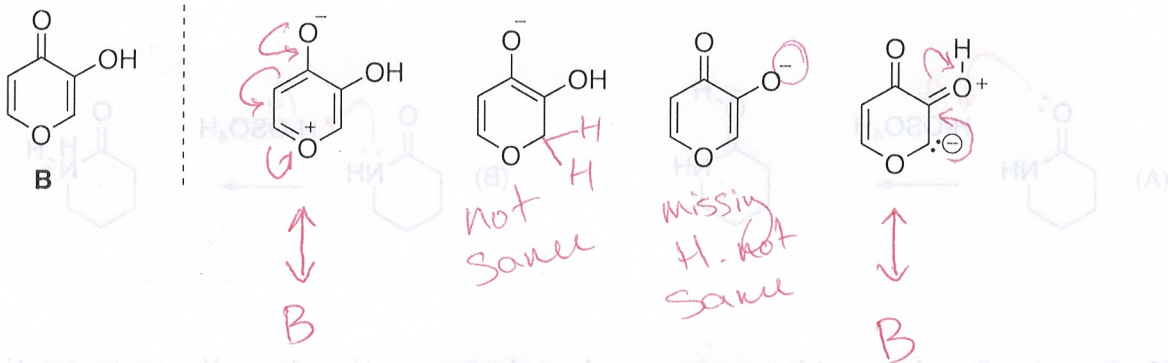
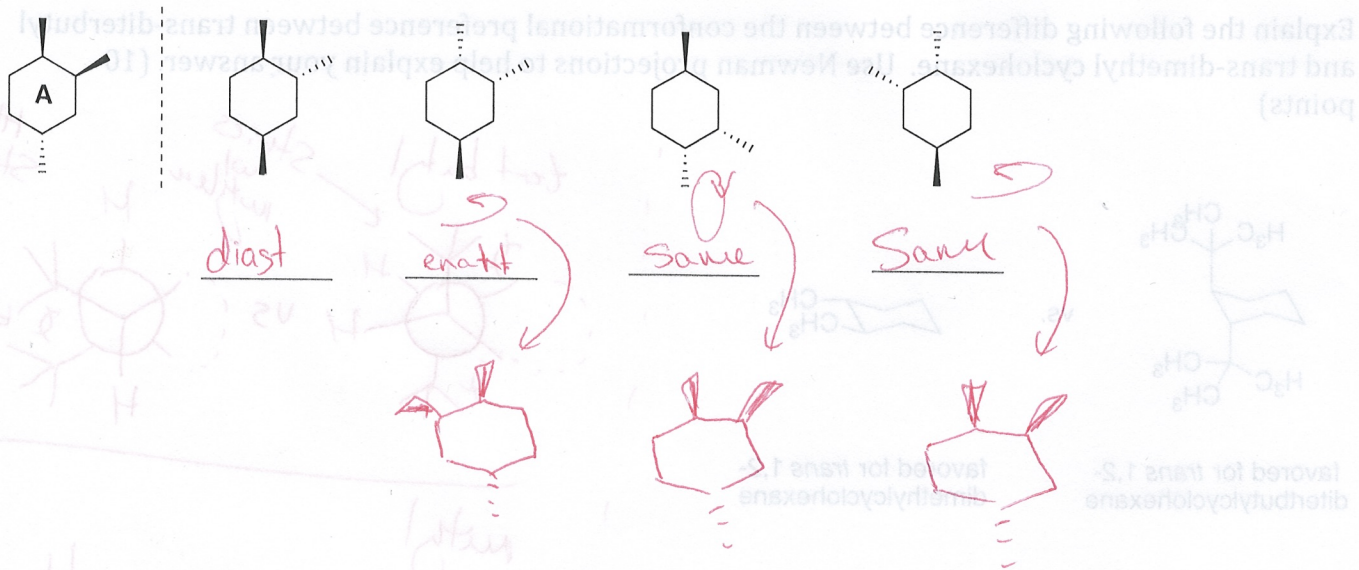


