

Science & Technology 8

Pure Substances and Mixtures

Name:

REVIEW

Physical Change: A change in appearance. The substance remains the same.

Ex. Tearing a piece of paper in two.

Chemical Change: A non-reversible change that produces a new substance.

Ex. Burning a piece of paper.

Observations of a chemical change taking place:

- Light
- Heat given off
- Gas released
- Change of colour (ie. rusting)
- Precipitate/residue formed

Particle Model

Solid:

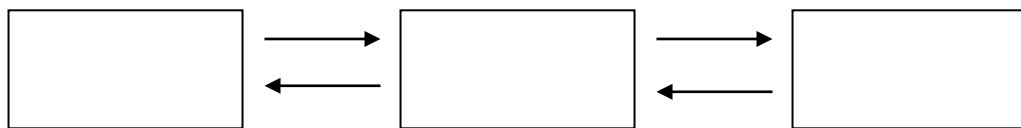
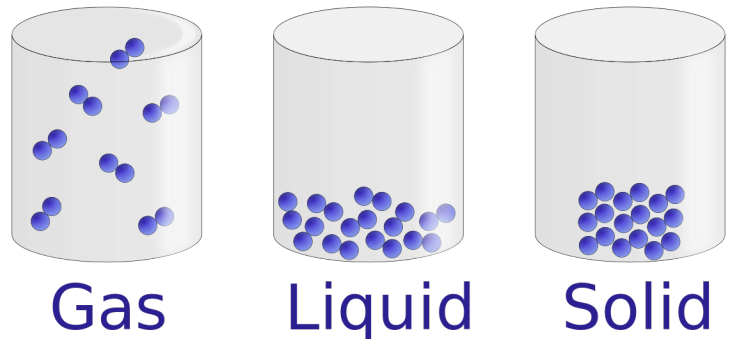
- The particles are close together.
- The particles vibrate

Liquid:

- The particles are more spread out.
- The particles rotate

Gas:

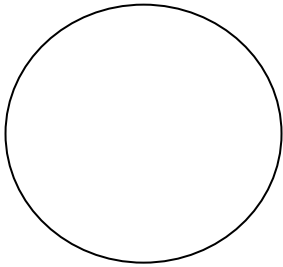
- The particles move around freely and are far apart.
- The particles translate (move in a straight line).



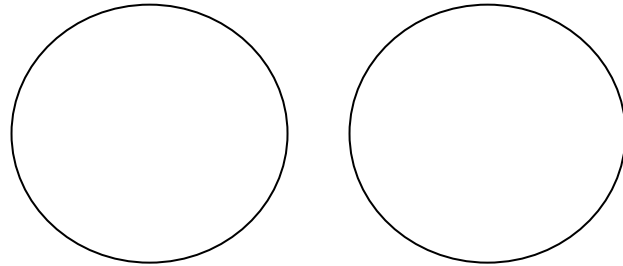
A change of state is a physical change

MICROSCOPE

A microscope will allow you to observe a small object in greater detail.



Low Magnification
(greater area viewed, less detail)



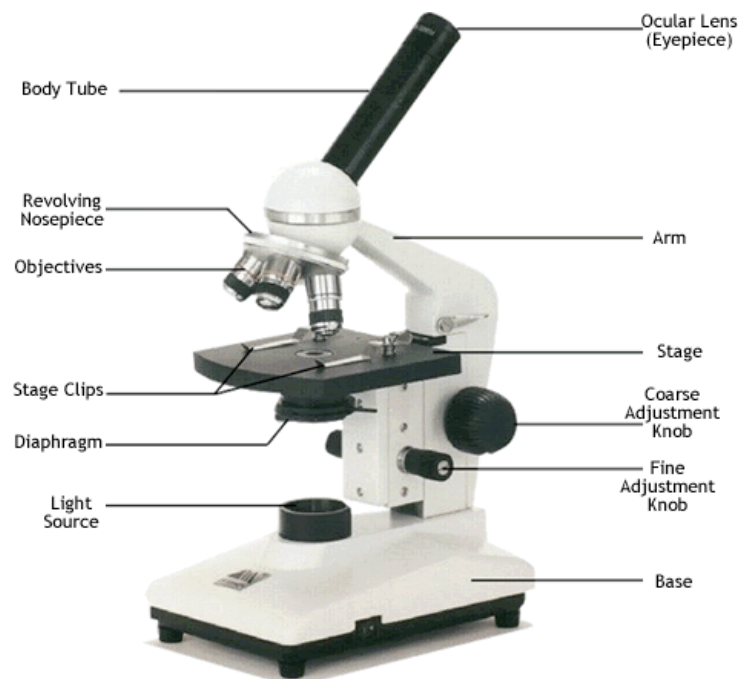
High Magnification
(smaller area viewed, more detail)

Magnification

Ocular (Eyepiece)		Objective Lens		Magnification
10	X	4	→	40
		10	→	100
		40	→	400

Coarse Focus → Raises, lower platform
→ Only used on low and medium magnification, not high.

