



Metallic Properties

UNIT 3 PERIODIC TRENDS

Location

- Metals are located on the **left side** of the periodic table

Metal			Metalloid		Nonmetal												
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-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac-Lr															
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

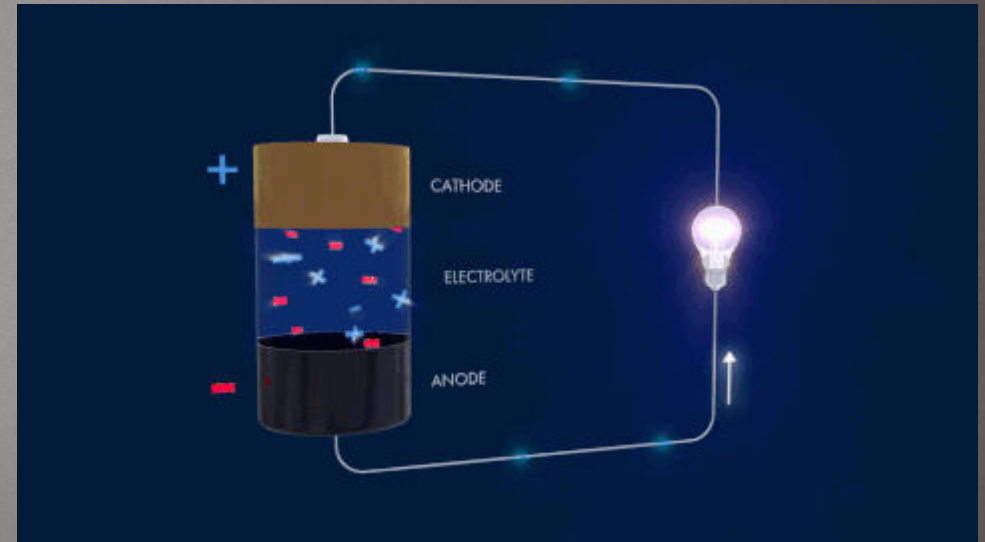
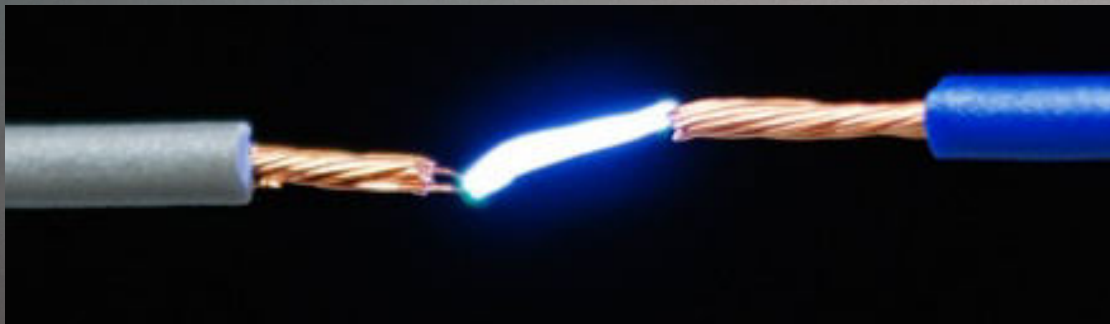
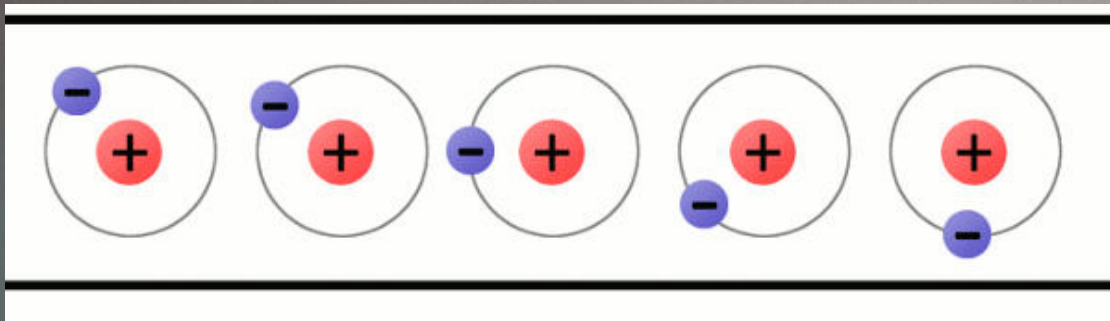
Luster

- Metals have luster, a gentle sheen or soft glow, especially that of a partly **reflective** surface.



