

Unit 4, Video 1: Ionic Compounds

1. When forming sodium chloride, what adjustments do sodium and chlorine make in order to satisfy the octet rule?
2. Define an ionic compound.
3. True or False: Chlorine and fluorine are both in group 17 on the periodic table. It is likely that an ionic bond would form between them.
4. True or False: Ionic compounds tend to have high melting temperatures.
5. True or False: Binary ionic compounds contain a metal and a nonmetal.
6. Complete the table below by providing the name or formula that is missing.

Name	Formula
	KCl
	Na ₂ O
	CrF ₂
aluminum oxide	
magnesium sulfide	
nickel(II) fluoride	

Unit 4, Video 2: Polyatomic Ions

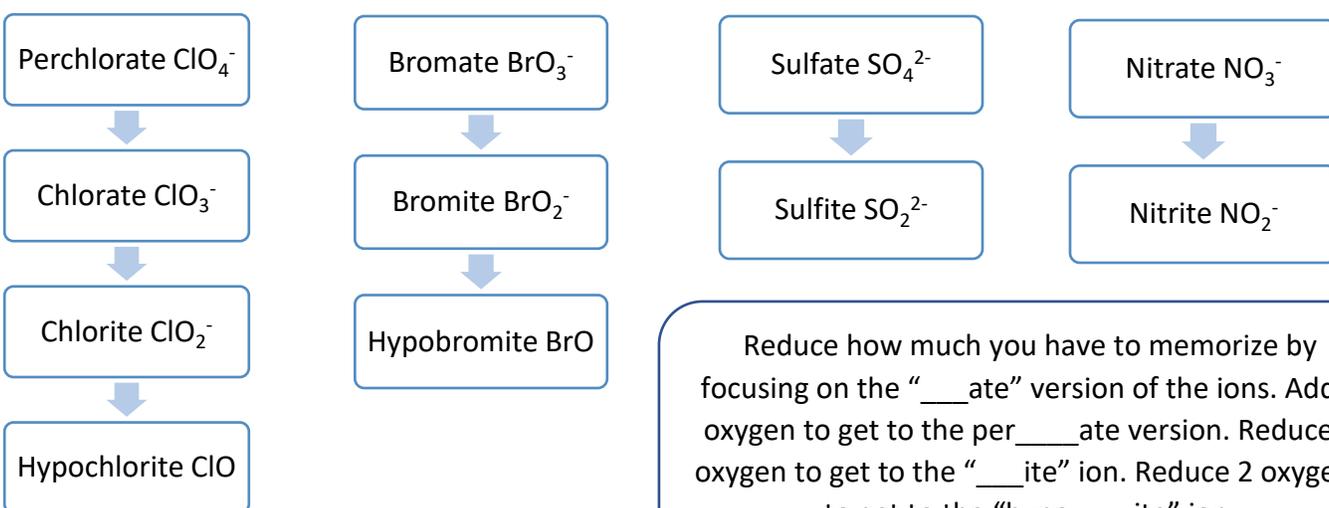
1. What is a polyatomic ion?
2. True or False: Polyatomic ions often participate in ionic bonding.
3. What is the charge of the nitrate ion?
4. True or False: The bond between nitrogen and oxygen in the nitrate ion is an ionic bond.
5. Use the space below to describe the naming trend for polyatomic ions.
6. The formula for the sulfate ion is SO_4^{2-} . What is the formula for the sulfite ion?
7. The formula for the bromate ion is BrO_3^{1-} . What is the formula for the perbromate ion?
8. The formula for the bromate ion is BrO_3^{1-} . What is the formula for the hypobromite ion?

Polyatomic Ions List

Alphabetically By Charge:

-1		-2	
Acetate	$C_2H_3O_2^-$	Carbonate	CO_3^{2-}
Acetate	CH_3COO^-	Chromate	CrO_4^{2-}
Bicarbonate	HCO_3^-	Dichromate	$Cr_2O_7^{2-}$
Bromate	BrO_3^-	Oxalate	$C_2O_4^{2-}$
Chlorate	ClO_3^-	Selenate	SeO_4^{2-}
Chlorite	ClO_2^-	Sulfate	SO_4^{2-}
Cyanide	CN^-	Sulfite	SO_3^{2-}
Hydroxide	OH^-	Thiosulfate	$S_2O_3^{2-}$
Hydrogen Sulfate	HSO_4^-		
Hydrogen Sulfite	HSO_3^-		
Hypobromite	BrO^-		
Hypochlorite	ClO^-	-3	
Iodate	IO_3^-	Phosphate	PO_4^{3-}
Nitrate	NO_3^-		
Nitrite	NO_2^-		
Perchlorate	ClO_4^-	+1	
Permanganate	MnO_4^-	Ammonium	NH_4^+
Thiocyanate	SCN^-		

By Series:



Reduce how much you have to memorize by focusing on the “__ate” version of the ions. Add 1 oxygen to get to the per__ate version. Reduce 1 oxygen to get to the “__ite” ion. Reduce 2 oxygens to get to the “hypo__ite” ion.

