Chemistry 231

Sample exam 1: Chapters 1 and 2

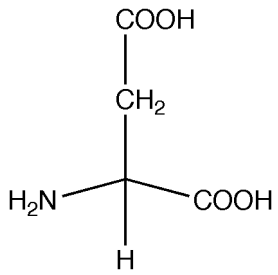
Answer all questions. Closed book, open notes, handouts, exercises, homeworks; no collaboration. Please turn in all appropriate exercises and homeworks with the exam. 50 minutes

2. (5 points) In the list of organic acids below, which will be the strongest acid?

Cl_3CCOOH $Cl_2HCCOOH$ ClH_2CCOOH H_3CCOOH

Give a short reason for your choice.

3. (4 points) Circle the carbons on the Kekule structure of aspartic acid (below) that are **sp^2 hybridized**.



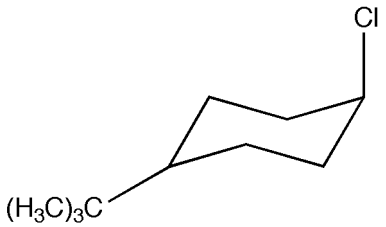
4. (5 points) In problem 3, the carboxylic acid at the top of the molecule has a pKa of 3.86; the carboxylic acid to the right of the molecule has a pKa of 2.10 and the amine group has a pKa of 9.82. Draw the predominant form of aspartic acid at pH 7.2.

5. a. (3 points) Is 2,4-dimethyl hexane a proper IUPAC name? If not, correct it. In any case, **draw** its structure using any format you wish.

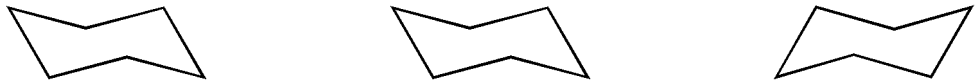
6. (5 points) Draw **three** constitutional isomers of C_3H_5Cl and **name** one of them using IUPAC rules.

7. a. (3 points) Isopropanol (2-propanol) boils at 82°C; n-propanol (1-propanol) has a boiling point of 97.5°C. Give an explanation for the difference in **boiling points** between these isomers. Your explanation must include the phrase "van der Waals force" or "dispersion force" or "London force" (they are indeed all synonymous).

8. Below is shown one of the **chair conformers** of 1-t-butyl-4-chlorocyclohexane.



a. (3 points) Draw the other **three** possible chair conformers. Label each as *cis* or *trans*. You may use the skeletal chair conformers below, or else draw your own on the back of the page.



b. (2 points) Using "1" for the highest **energy** (least stable) conformer and "4" for the lowest energy (most stable) conformer, order the **four** conformers above from highest energy to lowest.

9. a. (4 points) Draw **Newman projections** for the *anti* and one of the *gauche* conformations of the molecule 2-chloropentane. Hint: sight down the C3–C4 bond.