Answer to Some Selected Problems

UNIT 8

8.25 15 g

UNIT 12

12.32 Mass of carbon dioxide formed = 0.505 g

Mass of water formed = 0.0864 g

12.33 % fo nitrogen = 56

12.34 % of chlorine = 37.57

12.35 % of sulphur = 19.66

UNIT 13

13.1 Due to the side reaction in termination step by the combination of two $\dot{C}H_3$ free radicals.

13.2 (a) 2-Methyl-but-2-ene (b) Pent-1-ene-3-yne
(c) Buta-1, 3-diene (d) 4-Phenylbut-1-ene
(e) 2-Methylphenol (f) 5-(2-Methylpropyl)-decane
(g) 4-Ethyldeca –1,5,8- triene

13.3 (a) (i) $CH_2 = CH - CH_2 - CH_3$ But-1-ene
(ii) $CH_3 - CH_2 = CH - CH_3$ But-2-ene
(iii) $CH_2 = \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} - CH_3$ 2-Methylpropene

(b) (i) $HC \equiv C - CH_2 - CH_2 - CH_3$ Pent-1-yne
(ii) $CH_3 - C \equiv C - CH_2 - CH_3$ Pent-2-yne
(iii) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - C \equiv CH$ 3-Methylbut-1-yne

13.4 (i) Ethanal and propanal (ii) Butan-2-one and pentan-2-one
(iii) Methanal and pentan-3-one (iv) Propanal and benzaldehyde

13.5 3-Ethylpent-2-ene

13.6 But-2-ene

13.7 4-Ethylhex-3-ene

$$CH_3 - CH_2 - \underset{\displaystyle CH_2-CH_3}{\overset{\displaystyle |}{C}} = CH - CH_2 - CH_3$$

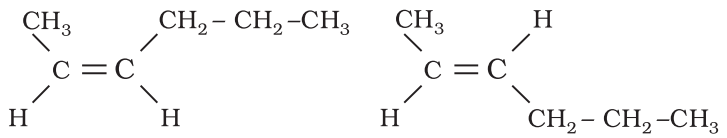
13.8 (a) $C_4H_{10}(g)+13/2\,O_2(g) \xrightarrow{\Delta} 4CO_2(g)+5H_2O(g)$

(b) $C_5H_{10}(g)+15/2\,O_2(g) \xrightarrow{\Delta} 5CO_2(g)+5H_2O(g)$

(c) $C_6H_{10}(g)+17/2\,O_2(g) \xrightarrow{\Delta} 6CO_2(g) + 5H_2O(g)$

(d) $C_7H_8(g) + 9O_2(g) \xrightarrow{\Delta} 7CO_2(g)+4H_2O(g)$

13.9



cis-Hex-2-ene *trans*-Hex-2-ene

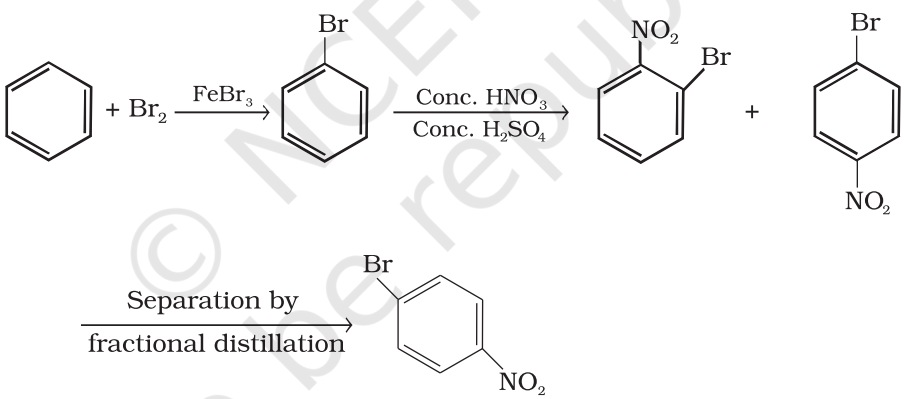
The cis form will have higher boiling point due to more polar nature leading to stronger intermolecular dipole–dipole interaction, thus requiring more heat energy to separate them.

