Homogenous Mixtures

A Homogenous mixtures is called a solution. (Blended together and cannot pick apart) They are everywhere the earth is surrounded by them.

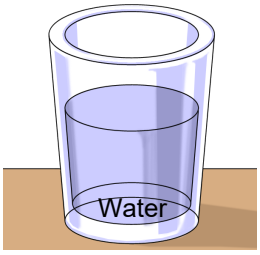
To be considered a solution the combination of materials must be the same.

Video:

6 min

https://www.youtube.com/watch?v=t0iHbY9sjDc

Why Do Some Materials NOT Dissolve?



Solvent

Solute

There is usually less solute than solvent in a solution (more solvent than solute.)

Solute - is the substance that dissolves in a solvent to form a solution (ex. the salt in water)

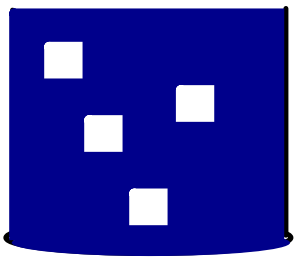
Solvent - is the substance that dissolves a solute to form a solution (Ex. usually water)

Water

Solvent

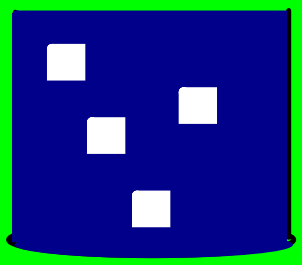
Sugar Cube

Solute



Sugar Water

Solution



Sugar Dissolves in Water

or

Sugar is Soluble in Water

Soluble - means able to be dissolved in a particular solvent

Insoluble - means not able to be dissolved in a particular solvent

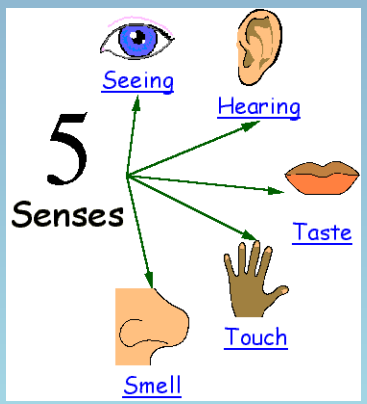
Solubility

- **The ability of a particular substance to dissolve.**


States of Matter
Hardness
Viscosity
Ductility
Physical Properties
malleability
Melting and Boiling Points
Crystal form
Density
Solubility

One of the physical properties of matter is its state.

Another way to describe physical properties is using our senses.



Physical Properties

What could we observe with from each of the 5 senses?

i) Sight: color, bright, dull

ii) Hearing: Bubbling, crackling, snapping

iii) Taste: sweet, salty, bitter

iv) Touch: Rough, soft, slimy,

v) Smell: Sweet, rotten,

Some you can see But some you have to measure with devices.

Physical Properties

Property	Describing the Property
Colour	Is it black, white, colourless, red, greenish-yellow ....?
Texture	Is it fine, coarse, smooth, gritty...?
Odour	Is it odourless, spicy, sharp, burnt...?
Lustre	Is it shinny, dull..?
Clarity	Is it clear, cloudy, opaque....?
Taste	Is it sweet, sour, salty, bitter...?

Fill in from your knowledge the blanks

Name of Substance	Physical Properties	State of matter
a) Oxygen	colorless, smooth, odorless,cloudy	gas
b) Cocoa Powder	brown, fine powder, bitter dull	solid
c) Water with food coloring	red, smooth, odorless, dull	liquid
d) Olive Oil	yellowish, oily, cloudy	liquid

Oxygen that we breathe

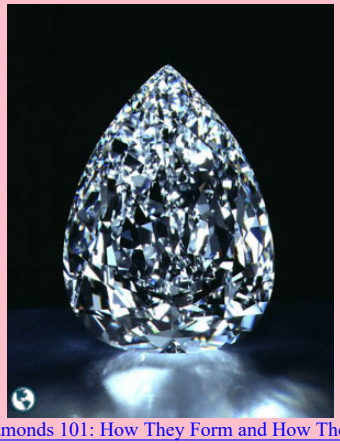
Water and food coloring

olive oil

Coco powder

2) Hardness

The measure of the resistance of a solid to being scratched or dented.



