

Chemistry 20 - Unit 1 - Exam Study Guide

You should know your tests come DIRECTLY from your homework and notes ... So study the notes and do the homework and you should be just fine. Come see me if you need some help!

Chemical Bonding

- Rules for bonding relationships
- Define valence electrons, electrostatic force, ionization energy,

Ionic Bonding

- Properties of the periodic table
- Define, explain and demonstrate ionic bonding (what it includes, what happens with the electrons, what's going on) Be able to draw ELECTRON DOT DIAGRAMS of ionic bonding
- Electronegativity; define and explain how it increases up and across the periods on the periodic table. Explain that it is the pull of electrons by the NUCLEUS Explain the effect on the melting temperature that the ionization and electronegativity have. (that is melting temp increases as ionization energy and electronegativity increase)

Molecular Bonding

- Define, explain and demonstrate molecular bonding (what it includes, what happens with the electrons, what's going on)
- Define what a diatomic molecule is
- Interpret the capacity of elements (ie. C usually has 4 bonds)

Lewis Formulas and VSEPR

- Know how to produce LEWIS DOT DIAGRAMS for molecular bonds
- Define VSEPR and explain in your own words what the theory is all about
- Using the chart, be able to identify and draw the VSEPR configurations of molecules (with correct configuration names)

Forces and Dipoles

- Define and give examples of intermolecular forces, intramolecular forces, Van der Waals Forces, Dipole Dipole, London Forces
- Explain how polarity occurs within a molecule (using electronegativity to explain the concept)
- Explain how bonding can be a continuum between ionic, polar covalent and non-polar covalent
- Give an example of like dissolves like
- Explain the rules for Hydrogen bonding

Definitions to Know:

VSEPR

Lewis Dot Diagrams

Structural Diagrams

Central Atom

Peripheral Atoms

Linear

Trigonal Planar

Trigonal Pyramidal

Bent

Tetrahedral

Bent tetrahedral

London Forces

Vander Waals Forces

Polarity

Dipole

Hydrogen Bonding

Intermolecular Forces

Definitions from
Text.

Practice Questions

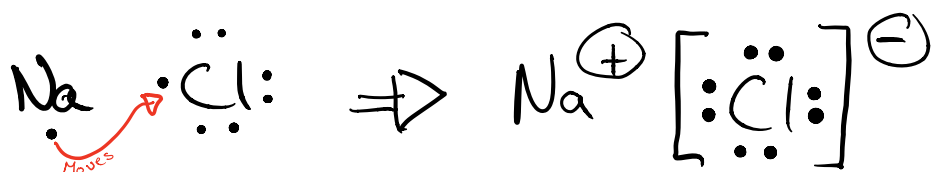
- 1) Write a theoretical definition of electronegativity, covalent (molecular) bond, and ionic bond, and describe the bonds in terms of a difference in electron rearrangement.

Electroneg = the pull of an atom on e^-

Molecular = 2 non-metals share e^-

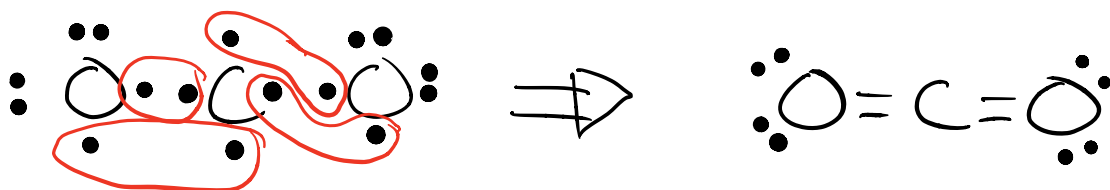
Ionic = m + nm transfer e^-
(held electrostatically)

- 2) Explain how an ionic bond is formed, give an example and use a diagram to show electron movement on this diagram.



- 3) Explain how a molecular bond is formed, give an example and use a diagram to show electron movement on this diagram.

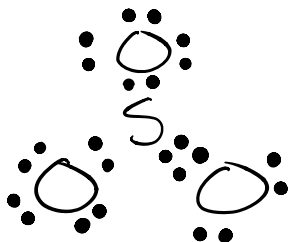
2 non-metals share e^-



- 4) Determine the Lewis structures for the following molecules:

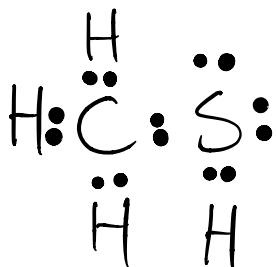
a) $\text{SO}_3(\text{g})$

$24e^-$

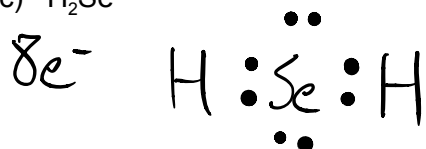


b) CH_3SH

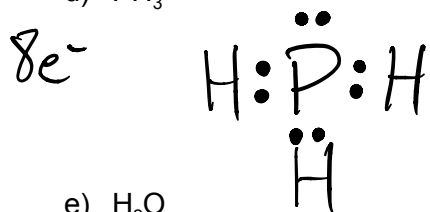
$14e^-$



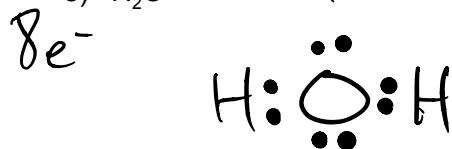
c) H_2Se



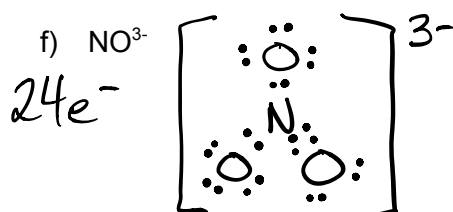
d) PH_3



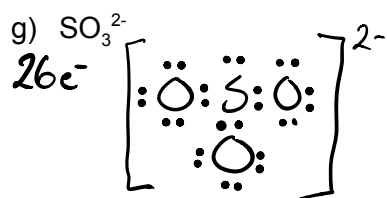
e) H_2O



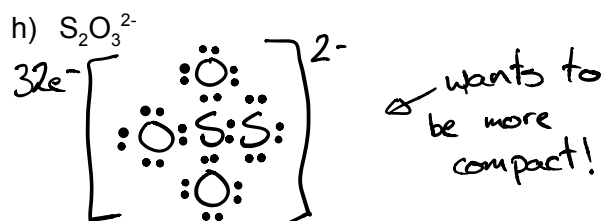
f) NO_3^-



g) SO_3^{2-}



h) $\text{S}_2\text{O}_3^{2-}$



5) Why is it incorrect to write the structural formula of H_2S molecule as $\text{H}-\text{H}-\text{S}$?

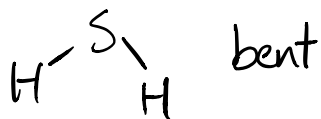


6) Use VSEPR theory to predict the geometry of a molecule of each of the following substances. Name the molecular geometry

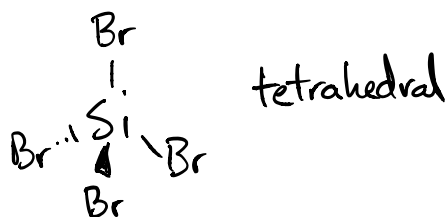
a) Cl_2O



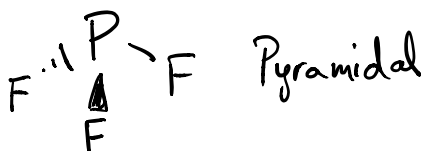
b) H₂S



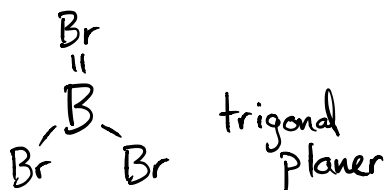
c) SiBr₄



d) PF₃



e) BBr₃

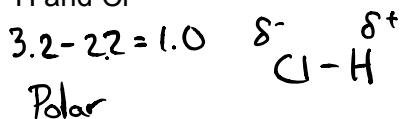


f) HCl

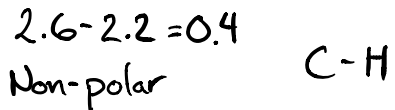


7) Draw the following bonds, label the charges (if any) on the ends of the bonds. Classify the bond as ionic, polar covalent, or nonpolar covalent.

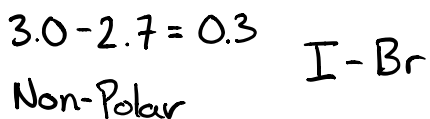
a) H and Cl



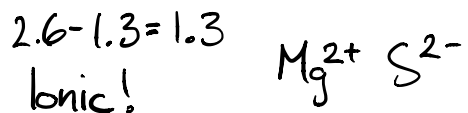
b) C and H



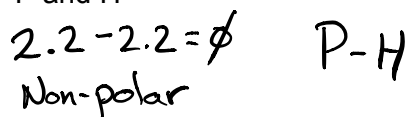
c) I and Br



d) Mg and S

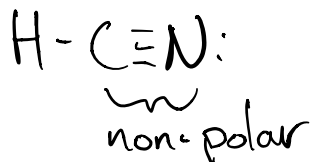


e) P and H



8) Predict the bond polarity for the following bonds. Use a diagram that includes the dipoles, and dipole direction if produced by the bond.

a) CN triple bond in hydrogen cyanide



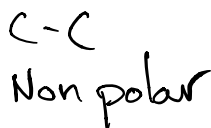
b) N=O bond in nitrogen dioxide



c) P-S bond in $\text{P}(\text{SCN})_3$

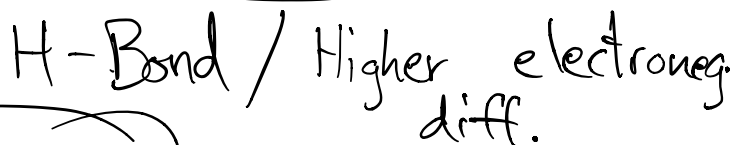


d) C-C in C_8H_{18}

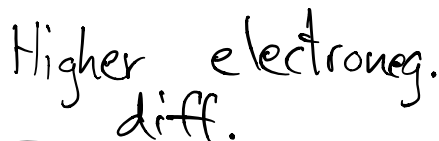


9) Which compound in each of the following pairs has a stronger dipole-dipole forces than the other in their liquid or solid state? Provide your reasoning.

