzene nucleus towards electrophilic substitution while presence of electron withdrawing group such as $-NO_2$ deactivates the benzene nucleus towards electrophilic substitution.

Therefore, the ease of nitration decrease in the order

Toluene > benzene > m-dinitrobenzene

Thus, toluene will undergo nitration most easily.

- 20) The general formula of alkanes is $C_nH_{2n+2} = 12n + 1 \times (2n+2) = 72$ or $12n + 2n + 2 = 72$ or $n=5$ 2
Thus, the molecular formula of the alkane is C_5H_{12} . For structural isomers and their IUPAC names.

Section-C

- 21) 5

Peroxide effect is not observed in addition of HCl and HI. This is due to fact that the H-Cl bond being stronger ($430.5 \text{ kJ mol}^{-1}$) than H-Br bond ($363.7 \text{ kJ mol}^{-1}$) is not cleaved by the free radical whereas the H-I bond is weaker ($296.8 \text{ kJ mol}^{-1}$) and iodine free radicals combine to form iodine molecules instead of adding to the double bond.

- 22) For exhibiting cis-trans (or geometrical isomerism, a molecule must fulfil the following condition. 5
It must have atleast one double bond.

- 23) For exhibiting cis-trans (or geometrical isomerism, a molecule must fulfil the following condition. 5
The groups attached to each double bonded carbon atom must be different.

- 24) 5

Presence of electron releasing group (or activating group) increases the electron density in benzene nucleus. Therefore, electrophile will attack benzene nucleus easily. But, the presence of electron withdrawing group like $-NO_2$ decrease the electron density in benzene ring. Therefore, electrophile will attack benzene nucleus with difficulty. The order of reactivity towards electrophile, E^+ in order of their decreasing relative reactivity is

(i) Chlorobenzene > p-nitrochlorobenzene > 2, 4- dinitrochlorobenzene

(ii) Toluene > $p - CH_3 - C_6H_4 - NO_2$ > $p - O_2N - C_6H_4 - NO_2$