

Lewis Diagrams and Structural Formulas

Name: _____

If you encounter any difficulties, please refer to your notes or section 3.2 of your textbook.

Complete the following table by stating each entity's chemical formula, calculating the number of valence electrons in each entity, drawing a Lewis diagram, and then drawing a structural formula.

Chemical Name:	Chemical Formula:	Lewis Diagram:	Structural Formula:
Elemental hydrogen	$H_{2(g)}$	$H : H$	$H - H$
Elemental bromine	$Br_{2(l)}$	$\begin{array}{c} \cdot\cdot \\ \cdot \\ : Br : Br : \\ \cdot \\ \cdot\cdot \end{array}$	$Br - Br$
Hydrogen iodide	$HI_{(g)}$	$\begin{array}{c} \cdot\cdot \\ \cdot \\ H : I : \\ \cdot \\ \cdot\cdot \end{array}$	$H - I$
Carbon monoxide	$CO_{(g)}$	$\begin{array}{c} \cdot\cdot \\ \cdot \\ : C : : O : \\ \cdot \\ \cdot\cdot \end{array}$	$C \equiv O$

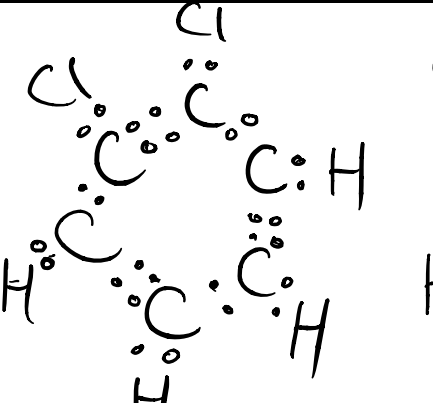
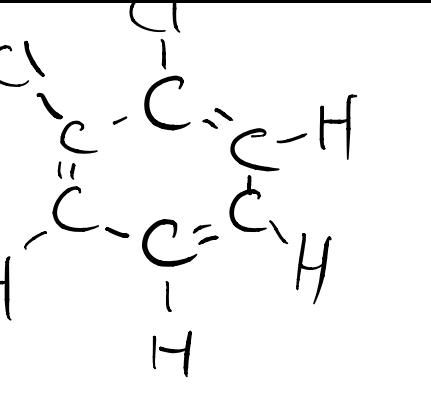
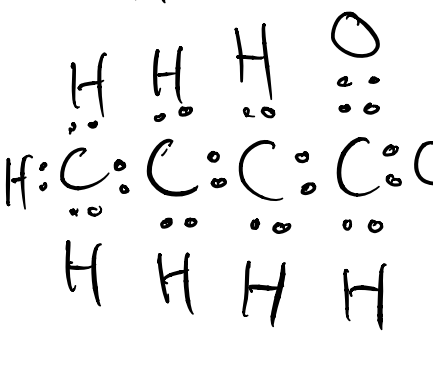
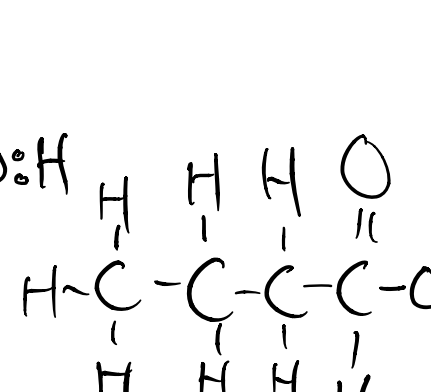
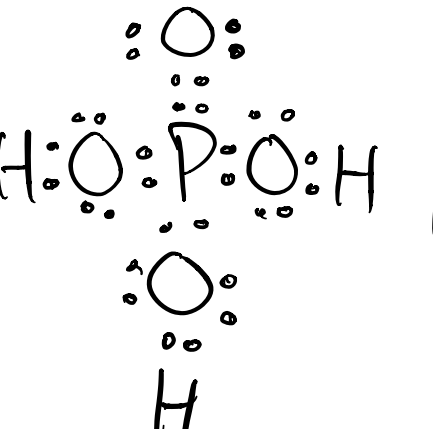
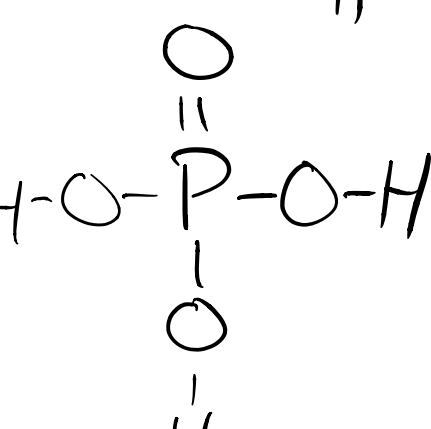
Methanol	$\text{CH}_3\text{OH}_{(l)}$	$\begin{array}{c} \text{H} \\ \vdots \\ \text{H} : \text{C} : \text{O} : \text{H} \\ \vdots \quad \vdots \\ \text{H} \end{array}$	$\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{O} - \text{H} \\ \\ \text{H} \end{array}$
Chlorite ion	$\text{ClO}_2^{-}(\text{aq})$	$\left[\begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \text{O} : \text{Cl} : \text{O} \\ \cdot\cdot \quad \cdot\cdot \\ \cdot\cdot \end{array} \right]^{-}$	$\left[\text{O} - \text{Cl} - \text{O} \right]^{-}$
Ethane	C_2H_6	$\text{C} -$	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H} - \text{C} - \text{C} - \text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
Ethene	C_2H_4	$\begin{array}{c} \text{H} \quad \text{H} \\ \cdot\cdot \quad \cdot\cdot \\ \text{C} : : \text{C} \\ \cdot\cdot \quad \cdot\cdot \\ \text{H} \quad \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
Acetylene	C_2H_2	$\text{H} : \text{C} : : : \text{C} : \text{H}$	$\text{H} - \text{C} \equiv \text{C} - \text{H}$
Ethanol	$\text{CH}_3\text{CH}_2\text{OH}$	$\begin{array}{c} \text{H} \quad \text{H} \\ \cdot\cdot \quad \cdot\cdot \\ \text{H} : \text{C} : \text{C} : \text{O} : \text{H} \\ \cdot\cdot \quad \cdot\cdot \quad \cdot\cdot \\ \text{H} \quad \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H} - \text{C} - \text{C} - \text{O} - \text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$

