Unit 4 Review

Vocabulary: explain each in your own words

Bond types

a. covalent bond, a bond between two nonmetals where electrons are shared (localized)

b. ionic bond, a bond between a cation and anion where electrons are transferred (from cation to anion)

e metallic bond, a bond between two metals where electrons are shared and create a "sea of electrons" (delocalized)

2. Complete the following table

	ionic bonds	covalent bonds	metallic bonds
types of elements involved (metal, nonmetal)	**Metal + Nonmetal**	**Nonmetal + Nonmetal**	**Metal + Metal**
what happens to the e- (give/take or share or sea of e-)	**Transferred from metal to nonmetal – locked into place**	**Shared between the two nonmetals – locked into place**	**Shared between metals with delocalized (mobile) electrons**
List all the properties of compounds with these bonds	**High Melting Point** **High Boiling Point** **Crystalline Solid** **Brittle** **Conducts electricity when dissolved** **Easy to dissolve**	**Low Melting Point** **Low Boiling Point** **Solid, Liquid, or Gas** **Does NOT conduct electricity**	**High Melting Point** **High Boiling Point** **Solid Lattice Structure** **Good conductor of heat** **Good conductor of electricity**

4. Describe the octet rule, what do we use if for?

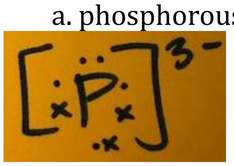
The octet rule tells us that all atoms want to have a full outer energy level of 8 valence electrons to act like a noble gas and become stable. Hydrogen and Helium follow the duet rule because they only have one energy level.

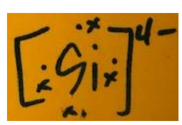
5. How many valence electrons are there in the following atoms?

a. arsenic 5 b. iodine 7 c. silicon 4 d. sulfur 6

6. What **ions** would the following atoms form? (Draw them below)

a. phosphorous b. chlorine c. silicon d. selenium





7a. Why do atoms form ions? Are the ions stable?

To become stable and fullfil the octet rule (full outer energy level). Ions are stable.

7b. Circle the correct answers:

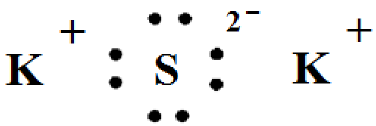
Cations **(lose e- / gain e-)** to become stable and this makes them (**bigger/smaller)** than their neutral atoms.

Anions **(lose e- / gain e-)** to become stable and this makes them (**bigger/smaller)** than their neutral atoms.

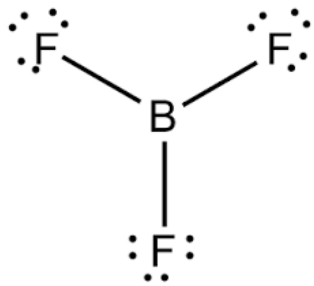
8. How many hydrogen atoms would be expected to bond covalently to each of the following atoms: (draw it out below)
a. Ge -4 H's   b. S – 2 H's   c. Br -1 H   d. Si – 4 H's   e. P – 3 H's

9. K_2S **(Ionic)** BF_3 **(Covalent)** NI_3 **(Covalent)**   KCl **(Ionic)**

a. Draw the Lewis Dot structures for the above compounds.
b. Are the above compounds ionic or molecular? Why?
c. Do the above compounds have ionic or covalent bonds? Why?



Ionic Lewis Dot



Covalent Lewis Dot

10a. What is necessary for an ionic compound to conduct electricity? Explain why.
They need to be dissolved in water in order for the ions to move freely.

10b. Why are metals good conductors of electricity?
Share to create a sea of electrons – electrons are delocalized and move freely within the metal.

Choose 4 compounds from below and draw the Lewis dot structure and if it's molecular, name the VSEPR shape, for each. Pick 2 molecular and 2 ionic compounds.

