



Year: 11

Topic: 5.5 CRUDE OIL, FUELS AND CARBON COMPOUNDS

Knowledge and Understanding to be developed:

This topic provides an introduction to the skills and knowledge, including the representation and naming of organic structures, needed in organic chemistry. The formation and fractional distillation of crude oil, cracking and polymerisation are explored and the products of each process explained. Higher tier learners will be introduced to the concept of isomerism. Learners should be able to write word and balanced symbol equations for combustion, cracking and addition reactions and symbol equations representing polymerisation.

Working Scientifically

There are opportunities here for learners to use theories, models and ideas to develop scientific explanations; to communicate information and ideas in appropriate ways using appropriate terminology

Mathematical Skills

Mathematical skills will be used in this topic to balance organic formulae and chemical equations. Ideas of general formulae and the relationships involved can be investigated

Key Terms to be learned this topic:

Hydrocarbons	Fractional Distillation
Alkane	Alkene
Polymer	Monomer
	recycling

Learning Objectives and Outcomes:

Students should be able to demonstrate and apply their knowledge and understanding of :

- (a) crude oil as a complex mixture of hydrocarbons that was formed over millions of years from the remains of simple marine organisms
- (b) the fractional distillation of crude oil
- (c) fractions as containing mixtures of hydrocarbons (alkanes) with similar boiling points
- (d) the trends in properties of fractions with increasing chain length and the effect on their usefulness as fuels
- (e) the global economic and political importance and social and environmental impact of the oil industry
- (f) the combustion reactions of hydrocarbons and other fuels
- (g) how to determine experimentally the energy per gram released by a burning fuel
- (h) the combustion reaction of hydrogen and its use as an energy source including its advantages and disadvantages as a fuel
- (i) the fire triangle in fire-fighting and fire prevention
- (j) the cracking of some fractions to produce smaller and more useful hydrocarbon molecules, including monomers (alkenes) which can be used to make plastics
- (k) the general formula C_nH_{2n+2} for alkanes and C_nH_{2n} for alkenes
- (l) the names and molecular and structural formulae for simple alkanes and alkenes
- (m) isomerism in more complex alkanes and alkenes
- (n) the addition reactions of alkenes with hydrogen and bromine and the use of bromine water in testing for alkenes
- (o) the addition polymerisation of ethene and other monomers to produce polythene, poly(propene), poly(vinylchloride) and poly(tetrafluoroethene)
- (p) the general properties of plastics and the uses of polythene, poly(propene), poly(vinylchloride) and poly(tetrafluoroethene)
- (q) the environmental issues relating to the disposal of plastics, in terms of their non-biodegradability, increasing pressure on landfill for waste disposal, and how recycling addresses these issues as well as the need to carefully manage the use of finite natural resources such as crude oil

SPECIFIED PRACTICAL WORK

- Determination of the amount of energy released by a fuel.