Unit 4, Video 3: Covalent Bonding

1. True or False: Electrons are shared when covalent bonds form.
2. True or False: The formula for an ionic compound indicates the actual number of atoms present in the compound.
3. True or False: The prefix indicates the charge of the element.
4. Covalent bonds form between _____ atoms.
5. From the list below, circle the pairs of elements you would expect to form a covalent bond.

Na-O

Cu-F

N-O

Ca-Br

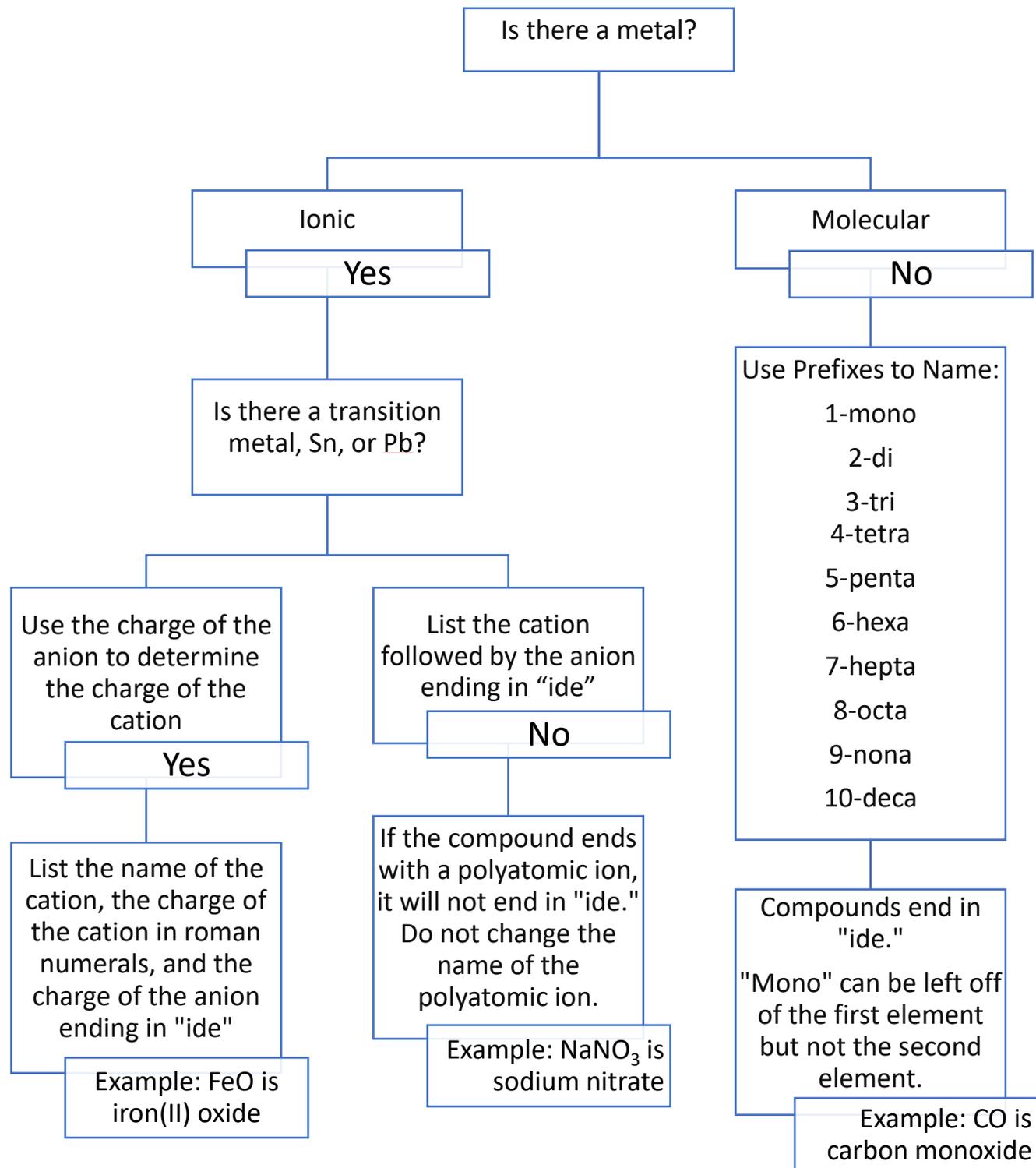
C-F

C-H

6. Complete the table below by providing the name or formula that is missing.

Name	Formula
	N ₂ O ₅
	CCl ₄
	N ₂ O
Sulfur dioxide	
Phosphorus tribromide	
Sulfur hexafluoride	

Naming Compounds Flow Chart



Unit 4, Video 4: Ionic Versus Molecular Compounds

1. Below is a list of ionic and molecular compound properties. Determine if each of the properties are ionic or molecular.

