

CHEMISTRY LAB: ELECTRON DOT DIAGRAMS FOR IONIC COMPOUNDS

WHAT TO TURN IN: Data Table, Conclusion, Questions #1-5

Objectives

- To review element and ion names and symbols
- To practice writing electron dot diagrams for ionic compounds
- To relate electron dot diagrams to ion formation

Materials

- Colored pencils or markers
- Printed data table, OR plain white paper and ruler

Procedure

- 1) Print or obtain a data table with ten rows and eight columns.
 - Use one color for the cation and a different color for the anion.
 - Columns 1 & 3 are identical.
 - Use colors for columns 3, 6, and 8.

1	2	3	4	5	6	7	8
Cation Symbol (with charge)	Cation Name	Cation Dot Diagram	Anion Symbol (with charge)	Anion Name	Anion Dot Diagram	Compound formula AND name	Compound Dot Diagram

- 2) The steps to writing the electron dot diagram of a binary ionic compound:
 - Write the symbols of the elements (such as Na and Cl).
 - (Columns 1 & 4) Look up their oxidation numbers (charges) from their placement in the periodic table. Write the proper ion symbols and charges.
 - (Columns 2 and 5) Write the names of the ions. Remember that all monatomic anions end in -IDE.
 - (Column 7) Write the chemical formulas given on page 2.
 - (Column 7) Write the name of the binary ionic compound.
 - (Column 3) Draw the electron dot diagram for the cation. The cation will lose its electrons to the anion. If you use blue for sodium, its blue valence electron will be taken to form the chloride ion. The sodium ion has no valence electron showing. The complete octet in the cation is the exposed, previously filled shell from underneath the original valence. It is not shown in dot diagrams, to reflect the loss of electrons from the original valence "shell."
 - (Column 6) Draw the electron dot diagram for the anion. Use a different color than you used for the cation. The anion will gain electron(s) by taking it/them from the cation(s). The electrons that come from the cations should be shown in the color you used for the cation. All anions should show a complete octet.



sodium atom



sodium ion



chlorine atom



chloride ion

- (Column 8) Draw the electron dot diagrams for the ions. Honors chemistry students must alternate positive and negative charges.

ENTRIES FOR DATA TABLE	
BONDING PARTNERS	CHEMICAL FORMULA
1) lithium and oxygen	Li₂O
2) magnesium and iodine	MgI₂
3) aluminum and fluorine	AlF₃
4) calcium and nitrogen	Ca₃N₂
5) zinc and selenium	ZnSe
6) aluminum and sulfur	Al₂S₃
7) potassium and chlorine	KCl
8) cesium and bromine	CsBr
9) sodium and phosphorus	Na₃P
10) lead(IV) and nitrogen	Pb₃N₄
(Note: lead forms more than one charge, so the Roman numeral indicates that Pb ⁴⁺ is the proper ion for this compound. If you write “lead” instead of “lead(IV),” the name is incomplete and will be marked wrong.)	

Questions

- 1) Why do dot diagrams of cations show no electrons?
- 2) How many electrons should the anions show in their dot diagrams?
- 3) Why are all 10 of these compounds “binary ionic” compounds?
- 4) Why is it recommended to *alternate the positive and negative ions* in the compound dot diagrams?
- 5) How can you use dot diagrams of cations and anions to show which type is more electronegative than the other?