

Station #4: Component of Compounds—Metals and Nonmetals

I		II											III	IV	V	VI	VII	VIII	
1		2											13	14	15	16	17	18	
3		4											5	6	7	8	9	10	
Li 6.941		Be 9.012											B 10.811	C 12.011	N 14.007	O 15.999	F 18.998	Ne 20.180	
11		12											13	14	15	16	17	18	
Na 22.990		Mg 24.305											Al 26.982	Si 28.086	P 30.974	S 32.065	Cl 35.453	Ar 39.948	
19		20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K 39.098		Ca 40.078		Sc 44.956	Ti 47.88	V 50.942	Cr 51.996	Mn 54.938	Fe 55.847	Co 58.933	Ni 58.69	Cu 63.546	Zn 65.39	Ga 69.723	Ge 72.61	As 74.922	Se 78.96	Br 79.904	Kr 83.80
37		38		39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb 85.468		Sr 87.62		Y 88.906	Zr 91.224	Nb 92.906	Mo 95.94	Tc (98)	Ru 101.07	Rh 102.906	Pd 106.42	Ag 107.868	Cd 112.411	In 114.82	Sn 118.710	Sb 121.757	Te 127.60	I 126.905	Xe 131.29
55		56		71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs 132.905		Ba 137.327		Lu 174.967	Hf 178.49	Ta 180.948	W 183.85	Re 186.207	Os 190.2	Ir 192.22	Pt 195.08	Au 196.967	Hg 200.59	Tl 204.383	Pb 207.2	Bi 208.980	Po (209)	At (210)	Rn (222)
87		88		103	104	105	106	107	108	109	110	111							
Fr (223)		Ra 226.025		Lr (260)	Rf (261)	Db (262)	Sg (263)	Bh (264)	Hs (265)	Mt (266)	(269)	(272)							

Periodic Table of the Elements



57	58	59	60	61	62	63	64	65	66	67	68	69	70
La 138.906	Ce 140.115	Pr 140.908	Nd 144.24	Pm (145)	Sm 150.36	Eu 151.965	Gd 157.25	Tb 158.925	Dy 162.50	Ho 164.93	Er 167.26	Tm 168.934	Yb 173.04
89	90	91	92	93	94	95	96	97	98	99	100	101	102
Ac 227.028	Th 232.038	Pa 231.036	U 238.029	Np 237.048	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (288)	No (289)

Using the periodic table above (blue = metals, yellow = metalloids, and pink = nonmetals) and the list of ionic/covalent compounds below, explore some of the rules of covalent bonds and ionic bonds.

Ionic

NaCl
MgBr₂
NaNO₃
CaF₂
CS₂O
KI

Covalent

H₂O
NO₂
BrCl
PO₄
CO₂
C₆H₁₂O₆

Station #6: Melting Points

Melting Points of Some Ionic and Covalent Compounds			
Ionic compound	Melting Point of Ionic Compounds	Covalent Compound	Melting Point of Covalent Compounds
NaI	660 °C	NCl ₃	-40 °C
KBr	734 °C	H ₂ O	0 °C
NaBr	747 °C	O ₃	-192 °C
CaCl ₂	782 °C	P ₄ O ₆	23.8 °C
CaI ₂	784 °C	SO ₂	-72 °C
NaCl	801 °C	OCl ₂	-20 °C
MgO	2852 °C	HNO ₃	-42 °C

The chart above indicates the melting points of various ionic compounds and covalent compounds. Use the data to complete the *observations* section in your lab record sheet. Observe the differences in melting points between ionic compounds and covalent compounds. Write a claim which indicates whether the melting points of ionic compounds tend to be higher or lower than covalent compounds and justify your claim using evidence.

Station #8: Differences in Electronegativity Values

Electronegativity

0.8-0.9 2.6-2.9
1.0-1.4 3.0-3.8
1.5-1.9 3.9-3.9
2.0-2.4 4.0+

(1) (2)

H
2.1

Li Be
1.0 1.6

Na Mg
0.9 1.3

(3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

B C N O F
2.0 2.5 3.0 3.5 4.0

Al Si P S Cl
1.6 1.9 2.2 2.5 3.0

K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr
0.8 1.3 1.4 1.5 1.6 1.7 1.6 1.8 1.9 1.9 1.9 1.7 1.6 2.0 2.2 2.6 2.8 --

Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe
0.8 1.0 1.2 1.3 1.6 2.2 2.1 2.2 2.3 2.2 1.9 1.7 1.8 2.0 2.1 2.1 2.7 2.6

Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn
0.8 0.9 1.1 1.3 1.5 1.7 1.9 2.2 2.2 2.2 2.4 1.9 2.0 2.3 2.0 2.0 2.2 --

Fr Ra Ac Rf Db Sg Bh Hs Mt Uun Uuu Uub Uuc
0.7 0.9 1.1 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --

Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr

Using the Periodic table of electronegativity values above, find the *difference in electronegativity* (subtract) for each of the compounds and place into the observations section of your lab. (Note: Ignore the subscripts. Focus only on the elements.) Determine any generalizations that you can make regarding the differences of electronegativity values among ionic vs. covalent.

Ionic

NaCl

 MgBr_2

NaF

 CaF_2 Cs_2O

Covalent

NO₂ BrCl SO_2 PO_4 CO_2