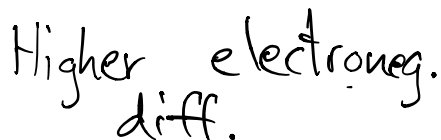
a) Hydrogen chloride or hydrogen fluoride



b) Chloromethane CH_3Cl or iodomethane CH_3I



c) Nitrogen tribromide or ammonia



d) Water or hydrogen sulfide

H-Bond / Higher electroneg diff.

10) Based upon London forces and dipole-dipole interactions, predict which molecular substance in the following pairs has a higher boiling point. Provide your reasoning.

a) Boron trifluoride or nitrogen trifluoride

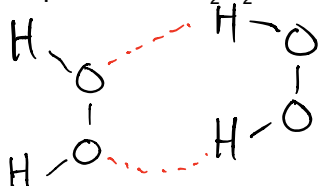
bigger!

b) Chloromethane or ethane

bigger!

11) For each of following compounds, evidence indicates that hydrogen bonds contribute to the attraction between molecules. Draw a Lewis formula using a dashed line to represent any hydrogen bond between 2 molecules of the substance.

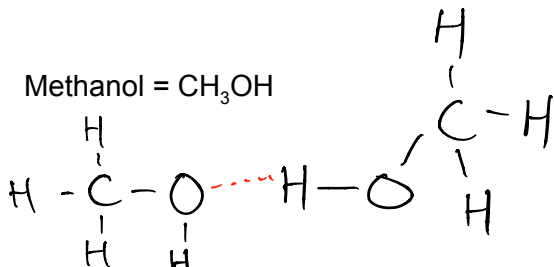
a) Hydrogen peroxide = H_2O_2



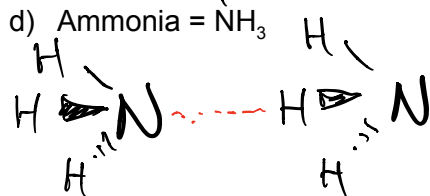
b) Hydrogen fluoride = HF



c) Methanol = CH_3OH



d) Ammonia = NH_3



12) Water beads on the surface of a freshly waxed car hood. Use your knowledge of intermolecular forces to explain beading.

Polar dissolves polar

Water = Polar

Wax = non-Polar

13) Predict the solubility of the following organic compounds in water as low, medium or high. Provide your reasoning.

a) 2-chloropropane = C_3H_7Cl

$$\begin{array}{l} Cl = 3.2 \\ C = 2.6 \end{array} \left. \vphantom{\begin{array}{l} Cl \\ C \end{array}} \right\} 0.6 \quad \text{Polar} = \text{soluble}$$

b) Propan-1-ol = C_3H_7OH

$$\begin{array}{l} O = 3.4 \\ C = 2.6 \end{array} \left. \vphantom{\begin{array}{l} O \\ C \end{array}} \right\} 0.8 \quad \text{Polar} = \text{soluble}$$

c) Propanone = $(CH_3)_2CO$

$$\begin{array}{l} O = 3.4 \\ C = 2.6 \end{array} \left. \vphantom{\begin{array}{l} O \\ C \end{array}} \right\} 0.8 \quad \text{Polar} = \text{soluble}$$

d) Propane = C_3H_8

$$\begin{array}{l} C = 2.6 \\ H = 2.2 \end{array} \left. \vphantom{\begin{array}{l} C \\ H \end{array}} \right\} 0.4 \quad \text{Non Polar} = \text{not soluble}$$

14) A student is intent upon finding a way to reduce the effect of hot spices in spicy food. The student finds that water does not help alleviate the effect of spices but sour cream does. Use your knowledge of chemistry to explain this finding.

$$\begin{array}{l} \text{Water} = \text{Polar} \\ \text{Spice} = \text{Non-polar} \\ \text{Milk} = \text{Non-polar} \end{array} \left. \vphantom{\begin{array}{l} \text{Water} \\ \text{Spice} \\ \text{Milk} \end{array}} \right\} \begin{array}{l} \text{does not dissolve} \\ \text{will dissolve.} \end{array}$$

15) Make up your own question. This should be an understanding question and should not be WHAT IS ... or HOW DOES ... If this question is good it may be used on your real test!