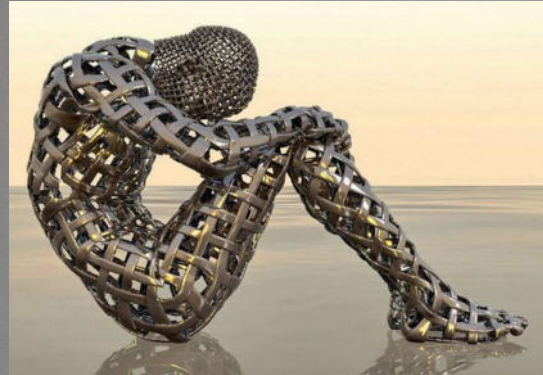
Conductivity

- ▶ Metals conduct **electricity** by giving away electrons.
- ▶ The flow of electrons is often called a “**sea of electrons**”



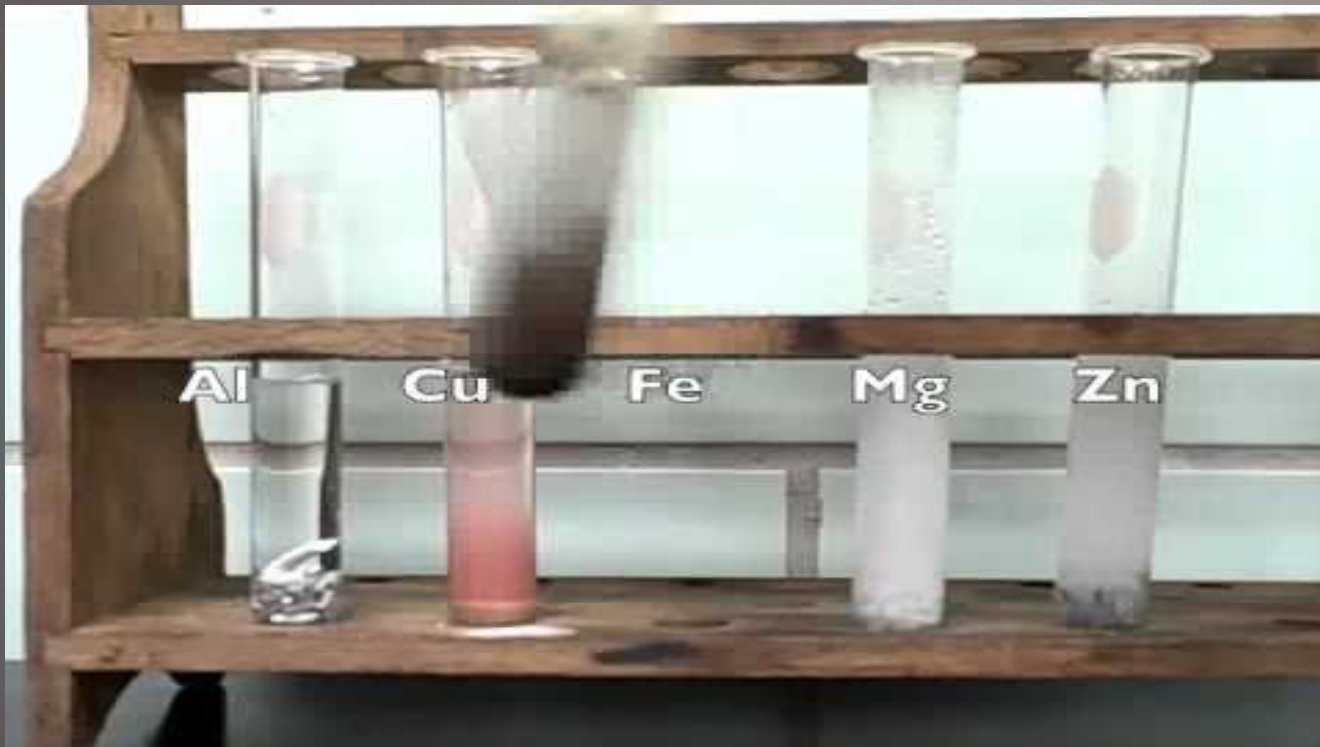
Malleability

- Metals are malleable because they can be bent and shaped **without breaking.**



Reactivity

- ▶ Metals react with acid to form **hydrogen gas**.
- ▶ Metals react with water to form **hydroxides**.