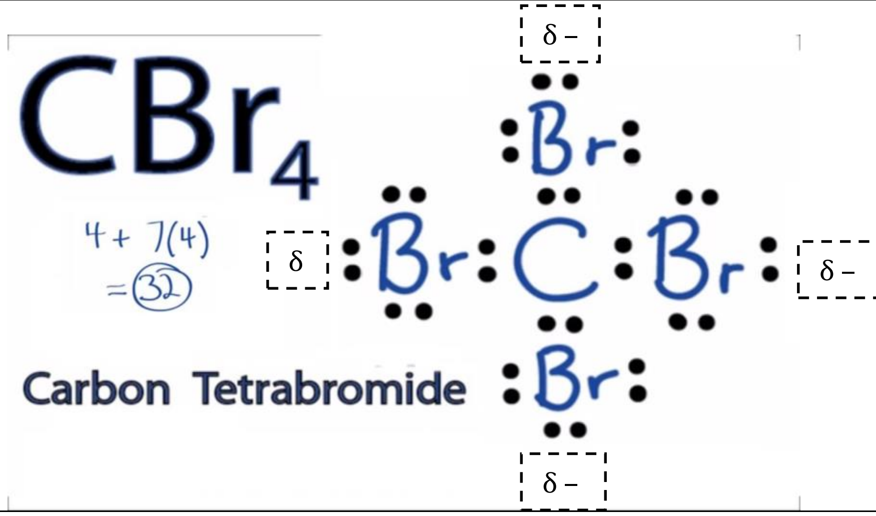
11. Write the following compounds formula:

Tetraarsenic decaoxide **As_4O_{10}**	Magnesium sulfide
Nitrogen Gas **N_2**	Ammonium nitrate
Boron tribromide **BBr_3**	Manganese (III) cyanide
Dichlorine pentaoxide **Cl_2O_5**	Phosphorus tribromide
Potassium iodide **KI**	Xenon difluoride
Sodium bromide **NaBr**	Disulfur dichloride
Sodium carbonate **Na_2CO_3**	Sulfur trioxide
Tin (IV) chlorite **$Sn(ClO_2)_4$**	Copper (II) oxide
Calcium oxide **CaO**	Cadmium oxide

12. Write the following compounds name:

NaCl **Sodium Chloride**	P_3O_3
$BaCl_2$ **Barium Chloride**	$MgCO_3$
AlF_3 **Aluminum Fluoride**	$Fe(ClO_4)_3$
FeO **Iron (II) Oxide**	$Be(CH_3COO)_2$
KI **Potassium Iodide**	N_2O_5
AgCl **Silver Chloride**	SnS_2
S_4N_4 **Tetrasulfur Tetranitride**	CoO
$(NH_4)_3PO_4$ **Ammonium Phosphate**	$CrCl_3$
OF_2 **Oxygen Difluoride**	$SnCl_2$
$SnCl_4$ **Tin (IV) Chloride**	Co_2O_3

	Bond type (Circle one)	**Draw the dot structure--- be careful do they share e- or give/get e-** **<u>If covalent</u>**- label the partial charges over each bond with δ + or δ – in the molecule **<u>If ionic</u>**- don't label the partial charges!

CBr_4	covalent or ionic polar or non-polar	
OI_2	covalent or ionic polar or non-polar	
NF_3	covalent or ionic polar or non-polar	
$GaCl_3$	covalent or ionic polar or non-polar	$[Cl]^{-1}[Ga]^{3+}[Cl]^{-1}$ $[Cl]^{-1}$ Gallium should appear "naked" because it gave all of its electrons to Chlorine. Chlorine should have seven dots with one x to show where it took one of Gallium's electron.

What is the strongest intermolecular force in each molecule?

a. CaS Hydrogen bonding, Dipole-Dipole, London dispersion, Ionic- no IMF (*circle one)*

b. $SeBr_2$ Hydrogen bonding, Dipole-Dipole, London dispersion, Ionic- no IMF (*circle one)*

c. NF_3 Hydrogen bonding, Dipole-Dipole, London dispersion, Ionic- no IMF (*circle one)*