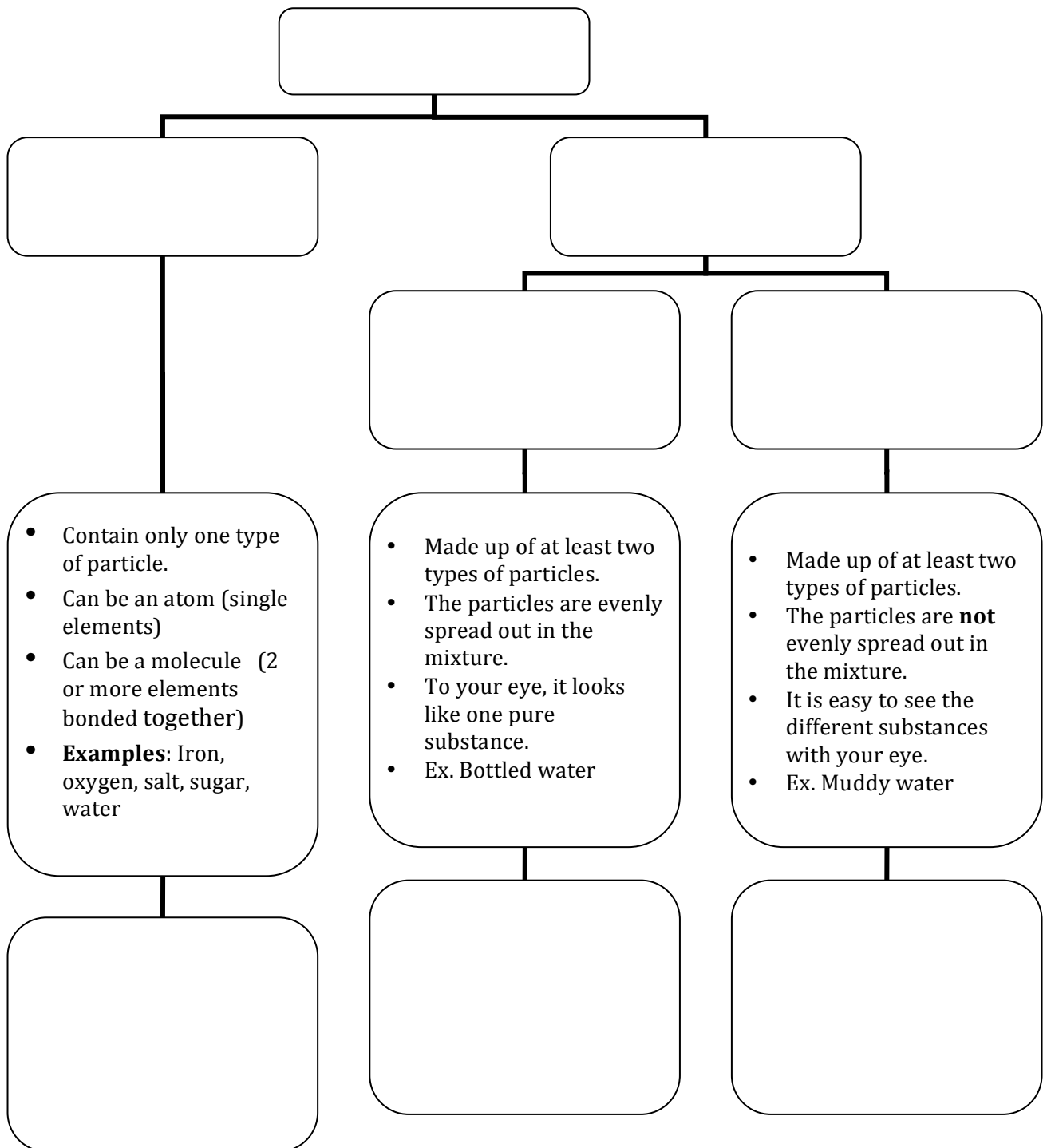
Fine Focus → Sharpens focus
→ Used on low, medium and high magnification.



Matter

- Anything that has mass and occupies a volume. Solids, liquids and gases are all made from matter.

A _____ contains only one type of particle, but a _____ contains at least two types of particles.



Mixtures: Heterogeneous or Homogeneous?