How to remember the Reactivity Series?

Please	Potassium	<div>Most reactive</div> <div>↑</div> <div>Least reactive</div>
Stop	Sodium	
Calling	Calcium	
Me	Magnesium	
A	Aluminium	
Careless	(Carbon)	
Zebra	Zinc	
Instead	Iron	
Try	Tin	
Learning	Lead	
How	(Hydrogen)	
Copper	Copper	
Saves	Silver	
Gold	Gold	

Reactivity

- Metals are more reactive as you move across the **table toward Group 1** and more reactive as you go **down a group**.

Periodic Table of the Elements
For Assessments Based on the 2010 Chemistry Standards of Learning

Valence 1 2 3 4 5 6 7 8
Oxidation +1 +2 +3 X -3 -2 -1 0
Group 1 2 13 14 15 16 17 18

Periodic Table of the Elements

Atomic mass: 28.0855
Symbol: Si
Atomic number: 14
Name: Silicon

Transition Elements

Lanthanoid Series

Actinoid Series

Mass numbers in parentheses are those of the most stable or most common isotope.

Metals ← → Nonmetals

Revised May 2011

How to remember the Reactivity Series?

Please
Stop
Calling
Me
A
Careless
Zebra
Instead
Try
Learning
How
Copper
Saves
Gold

Potassium
Sodium
Calcium
Magnesium
Aluminium
(Carbon)
Zinc
Iron
Tin
Lead
(Hydrogen)
Copper
Silver
Gold

Most reactive
↑
Least reactive

Oxidation

- ▶ Oxygen reacts with metals to form **rust** or **tarnish**.



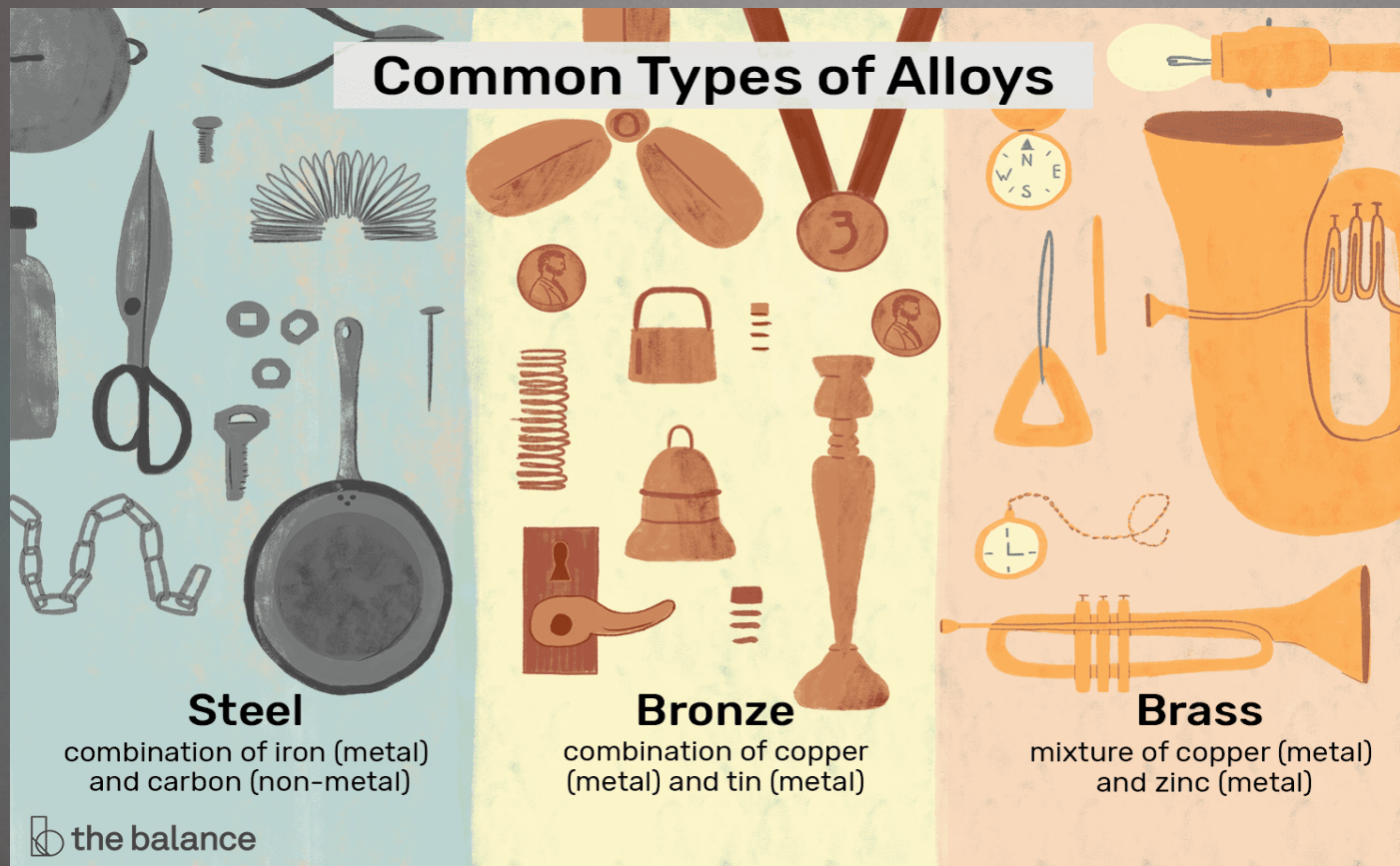
- ▶ Iron reacts with oxygen to form **iron oxide**.