1) **Resonance.** Which of the following 4 molecules are resonance forms of compound **B**. (10 points)

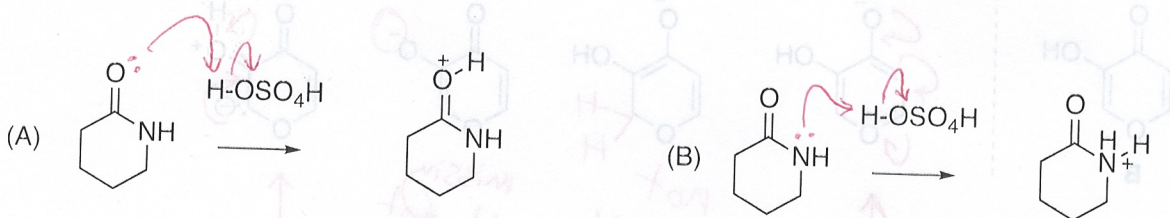


2) **Stereochemistry.** Describe the relationship between the following molecules with compound **A**. Enantiomers, Diastereomers, or Identical (5 points each)

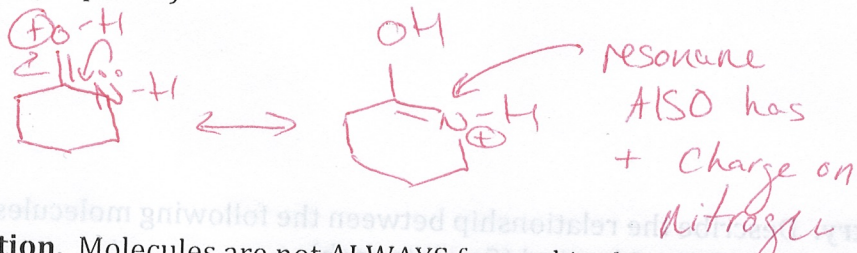


3) **Acid/Base.** Refer to the following two reactions illustrating how an amide could in theory be protonated for this two-part question

3a. Show mechanism arrows for each of these transformations. (10 points)

