Assignment Name

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20th February 2024

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. This assignment will utilize questions from the textbook, *Chemistry: Atoms First, 2e*, to practice the skills and learning objectives for this class.

1 Valence Bond Theory

Q.1: Explain how σ and π bonds are similar and how they are different.

Q.5: A friend tells you that N_2 has three π bonds due to the overlap of the three *p*-orbitals in each Nitrogen atom. Do you agree?

2 Hybrid Atomic Orbitals

Q.9: Explain why a Carbon atom cannot form five bonds using sp^3d hybrid orbitals.

Q.13: Sulfuric acid is manufactured by the series of reactions:
$S_8(s) + 8\,O_2(g) \longrightarrow 8\,SO_2(g)$
$2\,SO_2(g) + O_2(g) \longrightarrow 2\,SO_3(g)$
$SO_3(g) + H_2O\,(l) \longrightarrow H_2SO_4(l)$
Draw the Lewis Structure, predict the molecular geometry by VSEPR, and determine the hybridization of sulfur for the following:

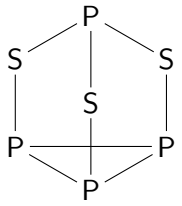
a. Circular S_8 model

b. SO_2 molecule

c. SO_3 molecule

d. H_2SO_4 molecule

Q.17: Strike-anywhere matches contain a layer of $KClO_3$ and a layer of P_4S_3. The heat produced by the friction of striking the match causes these two compounds to react vigorously, which sets fire to the wooden stem of the match. $KClO_3$ contains the ClO_3^- ion. P_4S_3 is an unusual molecule with the following skeletal structure:



a. Write the Lewis structures for P_4S_3 and the ClO_3^- ion.

b. Describe the geometry about the P atoms, the S atom, and the Cl atom in these species

c. Assign a hybridization to the P atoms, the S atom, and tho Cl atom in these species

d. Determine the oxidization states and formal charge of the atoms in P_4S_3 and the ClO_3^- ion.

3 Multiple Bonds

Q.21: The bond energy of a C-C single bond averages 347 kJ mol^{-1}; $that of a C \equiv C triple bond averages$

Q.25: Identify the hybridization of the central atom in each of the following molecules and ions that contain multiple bonds:

a. ClNO

b. CS_2

c. Cl_2CO

d. Cl_2SO

e. SO_2F_2

f. XeO_2F_2

g. $ClOF_2^+$

Q.29: Draw the orbital diagram for carbon in CO_2 showing how many carbon atom electrons ore in each orbital.

4 Molecular Orbital Theory

Q.33: Can a molecule with an odd number of electrons ever be diamagnetic? Explain why or why not.

Q.37: Explain why an electron in the bonding molecular orbital in the H_2 molecule has a lower energy than an electron in the 1*s* atomic orbital hydrogen atoms.

Grading

Points Possible	Points Earned	Score
32	X	X/32