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Answer to Some Selected Problems

UNIT 8

8.25 15 g

UNIT 12

Mass of carbon dioxide formed = 0.505 g12.32 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 CH₃ 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
 - (a) (i) $CH_{2} = CH CH_{2} CH_{3}$
 - (ii) $CH_3 CH_2 = CH CH_3$
 - (iii) $CH_2 = C CH_3$ CH₃

But-1-ene

But-2-ene

2-Methylpropene

(b) (i)
$$HC = C - CH_2 - CH_2 - CH_3$$

(ii) $CH_3 - C = C - CH_2 - CH_3$

$$HC \equiv C - CH_2 - CH_3 - CH_3$$
 Per

(iii)
$$CH_3 - CH - C \equiv CH$$

$$CH_3$$

Pent-1-yne Pent-2-yne

3-Methylbut-1-yne

- 13.4 (i) Ethanal and propanal
 - (iii) Methanal and pentan-3-one
- (ii) Butan-2-one and pentan-2-one
- 13.5 3-Ethylpent-2-ene
- But-2-ene 13.6

13.3

4-Ethylhex-3-ene 13.7

$$\label{eq:ch3} \begin{array}{c} \operatorname{CH}_3 - \operatorname{CH}_2 - \operatorname{C} = \operatorname{CH} - \operatorname{CH}_2 - \operatorname{CH}_3 \\ | \\ \operatorname{CH}_2 - \operatorname{CH}_3 \end{array}$$

(iv) Propanal and benzaldehyde

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

(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
$$CH_3$$
 $CH_2 - CH_2 - CH_3$ CH_3 H $C = C$ $C = C$

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 $(4n +2) \pi$ electrons in the cyclic system.
- 13.13 (i)

$$+ \operatorname{Br}_{2} \xrightarrow{\operatorname{FeBr}_{3}} \xrightarrow{\operatorname{Conc. \ HNO_{3}}} \operatorname{Conc. \ H2SO_{4}} + \operatorname{NO_{2}} \operatorname{Br}$$

(ii)

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(iii)

$$\overbrace{\text{Separation by}}^{\text{CH}_3}$$

$$\overbrace{\text{fractional distillation}}^{\text{CH}_3}$$

(iv)
$$\begin{array}{c} O \\ C - CH_3 \end{array}$$

$$\begin{array}{c} O \\ C - CH_3 \end{array}$$

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
$$CH_3 - C = O$$
 $CH_3 - C = O$ CHO and $CH_3 - C = O$ CHO

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 > C₆H₆ > C₆H₁₄. 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.

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

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

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

2-Methylbut-1-ene

$$CH_{3}$$

$$CH_{3} - C = CH - CH_{3}$$

2-Methylbut-2-ene

$$\begin{array}{c} \operatorname{CH_3} \\ | \\ \operatorname{CH_3-CH-CH=CH_2} \end{array}$$

3-Methylbut-1-ene

- 13.22 (a) Chlorobenzene>p-nitrochlorobenzene> 2,4 dinitrochlorobenzene (b) Toluene>p-CH $_3$ -C $_6$ H $_4$ -NO $_2$ >p-O $_2$ N-C $_6$ H $_4$ -NO $_2$
- 13.23 Toleune undergoes nitration most easily due to electron releasing nature of the methyl group.
- 13.24 FeCl₃
- 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.