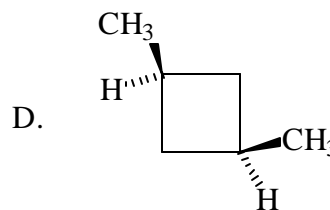
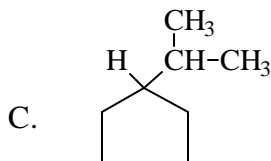
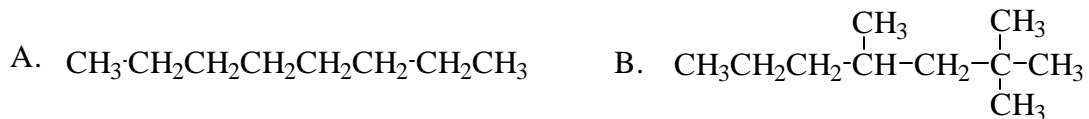


CHEMISTRY 2401  
Exam # 1 -- June 21, 1998

(12) I. Provide acceptable IUPAC names for each of the following alkanes or cycloalkanes.



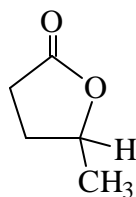
(18) II. Draw structural formulas for each of the following.

A. An alkyne that contains four carbon atoms.

B. A tertiary alcohol that has a formula of  $\text{C}_5\text{H}_{10}\text{O}$ .

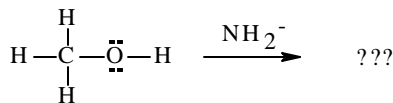
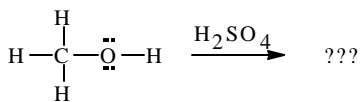
C. An isomer of the lactone shown below:

D. sec-butyl bromide



E. The conjugate acid of methanol that is produced when it is mixed with  $\text{H}_2\text{SO}_4$ .

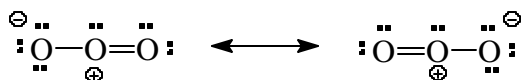
F. The conjugate base of methanol that is produced when it is mixed with  $\text{NaNH}_2$ .







(12) VI. An ozone molecule is represented by the two resonance structures shown below.



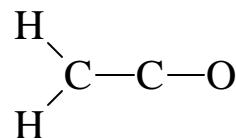
What does a "real" ozone molecule look like in terms of

- 1) the lengths of the O-O bonds and                      2) the distribution of electrical charge?

3) Sketch a drawing of the p-orbital interactions that produce the pi bonds in ozone.



4) Ketene is an industrially important compound with the formula  $\text{CH}_2=\text{C}=\text{O}$ . At the right sketch the p-orbital interactions that produce the pi bonding in ketene.

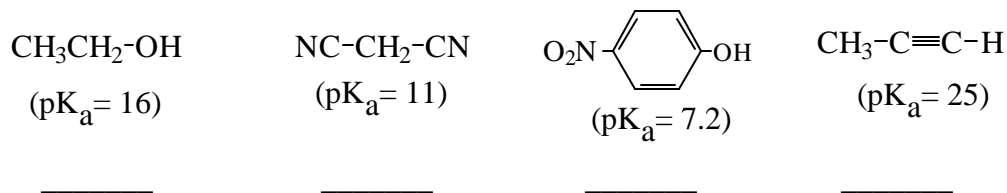


(6) VII. Explain each of the following in molecular terms

A. The enthalpy of vaporization ( $\Delta H_{\text{vap}}$ ) of n-pentane is larger (6595 cal/mole) than that of neopentane (2,2-dimethylpropane) (5649 cal/mole).

B. The entropy of fusion ( $\Delta S_{\text{fus}}$ ) of n-pentane is larger (14 cal / deg-mol) than that of neopentane (2,2-dimethylpropane) (3 cal / deg-mol).

(12) VIII. A. Rank the following in order of acidity (1 for most acidic, etc.)



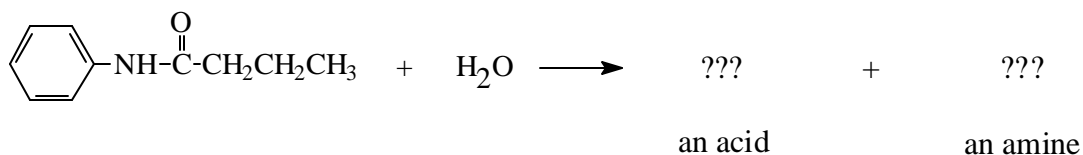
B. Below are the conjugate bases of the acids above. Circle the strongest base and underline the weakest base.



C. Suppose equal molar amounts of each of the following four chemical species (from parts A & B above) were mixed in solution. Once the system had reached equilibrium, which two of the species would be present in largest concentrations? (circle them)



(6) IX. Amides react with water in the presence of an acid catalyst to yield an acid and an amine. Write the structure of the acid and amine that result from the reaction shown below:



(6) X. How many different kinds of carbon atoms (as indicated by  $^{13}\text{C}$  NMR spectroscopy) do each of the following contain?