Diamonds 101: How They Form and How They're Found - YouTube
How Do They Mine Diamonds? - YouTube

Cool Fact: The Millenium Star (above) is the second largest flawless diamond at 203 carats. These types of diamonds are considered the rarest and the most valuable set of diamonds created. One of these only 10 carat diamonds cost in excess of 10 million dollars.

See how diamonds are cut from rocks - YouTube

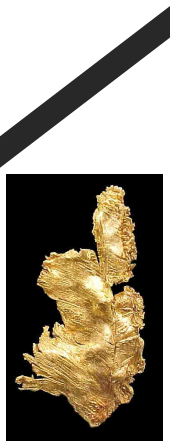
Diamond Mining - Inside the Largest Mine in the World | Free Documentary Shorts - YouTube

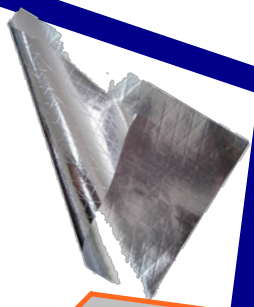
The BIGGEST DIAMONDS In The World - YouTube

How Lab Grown Diamonds are made? - YouTube

Why lab-grown diamonds are better than mined diamonds - YouTube

3) **Malleability**: ability of a substance to be hammered or bent into different shapes.

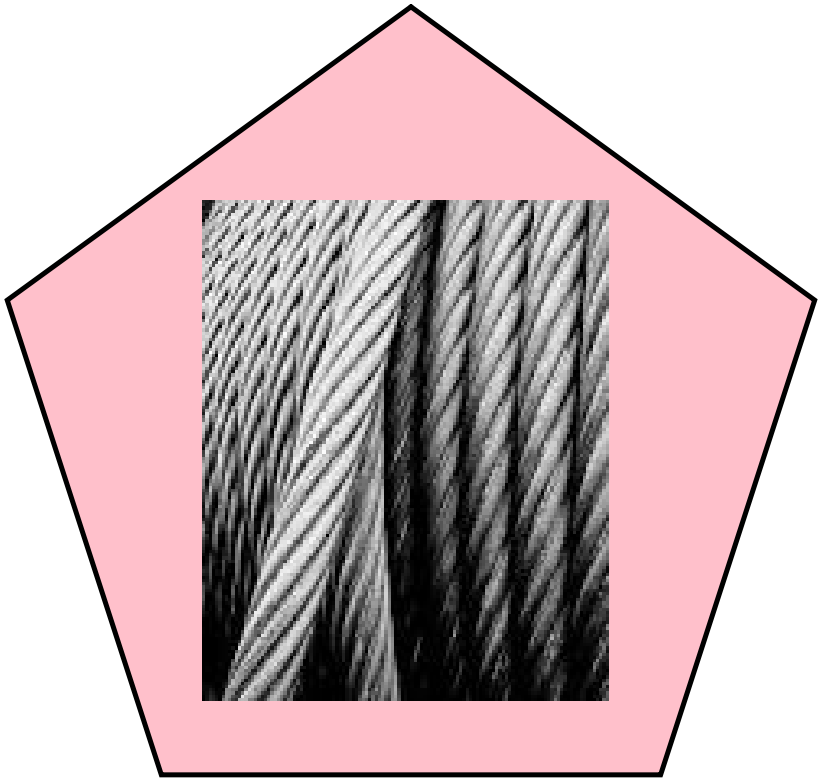




Cool Fact:
Older generations used to call aluminum foil, tin foil, because well... it was made of tin.
In 1910, manufacturers started to use aluminum instead.
Tin left a metallic taste on food, mmm.

4) Ductility: the ability to be pulled into wire.

