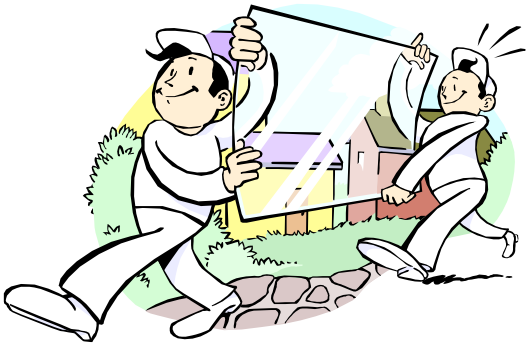
Working document

centre de développement pédagogique
pour la formation générale en science et technologie

Get cleaning!



THEORETICAL CAPSULE
(This document is intended for adults.)

2010-2011

It is important to know …

Relating to Activity 1

• Miscible and immiscible liquid mixtures

In science, various types of mixtures are possible. Here are two, with their respective definitions.

Mixture of **miscible liquids:** Term used for liquids that can be perfectly mixed (for example water and milk).

Mixture of **immiscible liquids:** Term used for liquids that do not mix: one floats on the other (for example water and oil).

• Properties

A **property** is a particular aspect of an object or a substance. In other words, we may say that a property is a clue that allows us to describe an object or a substance.

Here are some examples of properties of a substance or an object:

- Odour[1]
- Colour
- Texture
- Shape
- Size
- Translucence (opacity or transparency)[2]

[1] See the technical capsule entitled *"How to safely smell a substance"*.

[2] It is important to note that a transparent substance may be coloured (e.g. cranberry juice, tea, etc.).

Parallel to the properties of a substance, there are **characteristic properties** of this substance or object. A characteristic property is more that a simple clue that describes the object or substance. A characteristic property is a property **unique to** a substance or object.

A simple example of a characteristic property is a person's fingerprint. Everyone has fingerprints, but each person's are unique to that person. In science, the information found in the periodic table are properties unique to each element (atomic mass, chemical symbol, etc.)

• States and phases of matter

Matter is the substance that makes up the objects that surround us. Anything that occupies space or has mass, is matter.

States of matter

Matter exists in three different states: **solid, liquid and gas (or vapour).** Its state depends essentially on two factors: temperature and atmospheric pressure.

Thus, at normal atmospheric pressure (namely at sea level), water is in its solid form (ice) when the temperature is below 0 °C. It is in liquid form between 0 °C and 100 °C and finally, in its gaseous form (water vapour) above 100 °C.

Phase transitions

When matter passes from one state to another, it is said to be changing **phases**.

At 0 °C, for instance, water changes phase when it goes from solid to liquid **(fusion)** or from liquid to solid **(freezing)** depending on whether it is heated or cooled.

At 100 °C, water changes phase again when it goes from its liquid state to its gaseous state. If the water is heated rapidly, we call it **boiling.** If it occurs slowly, we will refer to **vaporization.** Conversely, when going from a gas to a liquid, we will use the terms **liquefy** and **condensation**.

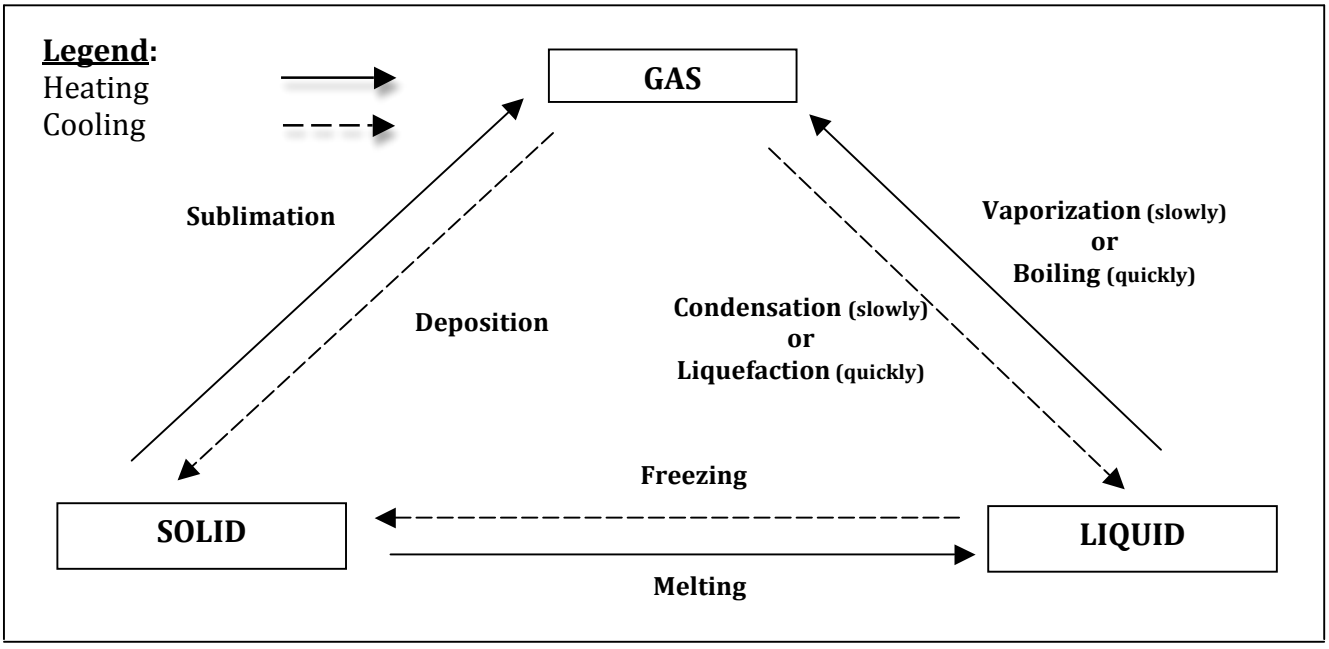
Finally, matter may go directly from a gaseous state to a solid state without passing through the liquid state. We will then refer to **sublimation** and **deposition**. Here are everyday examples that illustrate these two phase changes:

