**CHE2060 Lecture 4 HW**

Problems must be solved, or written out, in their entirety with all work shown on engineering graph paper. You must label each set in the upper left hand corner with your name, the date and the chapter. Problems must be identified by number and all work must be shown with answers boxed. Be sure your handwriting is legible. An example is posted in the ‘course basics’ section of our Moodle page.

*Note: there will be no in-class example set for chapter 4.*

**4.1: Physical properties of organic molecules**

1. How do physical properties differ from chemical properties?

2. What forces hold molecules together in a solid?

3. Why are liquid crystals called a ‘mesophase’?

4. Why are molecules with several arenes likely to form liquid crystals?

**4.2: Types of intermolecular interactions**

5. How is melting point affected by chemical purity or mixtures? Why?

6. What is the relationship between melting point and molecular weight or size?

7. What is unusual about the melting point of spherical molecules? Why?

8. Which member of these pairs has a higher melting point?

a. pentane or cyclopentane

b. pentane or 2-methylbutane

c. pentane or 2,2-dimethylpropane

d. cyclobutane or cyclohexane

9. For each of the four cases above, why does one molecule have the higher melting point? Give a reason for each pair!

a.

b.

c.

d.

10. Rank the likely boiling points of these compounds from low to high. Of course, you can use the web to discover these bps, so I’d like you to include an explanation of why the boiling points increase as they do.

a. butane

b. chlorobutane

c. butanol (CH3CH2CH2CH2OH)

d. butanoic acid (CH3CH2CH2COOH)

11. Define each of these terms:

a. covalent bond

b. hydrogen bond

c. dipole-dipole bond

d. van der Waals bond

12. Is van der Waals attraction an example of an inductive effect or a field effect?

13. Do linear or branched molecules of the same carbon number experience greater van der Waals attraction? Why?

14. What are the essential similarities and differences between dipolar and hydrogen bonding interactions?

**4.3: Solubility**

15. Label the most soluble & least soluble in hexane.

1. CH3(CH2)6CH3
2. H2O
3. CH3OH

**4.4: Surfactants**

16. List two types of molecules that can act as surfactants? And what essential characteristic(s) of these molecules allow them to be surfactants?

17. Why do fatty acids, surfactants, lipids and other amphipathic molecules form micelles when added to water?