

The Periodic Table of the Elements

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

The Periodic Table of the Elements

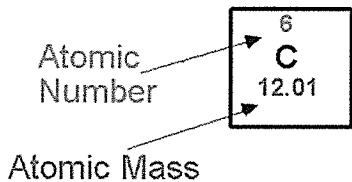
The Periodic table is a chart that organizes information about all of the known elements according to their properties.

PERIODIC TABLE OF THE ELEMENTS



Periodic Organization

- The elements are arranged in increasing atomic number going from left to right.
- Atomic number is the number of protons in the nucleus



Groups of the Periodic Table

- Each vertical column is a group or chemical family
- Elements in the same group have similar chemical properties.

GROUPS

There are 18 different groups in the Periodic Table

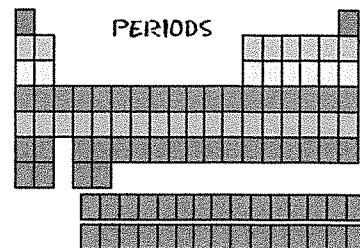
Periodic table of videos

- What do the elements in the first 3 videos have in common?
- Hydrogen Sodium Lithium
- How about these 3 videos?
- Helium Neon Krypton

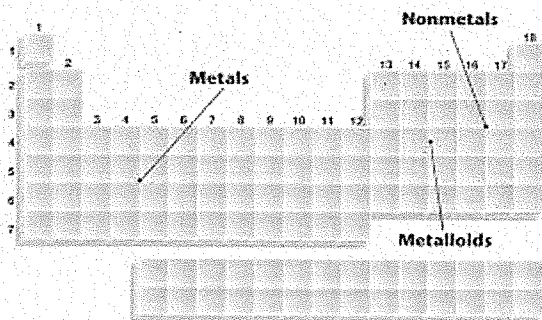
Periodic Organization

- Each horizontal row in the periodic table is called a period.
- Elements in each period increase in atomic number.

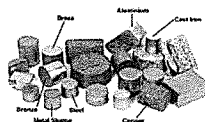
There are 7 different periods in the table.



Metals & Nonmetals



Metals & Nonmetals



METALS	NONMETALS
Metals are generally solids. (exception : mercury, gallium)	Nonmetals are found in all three states.
Metals are heavy. (exception : sodium, potassium, magnesium)	Nonmetals are generally light in weight.
They are hard and nonbrittle. (exception : sodium, potassium and lead which are soft)	Solid nonmetals are hard but brittle.
They are good conductors of heat and electricity. (exception : lead)	They are bad conductors of heat and electricity. (except graphite)
They are ductile and malleable.	They are neither ductile nor malleable.
Their melting point and boiling point are generally high.	Their melting point and boiling point are generally low.
They generally produce ringing sound on collision.	They do not produce ringing sound.
They are generally lustrous and can be polished.	They are generally non-lustrous and cannot be polished.

Halogens & Noble Gases

- Halogens are found in group 17 of the periodic table.
- They are the most reactive nonmetals.

Group 18 elements are the Noble Gases. They are all in the gas phase and are the least reactive elements.

The Periodic Table of the Elements

Group 1 - The Alkali Metals

- These elements are highly reactive metals. The reactivity increases on descending the Group from lithium to cesium.

The alkali metals differ from other metals in several ways. They are soft, with low melting and boiling temperatures. They have low densities - Li, Na and K are less dense than water

H	
Li	Lithium
Na	Sodium
K	Potassium
Rb	Rubidium
Cs	Cesium
Fr	Francium

Group 2 - The Alkaline Earth Metals

- The metals of Group 2 are harder and denser than sodium and potassium, and have higher melting points

These elements are all found in the Earth's crust, but not in the elemental form as they are so reactive. Instead, they are widely distributed in rock structures

4 Be beryllium	38 Sr strontium
12 Mg magnesium	56 Ba barium
20 Ca calcium	88 Ra radium

Group 14- Elements

In Group 14 the elements change from non-metallic in character at the top of the Group to metallic at the bottom. Carbon is a non-metal, silicon and germanium are metalloids, and tin and lead are typical metals.