13.10 Due to resonance

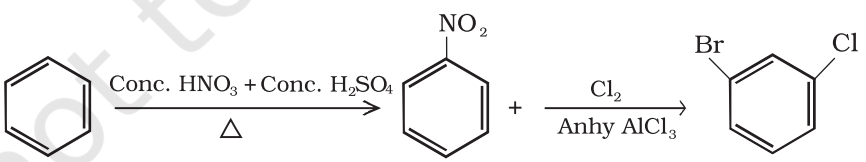
13.11 Planar, conjugated ring system with delocalisation of (4n+2) π electrons, where, n is an integer

13.12 Lack of delocalisation of (4n +2) π electrons in the cyclic system.

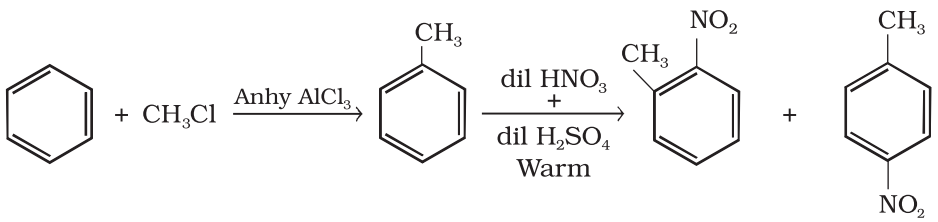
13.13 (i)

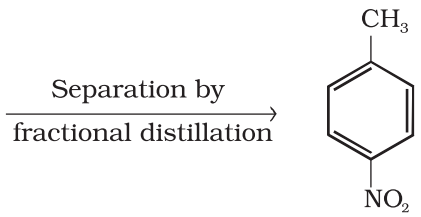


(ii)

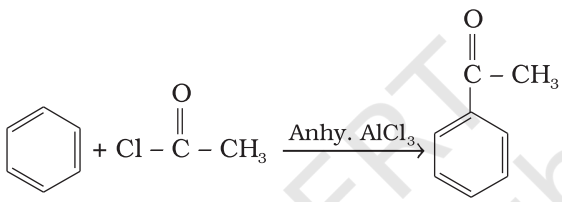


(iii)

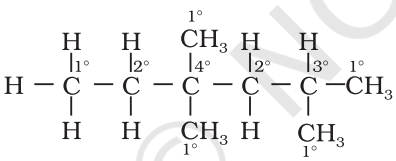




(iv)



13.14



15 H attached to 1° carbons
4 H attached to 2° carbons
1 H attached to 3° carbons

13.15 More the branching in alkane, lower will be the boiling point.

13.16 Refer to addition reaction of HBr to unsymmetrical alkenes in the text.

13.17 $CH_3 - C(=O) - CH_3$, $CH_3 - CH(=O)$ and $C_6H_4(CHO)_2$

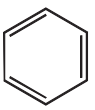
All the three products cannot be obtained by any one of the Kekulé's structures. This shows that benzene is a resonance hybrid of the two resonating structures.

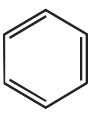
13.18 $H - C \equiv C - H > C_6H_6 > C_6H_{14}$. Due to maximum *s* orbital character in enthyne (50 per cent) as compared to 33 per cent in benzene and 25 per cent in *n*-hexane.

13.19 Due to the presence of 6 π electrons, benzene behaves as a rich source of electrons thus being easily attacked by reagents deficient in electrons.

13.20 (i) $3\ CH{\equiv}CH \xrightarrow[\text{Iron tube}\\ 873K]{\text{Red hot}}$ 

(ii) $C_2H_4 \xrightarrow{Br_2} \underset{\underset{Br}{|}}{CH_2}-\underset{\underset{Br}{|}}{CH_2} \xrightarrow{\text{alc. KOH}} CH_2=CHBr \xrightarrow{NaNH_2}$

$HC \equiv HC \xrightarrow[\text{Iron tube}\\ 873k]{\text{Red hot}}$ 

(iii) $C_6H_{14} \xrightarrow[773\ K,\ 10\text{-}20\ atom]{Cr_2O_3\ /\ V_2O_5/Mo_2O_3}$ 

13.21 $CH_2 = \underset{\underset{CH_3}{|}}{C} - CH_2 - CH_3$ 2-Methylbut-1-ene

$CH_3 - \underset{\underset{CH_3}{|}}{C} = CH - CH_3$ 2-Methylbut-2-ene

$CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH = CH_2$ 3-Methylbut-1-ene

13.22 (a) Chlorobenzene>*p*-nitrochlorobenzene> 2,4 – dinitrochlorobenzene

(b) Toluene > *p*-CH_3-C_6H_4-NO_2 > *p*-O_2N–C_6H_4–NO_2

13.23 Toleune undergoes nitration most easily due to electron releasing nature of the methyl group.

13.24 $FeCl_3$

13.25 Due to the formation of side products. For example, by starting with 1-bromopropane and 1-bromobutane, hexane and octane are the side products besides heptane.