## PRACTICE EXAM \#4

Chem20, Elementary Chemistry
1.) For each of the following compounds, draw the correct Lewis structure and indicate the expected electronic AND molecular geometries. Indicate whether the molecule is polar or nonpolar. Be sure to include ALL possible resonance structures where applicable. ( 30 pts )

| Element | O | H | C | N | B |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{e N}$ | 3.5 | 2.1 | 2.5 | 3.0 | 2.0 |

a.) $\mathrm{O}_{3}$

## ELECTRONIC

$\qquad$
b.) HCN (the carbon is central)

MOLECULAR $\qquad$

ELECTRONIC $\qquad$
c.) $\mathrm{BH}_{3}$
$\qquad$
$\qquad$
2.) A sample of $\mathrm{NH}_{3}(\mathrm{~g})$ in a 452 mL container has a pressure of 605 torr. A closed valve connects it to a 623 mL container that contains a sample of $\mathrm{CH}_{4}(\mathrm{~g})$ at a pressure of 598 torr. When the valve is opened, the two gases are allowed to mix and travel freely between both containers. Assume the valve adds no volume. ( 23 pts)
a.) What is the new partial pressure of $\mathrm{NH}_{3}(\mathrm{~g})$ after the valve is opened?
b.) What is the new partial pressure of $\mathrm{CH}_{4}(\mathrm{~g})$ after the valve is opened?
c.) What is the total pressure of the mixture of $\mathrm{NH}_{3}(\mathrm{~g})$ and $\mathrm{CH}_{4}(\mathrm{~g})$ ?
3.) Complete the following statements. (12 pts)
a.) Kinetic Molecular Theory assumes that gas particles have no $\qquad$ meaning that they take up no space and behave as points.
b.) The Duet Rule for Lewis dot structures applies to two elements: $\qquad$ and $\qquad$ , whose valence shell is the $\mathrm{n}=1$ level.
c.) $A(n)$ $\qquad$ bond forms between two atoms that have a difference in electronegativity between 0.0-0.4.
4.) Consider the combustion of propane gas by the following reaction.

$$
\mathrm{C}_{3} \mathrm{H}_{8}(\mathrm{~g})+5 \mathrm{O}_{2}(\mathrm{~g}) \rightarrow 3 \mathrm{CO}_{2}(\mathrm{~g})+4 \mathrm{H}_{2} \mathrm{O}(\mathrm{I})
$$

The reaction was carried out in a 1.20 L container at $25^{\circ} \mathrm{C}$. Initially, 0.365 mols of $\mathrm{C}_{3} \mathrm{H}_{8}(\mathrm{~g})$ were added to $1.27 \mathrm{mols}_{2}(\mathrm{~g})$ and then allowed to fully react. ( 35 pts )
a.) Determine the limiting reactant and the theoretical yield of $\mathrm{CO}_{2}(\mathrm{~g})$, in mols.
b.) What is the partial pressure in atm of the leftover reactant in excess?
c.) The total pressure of the mixture of water vapor, $\mathrm{CO}_{2}(\mathrm{~g})$, and reactant was 5.22 atm . The vapor pressure of water at this temperature is 23.8 mmHg . What is the partial pressure of $\mathrm{CO}_{2}(\mathrm{~g})$ actually collected, in atm?
d.) Calculate the percent yield of $\mathrm{CO}_{2}(\mathrm{~g})$.

