Answer to Some Selected Problems

UNIT 7

7.25 15 g

UNIT 8

8.32 Mass of carbon dioxide formed =
$$0.505 g$$

Mass of water formed = $0.0864 g$

UNIT 9

- 9.1 Due to the side reaction in termination step by the combination of two $\mathring{C}H_3$ free radicals.
- 9.2 (a) 2-Methyl-but-2-ene
 - (c) Buta-1, 3-diene
 - (e) 2-Methylphenol
 - (g) 4-Ethyldeca -1,5,8- triene
- 9.3 (a) (i) $CH_2 = CH CH_2 CH_3$ (ii) $CH_3 - CH_2 = CH - CH_3$

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

 CH_3

(b) (i)
$$HC \equiv C - CH_2 - CH_2 - CH_3$$

(ii) $CH_3 - C \equiv C - CH_2 - CH_3$

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

 CH_3

- 9.4 (i) Ethanal and propanal
 - (iii) Methanal and pentan-3-one
- 9.5 3-Ethylpent-2-ene
- 9.6 But-2-ene
- 9.7 4-Ethylhex-3-ene

- (b) Pent-1-ene-3-yne
- d) 4-Phenylbut-1-ene
- (f) 5-(2-Methylpropyl)-decane

But-1-ene

But-2-ene

2-Methylpropene

Pent-1-yne

Pent-2-yne

3-Methylbut-1-yne

- (ii) Butan-2-one and pentan-2-one
- (iv) Propanal and benzaldehyde

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9.8 (a)
$$C_4H_{10}(g)+13/20_2(g) \xrightarrow{\Delta} 4CO_2(g) + 5H_2O(g)$$

(b)
$$C_5H_{10}(g)+15/20_2(g) \xrightarrow{\Delta} 5CO_2(g) + 5H_2O(g)$$

(c)
$$C_5H_{10}(g) + 17/2 O_2(g) \xrightarrow{\Delta} 6CO_2(g) + 5H_2O(g)$$

(d)
$$C_7H_8(g) + 90_2(g) \xrightarrow{\Delta} 7CO_2(g) + 4H_2O(g)$$

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.

- 9.10 Due to resonance
- 9.11 Planar, conjugated ring system with delocalisation of (4n+2) electrons, where, n is an integer
- 9.12 Lack of delocalisation of $(4n +2) \pi$ electrons in the cyclic system.
- 9.13 (i)

(ii)
$$NO_2$$
 $Conc. HNO_3 + Conc. H_2SO_4$ $+$ Cl_2 $Anhy AlCl_3$

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(iii)

$$\begin{array}{c} \text{Separation by} \\ \hline \text{fractional distillation} \end{array} \qquad \begin{array}{c} \text{CH}_3 \\ \\ \text{NO}_2 \end{array}$$

(iv)
$$O \\ C - CH_3$$

$$Anhy. AlCl_3$$

9.14

15 H attached to 1 carbons

4 H attached to 2 carbons

1 H attached to 3 carbons

- 9.15 More the branching in alkane, lower will be the boiling point.
- 9.16 Refer to addition reaction of HBr to unsymmetrical alkenes in the text.

9.17
$$CH_3 - C = O$$
 $CH_3 - C = O$ 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.

- 9.18 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.
- 9.19 Due to the presence of 6π electrons, benzene behaves as a rich source of electrons thus being easily attacked by reagents deficient in electrons.

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9.20 (i)
$$_{3} \text{ CH} \equiv \text{CH} \xrightarrow{\text{Red hot} \atop \text{Iron tube} \atop 873\text{K}}$$

(ii) $C_{2}H_{4} \xrightarrow{\text{Br}_{2}} CH_{2} \xrightarrow{\text{CH}_{2}} CH_{2} \xrightarrow{\text{alc, KOH}} CH_{2} = \text{CHNr} \xrightarrow{\text{NaNH}_{2}} CH_{2} \xrightarrow{\text{Red hot} \atop \text{Iron tube} \atop \text{Roth hot} \atop \text{Iron tube} \atop \text{Roth hot}}$

(iii) $C_{6}H_{14} \xrightarrow{\text{Cr}_{2}O_{3} / V_{2}O_{5}/\text{Mo}_{2}O_{3}} CH_{3} \xrightarrow{\text{CH}_{3}} CH_{2} = C - CH_{2} - CH_{3}$

2-Methylbut-1-ene

$$CH_{3} \xrightarrow{\text{CH}_{3}} CH_{3} - C = CH - CH_{3}$$

2-Methylbut-2-ene

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

(b) Toluene > p-CH₃-C₆H₄-NO₂ > p-O₂N-C₆H₄-NO₂

- 9.24 FeCl₃
- 9.25 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.

