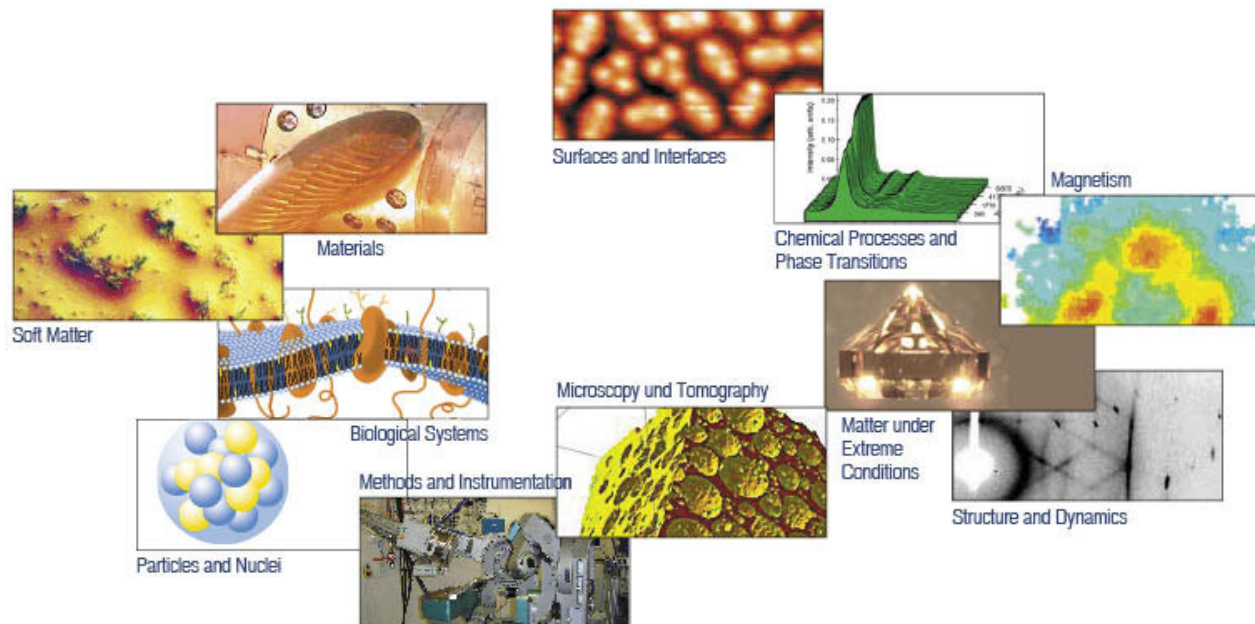


Classifying Matter:



Properties of Materials

OUTCOME QUESTION(S):

S1-2-07

What properties classify elements as **metals, **nonmetals** or **metalloids**?**

S1-2-12

How do you identify physical or chemical change, and how do you know if a chemical reaction has taken place?

Vocabulary & Concepts

State/Phase

Lustre

Ductility

Malleability

Solubility

Conductivity

Reactivity

Combustibility

Toxicity

Precipitate

Corrosion

Oxidation

Law of Conservation of Matter

Pre-Note Questions:

Where do we find metals, nonmetals, and metalloids on the periodic table?

to the right
of SC

NONMETALS

on SC ← METALLOIDS

to the left of SC

METALS

1 H 1.008	2 He 4.0026																	
3 Li 6.94	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180	
11 Na 22.990	12 Mg 24.305	13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948											
19 K 39.098	20 Ca 40.07	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.97	35 Br 79.904	36 Kr 83.798	
37 Rb 85.468	38 Sr 87.62											48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33											80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	#	Rf (265)	Db (268)	Sg (271)	Bh (270)	Hs (277)	Mt (276)	Ds (281)	Rg (280)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (294)	118 Og (294)	

* Lanthanide series

57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97
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Actinide series

89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)
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Physical properties

- Trait that is observed or measured without changing the composition of matter → atoms stay the same
- Can be qualitative or quantitative
↳ quality ↳ quantities
- Examples

- * State/phase – solid, liquid or gas (*normally*)
- * Hardness – how easy it is to *scratch or dent*
- * Viscosity – how easy it *flows*
- * Melting point – *unique temperature needed to*
- * Boiling point – *unique temperature needed to change from liquid into gas*

Unique means that no two elements have the same one!!

Other examples of Physical Properties:

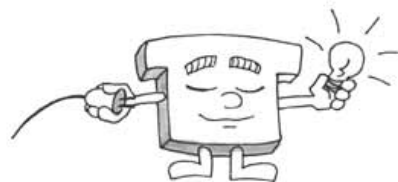
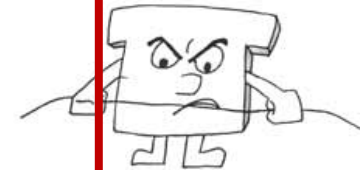
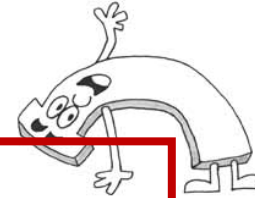
* Lustre – *shiny or dull*

* Malleability – how easy to *bend or flatten*
(*opposite – brittle*)

* Ductility – how easy to *pull into a wire*

* Solubility – does it *dissolve in water*

* Conductivity – does it *transfer heat/electricity*



Chemical properties

- Trait describes **if substance reacts** *chemically*

You have to be willing to **destroy or alter** the substance you are testing to find a ***chemical property***

- Examples

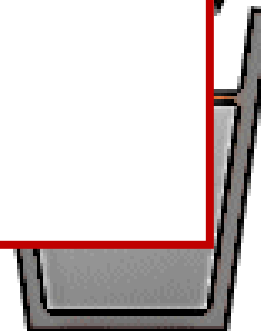
Reactivity – does it **react** *quickly*?


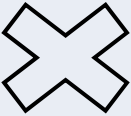
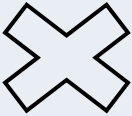




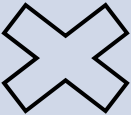
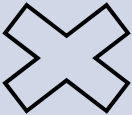


Combustibility – does it ignite or *burn*?

Corrosion – does it **react** with *acids*?

Oxidation – does it **react** with *air*?

Toxicity – does it **react** with the *body*?



Property	Metal	Nonmetal	Metalloid
Lustre	shiny	dull	shiny*
Malleable			 *
Ductile			 *
State (Rm Tp)	solid*	solid / gas*	solid
Conduct heat			 *
Conduct electricity			<i>semi</i>

(*) – there are exceptions to these properties