1. Heterogeneous Mixture

- In a _____ mixture, you can distinguish the types of _____ of which the mixture is composed.
- Heterogeneous mixtures are classified into three categories:
 - **Simple heterogeneous mixture:** particles of the two substances do not mix; some particles float on the surface, while others sink to the bottom.
 - **Suspension:** mixture with particles small enough to remain suspended for a long time.
 - Examples of suspensions are: fine sand or silt in water or tomato juice.
 - **Colloidal mixture:** particles are so small they cannot be seen with the naked eye and remain suspended for a very long time (possibly indefinitely).
 - Milk, fog, and Jell-o are examples of colloids.

Textbook P. 148	Simple heterogeneous mixture	Suspension	Colloidal mixture
Naked-eye observation			
Time needed for particles to separate			
Examples			

2. Homogeneous Mixture

- In a _____ mixture, it is not possible to distinguish the different types of _____ of which the mixture is composed.
- Homogeneous mixtures are also called _____.

Solutions: Homogeneous Mixtures

- A solution has the same appearance as a _____.
- In a solution, one substance _____ in another; the particles of the first substance are uniformly distributed in the second substance.
- A solution is made up of a _____ and one or more _____. The _____ is the part of the mixture that dissolves the other substance(s). It is the substance present in larger quantity.
- The _____ is the part of the mixture that is dissolved. It is present in smaller quantity. Example: when sugar is dissolved in water, _____ is the solute and _____ is the solvent.
- Common examples of solutions are: air (nitrogen is the solvent), alcohol with water and metal alloys (stainless steel).
- Water is often referred to as a universal solvent because it dissolves so many different solutes.

Definitions

- **Solution** - homogeneous mixture

Solute - substance being dissolved

Solvent - present in greater amount



- **Air** is an example of a solution. Nitrogen gas acts as the solvent to the other gases.

Dissolution

- When a _____ substance is mixed with a solvent, dissolution occurs and a solution is formed.
- Not all substances are soluble however. For example, _____ will dissolve in water, while _____ does not.
- The individual particles that make up a substance are _____ to each other to form larger particles (ex. grains of salt). When a substance is soluble in water, the attraction between its particles is _____ than the attraction between its particles and water. When a substance is not soluble in water, the attraction between its particles is _____ than the attraction between its particles and water.
- When water dissolves salt, the water particles cause the salt particles to detach from each other until all the salt particles are completely surrounded by the water particles.



A grain of salt placed in water.



The grain of salt dissolves: water particles detach the particles at the surface of the grain of salt.



The salt is dissolved: the salt particles uniformly disperse in the water.

A salt is **soluble** if it can dissolve in water.

Insoluble: A salt that is not able to dissolve in water.

- Water attraction is not strong enough to pull off the grains of the solid substance.

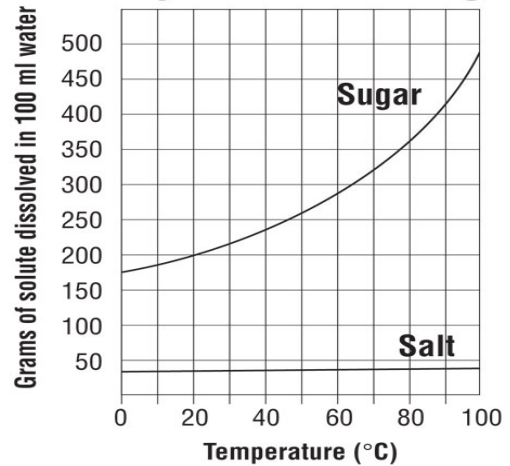
Methods to speed up dissolving salts in water:

1. Increase the temperature → use hot water.
2. Increase the surface area → break up the solute into smaller pieces
3. Stir often.

Solubility/Temperature Graph

- The graph shows how solubility of sugar increases as the temperature of the water increases.
- The solubility of this salt is not as great as the sugar.
- At 20°C, 200g of sugar dissolves in 100mL of water.

Solubility of Salt and Sugar

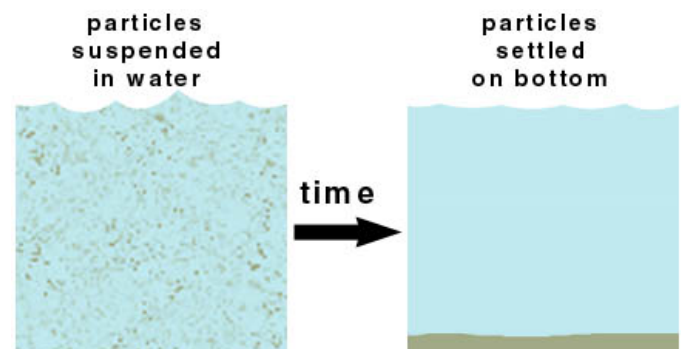


The Separation of Mixtures

- There are many reasons to separate mixtures:
 - Petroleum is a _____ mixture that must be separated to obtain products such as _____.
 - Most _____ are found in heterogeneous mixtures of rocks, but not in their pure forms. The rocks need to be crushed and heated for the metals to be _____.
 - _____ can be either a homogeneous or heterogeneous mixture that must be _____ and _____ before it is safe to drink.

