

Physical and Chemical Properties of Matter

Physical Property - a characteristic or description of a substance used to identify it

they can be observed without change to the physical make-up of the matter (it remains the **same substance**)

Chemical Property - describes behaviours when the substance interacts with other substances and becomes a **new substance**.

Physical Properties of Matter

1. Colour - the light reflected of a substance
e.g. red, blue, white, black

2. Texture - what does it feel like?
e.g. smooth, rough, bumpy, soft

3. Odour - what does it smell like?
e.g. stinky, flowery, ...

4. Lustre - how shiny something is
e.g. shiny, dull

5. Clarity - how transparent a substance is
e.g. clear, cloudy, opaque, transparent, translucent

6. Taste - This is NOT a good choice in most chemistry labs!
e.g. salty, sweet, sour, bitter



light doesn't see clearly through it.

we can see light through it, but not specific shapes or form

Note: The above physical properties we can obtain directly with our senses.

(taste, touch, sight, smell, hearing)

7. State - solid, liquid, gas (most common)
 Also plasma, Bose-Einstein condensate
 ← really high high temp. ← really low temperature



	Definite Shape (Yes or No)	Definite Volume (Yes or No)
Solid	yes	yes
Liquid	no	yes
Gas	no	no

Note: There are two other states of matter - plasma and Bose-Einstein Condensate (BEC) - that we don't see in the lab (or much at all on Earth).

Plasma is not common on earth, but may be the most common state in the universe. It involves highly charged particles at very high temperatures (like inside stars)

BECs occur at extremely LOW temperatures (near absolute zero), where the atoms don't move much and almost no energy is being transferred between atoms.

8. Hardness -



1 TALC		6 FELDSPAR	
2 GYPSUM		7 QUARTZ	
3 CALCITE		8 TOPAZ	
4 FLOURITE		9 CORUNDUM	
5 APATITE		10 DIAMOND	

9. Malleability - how easily something deforms (under shear force)
pushing
e.g. malleable, brittle



10. Ductility - the ability of a substance to stretch (under a strain/pulling force)



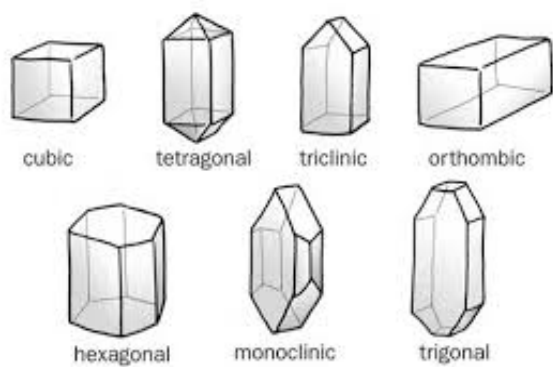
11. Melting and Boiling Points - the temperatures at which substances melt and boil.



Water Boiling Point
 100°C (at sea level)

Water Melting Point
 0°C (at sea level)

12. Crystal Form



Microcline (Triclinic)



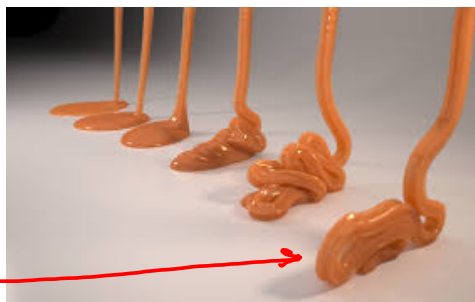
Rock Salt (Cubic)



13. Solubility - the ability of a substance to dissolve
(usually in H_2O or alcohol)

14. Viscosity - how runny/stiff a
substance is
(temperature often affects
this)

viscous



15. Density - the mass of an object divided by the volume

$$D = \frac{M}{V}$$



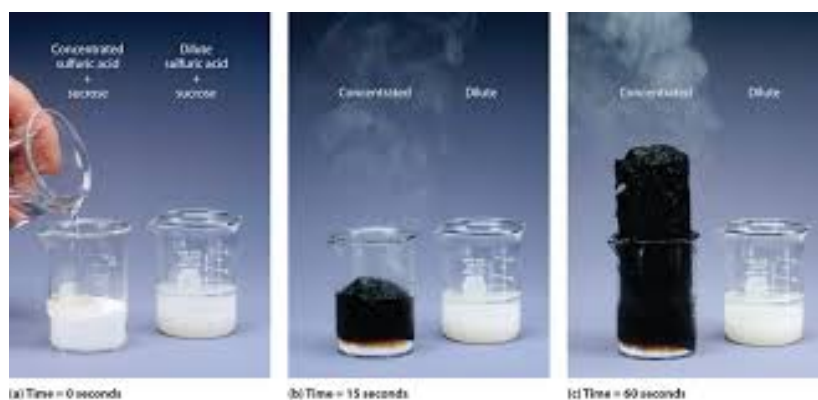
Chemical Properties

1. **Combustibility/Flammability** - how substances react with oxygen and heat,



2. Reaction with Acid - How a substance behaves when combined with an acid.

https://youtu.be/pgTRZjd_HSg



Note: There are many other Physical and Chemical properties of matter - these are just the common physical properties and a couple of chemical properties.

Exercise: Physical vs. Chemical Properties

1. What property is described by each of the following statements?
 - a) Copper metal can be bent into different shapes.
 - b) A steel blade can scratch glass.
 - c) Alcohol boils at 60°C .
 - d) Under a magnifying glass, sugar appears to be made of tiny cubes.
 - e) A nickel coin is shiny.