- ▶ **Tarnish** occurs when silver and copper form metal oxides.

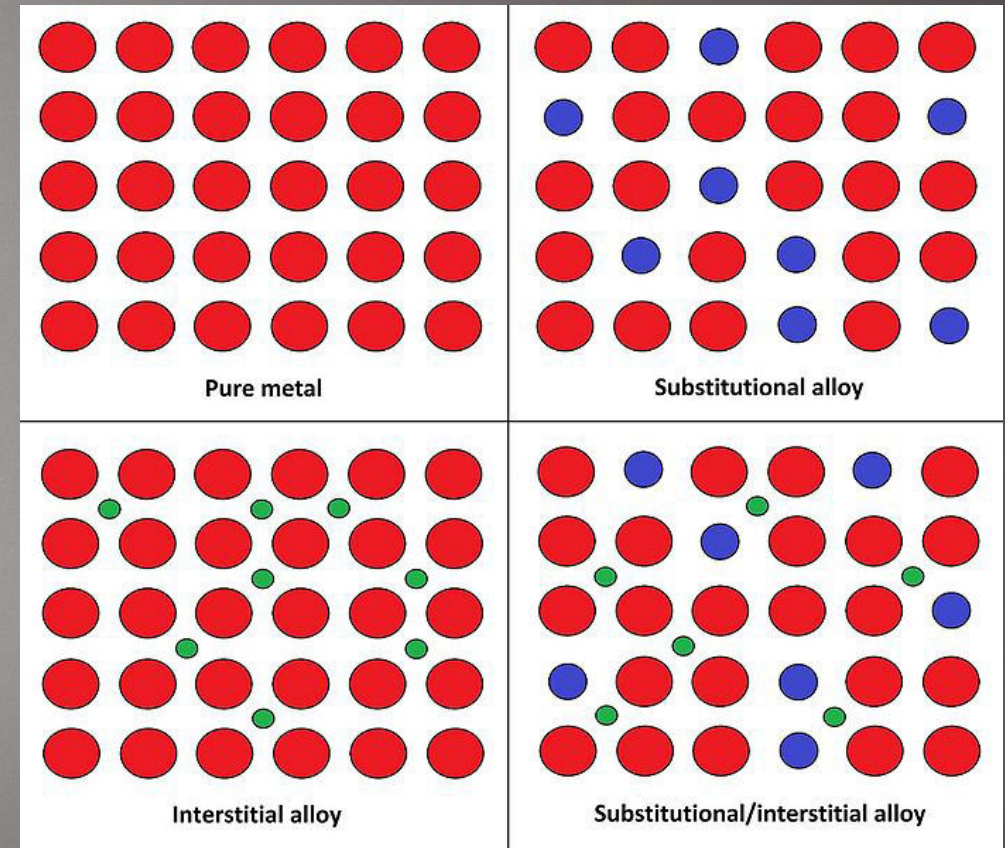
Alloys

- An alloy is a **homogeneous mixture** of metals.