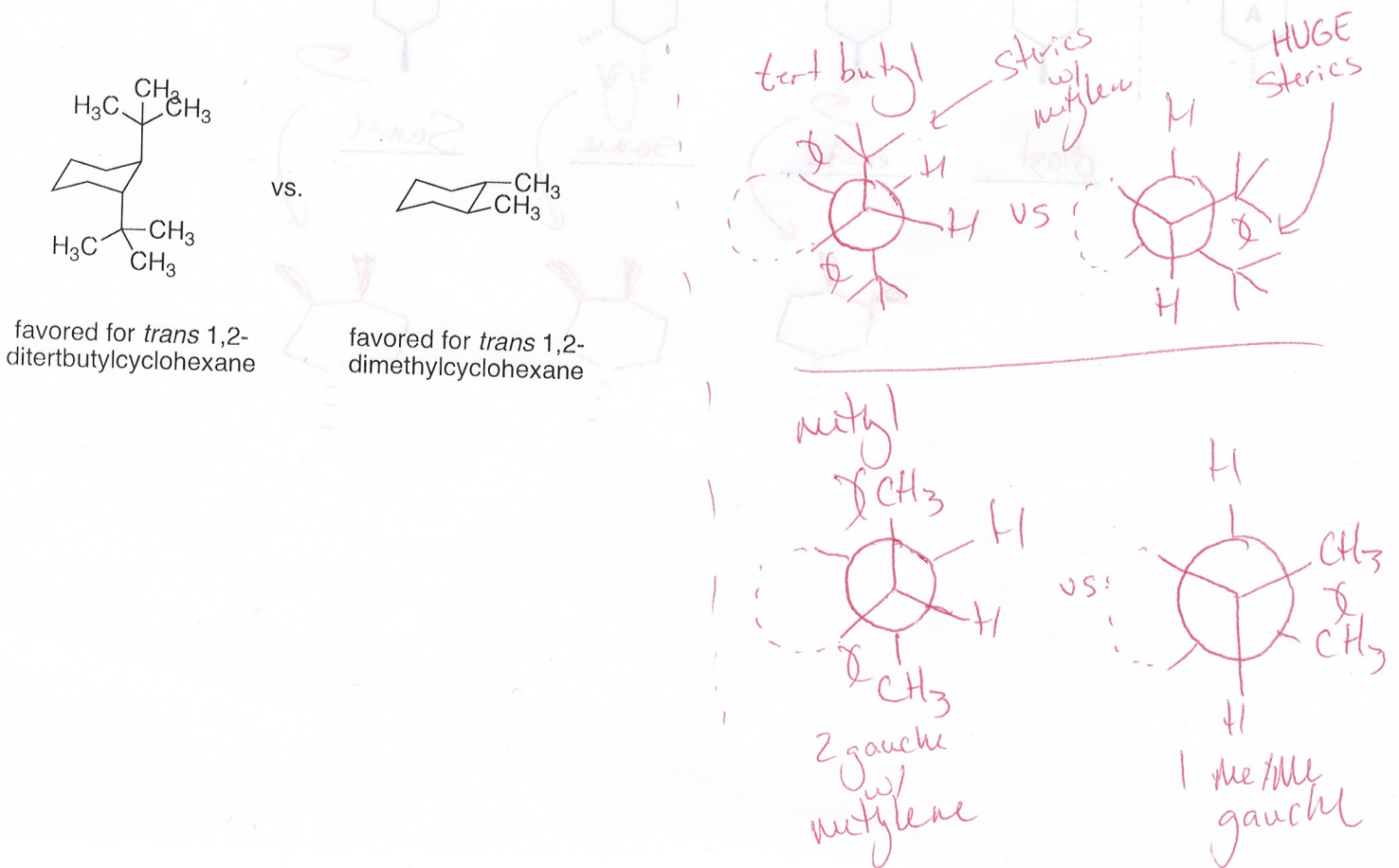


3b. Reaction B ends up with a proton on a less electronegative atom. However, reaction **A** is in fact favored. Why? (10 points)

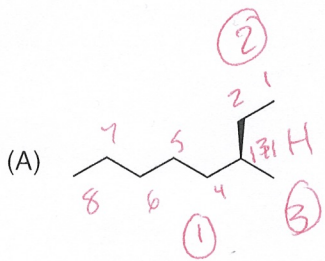


4) **Concept Question.** Molecules are not ALWAYS favored in the axial conformation.

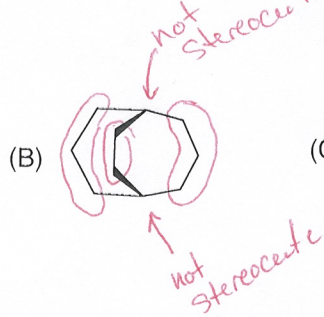
Explain the following difference between the conformational preference between trans-ditertbutyl and trans-dimethyl cyclohexane. Use Newman projections to help explain your answer. (10 points)



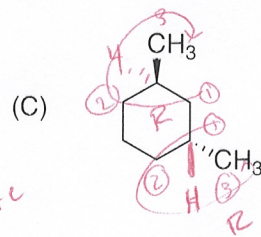
1) **Nomenclature.** Provide the IUPAC names of 2 of the following 3 molecules (5 points each)