Malleability and Ductility-Physical Properties - YouTube



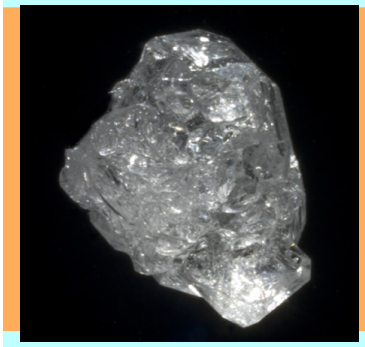
5) Melting and Boiling Points

Boiling point and Melting point-Physical Properties - YouTube

melting point = the temperature a substance changes from a solid to a liquid

boiling point = the temperature a substance changes from liquid to a gas

Does anyone know the melting point or boiling point of water?



Crystal form (another form of a solid)
A solid mineral structure with a regular pattern of 3-D shapes. Salt crystals are cubic, plastic has no crystal form

Recall
Solubility- The ability to dissolve in a solvent such as water. Salt is **soluble** in water, pepper/copper are **insoluble** in water.

Quantitative physical property is something that can be measures with an instrument of some kind.

Some Quantitative Physical properties are:

Volume – The amount of space occupied by a substance

- Volume of liquids can be measured using measuring cups, graduated cylinders.

- Volume of gases can be determined by measuring volume of the containers that hold them

Temperature is a physical quantity that expresses the degree of hotness or coldness of a substance and the internal energy given off by a substance. Measures with a thermometer.

Mass – The amount of matter in a substance

- Measured in kilograms (Kg) or grams (g)

Density- The amount of matter (mass) per unit of volume of a substance.

Lead is denser than feathers or some may say lead is heavier than feathers.

For example: Density of water is 1.0 g/ cm3.

Density

- can be described as the crowdedness of the particles in a substance

- Scientifically, it is the amount of substance that occupies a particular space.

- Can be measured (Discussed later)

– A “heavy” substance has a high density
– A “light” substance has a low density

Density and Buoyancy

Take a guess at what these terms mean.

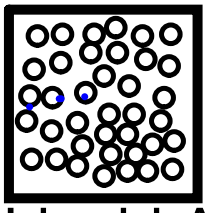
You may have heard them before.

Here are a couple of hints:

Density helps explain why a piece of steel sinks in water and a beach ball floats.

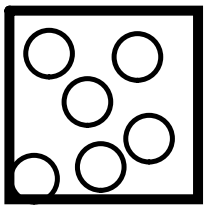
Buoyancy explains why a huge piece of steel in the shape of a ship floats!

-According to the particle theory, different substances have different sized particles. The size of the particles determines the number of particles that can fit into a given space. Each substance has its own unique density, based on its particle size.



Liquid A

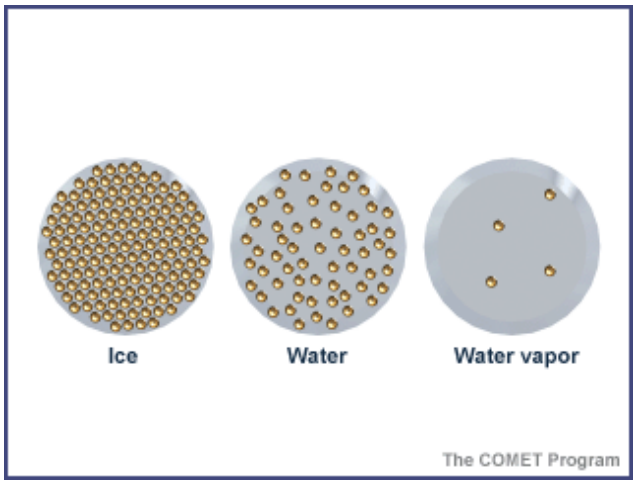
- small particles so many can fill the area