- sublimation: naphthalene (moth balls) that we put in cupboards and that end up disappearing without a trace other than the odour;

- deposition: in the winter, when the temperature of the windows is cold, the water vapour from our breath freezes and forms frost when it comes into contact with the surface of the window.

The following diagram presents the states of matter as well as various names of the phases depending on whether the matter is heated or cooled.

The states of matter



Relating to Activity 2

- **Hazard symbols**

According to Health Canada, a safety symbol is made up of two elements: a pictogram and a frame. The **pictogram** designates the type of hazard. The type of **frame** specifies the nature of the danger: the contents or the container.

The following table presents the four safety symbols affixed on hazardous domestic products. For more details concerning regulation, consult the following website (in French only):
www.apsam.com/publication/fiche/FT50.pdf

Hazard symbols

Symbol	Hazard (risk)	Examples of products
Explosive 	This **container** may explode if heated or pierced. Shards of metal or plastic may cause serious injury, particularly to the eyes.	• Aerosol bottles of waterproofing products for boots or shoes. • Spray paints
	This **product** burns the skin or eyes if they enter into contact with it. If ingested, it burns the throat and stomach.	• Toilet bowl cleaner • Oven cleaner
Inflammable 	This **product** or its vapours may catch fire easily if exposed to a heat source, flames or sparks.	• Contact cement. • Solvents.
Poison 	This **product** may cause sickness or death if licked, ingested or drunk and sometimes if it is simply inhaled.	• Windshield washer fluids. • Furniture polish.

Source : Health Canada, http://www.hc-sc.gc.ca/cps-spc/pubs/indust/stay_safe-soyer_en_securite/index-eng.php

Relating to Activity 3

- **Experiments and laboratory techniques**

Refer to:

- Technique for reading a graduated cylinder, 1st cycle version
- *"How to safely smell a substance"* technique, see activity 1

Relating to Activity 4

- **Initiation to diagramming**

The diagram:

What is a diagram?

- A figure showing a simplified and functional version of an object, movement, process or organisation.

In fact, diagramming constitutes a very useful and easily used tool. Thus, the diagram allows the student to communicate using appropriate language for science and technology.

There are several types of diagrams. We will address two types, namely the principles diagram and the construction diagram.

Please note that for this LES, we will focus only on the construction diagram.

- **The diagram of principles and the construction diagram.**

The diagram of principles is a simplified drawing that presents the operation of an object, that is, its functioning principles. This type of diagram gives no precisions as to measurements or to the materials to be used. Only the forces, movements and links are indicated on this type of representation.

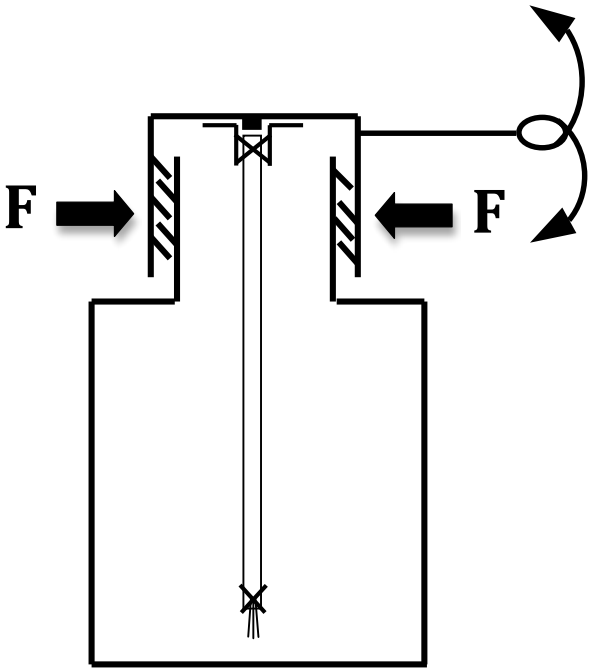
The construction diagram is a simplified drawing that clearly presents the parts and materials to be used in the fabrication of the object. In this type of drawing, how the parts are linked to one another must also be indicated.