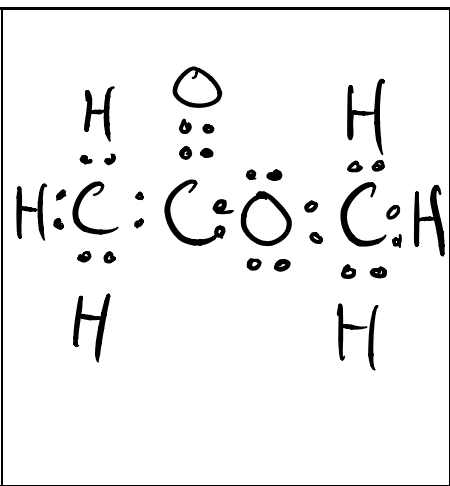
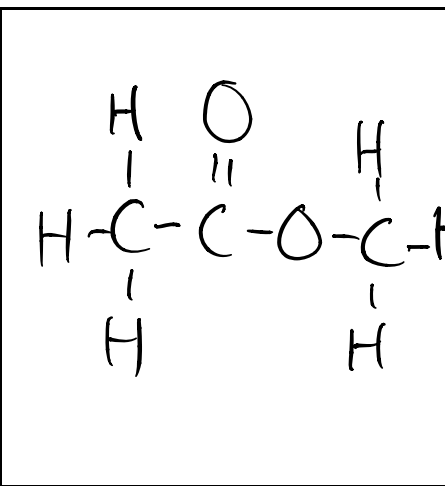
Hydrazine	N_2H_4	$ \begin{array}{c} H \\ \cdot\cdot \\ \vdots \\ H:\overset{\cdot\cdot}{N}:\overset{\cdot\cdot}{N}:H \\ \cdot\cdot \quad \cdot\cdot \\ H \end{array} $	$ \begin{array}{c} H \\ \\ H-N-N-H \\ \\ H \end{array} $
Dichloromethane	CH_2Cl_2	$ \begin{array}{c} H \\ \cdot\cdot \\ \vdots \\ Cl:\overset{\cdot\cdot}{C}:H \\ \cdot\cdot \\ Cl \end{array} $	$ \begin{array}{c} Cl \\ \\ Cl-C-H \\ \\ H \end{array} $
Oxygen diastatide	$OAt_{2(g)}$	$ \begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ \vdots \quad \vdots \\ :\overset{\cdot\cdot}{At}:\overset{\cdot\cdot}{O}:\overset{\cdot\cdot}{At}: \\ \cdot\cdot \quad \cdot\cdot \end{array} $	$At-O-At$
Hydrogen peroxide	H_2O_2	$ \begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ \vdots \quad \vdots \\ H:\overset{\cdot\cdot}{O}:\overset{\cdot\cdot}{O}:H \\ \cdot\cdot \quad \cdot\cdot \end{array} $	$H-O-O-H$
3-dichloroprop-1-yne	$CHCCHCl_2$	$ \begin{array}{c} H \\ \cdot\cdot \\ \vdots \\ H:\overset{\cdot\cdot}{C}::\overset{\cdot\cdot}{C}:Cl \\ \cdot\cdot \\ Cl \end{array} $	$ \begin{array}{c} H \\ \\ H-C\equiv C-Cl \\ \\ Cl \end{array} $
Dichloroethane	CH_2Cl_2	See above...	