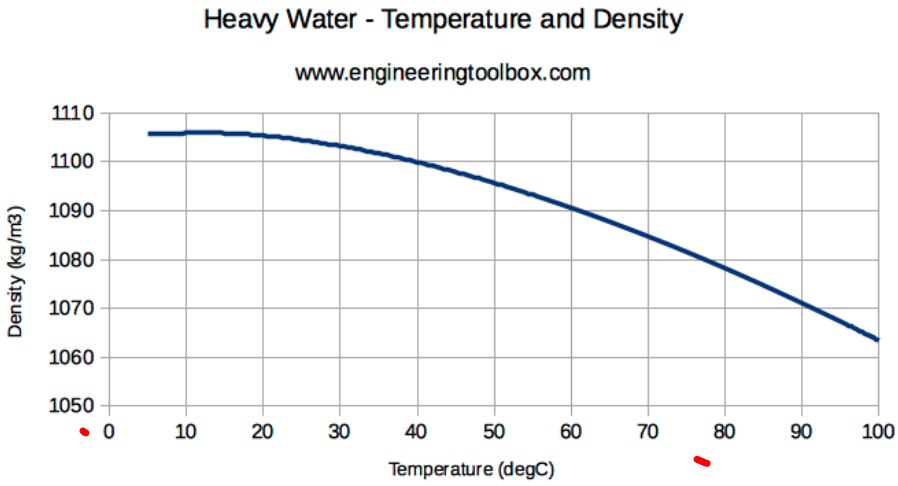
Liquid B

- Large particles so few fill the area

-Each substance has its own density



You can see with ice there is more particles bunched together in the area. Water the particles are spread out some BUT with water vapor the particles are really spread out.

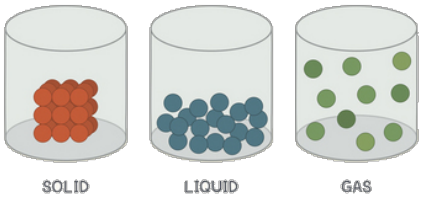


As temperature increases the density of water decreases

Density of Solids, Liquids, and Gas

The only way the density of a substance will change is if it changed states.

Ex) Liquid water is a different density than solid water and water vapor



Water

Both liquid water and water vapor have the same particles and the particles are all the same size.

According to the particle theory of gas, gas particles have more space between them than liquid particles. Therefore, water vapor would have fewer particles than liquid water.

The density of the water vapor is less than the density of the liquid water.

Dolphin can leap through the air and dive back into water smoothly and effortlessly.

Solid objects can move easily though liquids and gases. The particle theory states that fluid properties of water and air allow water particles and air particles to move out of the way solids.

You cannot push through a solid substance, like ice, since the particles are held strongly together and will not push aside.

We sometimes confuse weight with mass. When you step on a scale at home you are getting your mass.

Force - is a push or pull.

Gravity - is a natural force that causes an object to move toward the center of the earth.

Weight - is the force of gravity exerted on an object.

- Measured in Newtons (N)

Brian Cox Experiences Zero Gravity! | World Space Week - Wonders of the Universe | BBC Studios - YouTube

The pull of gravity everywhere on an earth' surface is the same. It is a downward force of 9.8 N for every kilogram of its mass. (9.8N/kg)

Ex) A bag of sugar has a mass of 2kg

$$2\ kg \times \frac{9.8\ N}{1kg} = 19.6\ N$$ BUT weighs 19.6 N

Density Formula

-For liquids density is measured in g/mL or g/L

-For solids density is measured in g/cm^3

Density of water is 1.00 g/mL

A substance that had a density of 2.85 g/mL would _____ in water. It is _____ dense than water.

A substance that had a density of 0.82 g/mL would _____ in water. It is _____ dense than water.

Which substance would float or sink in water?

Substance	Density of substance	Sink or Float
A	1.35 g/mL	
B	0.32 g/mL	
C	2.68 g/mL	

Changing States REVIEW

Change of state is when the physical state of a substance is transformed into another state.

