

Station 1: Mini Lab

CONDUCTIVITY

SAFETY: DO NOT **touch** the anode or the cathode, it will shock you.



Procedure:

1. Test the conductivity of solid NaCl by bringing the beaker labeled “**solid NaCl**” up to the anode and cathode. Ensure the anode and cathode touch the solid NaCl.
2. Rinse the cathode and anode by bringing the beaker labeled “**RINSE**” up to the anode and cathode. Submerge the anode and cathode in the rinse water.
3. Record your results into your data table.
4. Repeat steps 1-3 for each sample.

Post Lab Questions:

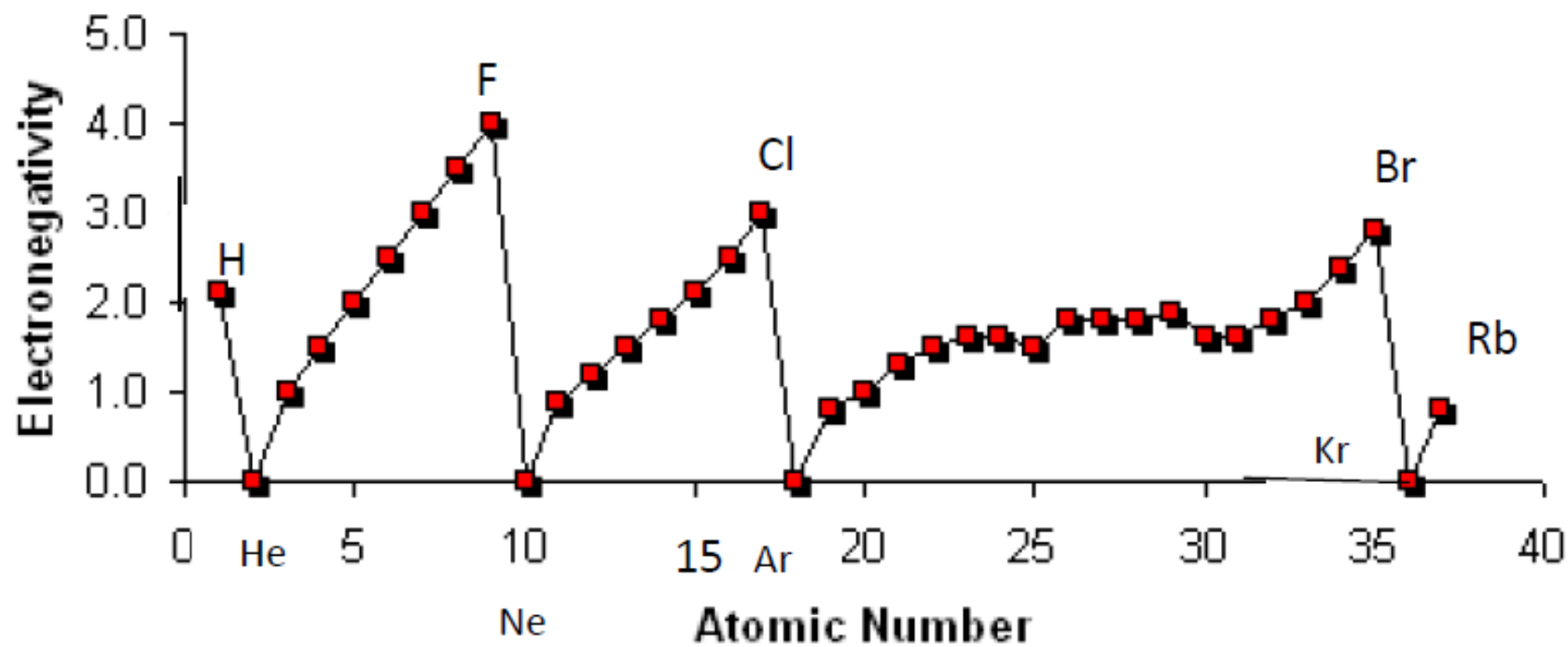
1. What do you observe when the sample conducts electricity?
2. Which sample(s) conducted electricity?
3. Discuss how the conductivity of the NaCl samples were different.
4. What conclusions can be made about how the conductivity of ionic compounds is different from that of molecular compounds?

STATION 2: Analyze Graph

Examine the graph of Electronegativity vs. Atomic Number.

1. Which element has the highest electronegativity value?
2. Why do He, Ne, and Ar have electronegativity values of zero?
3. What is the general electronegativity trend as atomic number increases, but number of energy levels remains constant? Why do you think this trend occurs?

