

Exercise 8.13

VSEPR & Molecular Geometry

Name: _____

Date: _____ Per: _____

DIRECTIONS: Answer the following in the space provided:

- Order the following species with respect to carbon-oxygen bond length (longest to shortest):
CO / CO₂ / CO₃²⁻ / CH₃OH : _____
- What is the order from the weakest to the strongest carbon—oxygen bond?
CO / CO₂ / CO₃²⁻ / CH₃OH : _____
- Place the species below in order of the shortest to the longest nitrogen—oxygen bond.
H₂NOH / N₂O / NO¹⁺ / NO₂⁻ / NO₃⁻ : _____
- Use formal charge arguments to explain why CO has a much smaller dipole moment that would be expected on the basis of electronegativity.

- Using only a periodic table, predict the order of increasing electronegativity in each of the following groups of elements.
 - C, N, O : _____
 - Si, Ge, Sn : _____
 - S, Se, Cl : _____
 - Tl, S, Ge : _____
- Using only a periodic table, predict which bond in each of the following groups will be most polar.
 - C-F, Si-F, Ge-F : _____
 - S-F, S-Cl, S-Br : _____
 - P-Cl, S-Cl : _____
 - Ti-Cl, Si-Cl, Ge-Cl : _____
- Using only a periodic table, predict which bond in each of the following groups will be the most polar.
 - C-H, Si-H, Sn-H : _____
 - C-O or Si-O : _____
 - Al-Br, Ga-Br, In-Br, Tl-Br: _____
 - O-F or O-Cl : _____
- Repeat problem 6 and 7, this time using the values for electronegativities of the elements given on your periodic table. Are there differences in your answer?
 - C-F, Si-F, Ge-F : _____
 - S-F, S-Cl, S-Br : _____
 - P-Cl, S-Cl : _____
 - Ti-Cl, Si-Cl, Ge-Cl : _____
 Differences: _____

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 - C-H, Si-H, Sn-H : _____
 - C-O or Si-O : _____
 - Al-Br, Ga-Br, In-Br, Tl-Br : _____
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 Differences: _____

- What two requirements must be satisfied for a molecule to be polar?
 - _____
 - _____

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DIRECTIONS: For each compound listed, draw the Lewis structure, then the ball and stick diagram. For each bond, label the polarity by placing an arrow(\rightarrow) over the bond. Then indicate the shape of the molecule and if the molecule is polar or non-polar.