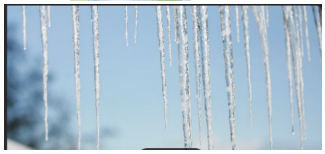
Requires an increase of heat

Melting is a change from solid to liquid 

Vaporization is a change from Liquid to gas 

Requires a Loss of heat

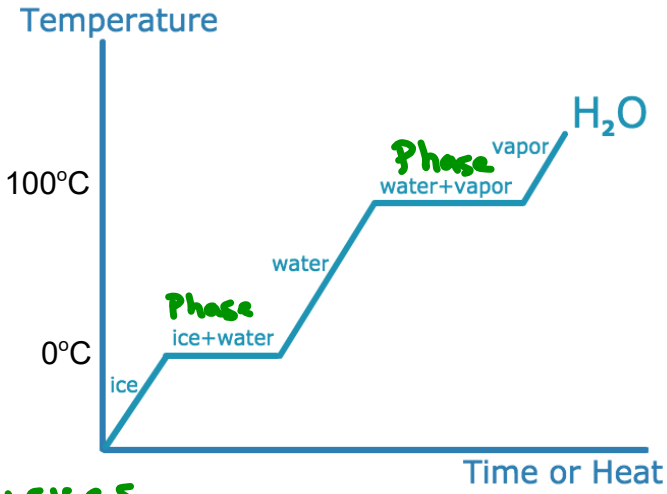
condensation - change from gas to liquid 

Freezing - change from liquid to solid 

Heating Curves

What happens to the temperature of a block of ice when you put a Bunsen burner underneath it?

You might think that the temperature goes up smoothly, but that's not what happens. The graph of temperature against time is called a heating curve. Let's look at the heating curve for water.



Heating Curves

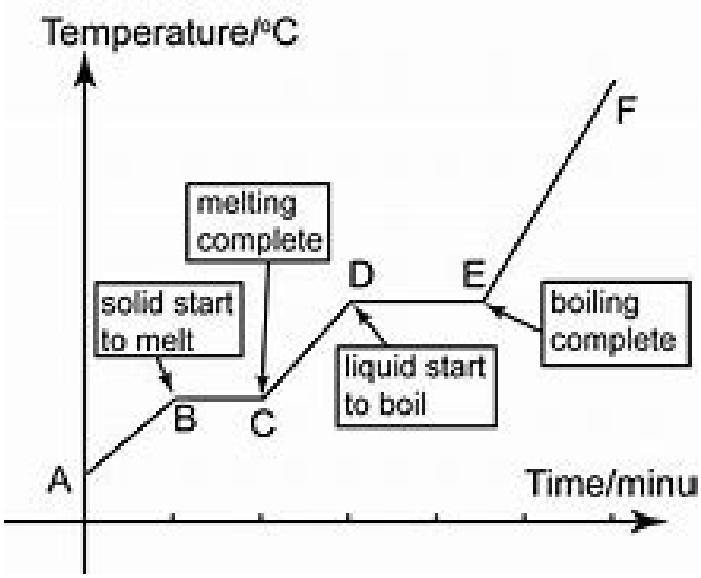
Notice that, in general, the temperature goes up the longer the heating continues. However, there are two horizontal flat parts to the graph. These happen when there is a change of state. The plateaus are also called phase changes

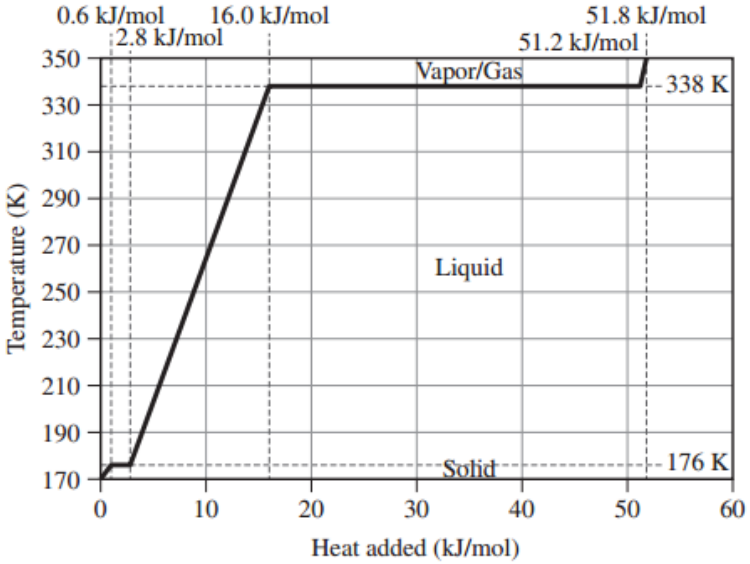
The first change of state (ice+water) is melting (changing from a solid to a liquid). The temperature stays the same while a substance melts.