Electronegativity vs Atomic Number



STATION 3: Analyze Table

Examine the table of Electronegativity Values.

1. Which elemental family is excluded from this table?
Why do you think this family has been excluded?
2. In general, do metals or nonmetals have a greater attraction for electrons in a chemical bond? Why do you think this is?

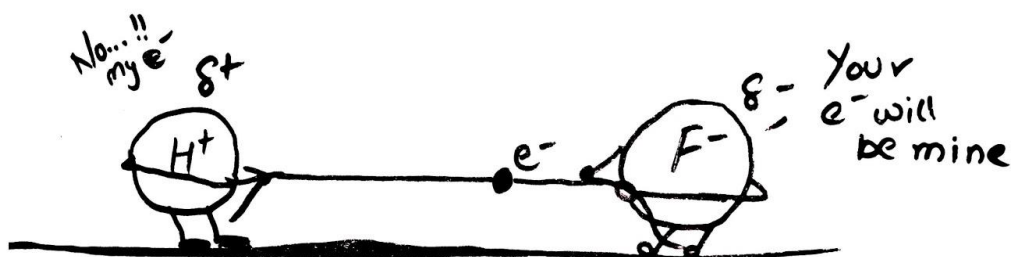
Electronegativity Values

H 2.1												B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	
Li 1.0	Be 1.5												Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0
Na 0.9	Mg 1.2												Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.9	Ni 1.8	Cu 1.9	Zn 1.6	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2	
Cs 0.7	Ba 0.9			Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2
Fr 0.7	Ra 0.9																

Station 4: Copy Notes

Higher electronegativity (EN) = greater ability to attract e^- from another atom in a chemical bond

Bond Type	Valence electrons are...	Δ EN
Nonpolar Covalent	SHARED <u>equally</u>	0 – 0.3
Polar Covalent	SHARED <u>unequally</u>	0.31 – 1.7
Ionic	STOLEN by the nonmetal	Greater than 1.7



Nonpolar covalent bonding

Electrons are shared equally



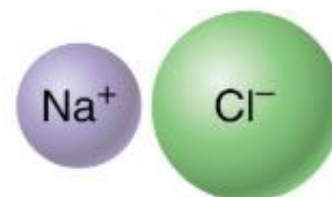
Polar covalent bonding

Electrons are shared unequally



Ionic bonding

Electrons are transferred

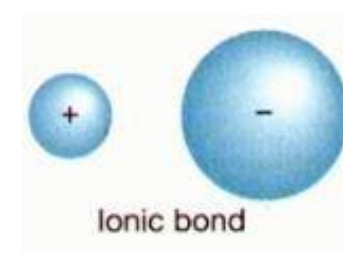
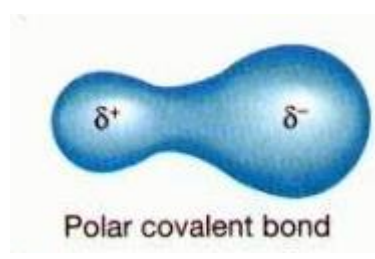
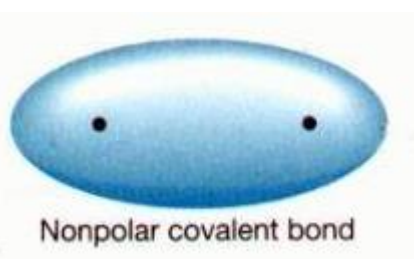