	Ionic or Molecular?
Solid crystals at room temperature.	
The formula represents the actual number of atoms present.	
The formula represents a ratio of the number of ions present.	
Composed of elements from opposite sides of the periodic table.	
Composed of only nonmetals.	

2. For each of the compounds listed below, decide if the compound is ionic or molecular. Name the compound.

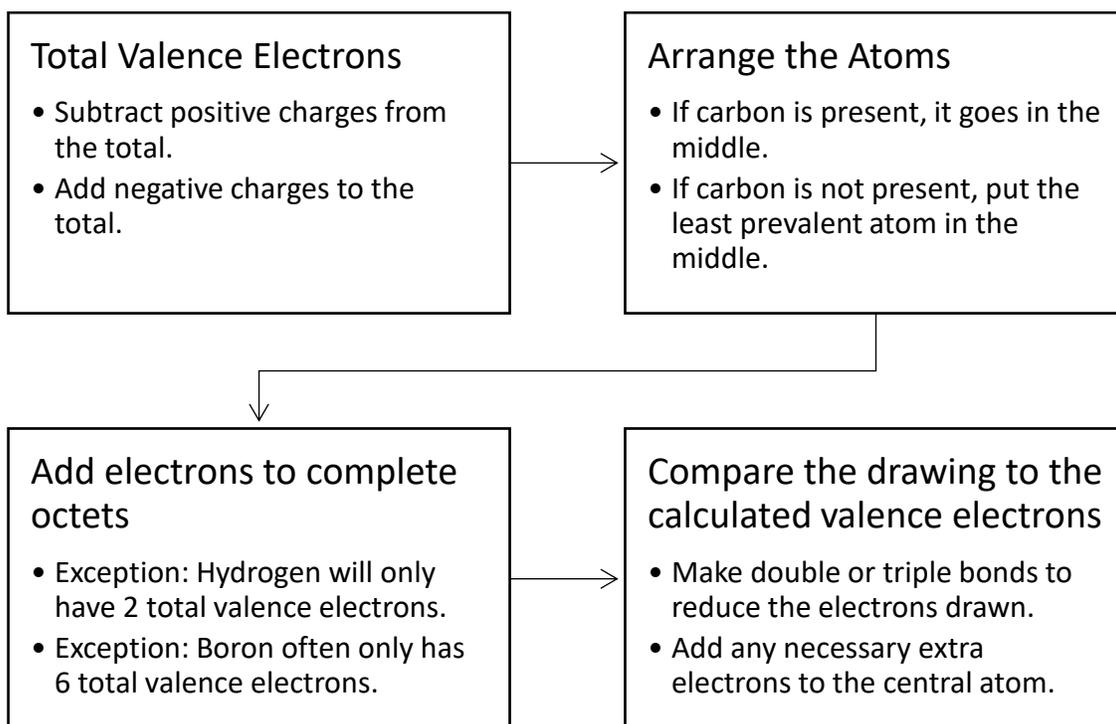
Compound	Ionic or Molecular	Name
Na_2S		
N_2O_3		
CuO		
NaNO_3		
CO_2		
LiF		
P_2Br_3		

Lewis Structure Steps

Lewis Structures are drawings that indicate:

- The location of the atoms within a molecule.
- The type of bond between the atoms in a molecule.
- The location of any unshared valence electrons in a molecule.

Steps for drawing a Lewis Structure:



Remember:

- In order to draw a double bond, a pair of electrons should be removed from both of the atoms that the bond touches.
- Only elements in groups 3 and below on the periodic table can exceed the octet rule.

Check yourself:

- Does every atom drawn have a complete octet? Exceptions: hydrogen and boron.
- Does the number of valence electrons match the number of electrons drawn?

Unit 4, Video 5: Lewis Structures

1. For a water molecule (H_2O), which element should go in the middle of the Lewis Structure? The hydrogen or the oxygen?
2. How many valence electrons are in a molecule of CCl_4 ?
3. True or False: Adding a double bond reduces the number of electrons drawn by 2.
4. How many valence electrons are present for the nitrate ion (NO_3^{-1})?
5. True or False: Single bonds are longer and stronger than triple bonds.
6. Use the space below to draw the Lewis Structure for H_2S .