(A) (R)-3-methyloctane

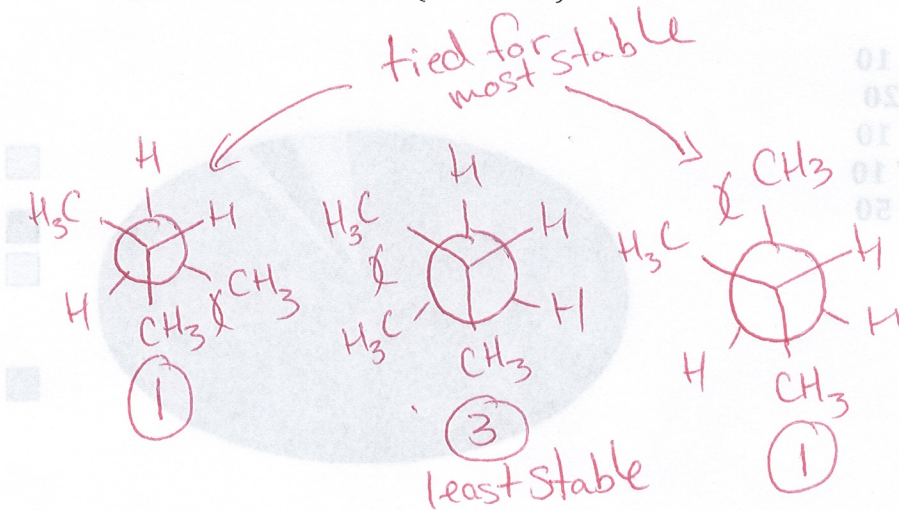
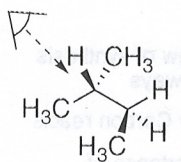


(B) bicyclo[3.3.2]decane



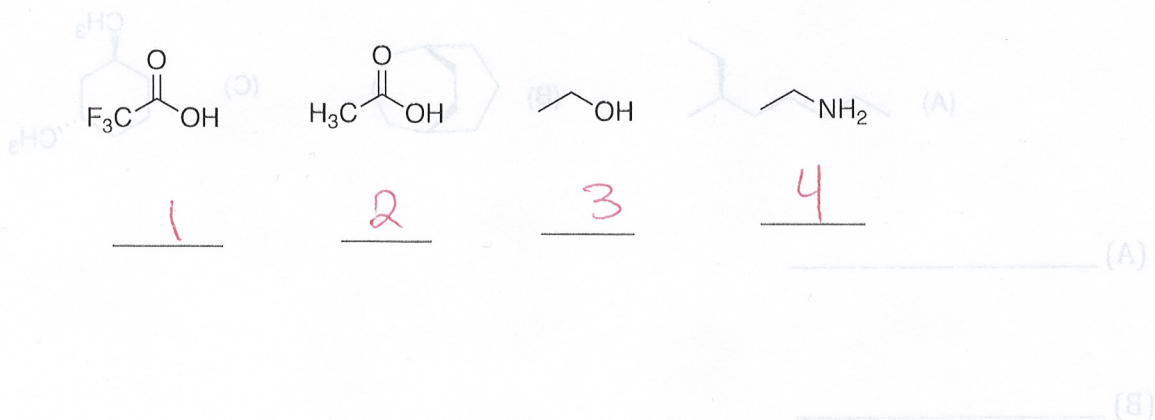
(C) (1R,3R)-1,3-dimethylcyclohexane

2) **Conformational Analysis.** Draw the three Newman Projections of the following molecule from the vantage point indicated. Rank them from most (1) to least (3) stable. If any of the molecules are equal in energy, make a note of it. (10 Points)



1.	10
2.	20
3.	10
4.	10
Total	50

3) **Acid/Base.** Rank the following molecules in order of acidity from most acidic (1) to least acidic (4) (10 points)



4) **Concept Question.** Chair-like conformations explain several stereochemical outcomes of various reactions that proceed through 6-membered rings. The following is an example of one of them.

Try to complete the substitution of the two chair-like transition states of the following 6-membered ring-containing intermediates (shown below). Using this information, which of the products do you believe are formed (10 points).