Increasing ionic character

Difference in electronegativity

0.3

1.7



STATION 5: Examples

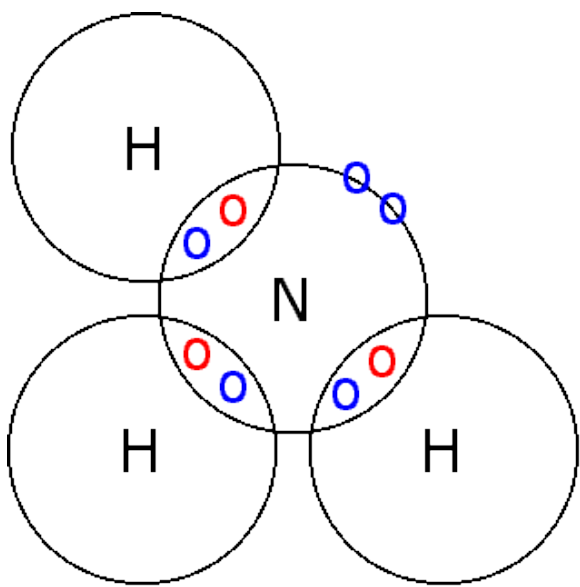
1. Record the electronegativity value for each element below.
 - a. Sodium (Na)
 - b. Chlorine (Cl)
 - c. Phosphorus (P)
2. For each bond below, determine the atom that would have the highest attraction for the electrons in the chemical bond.
 - a. Na and Cl
 - b. P and Cl
 - c. Cl and Cl
3. Calculate the electronegativity difference (Δ EN) between the atoms in each bond below. You may express your answers as positive values.
 - a. Na and Cl
 - b. P and Cl
 - c. Cl and Cl
4. Predict whether valence electrons will be transferred, shared equally or shared unequally between the atoms in each bond below.
 - a. Na and Cl
 - b. P and Cl
 - c. Cl and Cl
5. Classify each bond as either ionic, polar covalent or nonpolar covalent.
 - a. Na and Cl
 - b. P and Cl
 - c. Cl and Cl

Electronegativity Values

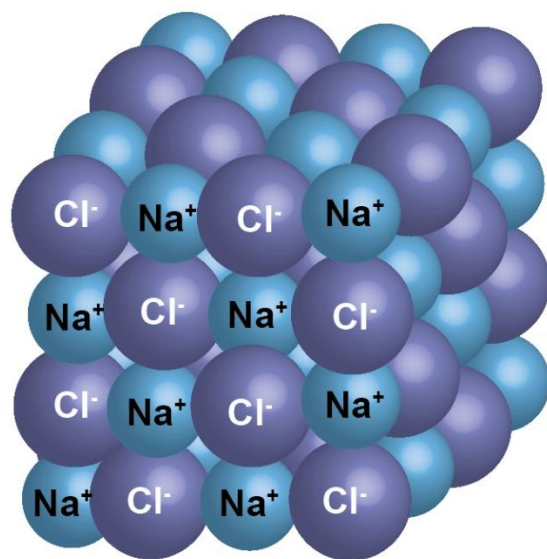
H												B	C	N	O	F	
2.1												2.0	2.5	3.0	3.5	4.0	
Li	Be											Al	Si	P	S	Cl	
1.0	1.5											1.5	1.8	2.1	2.5	3.0	
Na	Mg																
0.9	1.2																
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	
0.8	1.0	1.3	1.5	1.6	1.6	1.5	1.8	1.9	1.8	1.9	1.6	1.6	1.8	2.0	2.4	2.8	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	
0.8	1.0	1.2	1.4	1.6	1.8	1.9	2.2	2.2	2.2	1.9	1.7	1.7	1.8	1.9	2.1	2.5	
Cs	Ba			Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At
0.7	0.9			1.3	1.5	1.7	1.9	2.2	2.2	2.2	2.4	1.9	1.8	1.9	1.9	2.0	2.2
Fr	Ra																
0.7	0.9																

STATION 6: Analyze Pictures

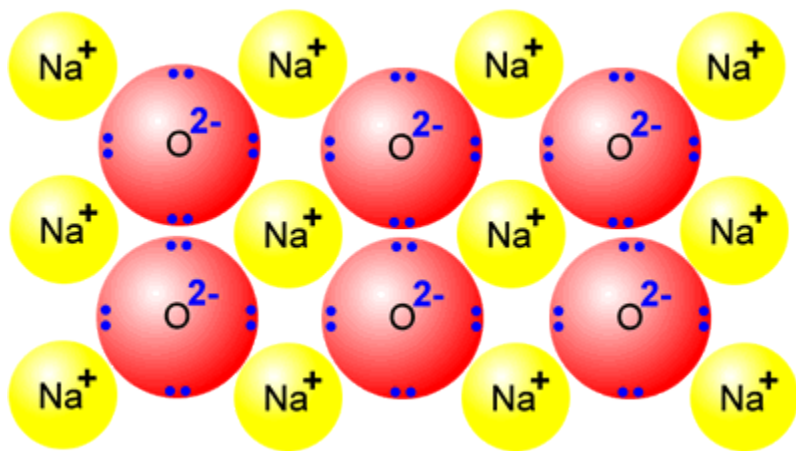
1. Identify each compound as either ionic or molecular.
2. Name each compound.
3. Examine the pictures of ionic compounds vs. molecular compounds.
 - a. What do all ionic compounds have in common?
 - b. What do all molecular compounds have in common?