Valence Electrons	Lewis Structure

Unit 4, Video 6: Expanded Octets

1. Hydrogen is an exception to the octet rule. How many valence electrons are often found on hydrogen?
2. Boron is an exception to the octet rule. How many valence electrons are often found on boron?
3. True or False: Nitrogen is an element that can exceed the octet rule by having more than 8 valence electrons.
4. In the Lewis Structure for sulfur hexafluoride, how many electrons does sulfur have? Why is this acceptable?
5. Use the space below to draw the Lewis Structure for PCl_4 .

Valence Electrons	Lewis Structure

VSEPR Chart

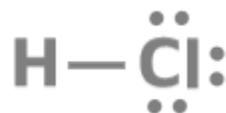
Total Domains	Lone Pairs	Example	Lewis Structure	Shape	Hybridization	Bond Angle
2	0	CO ₂	$\text{:}\ddot{\text{O}}=\text{C}=\ddot{\text{O}}\text{:}$	 Linear	sp	180°
3	0	BH ₃	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{B}-\text{H} \end{array}$	 Trigonal Planar	sp ²	120°
3	1	SO ₂	$\text{:}\ddot{\text{O}}-\ddot{\text{S}}=\ddot{\text{O}}\text{:}$	 Bent		
4	0	CH ₄	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	 Tetrahedral	sp ³	109.5°
4	1	NH ₃	$\begin{array}{c} \text{H} \\ \\ \text{H}-\ddot{\text{N}}-\text{H} \\ \\ \text{H} \end{array}$	 Trigonal Pyramidal		
4	2	H ₂ O	$\begin{array}{c} \text{H} \\ \\ \text{H}-\ddot{\text{O}}-\text{H} \\ \\ \text{H} \end{array}$	 Bent		

Unit 4, Video 7: VSEPR Theory

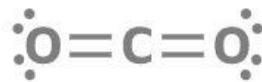
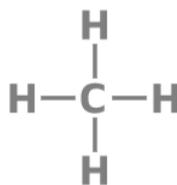
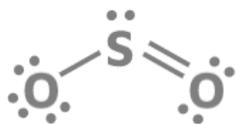
1. True or False: Lone pairs on the central atom of a molecule do not affect the shape of the molecule.
2. What is a domain?
3. What shape will result from a molecule where the central atom has two domains?
4. True or False: A flat drawing of a trigonal planar structure is accurate because all of the bonds are in the same plane.
5. True or False: The bent shape of silicon dioxide results from the lone pairs of electrons on the sulfur repelling the bonded electrons.
6. The Lewis Structure for PH_3 has 3 single bonds and a pair of electrons. What shape do you expect this molecule to have?
7. True or False: The shape of the original orbitals within an atom allow bonded electrons to spread out as much as possible.
8. What is the hybridization for a molecule where the central atom has four single bonds?
9. A molecule has a central atom with two single bonds and one double bond. What is the expected bond angle for this molecule?
10. True or False: A lone pair on the central atom of a molecule takes up as much space as a bonded pair of electrons.

Unit 4, Video 8: Polar Covalent Bonds

1. Describe the trend for electronegativity found on the periodic table.
2. True or False: Polar covalent bonds are made up of atoms with differences in their electronegativity values.
3. The bond between hydrogen and chlorine is a polar covalent bond. Use the Lewis Structures below to demonstrate the two ways this polarity can be indicated.

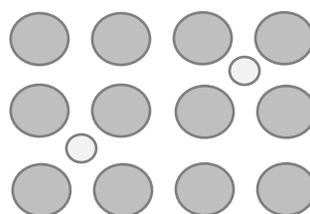
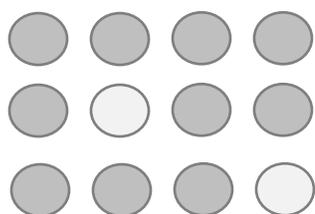


4. Describe what is happening with the electrons in the bond between hydrogen and chlorine.
5. True or False: All molecules that contain a polar covalent bond are polar molecules.
6. List the molecular shapes that often cancel out polarity in molecules.
7. For each of the molecules below, indicate if the molecule is polar or nonpolar.



Unit 4, Video 9: Metallic Bonding

1. Describe the arrangement of electrons in metallic bonding.
2. What does it mean for a metal to be malleable?
3. What does it mean for a metal to be ductile?
4. Define luster.
5. True or False: Alloys tend to have different properties from pure metals.
6. Label the illustrations below as "substitutional" or "interstitial."



7. True or False: Gold and silver atoms would most likely make up an interstitial alloy because the atoms are roughly the same size.
8. True or False: Iron and carbon atoms would most likely make up an interstitial alloy because there is a large difference in the size of the atoms.