The diagrams below give us some examples of a principles diagram and a construction diagram for a bottle of nail polish or liquid corrector.

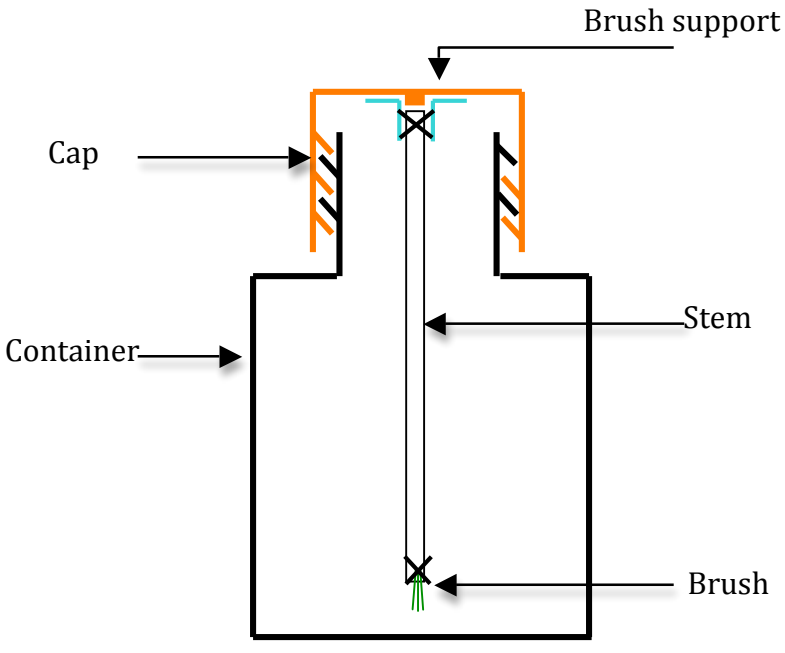
Nail polish bottle

Diagrams drawn from the "My animated object" LES

Diagram of principles



Construction diagram



The parts in this container are all made out of plastic

- **To go a little further …**

- **Other important elements to be considered in a diagram**

➢ Forces

There are several types of forces. We will cover two: compression and tension.

Compression is a force that exerts a push on a body. When this force is applied, it causes or modifies the motion of the body. It may also distort it.

Conversely, **tension** is the force that pulls a body. When this force is applied, it may cause or modify the motion of the body. Finally, it may also cause distortion.

Compression symbol



Tension symbol



➢ Movements

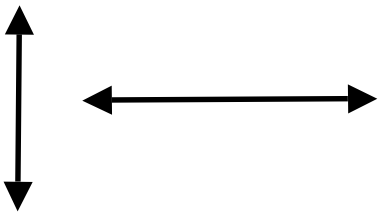
The mobile parts of a technical object may move according to three types of movement: rotation, translation and helical movement.

Here are the symbols for these movements:

Rotation



Translation



Helical



When a movement is unidirectional, the movement symbol has only one arrow.

- The shape of surface and dimensions

  The shapes of the surfaces are simplified as much as possible, while still maintaining the proportions.

- Cut views

  Diagrams are generally shown in cut views. A cut view is a graphical representation that allows you to see inside an object, as if it had been sliced into two equal parts. One or several views may be used (top, face or side views) according to your needs.

- Colour

  Colour is an element that makes reading and understanding a diagram easier. In a set, different colours are used to represent two adjacent parts.

- Links

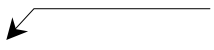
  A link is simply anything that can hold together at least two parts of a technical object. Thus, when two objects are held together, we are using a link (glue, nail, nut and bolt...)

  Symbol for a link



- "Basic lines"

  In technical drawing, several lines are used according to an international system (IS). This convention allows everyone to interpret the drawing the same way. These lines are called the "basic lines".

Visible contour line	Hidden contour line	Leader line
		

- The sketch

  On a piece of paper, the sketch is drawn by hand or using a ruler, with a lead pencil, followed by coloured pencils.

- Line

  Depending on the needs of the object, three types of lines varying from thick to fine are used in technical drawing.

Thick line (e.g.: visible contour line)	Medium line (e.g.: hidden contour line)	Fine line (e.g.: leader line)

Webography

- **Complementary sites that may complete the given information**

Canada Science and Technology Museum
http://www.sciencetech.technomuses.ca/english/schoolzone/Info_Matter.cfm

La physique c'est fantastique (Physics is fantastic)
http://phys.free.fr/etats.htm

La bibliothèque Allo Prof
http://biblio.alloprof.qc.ca/PagesAnonymes/DisplayFiches.aspx?ID=6031

- **Complementary Flash Animations**

BrainPop français (états de la matière)
http://www.brainpop.fr/category_20/subcategory_219/subjects_1691/

BrainPop français (phases de la matière)
http://www.brainpop.fr/category_20/subcategory_219/subjects_4513/