Strength and Durability

- ▶ **Interstitial alloys**, like steel, are stronger and more durable because the tiny atoms fill in the gaps and prevent the alloy from bending
- ▶ **Substitutional alloys**, like brass and bronze, are more flexible because the new atom is almost the same size as the original atoms.



Metallic Properties Trend

INCREASING METALLIC CHARACTER

INCREASING METALLIC CHARACTER

1 H <small>Hydrogen 1.00794</small>																	2 He <small>Helium 4.003</small>
3 Li <small>Lithium 6.941</small>	4 Be <small>Beryllium 9.012182</small>																
11 Na <small>Sodium 22.989770</small>	12 Mg <small>Magnesium 24.3050</small>																
19 K <small>Potassium 39.0983</small>	20 Ca <small>Calcium 40.078</small>	21 Sc <small>Scandium 44.955910</small>	22 Ti <small>Titanium 47.867</small>	23 V <small>Vanadium 50.9415</small>	24 Cr <small>Chromium 51.9961</small>	25 Mn <small>Manganese 54.938049</small>	26 Fe <small>Iron 55.845</small>	27 Co <small>Cobalt 58.933200</small>	28 Ni <small>Nickel 58.6934</small>	29 Cu <small>Copper 63.546</small>	30 Zn <small>Zinc 65.39</small>	31 Ga <small>Gallium 69.723</small>	32 Ge <small>Germanium 72.61</small>	33 As <small>Arsenic 74.92160</small>	34 Se <small>Selenium 78.96</small>	35 Br <small>Bromine 79.904</small>	36 Kr <small>Krypton 83.80</small>
37 Rb <small>Rubidium 85.4678</small>	38 Sr <small>Strontium 87.62</small>	39 Y <small>Yttrium 88.90585</small>	40 Zr <small>Zirconium 91.224</small>	41 Nb <small>Niobium 92.90638</small>	42 Mo <small>Molybdenum 95.94</small>	43 Tc <small>Technetium (98)</small>	44 Ru <small>Ruthenium 101.07</small>	45 Rh <small>Rhodium 102.90550</small>	46 Pd <small>Palladium 106.42</small>	47 Ag <small>Silver 107.8682</small>	48 Cd <small>Cadmium 112.411</small>	49 In <small>Indium 114.818</small>	50 Sn <small>Tin 118.710</small>	51 Sb <small>Antimony 121.760</small>	52 Te <small>Tellurium 127.60</small>	53 I <small>Iodine 126.90447</small>	54 Xe <small>Xenon 131.29</small>
55 Cs <small>Cesium 132.90545</small>	56 Ba <small>Barium 137.327</small>	57 La <small>Lanthanum 138.9055</small>	72 Hf <small>Hafnium 178.49</small>	73 Ta <small>Tantalum 180.9479</small>	74 W <small>Tungsten 183.84</small>	75 Re <small>Rhenium 186.207</small>	76 Os <small>Osmium 190.23</small>	77 Ir <small>Iridium 192.217</small>	78 Pt <small>Platinum 195.078</small>	79 Au <small>Gold 196.96655</small>	80 Hg <small>Mercury 200.59</small>	81 Tl <small>Thallium 204.3833</small>	82 Pb <small>Lead 207.2</small>	83 Bi <small>Bismuth 208.98038</small>	84 Po <small>Polonium (209)</small>	85 At <small>Astatine (210)</small>	86 Rn <small>Radon (222)</small>
87 Fr <small>Francium (223)</small>	88 Ra <small>Radium (226)</small>	89 Ac <small>Actinium (227)</small>	104 Rf <small>Rutherfordium (261)</small>	105 Db <small>Dubnium (262)</small>	106 Sg <small>Seaborgium (263)</small>	107 Bh <small>Bohrium (262)</small>	108 Hs <small>Hassium (265)</small>	109 Mt <small>Meitnerium (266)</small>	110 (269)	111 (272)	112 (277)	113	114				