Homework #1
Due Wednesday, February 23 at the start of class

Important Notes
You are encouraged to collaborate with classmates on approaches (not answers) to problems, but worked turned in must be your own. Unless otherwise stated, you may only use the following resources:
- your class notes,
- assigned readings,
- handouts/power point slides (available at “go/echem” course website), and
- a periodic table

For example, I am often asking you to predict a property or draw a structure that could be looked up on the Internet or in a book. Looking up the answer (instead of reasoning your way to an answer) would be a violation of the honor code. **If you believe you are missing necessary information, please let me know.** Remember that when I ask for a prediction I am looking for reasonable answers. I don’t expect your answer to match exactly.

1. a) Redraw these two “carbon skeleton” structures as full structures.

   ![Malathion Structure](malathion.png)  
   ![Doxycycline Structure](doxycycline.png)

   malathion (organophosphate insecticide)  
   doxycycline (antibiotic)

   b) For each bond shown in the skeleton structures in (1), draw electronegativity arrows.

2. Consider the following three substances and answer the questions that follow. Please provide a detailed, concise rationale for your answers to a-c (you will not receive credit without a detailed rationale).

   ![Pyrene](pyrene.png)  
   ![Naphthacene](naphthacene.png)  
   ![Triphenylene](triphenylene.png)

   pyrene  
   naphthacene  
   triphenylene

   a) Classify each molecule as nonpolar or polar.
b) Rank the substances (1-3) in order of increasing boiling point.
c) At what retention time might you expect these compounds to elute from a GC run under the same conditions as our fuel standards?
d) To which class of environmentally important compounds do these substances belong?

3. For each of the two substances (separately), identify and explain which intermolecular forces of attraction would operate between it and water.

![2,4-dimethylphenol](image1)

![dimethylaniline](image2)

4. Write a complete physical reaction for the dissolution of 2,4-dimethylphenol (above) in 1-octanol (shown below).

![1-octanol](image3)