C Non-metal	
Si Non-metal	
Ge Metalloid	
Sn Metalloid	
Pb Metal	

Solubility

- The ability of a substance to be dissolved in another. EX: salt dissolves in water
- Solute- The substance being dissolved. EX: salt
- Solvent- The substance doing the dissolving. EX: water
- Several things affect the rate of solubility. EX: temperature, surface area and pressure

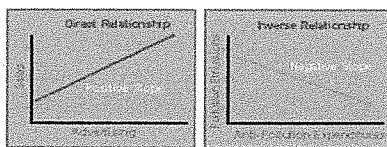
Solubility lab

- First get: triple beam balance, beaker, stirring rod, stopwatch, sugar cube, granulated sugar.
- Determine mass of sugar cube
- Place 250 ml of room temp water in beaker.
- Place cube in water and start stopwatch
- Stir until dissolved(DO NOT TOUCH CUBE)
- Repeat with equal mass of gran. sugar

Solubility and temperature

- For solids, as temperature increases solubility increases
- For gasses, as temperature increases solubility decreases

■ Direct vs. Inverse Relationship

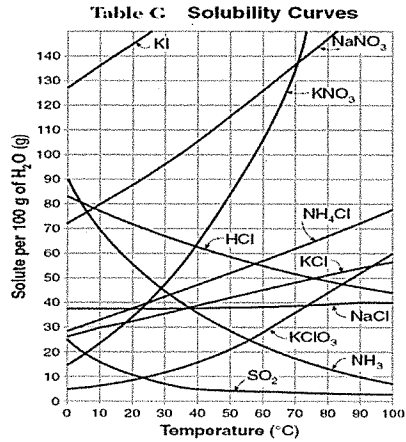


Saturated Vs. Unsaturated Vs. Supersaturated Solutions

- Saturated solution contains as much as it can hold at that temperature.
- Unsaturated solution contains less than it can hold at that temperature.
- Supersaturated Solution contains more than it can hold at that temperature.



Solubility graphs



Gas solubility and pressure

- As the pressure on a gas increases it's solubility increases.
- If you want to dissolve a lot of gas in a liquid, make it cold and under lots of pressure.
- Diet Coke and Mentos... nucleation

Conductivity

- Conductivity is the ability of a substance to conduct electricity or heat.
- Metals are good conductors
- Non-metals are poor conductors, but good insulators.

Electrolytes

- Electrolytes are liquids that conduct electricity
- Electrolytes are important to us because they transmit electro-chemical signals from our brain to our muscles

RUNNER ACADEMY Electrolyte Use While Running

Electrolyte	Fit/Acclimated	Unfit/Unacclimated
Sodium Chloride	1.8 grams/hr	3.5 grams/hr
Potassium	0.9 grams/hr	1.4 grams/hr
Magnesium	0.2 grams/hr	0.1 grams/hr

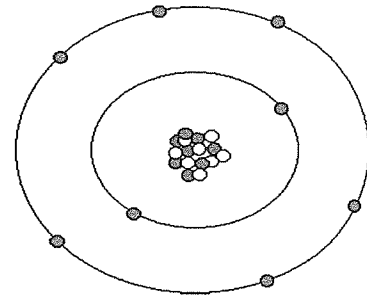
From: Watson, S., and Frank, R.J. Corry, R. Moore, R., Sweet's Compendium in Exercise and Health, Journal of Applied Physiology, 1982, 52, 948-954

Atomic Structure

- All elements on the periodic table are made of atoms.
- Each element has the same kind of atoms that are different from the other atoms due to their different # of protons.
- Each atom of oxygen is similar to every other atom of oxygen. They have 8 protons in the nucleus.

Structure of the atom

- Oxygen Atom



Atomic # and atomic mass

- Atomic # is the number of protons in the nucleus of the atom. EX: Hydrogen = 1, Oxygen = 8
- The atomic mass of an atom is the combined mass of all an atoms protons and neutrons.
- So Oxygen, atomic mass 16, is made up of 8 protons and 8 neutrons

Isotopes

- An isotope is an atom of an element with different numbers of neutrons.
- EX: Carbon 12 has 6 protons and 6 neutrons, while Carbon 14 has 6 protons and 8 neutrons.
- Both are Carbon, but they have different masses