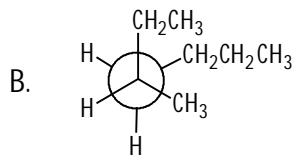
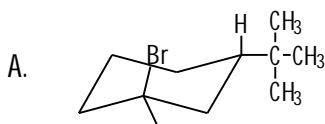


CHEMISTRY 2401
Exam # 2 – October 9, 2000

(8) I. Name each of the following.



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

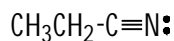
A. *cis*-1,3-dichlorocyclopentane

B. A Newman projection formula for the lowest energy conformation of 2,3-dimethylbutane.

C. The lowest energy conformation for *trans*-1,2-dimethylcyclohexane.

D. The lowest energy conformation for *cis*-1,4-di-*tert*-butylcyclohexane. (trick question).

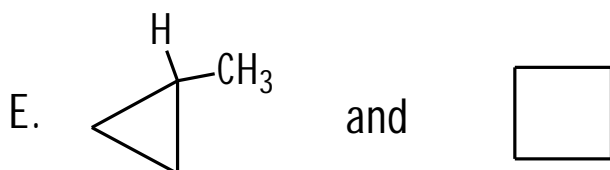
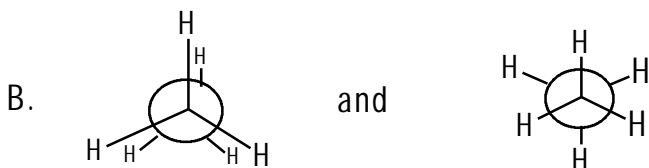
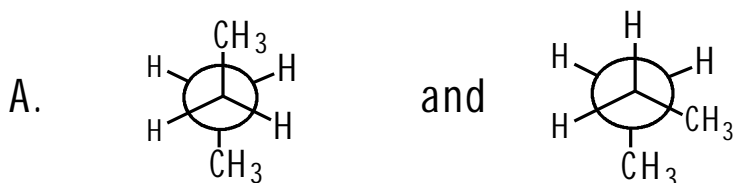
(4) III. Consider a molecule of propionitrile (below). Explain where a nucleophile would attack a propionitrile molecule. What kind of orbital would it attack? Give an example of such a nucleophile.



(20) IV. On page 124 our textbook defines three types of molecular strain as follows:

- Angle strain – the strain due to expansion or compression of bond angles.
- Torsional strain – the strain due to eclipsing of bonds on neighboring atoms.
- Steric strain – the strain due to repulsive interactions when atoms approach each other too closely.

For each of the following (1) circle the conformation that is higher in energy, (2) identify the type of strain responsible for the high energy and (3) describe the specific source of the strain in this specific case.



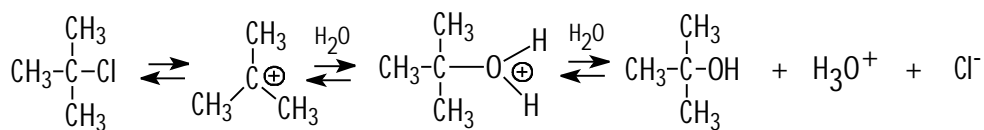
(2 types of strain)

(12) X. Explain in as much detail as you can what is meant when a reaction is said to be exothermic.

B. A similar term is exergonic. How does exergonic differ from exothermic and what does exergonic mean with regard to the reaction?

C. What is required for an endothermic reaction to be exergonic? Under what circumstances is such a reaction most favorable. Explain.

(8) XI. 2-Chloro-2-methylpropane reacts with water in three steps to yield 2-methyl-2-propanol. The first step is slower than the second, which in turn is much slower than the third. The equilibrium constant for the reaction is near 1.



Draw a reaction energy diagram, labeling all points of interest (transition states, intermediates, etc) and making sure that the relative energy levels on the diagram are consistent with the information given.