Methanal	HCHO	$\begin{array}{c} \text{H}:\text{C}::\text{O} \\ \vdots \\ \text{H} \end{array}$	$\begin{array}{c} \text{H}-\text{C}=\text{O} \\ \\ \text{H} \end{array}$
Hydrogen peroxide	H ₂ O ₂	See above	
Dichloroethyne	C ₂ Cl ₂	$\text{Cl}:\text{C}::\text{C}:\text{Cl}$	$\text{Cl}-\text{C}\equiv\text{C}-\text{Cl}$
Hydronium ion	H ₃ O ⁺	$\left[\begin{array}{c} \text{H} \\ \vdots \\ \text{H}:\text{O}:\text{H} \\ \vdots \end{array} \right]^+$	$\left[\begin{array}{c} \text{H} \\ \\ \text{H}-\text{O}-\text{H} \end{array} \right]^+$
Nitrosyl ion	NO ⁺ N 5 O 6	$\left[:\text{N}::\text{O}: \right]^+$	$\left[\text{N}\equiv\text{O} \right]^+$
Carbonate ion	CO ₃ ²⁻ (aq)	$\begin{array}{c} \text{O} \\ \vdots \\ \text{C} \\ \vdots \\ \text{O} \end{array}$	$\left[\begin{array}{c} \text{O} \\ \\ \text{C} \\ / \quad \backslash \\ \text{O} \quad \text{O} \end{array} \right]^{2-}$

Challenge Problems:

Try drawing Lewis Diagrams and their corresponding structural formulas for each of the following compounds!

<p>1,2-dichlorobenzene (<i>Hint: some structures are based on <u>rings</u>, not chains of carbon atoms</i>)</p>	$C_6H_4Cl_2$		
<p>Butanoic acid</p>	C_3H_7COOH		
<p>Phosphoric acid</p>	H_3PO_4		

Methyl ethanoate	$\text{CH}_3\text{COOCH}_3$	 <p>The Lewis structure shows three carbon atoms in a horizontal chain. The leftmost carbon is bonded to three hydrogen atoms (top, left, and bottom) and the middle carbon. The middle carbon is double-bonded to an oxygen atom above it and single-bonded to another oxygen atom to its right. The rightmost carbon is bonded to three hydrogen atoms (top, right, and bottom) and the middle oxygen atom. All valence electrons are represented by dots.</p>	 <p>The structural formula uses lines to represent bonds. The leftmost carbon is bonded to three hydrogen atoms and the middle carbon. The middle carbon is double-bonded to an oxygen atom above it and single-bonded to another oxygen atom to its right. The rightmost carbon is bonded to three hydrogen atoms and the middle oxygen atom.</p>
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