Name_____ Date_____ Page_____

Bonding Review Packet

Write the Lewis Dot Diagrams for the following:

helium atom:

beryllium atom: beryllium ion:

neon atom:

aluminum atom: aluminum ion:

magnesium atom: magnesium ion:

sodium atom: sodium ion:

Write the Lewis Dot Diagrams for:

oxygen atom: oxide ion:

chlorine atom: chloride ion:

phosphorus atom: phosphide ion:

How would you describe (in general) the Lewis Dot Diagram for:

a) a cation?

b) an anion?

What type of bonding would you expect in a compound that contains a metal and a nonmetal?

Name_____ Date_____ Page_____

Ionic Bonds

Remember: *Ionic bonds form between POSITIVE IONS and NEGATIVE IONS. Ionic bonding is when one of the atoms is donating an electron(s) (the cation) and one of atoms is accepting an electron(s) (the anion). The electrons are not shared, the anion gains an electron(s) to achieve a full valence and the cation loses an electron(s) to achieve a full valence.*

Diagram the ionic bonding process from neutral atoms to ions showing the valence electrons and indicating with arrows the direction in which the electrons are going. Write your final answer in the box.

Ex: sodium nitride (Na_3N)

1. sodium chloride (NaCl)

2. barium oxide (BaO)

3. magnesium chloride ($MgCl_2$)

4. calcium chloride ($CaCl_2$)

5. potassium fluoride (KF)

6. sodium oxide (Na_2O)

7. aluminum chloride ($AlCl_3$)

8. rubidium oxide (Rb_2O)

Name_____ Date_____ Page_____

Single Covalent Bonds

Background info:
When atoms of nonmetals bond to each other they share valence electrons and form a covalent bond. When atoms bond they usually have to rearrange their electrons from the positions we pictured in the single atom. The goal is for every atom to have eight electrons around it except for hydrogen which has only two electrons. Hydrogen only forms one single bond; other atoms can form up to four single bonds. When you draw a dot diagram for a molecule you start with the atom that is only in the formula once—it will be in the center of the molecule with the other atoms arranged around it. If there are only two atoms it doesn't matter where you start. Draw Lewis dot diagrams for the following molecules.

HINT: Carbon, nitrogen, and sulfur are usually the central atom(s) (in the center) surrounded by terminal atoms (surrounding central). Carbon is always a central and hydrogen is always a terminal. When in doubt, put the any single atom in the middle, surrounding it with the element that contains more than one atom.

Final Answer

Ex: nitrogen triiodide (NI_3)

Show work here

1. carbon tetrabromide (CBr_4)

2. dihydrogen monosulfide (H_2O)

3. dihydrogen monoselenide (H_2Se)

4. phosphorus triodide (PI_3)

Name_____ Date_____ Page_____

1. Draw the single bonds below.

a) hydrogen (H_2)

b) bromine (Br_2)

c) water (H_2O)

d) ammonia (NH_3)

2. **Determine if it is an ionic bond or a covalent bond. Show the work and the final answer**

Remember: *Covalent bonds form between two nonmetals that share electrons. Ionic bonds are formed between a metal and a nonmetal that completely transfer electrons.*

e) methane (CH_4)

f) iron (II) oxide (FeO)

g) carbon tetrachloride (CCl_4)

h) phosphorus tribromide (PBr_3)

i) sodium nitride (Na_3N)

j) hydrochloric acid (HCl)

Name_____ Date_____ Page_____

Double AND Triple Bonds

Double bonds can form when a shared single bond alone doesn't satisfy either atoms valence. Double bonds are TWO SHARED PAIRs of electrons for a total of 4 electrons (2 electrons from one atom and 2 from the other). Double bonds are much stronger and bond the atoms closer than a single bond.

Ex: carbon dioxide

Show work here. Final Answer

1. oxygen (O_2)

2. ethene (C_2H_4)*** C's are always central and they will link together.

Triple bonds can form when 3 pairs of electrons are shared for a total of 6 shared electrons. Typically one atom donates 3 electrons and the other atom donates the other 3. Triple bonds are even stronger than double bonds and the atoms are held even closer together.

EX: nitrogen (N_2)

Name_____ Date_____ Page_____

3. ethyne (C_2H_2) (remember C's are always central atoms)

Name_____ Date_____ Page_____

We have looked at diagrams for ionic compounds and for molecules of covalent substances that contain only single bonds. Many molecules contain double or triple bonds. Ideally an atom is involved in only single bonding that is a more stable arrangement. But, if the atom cannot achieve eight electrons in its valence shell it will become involved in double or triple bonds to reach this stable arrangement. Draw diagrams for the following molecules.

1. **Double Bonds:**

a) oxygen (O_2)

b). formaldehyde (H_2CO) * the C's in the middle attach the 2 Hs and the O to it.

2. **Triple Bonds:**

c) nitrogen (N_2)

d). hydrogen cyanide (HCN) *the carbon is in the middle with the other two attached to it.

3. **A mixture of all types of bonds:** RECALL THE DIFFERENCE BETWEEN IONIC AND COVALENT!!!

e) N_2H_2 *** (N goes in the middle)

f) C_2H_6 *** (C's in the middle)

g) CF_2Cl_2 *** (C in the middle, 2 F's and Cl's around it)

h) KF

i) N_2F_4 *** (N's in the middle)

j) Mg_3N_2

Name_____ Date_____ Page_____