

Solutions

Each answer shows the steps, then the **result**.

2.1

- alkanes are saturated because they have **only single C–C bonds**

2.2

- complete combustion: **carbon dioxide** and **water**

3.1 B

- the substitution needs **ultraviolet light**
- A is hydrogenation; C is hydration; D is not enough

3.2

(a)

- $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$

(b)

- substitution**

3.3

- $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$

3.4

(a)

- a hydrocarbon: **only C and H**
- only single C–C bonds**
- general formula $\text{C}_n\text{H}_{2n+2}$

(b)

- $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- incomplete combustion produces **toxic, colourless, odourless carbon monoxide**

(c)

- substitution**
- $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$
- UV light supplies the energy to **break the Cl–Cl bond**

(d)

- two carbons joined by a single bond, each with three hydrogens, all bonds drawn
- C–C and C–H bonds are **strong and not polar**, so a great deal of energy is needed to react