Show your work on any numerical problems to receive any credit. This homework is due at class time on Wednesday, January 17, 2007. No late submissions will be accepted.

(10) 1. Draw Lewis structures for the following molecules and ions and state the electronic geometry, molecular geometry, and whether or not the species is polar.

\[
\text{CH}_4
\]

\[
\text{CHCl}_3
\]

\[
\text{CH}_3\text{CN}
\]

\[
\text{CO}_2
\]

\[
\text{H}_2\text{O}
\]
2. For each of the molecules in question 1, state the significant intermolecular forces operating.

- CH₄
- CHCl₃
- CH₃CN
- CO₂
- H₂O

3. Arrange the molecules of question 2 in order from what you would expect to be the highest boiling to the lowest boiling. It may help you to list the molecular weights to get a sense of the magnitude of dispersion forces. Don’t look up the boiling points to do this – use your sense of intermolecular forces. Explain your reasoning for arriving at the order you do.

4. Now list the boiling points for the materials from a source such as the Chemical Rubber Company Handbook (CRC) or a website such as [http://webbook.nist.gov/chemistry/](http://webbook.nist.gov/chemistry/). This site is very reliable as it is maintained by the National Institute of Standards and Technology, formerly known as the National Bureau of Standards. State any discrepancies in your predicted order from question 3 and the actual order as indicated by your reference data. State the source you used to find boiling points and suggest any reasons you can think of for any discrepancy.

If you would like to be included in any email messages I send to the class, please provide an email address that you actually read once in a while: ___________________________