For water, this temperature is 0°C because the melting point for water is 0°C. Over the course of this line segment, both liquid and solid exist in various ratios, starting at 100% solid and ending at 100% liquid.

The second change of state (water +vapor) is boiling (changing from a liquid to a gas). The temperature stays the same while a substance boils.

For water, this temperature is 100°C because the boiling point for water is 100°C. Over the course of this line segment, both liquid and gas exist in various ratios, starting at 100% liquid and ending at 100% gas.

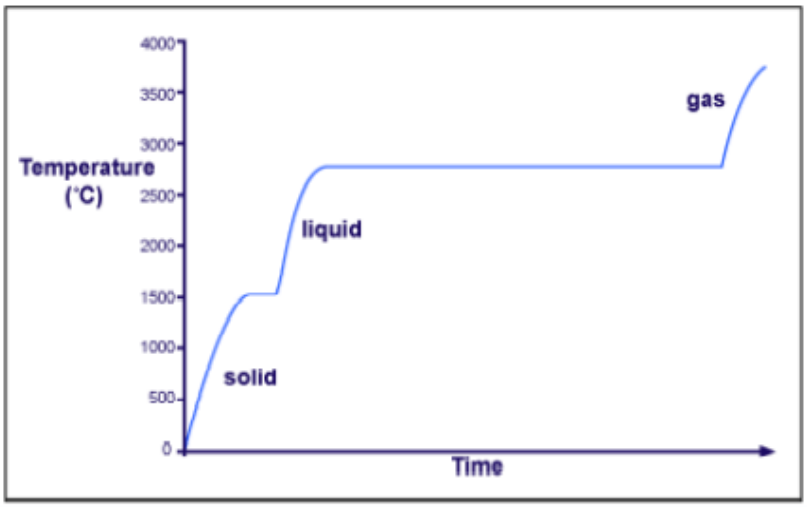

Temperature/°C
F
melting complete
D
E
solid start to melt
boiling complete
liquid start to boil
B
C
A
Time/minu


0.6 kJ/mol
2.8 kJ/mol
16.0 kJ/mol
51.8 kJ/mol
51.2 kJ/mol
Vapor/Gas
338 K
Liquid
Solid
176 K
Temperature (K)
350
330
310
290
270
250
230
210
190
170
0
10
20
30
40
50
60
Heat added (kJ/mol)

0.53 How much energy in kilojoules is released when 25.0 g of ethanol vapor at 93.0 °C is cooled to −10.0 °C? Ethanol has mp = −114.1 °C, bp = 78.3 °C, ΔH_{vap} = 38.56 kJ/mol, and ΔH_{fusion} = 4.93 kJ/mol. The molar heat capacity is 112.3 J/(K · mol) for the liquid and 65.6 J/(K · mol) for the vapor.