Sedimentation: Slow but Sure

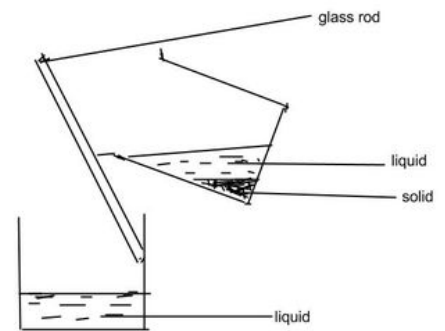
- In a heterogeneous mixture, the substances may separate over time forming two or more layers. This process is called _____.



- In the case of a solid and a liquid, the solid that deposits at the bottom of the container is called a _____.
- In the case of two liquids, the liquid that is _____ dense will float to the top.
- Sedimentation is a process that occurs _____; the mixture simply needs to sit.
- This separation technique can be used for two types of heterogeneous mixtures: _____ and _____, but cannot be used effectively for _____ mixtures.

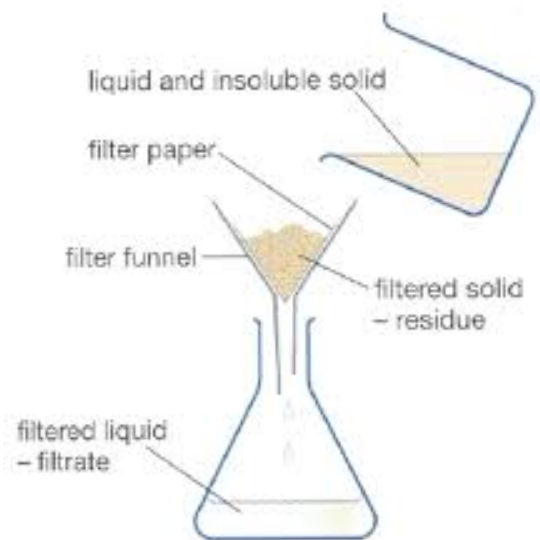
Decantation: From One Container to Another

- Decantation is often used after _____.
- A _____ mixture that has layers can be separated into distinct substances by _____ out one of the layers into another container.
- This technique can be used to separate two liquids or a liquid and a _____.



Filtration: Fast and Effective

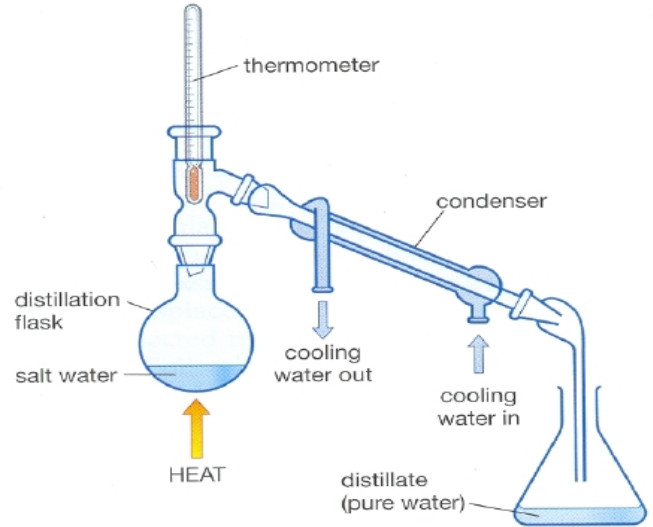
- Filtration separates different substances in a heterogeneous mixture by passing the mixture through a filter that holds back larger particles, called the _____. The smaller particles, called the _____ pass through the holes in the filter paper.



Distillation: Separating the Invisible

- Distillation can be used to separate the substances in a _____ mixture.
- Distillation relies on the _____ of the substances.
- For example, to separate water and salt:

- the salt water solution must be heated until it begins to _____;
- then, the water _____ passes through a _____ where it cools and returns to its liquid state;
- the _____ is left behind.



- The _____ is the substance obtained from condensation.
- The _____ is the substance that remains behind.
- Two _____ can also be separated by distillation. For example, water and ethanol can be separated by distillation because the boiling point of ethanol is _____ °C while the boiling point of water is _____ °C.
- If the mixture is heated to above _____ but below _____, the _____ will boil and evaporate and be collected as the distillate, while the _____ will remain behind.

Centrifugation

- A process that separates the components of a colloid by spinning it very rapidly.