WKS 6.1 - Classifying Ionic versus Covalent / Lewis Dot Structures of Atoms

Classify the following compounds as ionic ([metal or ammonium ion] + [non-metal or polyatomic ion]), covalent (nonmetal+ nonmetal).

$CaCl_2$	CO_2	H_2O
$BaSO_4$	K_2O	NaF
Na_2CO_3	CH_4	SO_3
LiBr	MgO	NH_4Cl
HCl	KI	NaOH
NO_2	$AlPO_4$	$FeCl_3$
P_2O_5	N_2O_3	$CaCO_3$

Draw Lewis dot structures for each of the following atoms:

Aluminum	Silicon	Potassium
Xenon	Sulfur	Carbon
Hydrogen	Helium (watch out!)	Bromine
Selenium	Nitrogen	Barium
Chlorine	Gallium	Argon

WKS 6.2 - LDS for Ions/ Typical Charges

Determine the common oxidation number (charge) for each of the following ions, and then draw their Lewis Dot Structure. Don't forget to show brackets and charge on your LDS for ions!
Note: Notice that non-metals get the –ide ending to their names when they become an ion.

Aluminum ion	Silicon ion	Potassium ion
Fluoride ion	Sulfide ion	Carbide ion
Hydrogen ion	Cesium ion	Bromide ion
Chloride ion	Gallium ion	Zinc ion
Silver ion	Oxide ion	Barium ion

Predict the common oxidation numbers (CHARGE) for each of the following elements when they form ions. ALSO - there may be more than one!!! Especially on those pesky non-metals in Groups 14 & 15.

Element	Common Oxidation Number(s)	Element	Common Oxidation Number(s)
Rubidium		Sulfur	
Arsenic		Bismuth	
Strontium		Tin	
Cadmium		Phosphorous	
Zinc		Silver	
Lead		Bromine	
Aluminum		Gallium	

WKS 6.3 - LDS for Ionic Compounds (2 pages)

Fill in the chart below. You will need to determine how many of each ion you will need to form a neutral formula unit (compound)

	Cation LDS	Anion LDS	Algebra for neutral compound	IONIC COMPOUND LDS
Na + Cl	**$Na\bullet \rightarrow [Na]^+$**	**$:\ddot{Cl}\bullet \rightarrow [:\ddot{Cl}:]^-$**	**(+1) + (-1) = 0**	**$[Na]^+ [:\ddot{Cl}:]^-$**
1. K + F				
2. Mg + I				
3. Be + S				
4. Na + O				
5. Ga + S				
6. Rb + N				

90% of a worksheet must be completed to earn credit for that worksheet!

WKS 6.3 - LDS for Ionic Compounds (continued)

Draw just the final Lewis dot structure for each of the following IONIC compounds. REMEMBER THE NAMING PATTERN FOR ANIONS – THEY HAVE AN –IDE ENDING!

This means you need to figure out how many of each ion you need to balance out the charge!

7. Calcium bromide	8. Aluminum bromide
9. Magnesium oxide	10. Rubidium nitride
11. Aluminum selenide	12. Cesium sulfide
13. Strontium phosphide	14. Beryllium nitride
15. Potassium iodide	16. Lithium silicide

WKS 6.4 – LDS for Covalent Compounds and Polyatomic Ions (1 page)

Covalent molecules are named using prefixes. If there is no prefix, then it is understood that there is only one of that element in the compound. If there is a prefix, then the prefix indicates how many of that element is in the compound. (ex: mono = 1, di = 2, tri = 3, tetra = 4, penta = 5, hexa = 6)

Molecule	Lewis Dot Structure	# bonds on central atom	# non-bonded pairs of electrons on central atom	General "ABX" Formula	Does the particle resonate? (Y or N)
1. carbon tetrabromide CBr_4					
2. sulfate ion					
3. hydrogen sulfide H_2S					
4. bromine trichloride $BrCl_3$					
5. nitrate ion					
6. xenon tetrafluoride $\mathbf{XeF_4}$					
7. phosphorous trifluoride $\mathbf{PF_3}$					

WKS 6.5 – LDS for All Kinds of Compounds! (1 page)

Draw the Lewis structure for each of the following. IDENTIFY each first as being a simple ion, polyatomic ion, ionic compound (with or without a polyatomic ion), or covalent compound. Don't forget to balance out the charge on the ionic compounds. REMEMBER: include brackets with a charge for ions!

