

Workbook



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Introduction to Chemical Bonding

Lewis Theory of Chemical Bonding

Questions

1) Write the Lewis symbols for the following atoms:

- a. Ne
- b. P
- c. Cs
- d. I
- e. Sr
- f. Al
- g. Sn

2) Write the Lewis symbols for the following ions:

- a. Cl^-
- b. Ca^{2+}
- c. Cs^+
- d. Pb^{2+}

3) Write Lewis structures for the following structures:

- a. CHCl_3
- b. H_2S
- c. Cl_2
- d. CH_4O
- e. NH_4^+
- f. PO_3^{3-}

4) Write Lewis structures for the following structures:

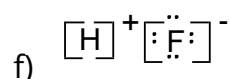
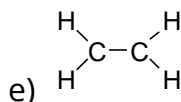
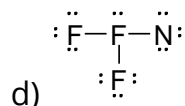
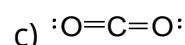
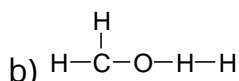
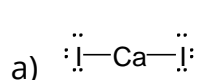
- N_2
- C_2H_4
- CN^-
- COF_2

5) Write Lewis structures for the following ionic compounds:

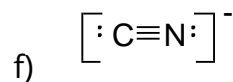
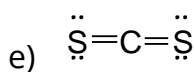
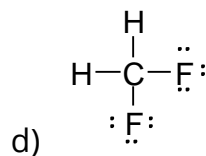
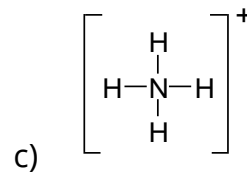
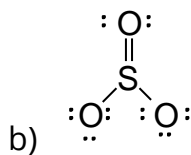
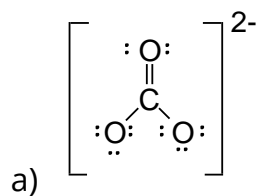
- calcium iodide
- potassium sulfide
- strontium oxide

6) State what is wrong with the following structures.

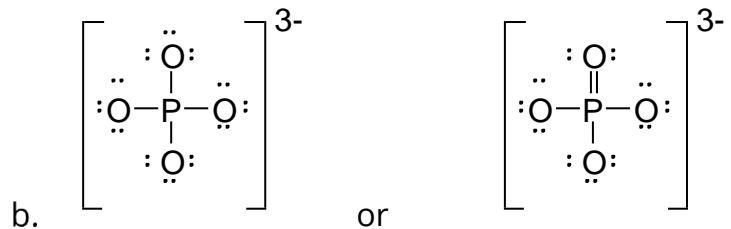
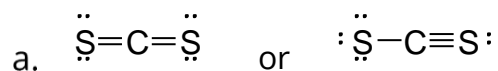
Write acceptable Lewis structures for each structure.



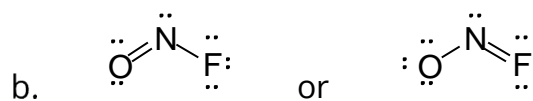
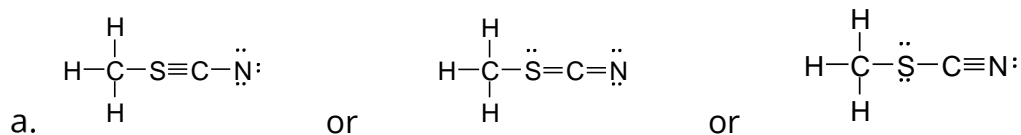
7) Calculate the formal charge of each atom in the following Lewis structures:



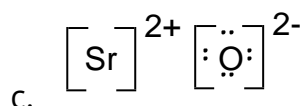
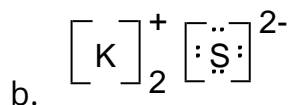
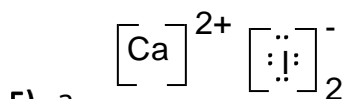
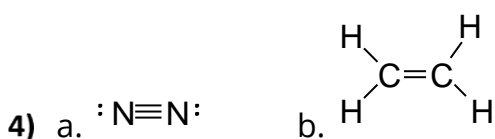
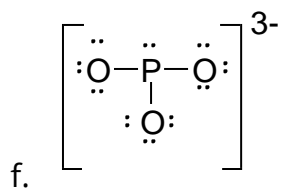
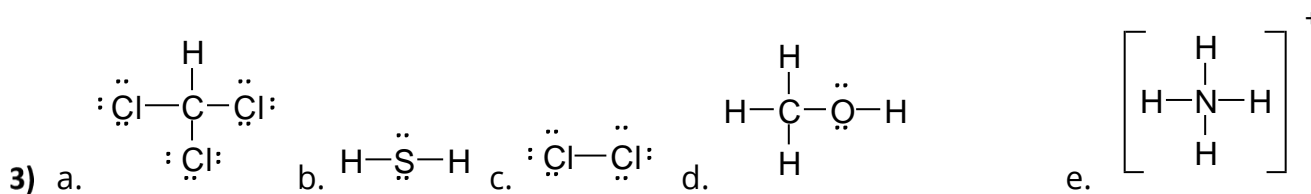
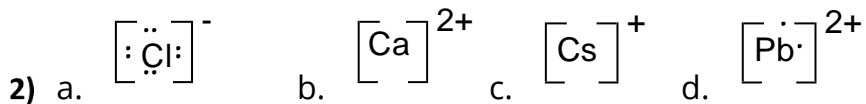
8) Which of the following is the more favorable Lewis structure?



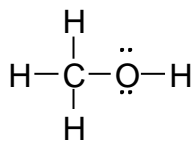
9) Which of the following is the more favorable Lewis structure?



Answer Key

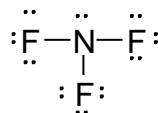


6) a. The Lewis structure should be ionic, not covalent. $[\text{Ca}]^{2+} [\text{:}\ddot{\text{I}}\text{:}]_2^-$

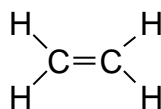


b. Hydrogen can't be a central atom.

c. The oxygens don't have octets. $\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$



d. Fluorine can't be a central atom.



e. The carbons don't have octets.

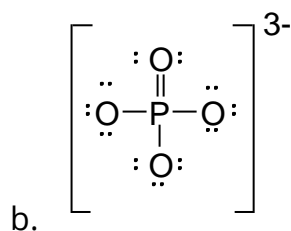
f. The Lewis structure should be covalent, not ionic. $\text{H}-\ddot{\text{F}}\text{:}$

7) a. $\text{FC}_\text{C} = 0$ $\text{FC}_{\text{O}1} = 0$ $\text{FC}_{\text{O}2} = -1$ b. $\text{FC}_\text{S} = 2$ $\text{FC}_{\text{O}1} = 0$ $\text{FC}_{\text{O}2} = -1$

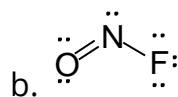
c. $\text{FC}_\text{N} = 1$ $\text{FC}_\text{H} = 0$ d. $\text{FC}_\text{C} = 0$ $\text{FC}_\text{H} = 0$ $\text{FC}_\text{F} = 0$

e. $\text{FC}_\text{S} = 0$ $\text{FC}_\text{C} = 0$ f. $\text{FC}_\text{C} = -1$ $\text{FC}_\text{N} = 0$

8) a. $\ddot{\text{S}}=\text{C}=\ddot{\text{S}}$



9) a. $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\ddot{\text{S}}-\text{C}\equiv\text{N}\text{:} \\ | \\ \text{H} \end{array}$



Shapes of molecules - VSEPR theory

Questions

- 1) Use VSEPR theory to determine the electron group geometry and the molecular geometry of the following molecules:
- a) SCl_4
 - b) COH_2
 - c) CH_3OH

Answer Key

- 1) a. trigonal bipyramidal, seesaw.
b. trigonal planar, trigonal planar.
c. C: tetrahedral, tetrahedral.
O: tetrahedral, bent.