

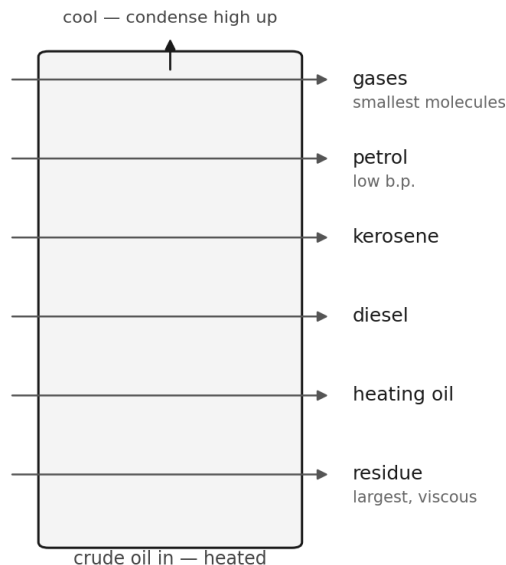
Exercise walk-through

7.1

Crude oil, fuels and feedstock (4.7.1.1–4.7.1.3)

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Crude oil and fractions



- Alkanes C_nH_{2n+2} — methane, ethane, propane, butane.
- Distillation — evaporate, condense by boiling point; small high, large low.
- Bigger molecules — hotter boiling, thicker, less flammable.

Polymers

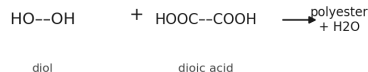
addition — monomer to repeating unit



n of them join — no other product

condensation — two monomers, water out

(2 functional groups)



- Addition — monomers join, nothing lost, unit equals monomer.
- (HT) condensation — two functional groups each, water lost, polyester.
- Natural — DNA nucleotides; proteins, starch, cellulose.

Exercises 2.1·2.3

2.1 Give the formula of the alkane with four carbon atoms. [1]

2.2 State two trends in properties as hydrocarbon molecules get bigger. [2]

2.3 What type of hydrocarbon decolourises bromine water? [1]

3 Exam-style questions

Exercises 2.1·2.3

2.1 Give the formula of the alkane with four carbon atoms. [1]

2.1 C₄H₁₀.

2.2 State two trends in properties as hydrocarbon molecules get bigger. [2]

2.2 Any two of: boiling point rises; viscosity increases; flammability decreases.

2.3 What type of hydrocarbon decolourises bromine water? [1]

3 Exam-style questions

2.3 An alkene – unsaturated.

Exercises 3.1·3.3

3.1 Explain how fractional distillation separates crude oil into fractions. [4]

3.2 Balance and complete: $\text{C}_6\text{H}_{14} \rightarrow \text{C}_4\text{H}_{10} + \text{_____}$. Name the missing product. [3]

3.3 Describe the two industrial methods of cracking and why cracking is commercially necessary. [5]

Exercises 3.1·3.3

3.1 Explain how fractional distillation separates crude oil into fractions. [4]

3.1 The oil is heated and vapourised; the column is cooler towards the top; vapours condense at the level where the temperature equals their boiling point; molecules with similar boiling points – similar sizes – collect as the same fraction.

3.2 Balance and complete: $\text{C}_6\text{H}_{14} \rightarrow \text{C}_4\text{H}_{10} + \text{_____}$. Name the missing product. [3]

3.2 C_2H_4 ; $\text{C}_6\text{H}_{14} \rightarrow \text{C}_4\text{H}_{10} + \text{C}_2\text{H}_4$ is balanced – 6 C and 14 H each side; ethene.

3.3 Describe the two industrial methods of cracking and why cracking is commercially necessary. [5]

3.3 Catalytic cracking – vaporised hydrocarbon passed over a hot catalyst; steam cracking – vaporised hydrocarbon mixed with steam at very high temperature. Cracking provides smaller alkanes for fuels, in higher demand than the large fractions supplied by distillation; and alkenes for polymers and other chemicals.