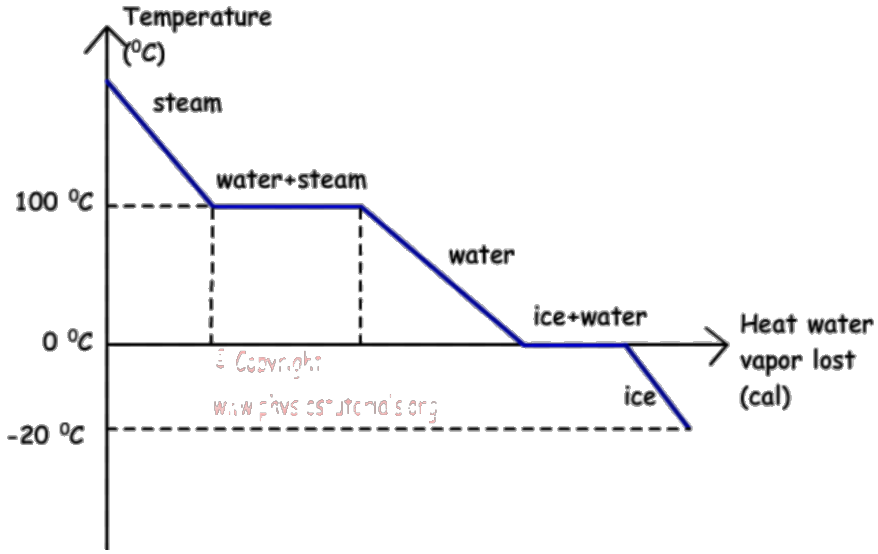
What we do in CHEMISTRY CLASS later on (High school)

Different substances have different melting points and boiling points, but the shapes of their heating curves are very similar. For example, this is the heating curve for iron, a metal that melts at 1538°C and boils at 2861°C.



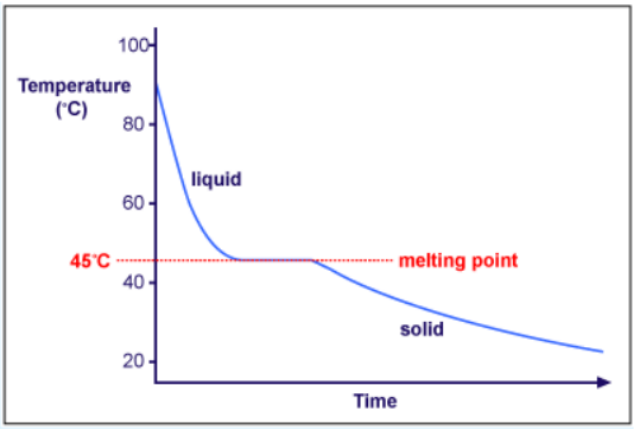
Cooling Curves

Heating curves show how the temperature changes as a substance is heated up. Cooling curves are the opposite. Cooling curves show how the temperature changes as a substance is cooled down. Just like heating curves, cooling curves have horizontal flat parts where the state changes from gas to liquid, or from liquid to solid. These are mirror images of the heating curve.



Example of Lucric Acid

Lauric acid has a melting point of about 45°C and is easily melted in a test tube placed in a beaker of hot water. The temperature can be followed using a thermometer or temperature probe connected to a data logger. The liquid may be cooled by putting the boiling tube in a beaker of cold water or just leaving it in the air.



***Note- The melting and freezing occur at the same temperature. During freezing, energy is removed and during melting, energy is absorbed.

Energy Changes

Since Temperature is a measure of "Average Kinetic Energy", any change in temperature is a change in Kinetic Energy. All of the diagonal line segments on a heating or cooling curve show a temperature change and therefore a change in kinetic energy. During these regions, a single state of matter exists and the sample is either getting hotter or cooler.

During the horizontal line segments, there is no change in temperature, so kinetic energy remains constant. However, all the energy that is absorbed or released is related to changes in potential energy.

Remember the 3 Ps:

Plateau,

Phase change

Potential Energy Change

Science Quiz Matter (Part 2) OUTLINE

Know the definitions of the following (Matching or Multiple choice)

1. Solute, solvent , solubility, solution, Hardness, Ductility, Malleability, Boiling point, Melting Point, Temperature, Volume, Mass, Density, Phases of (Melting, Vaporization, Freezing)
2. How to describe something with color , taste, clarity and lustre (what do they mean)Weight
3. How does density change with temperature?
4. Know how density of water in different states compare
5. If given a substance can you determine if it would sink or float in water

12 matching

7 Multiple choice

2 short response (work 4 points)