

AP Chemistry VSEPR and Molecular Geometry Review

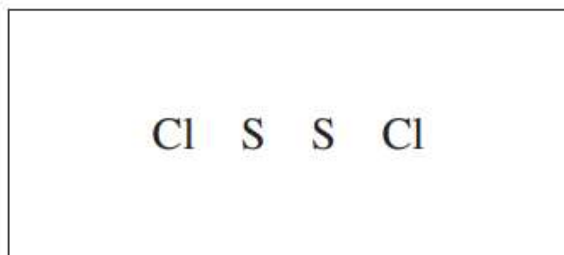
(d) The skeletal structure of the HNO_2 molecule is shown in the box below.

- (i) Complete the Lewis electron-dot diagram of the HNO_2 molecule in the box below, including any lone pairs of electrons.



(c) S_2Cl_2 is a product of the reaction.

- (i) In the box below, complete the Lewis electron-dot diagram for the S_2Cl_2 molecule by drawing in all of the electron pairs.



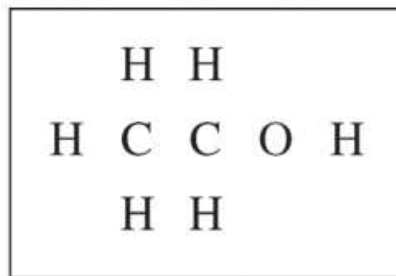
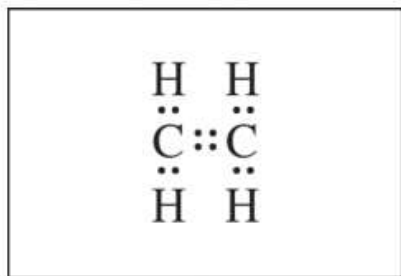
- (ii) What is the approximate value of the Cl-S-S bond angle in the S_2Cl_2 molecule that you drew in part (c)(i)? (If the two Cl-S-S bond angles are not equal, include both angles.)
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- (e) The HCO_3^- ion has three carbon-to-oxygen bonds. Two of the carbon-to-oxygen bonds have the same length and the third carbon-to-oxygen bond is longer than the other two. The hydrogen atom is bonded to one of the oxygen atoms. In the box below, draw a Lewis electron-dot diagram (or diagrams) for the HCO_3^- ion that is (are) consistent with the given information.



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- (d) The Lewis electron-dot diagram for C_2H_4 is shown below in the box on the left. In the box on the right, complete the Lewis electron-dot diagram for C_2H_5OH by drawing in all of the electron pairs.



- (e) What is the approximate value of the $C-O-H$ bond angle in the ethanol molecule?
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- (b) In an attempt to verify the hypothesis, the student researches the fluoride compounds of the other halogens and finds the formula ClF_3 . In the box below, draw a complete Lewis electron-dot diagram for a molecule of ClF_3 .

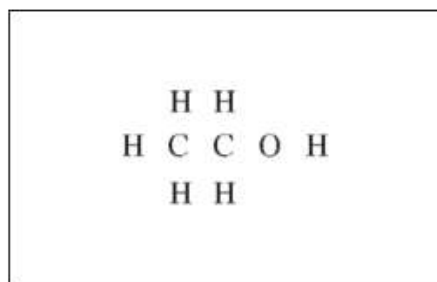


- (c) Two possible geometric shapes for the ClF_3 molecule are trigonal planar and T-shaped. The student does some research and learns that the molecule has a dipole moment. Which of the two shapes is consistent with the fact that the ClF_3 molecule has a dipole moment? Justify your answer in terms of bond polarity and molecular structure.

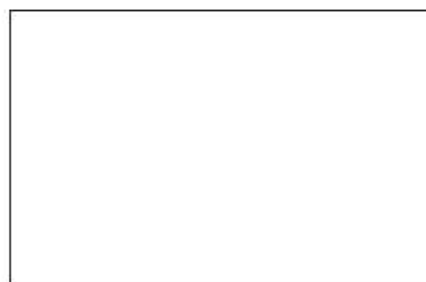
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(a) The skeletal structure for one of the two compounds is shown below in Box X.

(i) Complete the Lewis electron-dot diagram of the molecule in Box X. Include any lone (nonbonding) pairs of electrons.



Box X



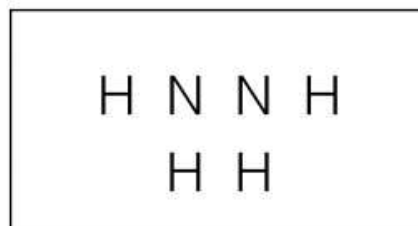
Box Y

(ii) In Box Y above, draw the complete Lewis electron-dot diagram for the other compound, which is a structural isomer of the compound represented in Box X. Include any lone (nonbonding) pairs of electrons.

(i) In the box below, draw the complete Lewis electron-dot diagram for the I_3^- ion.



(a) In the box below, complete the Lewis electron-dot diagram for the N_2H_4 molecule by drawing in all the electron pairs.

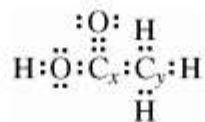


(b) On the basis of the diagram you completed in part (a), do all six atoms in the N_2H_4 molecule lie in the same plane? Explain.

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Compound	Formula	Lewis Electron-Dot Diagram
Ethanethiol	CH ₃ CH ₂ SH	$ \begin{array}{c} \text{H} \quad \text{H} \\ \text{H} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{S}}} : \text{H} \\ \text{H} \quad \text{H} \end{array} $
Ethane	CH ₃ CH ₃	$ \begin{array}{c} \text{H} \quad \text{H} \\ \text{H} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \text{H} \\ \text{H} \quad \text{H} \end{array} $
Ethanol	CH ₃ CH ₂ OH	$ \begin{array}{c} \text{H} \quad \text{H} \\ \text{H} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{C}}} : \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}} : \text{H} \\ \text{H} \quad \text{H} \end{array} $
Ethyne	C ₂ H ₂	

- (a) Draw the complete Lewis electron-dot diagram for ethyne in the appropriate cell in the table above.
- (b) Which of the four molecules contains the shortest carbon-to-carbon bond? Explain.
- (c) A Lewis electron-dot diagram of a molecule of ethanoic acid is given below. The carbon atoms in the molecule are labeled *x* and *y*, respectively.



Identify the geometry of the arrangement of atoms bonded to each of the following.

- (i) Carbon *x*
- (ii) Carbon *y*