

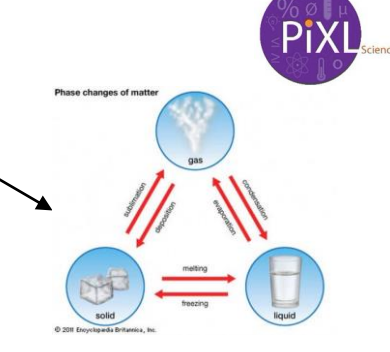
Pure substances
A pure substance is a single element or compound, not mixed with any other substance.
Pure substances melt and boil at specific temperatures. Heating graphs can be used to distinguish pure substances from impure.

Solid, liquid, gas
Melting and freezing happen at melting point, boiling and condensing happen at boiling point.

SOLID **LIQUID** **GAS**

The amount of energy needed for a state change depends on the strength of forces between particles in the substance.

s	solid
l	liquid
g	gas



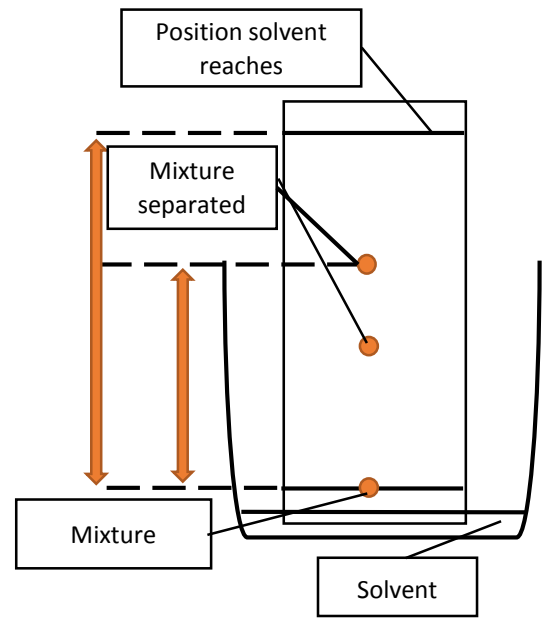
States of matter

Energy and movement
Gas particles have higher levels of energy than liquids and solids

Gas particles move more than the other states of matter, with solids moving the least due to their tightly packed arrangement. Solid particles can only vibrate around their fixed positions.

EDEXCEL TOPIC 2: STATES OF MATTER AND MIXTURES 1

Method of separating substances



Chromatography

Fractional distillation

Fractions
The hydrocarbons in crude oil can be split into fractions

Fractional distillation
Crude oil is heated and hydrocarbons boil and condense at certain temperatures

Each fraction contains molecules with a similar number of carbon atoms in them. The process used to do this is called fractional distillation.

This is due to the different lengths of hydrocarbon chains.

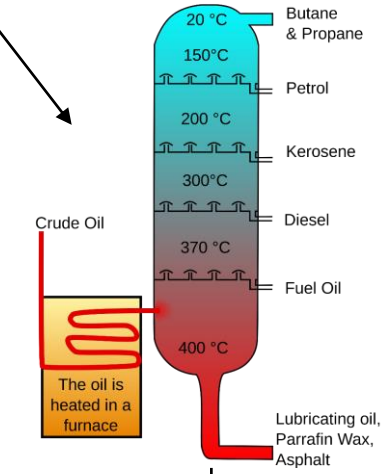
Simple distillation

Distillation
Used to separate a mixture of liquids

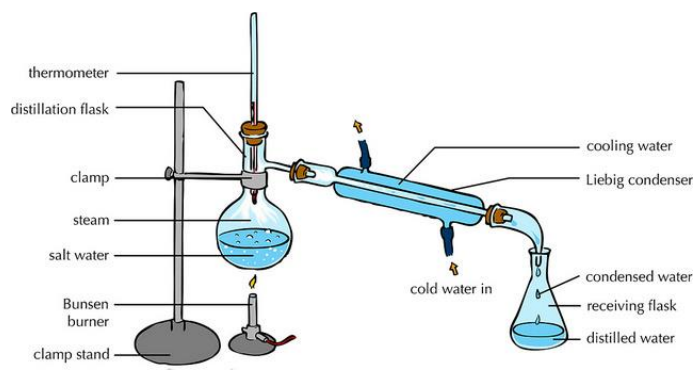
Boiling points
Each of the liquids in the mixture will have a different boiling point

During distillation, the mixture gets heated causing one liquid at a time to evaporate and then condense in the Liebig condenser.

This enables the liquids to be separated. Distillation can also be used to analyse purity of a substance as pure substances have a sharp boiling point.



Chromatography	Can be used to separate mixtures and help identify substances.	Involves a mobile phase (e.g. water or ethanol) and a stationary phase (e.g. chromatography paper).
R_f Values	The ratio of the distance moved by a compound to the distance moved by solvent.	$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$
Pure substances	The compounds in a mixture separate into different spots.	This depends on the solvent used. A pure substance will produce a single spot in all solvents whereas an impure substance will produce multiple spots.



Using fractions
Fractions can be processed to produce fuels and feedstock for petrochemical industry

We depend on many of these fuels; petrol, diesel and kerosene.

Many useful materials are made by the petrochemical industry; solvents, lubricants and polymers.