1.nitrite ion		2.nitrogen gas (hint: it's diatomic!)	
3. cyanide ion		4.bromide ion	
5.sulfur dioxide **SO_2**		6.ammonium phosphate	
7.sulfur hexafluoride **SF_6**		8.bromine pentachloride **$BrCl_5$**	
9.chlorate ion		10. carbon monoxide **CO**	
11. carbonate ion		12. chlorine tribromide **$ClBr_3$**	

WKS 6.6 – VSEPR Shapes of Molecules (2 pages)

Predict the AB_yX_z and molecular shape of each of the following. Note: you must draw your Lewis Dots first in order to be able to do this!!! Also, all of these are predicted to be covalent compounds.

Particle	Lewis Dot	AB_yX_z formula	Molecular Shape
1. sulfur trioxide **SO_3**			
2. carbon tetrachloride **CCl_4**			
3. phosphate ion			
4. arsenic trichloride **$AsCl_3$**			
5. ammonium ion			
6. oxygen difluoride **OF_2**			
7. phosphorus pentachloride **PCl_5**			
8. hydrogen selenide **H_2Se**			
9. nitrogen triiodide **NI_3**			

WKS 6.6 – VSEPR Shapes of Molecules (continued)

Particle	Lewis Dot	AB_yX_z formula	Molecular Shape
10. sulfate ion			
11. bromate ion			
12. sulfur dichloride **SCl_2**			
13. selenium hexafluoride **SeF_6**			
14. arsenic pentabromide **$AsBr_5$**			
15. boron trichloride **BCl_3**			
16. water			
17. carbonate ion			
18. nitrate ion			

WKS 6.7 – Polarity and Intermolecular Forces (1 page)

All of the following are predicted to be covalent molecules. Indicate whether the intermolecular force (IMF) is predominantly H-bonding, Dipole-dipole, or London Dispersion.

PARTICLE	LEWIS DOT	#POLAR BONDS	# NON-POLAR BONDS	MOLECULE POLAR?	IMF
1. Arsenic trichloride **$AsCl_3$**					
2. Carbon tetrachloride **CCl_4**					
3. Carbon disulfide **CS_2**					
4. Sulfur trioxide **SO_3**					
5. Boron trichloride **BCl_3**					
6. Phosphorus pentachloride **PCl_5**					
7. Nitrogen gas (diatomic!)					
8. Sulfur dioxide **SO_2**					
9. Oxygen gas (diatomic!)					
10. $BeCl_2$ (assume covalent)					

WKS 6.8 – Basic Concepts & Definitions (1 page)

Fill in the following blanks using the work bank.

Affinity	**Charge**	**Conductivity**	**Covalent**	**Crystal lattice**
Force	**Ionic**	**Ionization**	**Lowest**	**Malleability**
Metallic	**Neutral**	**Nucleus**	**Protons**	**substances**

1. A chemical bond in an attractive _____ that holds atoms together.
2. Chemical bonding is the process of atoms combining to form new _____.
3. Matter tends to exist in its _____ energy state.
4. A(n) _____ bond is a bond in which one atom donates electrons to another atom.
5. When the number of protons equals the number of electrons an atom has a _____ charge.
6. Ions are atoms with a positive or negative _____.
7. _____ is the process of removing electrons from atoms to form ions.
8. Electron_____ is the tendency of an atom to gain electrons when forming bonds.
9. A bond in which atoms share electrons is called a _____ bond.
10. In a(n) _____ bond many electrons are share by many atoms.
11. Metallic bonds are _____ thus metals are able to be pounded into many shapes.
12. Ionic compounds have a low _____ in the solid state, and a higher _____(same work) in the molten state.

Indicate whether the following statements are true (T) or false (F). If the statement is false, re-write the statement to make it true.

1. Chemical bonding is the process of atoms combining to form new substances.
2. Valence electrons are in the innermost energy level.
3. Matter in its lowest energy state tends to be more stable.
4. Particles with a positive or negative charge are called ions.
5. One property common to metals is ductility.
6. Covalent molecules tend to have higher melting and boiling points compared to ionic compounds.
7. Covalent molecules conduct electricity in all states.
8. Hydrogen bonding intermolecular forces are stronger than London Dispersion intermolecular forces.
9. Ionic compounds typically exist in the gaseous phase at room temperature.
10. When an atom loses on or more electrons it becomes negatively charged and we call it a cation.
11. Polar molecules have a permanent dipole moment.