Key

Name _____

Period _____ Date _____

Study Guide for Bonding Test – Academic Chemistry

Vocabulary/Concepts: anion, cation, covalent bonding, ionic bonding, metallic bonding, ductile, malleable, nonpolar covalent, polar covalent, electronegativity, molecule, polyatomic ion, bond length, octet rule, lone pair, single bond, double bond, triple bond, VSEPR theory (official name for rules about molecular geometry), intermolecular force, intramolecular force, hydrogen bonding, dipole-dipole, London dispersion forces

I added this

	Ionic	Covalent	Metallic
How they form bonds	transferring electrons	sharing electrons	"sea of electrons"
How to tell which type from formula	metal with nonmetal or contains polyatomic ion	nonmetal-nonmetal	just a metal
Conductivity	conducts only when dissolved in water (aqueous) or molten (melted)	does not conduct	conducts
Structure or Shape	crystal lattice structure	molecular geometry (VSEPR theory)	n/a
How to draw electron dot structures	use arrows	share electrons	neutral atom
Intermolecular Force	electrostatic	hydrogen bonding, dipole-dipole, and/or London dispersion	n/a
Melting points and Boiling points	high	low	high
Usual state at room temperature (solid, liquid, gas?)	solid	liquid or gas	solid
Electronegativity difference	greater than 1.7	0-0.5 nonpolar covalent 0.5-1.7 polar covalent	n/a

Network solid

covalent many atoms

many NM

does not conduct

DBL helix polymers

DNA

graphite diamond silicon

hydrogen bonding

high

solid

N.A.

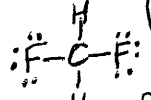
Ionic { M 1-3 e⁻ Valence / NM 5-7

Dipole - molecule - Polar δ+ δ−

Answers to back of Study Guide

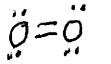
1. Identify the major intermolecular force in each compound.

a. CH_2F_2 (no hydrogen bonding because no H-F bond)

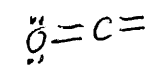


dipole-dipole because polar because not all four atoms around C are the same

b. oxygen, O_2 "even" molecule is nonpolar so only has London dispersion

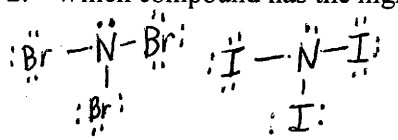


c. carbon dioxide



nonpolar so it has only London dispersion

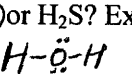
2. Which compound has the higher melting point: NBr_3 or NI_3? Explain.



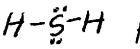
the lone pair on the nitrogen makes both polar with dipole-dipole as strongest force for both. So mass of NI_3 is greater than mass of NBr_3.

3. Which compound has the higher melting point: H_2O or H_2S? Explain.

H_2O has hydrogen-bonding



H_2S has dipole-dipole



polar because lone pairs on central atom

So H_2O has a stronger IMF

4. What is the difference between a hydrogen bond and a covalent bond?

Intermolecular (between two different molecules)

Intramolecular (within a molecule to hold atoms together)

5. A covalent bond in which the bonded atoms have an unequal attraction for the shared electrons is called a(n) polar covalent bond. (polar) (covalent)

6. A neutral group of atoms held together by covalent bonds is called a(n) molecule.

7. A covalent bond between two atoms produced by sharing two pairs of electrons is called a(n) double bond.

8. A chemical bond that results from the attraction between metal atoms and the surrounding sea of electrons is called a(n) metallic bond.

9. An ionic bond results from electrical attraction between large numbers of _____.

(A.) cations and anions B. atoms C. dipoles D. orbitals

10. Which of the following elements can form a double bond with another element?

A. chlorine B. hydrogen (C.) oxygen D. helium

group 1A and 7a elements can only form one single bond

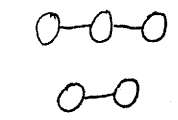
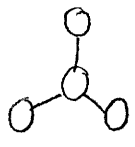
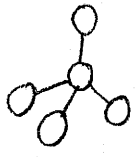
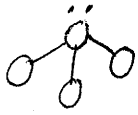
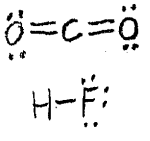
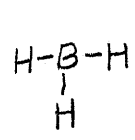
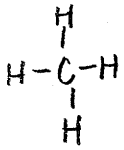
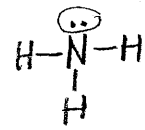
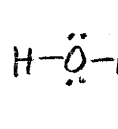
noble gas does not bond.

11. Which of the following is not ionic?

A. NaI M-NM B. $CaCl_2$ M-NM (C) CO_2 2 NM's only covalent compound D. Na_2O M-NM

12) Why did magic sand not mix or attract H_2O

Molecular Geometries (VSEPR theory, only for covalent compounds)

Drawing of Shape					
Example dot Structure					
Shape Name	Linear	Trigonal planar	Tetrahedral	Trigonal pyramid	Bent
Bond Angle	180	120	109.5	107	104.5
Hybrid Orbitals	sp	sp^2	sp^3	sp^3	sp^3
Polarity	NP → CO_2 P → HF	NP	NP	P 1 Lone pr	P 2 Lone pr

Intermolecular Force	Electrostatic	Hydrogen Bond	Dipole-dipole	London Dispersion
Strength	strongest	strongest Covalent	less strong than Hbond	the weakest
How to recognize	Ionic M + NM	NM + NM H with F, O, N	Polar	NP but present in all
Example of a substance with this IMF	NaCl KBr	CO_2 BCl_3	HF CH_3Cl PCl_3	Kr H_2 Cl_2 CH_4

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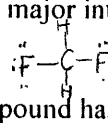
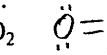
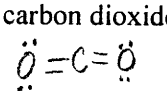
   a. CH_2F_2  D-D, LD
   b. oxygen, O_2  LD
   c. carbon dioxide  LD
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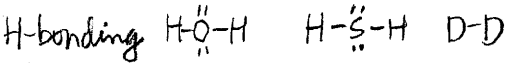
   H-bonding  D-D
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