Chapter 4 Homework

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Notice of ADA Accommodation and Methods

I have an ADA accommodation to do my assignment on paper. This document is a utilization of that accommodation. In the *Chemistry: Atoms First, 2e* book, some homework questions have corresponding answers in the back. I am doing half of those questions.

1 Ionic Bonding

Q.1: Does a cation gain protons to form a positive charge or does it lose electrons?

A cation loses electrons to form a positive charge.

Q.5: Predict the charge on the monatomic ions formed from the following atoms in binary ionic compounds:

P	Mg	Al	O	Cl	Cs
3-	2+	3+	2-	1-	1+

Q.9: Write out the electron configuration for each of the following atoms and for the monatomic ion found in binary ionic compounds for each element:

Al	Br	Sr	Li	As	S
$[Ne]3s^2 3p^1$	$[Ar]4s^2 3d^{10} 4p^5$	$[Kr]5s^2$	$[He]2s^1$	$[Ar]4s^2 3d^{10} 4p^3$	$[Ne]3s^2 3p^3$

2 Covalent Bonding

Q.13: Predict which of the following compounds are ionic and which are covalent, based on the location of their constituent atoms in the periodic table:

Cl_2CO	MnO	NCl_3	$CoBr_2$	K_2S	CO	CaF_2	HI	CaO	IBr	CO_2
Covalent	Ionic	Covalent	Ionic	Ionic	Covalent	Ionic	Covalent	Ionic	Ionic	Covalent

Q.17: From their positions in the periodic table, arrange the atoms in each of the following series in order of increasing electronegativity:

C, F, H, N, O	Br, Cl, F, H, I	F, H, O, P, S	Al, H, Na, O, P	Ba, H, N, O, As
H, C, N, O, F	H, I, Br, Cl, F	P, H, S, O, F	Na, Al, P, H, O	Ba, As, H, N, O

Q.21: Identify the more polar bond in each of the following pairs of bonds:

HF or HCl	NO or CO	SH or OH	PCl or SCl	CH or NH	SO or PO	CN or NN
HF	CO	SH	PCl	NH	PO	CN

3 Chemical Nomenclature

Q.25: Write the formulas of the following compounds:

Rubidium Bromide	Magnesium Selenide	Sodium Oxide	Calcium Chloride
RbBr	MgSe	NaO	$CaCl_2$
Hydrogen Fluoride	Gallium Phosphide	Aluminum Bromide	Ammonium Sulfate
HF	GaP	$AlBr_3$	$(NH_4)_2SO_4$

Q.29: Each of the following compounds contains a metal that can exhibit more than one ionic charge. Name these compounds:

Cr_2O_3	$FeCl_2$	CrO_3
Chromium(III) Oxide	Iron(II) Chloride	Chromium(VI) Trioxide
$TiCl_4$	$CoCl_2 \cdot 6\,H_2O$	MoS_2
Titanium(IV) Chloride	Cobalt(II) Chloride Hexahydrate	Molybdenum(II) Sulfide

4 Lewis Symbols and Structures

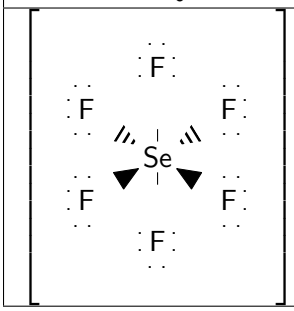
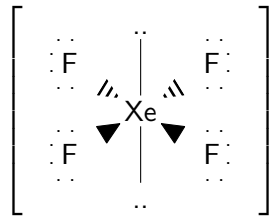
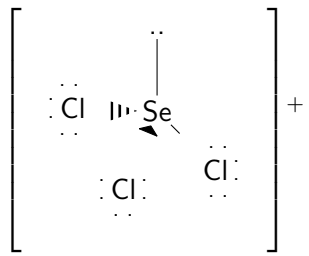
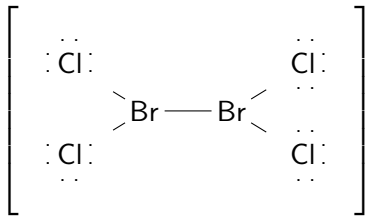
Q.34: Write the Lewis Symbols for each of the following ions:

As^{3-}	I^-	Be^{2-}	O^{2-}	Ga^{3+}	Li^+	N^{3-}
$[:\ddot{\underset{\cdot\cdot}{As}}:]$	$[:\ddot{\underset{\cdot\cdot}{I}}:]$	$[\,\cdot\underset{}{Be}\cdot\,]$	$[:\ddot{\underset{\cdot\cdot}{O}}:]$	$[:\ddot{\underset{\cdot\cdot}{Ga}}:]$	$[\,\cdot\underset{}{Li}\cdot\,]$	$[:\ddot{\underset{\cdot\cdot}{N}}:]$

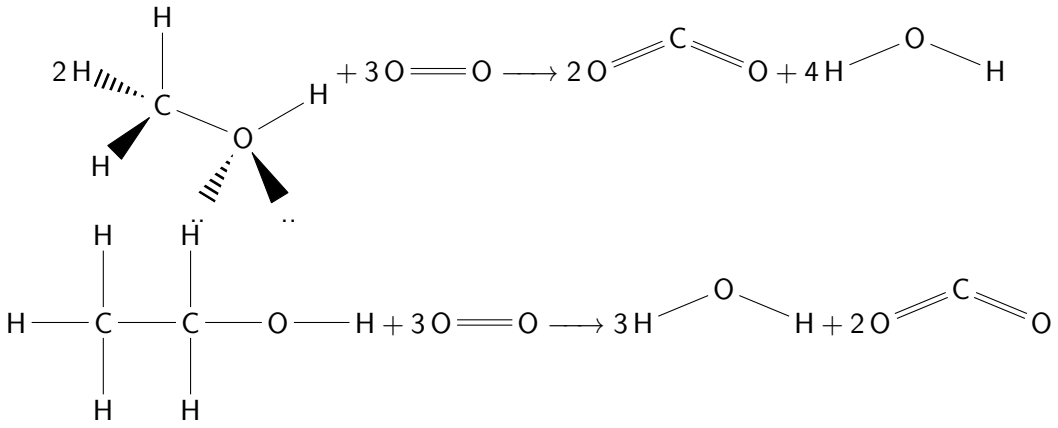
Q.38: Write the Lewis Structure for the diatomic molecule P_2, an unstable form of Phosphorus found in high-temperature phosphorus vapor:

$$:\mathbf{P} \equiv \mathbf{P}:$$

Q.42: Write the Lewis Structure for the following:

SeF_6	XeF_4	$SeCl_3^+$	Cl_2BBCl_2
			

Q.46: Methanol, H_3COH, is used as the fuel in some race cars. Ethanol, C_2H_5OH, is used extensively as motor fuel in Brazil. Both methanol and ethanol produce CO_2 and H_2O when they burn. Write the chemical equations for these combustion reactions using Lewis Structures instead of chemical formulas.



Q.50: The arrangement of atoms in several biologically important molecules is given here. Complete the Lewis strictures of these molecules by adding multiple bonds and lone pairs. Do not add any more atoms.

Q.54: How are single, double, and triple bonds similar? How do they differ?

5 Formal Charges and Resonance

Q.58: Sodium Nitrite, which has been used to preserve bacon and other meats, is an ionic compound. Write the resonance forms of the nitrite ion, NO_2^-.

Q.62: Determine the formal charge of each element in the following:

Q.66: Draw all possible resonance structures for each of these:

Q.72: Write the Lewis structures and chemical formula of the compound with the molar mass of about 70 g/mol that contains 19.7% nitrogen and 80.3% Fluorine by mass, and determine the formal charge of the atoms in this compound.

6 Molecular Structure and Polarity

Q.75: Explain why HOH molecules are bent, whereas the HBeH molecule is linear.

Q.79: Explain the difference between electron-pair geometry and molecular structure.

Q.83: What are the electron-pair geometry and molecular structure of each of the following molecules or ions?

Q.87: Which of the following molecules and ions contain polar bonds? Which of these molecules and ions hove dipole moments?

Q.91: The molecule XF_3 has a dipole moment. Is X Boron or Phosphorus?

Q.95: Describe the molecular structure around the indicated atom or atoms:

Q.99: Draw the Lewis electron dot structures for these molecules, including resonance structures where appropriate:

Q.103: Use the simulation at http://openstax.org/1/16MolecPolarity to perform the following exercises for a real molecule. You may need to rotate the molecules in three dimensions to see certain dipoles.

a. Sketch the bond dipoles and molecular dipole (if any) for O_3. Explain your observations.

b. Look at the bond dipoles for NH_3. Use these dipoles to predict whether N or H is more electronegative.

c. Predict whether there should be a molecular dipole for NH_3 and, if so, in which direction it will point. Check the molecular dipole box to test your hypothesis.