Summary
7.1

Section 7 Summary

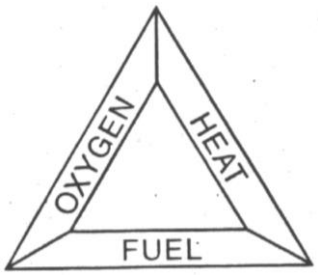
7.1 Fire

a) A **fuel** is a chemical which is burned to produce energy.

b) When a substance burns it reacts with **oxygen**.

c) **Combustion** is another word for burning.

d) A fire needs
- fuel
- oxygen (from air)
- high temperature



Remove any one of the three sides and the fire goes out!

e) **Fire-fighting methods** in the lab and the home include using:

fire blanket	water	carbon dioxide
sand	foam	white powder

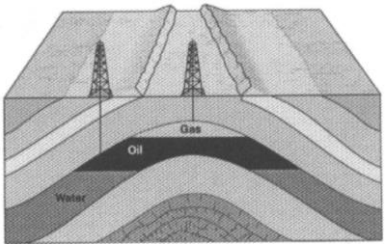
f) Different extinguishing methods are used in different situations:
- Water must not be used for electrical, oil or petrol fires
- Foam must not be used on electrical fires
- Fire-blankets stop oxygen getting to the burning fuel

Summary
7.2

Section 7 Summary

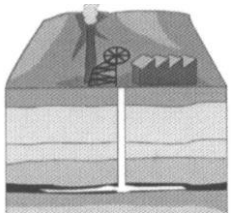
7.2 Finite Resources

a) **Fossil fuels** are formed from animal and plant remains over a very long period of time.



b) There are many examples of fossil fuels

- coal
- natural gas (sometimes called just 'gas')
- oil
- peat



c) Fossil fuels are **finite resources**

- finite resources cannot be replaced
- once they are used they are gone forever

d) Over-use of fossil fuels may lead to a **fuel crisis**

- If there is no petrol then no-one can get to work

e) **Oil spillages** at sea can cause great damage to marine life and the environment.

- Oil slicks form on top of water
- Birds get hurt and die when covered in crude oil

f) The compounds which are found in fossil fuels are mainly **hydrocarbons**.

g) A **hydrocarbon** is a compound which contains *hydrogen* and *carbon* only.

h) Hydrocarbons burn in a plentiful supply of air to produce **carbon dioxide** and **water**:

- Carbon dioxide turns limewater milky
- Water boils at 100°C and freezes at 0°C

Section 7 Summary

7.3 Renewable Resources

a) **Renewable sources** of energy can be replaced. They are not finite and will last a long time. They include:
- Methane (biogas)
- ethanol
- hydrogen

b) *Biogas* contains flammable **methane** gas
- generated by the decomposition of waste plant material e.g. grass cuttings and rotting food.

c) **Ethanol** is obtained from sugar cane
- mixed with petrol to make a fuel for cars.

d) **Hydrogen** is a likely fuel for the future
- Made from breaking down water
- When burned, water is made again
- Clean waste products and no carbon dioxide
- Hydrogen is not a fossil fuel

Summary 7.4

Section 7 Summary

7.4 Important Processes

a) **Crude oil** is a mixture of hydrocarbons.

b) **Fractional distillation** separates crude oil into different useful fuel fractions:
- each fraction is a mixture of hydrocarbons with a similar boiling point
- a **fraction** is a group of hydrocarbons with similar boiling points.

c) **Boiling points** of fractions is related to molecule size:
- smaller molecules tend to boil more easily
- larger molecules have higher boiling points.

d) The different fractions are used as different **fuels**.

Gas Fraction	is used to make	camping gas, Calor Gas
Naphtha Fraction	is used to make	petrol
Kerosene Fraction	is used to make	aircraft fuel, paraffin
Light Gas Oil Fraction	is used to make	diesel
Heavy Gas Oil Fraction	is used to make	lubricating oil
Residue	is used to make	tar & bitumen

e) Fractions have different **physical properties**:

Fraction	evaporation	viscosity	flammability	boiling point
Gas Fraction	easy	thin	high	low
Naphtha Fraction	↓	↓	↑	↓
Kerosene Fraction	↓	↓	↑	↓
Gas Oil Fraction	↓	↓	↑	↓
Heavy Gas Oil Fraction	↓	↓	↑	↓
Residue	hard	thick	low	high

f) Fractional distillation makes too more long-chain hydrocarbons than we use up:
- **cracking** uses up these extra long-chain hydrocarbons
- cracking produces smaller, more useful molecules for petrol
- cracking also produces smaller molecules for making plastics

Section 7 Summary

7.5 Pollution Problems

a) When hydrocarbons burn in a low supply of oxygen, pollution can be formed:
   - **carbon** (black soot)
   - **carbon monoxide** (a poisonous gas)

   This is called **incomplete combustion**.

b) The burning of some fuels like coal releases **sulphur dioxide**:
   - sulphur dioxide is a poisonous gas
   - sulphur dioxide dissolves in water to form acid rain.

c) **Nitrogen dioxide** is a poisonous gas:
   - nitrogen and oxygen from the air can react in the engine to form nitrogen dioxide
   - nitrogen dioxide dissolves in water to form acid rain
   - the spark in a petrol engine provides the energy to join nitrogen and oxygen gases into nitrogen dioxide

d) **Lead** compounds in some type of petrols cause pollution.

e) **Benzene** fumes in unleaded petrol are toxic.

f) **Catalytic converters** are fitted to car exhausts
   - convert the pollutant gases to harmless gases
   - unburnt hydrocarbons are burned completely
   - nitrogen dioxide is turned back into harmless nitrogen