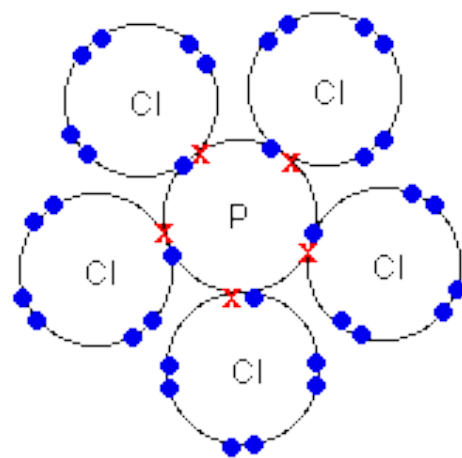
NH_3



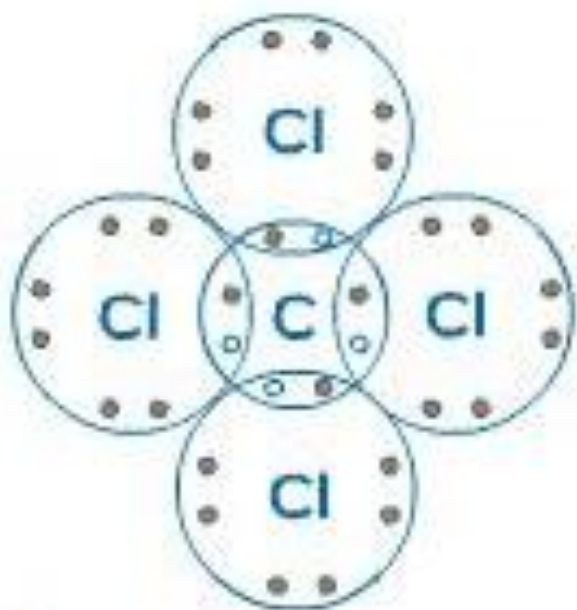
NaCl



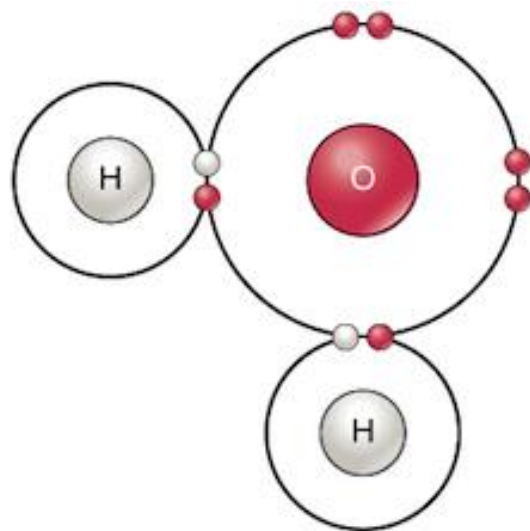
Na_2O



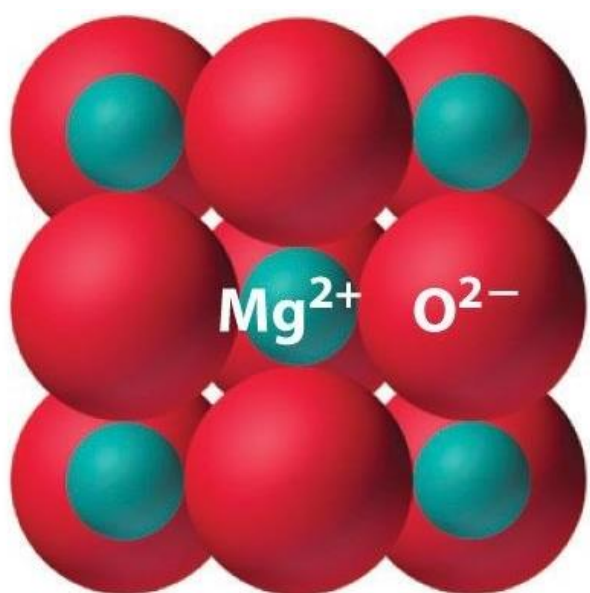
PCl_5



CCl₄



H₂O



MgO

Station 7: Watch Video

Scan the QR Code or find the video in Schoology.

Melting Sugar vs Salt Comparison

https://www.youtube.com/watch?v=E_q6OC1quSk



1. Which substance melted first?
2. Which substance has the highest melting point?
3. The substance with the highest melting point (#2), has what type of bond?
4. Complete the statement:
Ionic compounds have _____ melting points than molecular (covalent) compounds.