

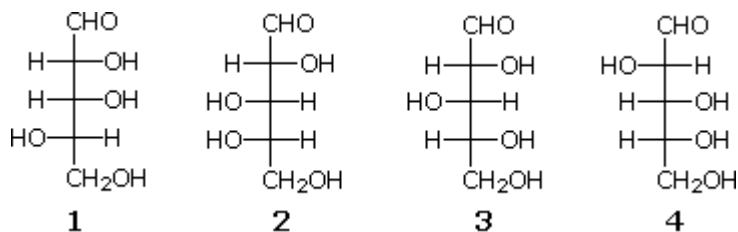
Name

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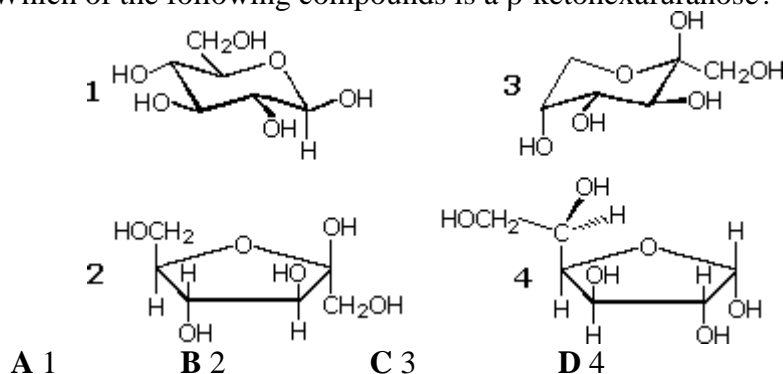
1) (5 points) For each multiple choice question, pick the most correct answer.

I. Which two of the following compounds are reduced to the same chiral alditol by sodium borohydride?



- A) 1 and 2
 B) 2 and 3
 C) 3 and 4
 D) 2 and 3

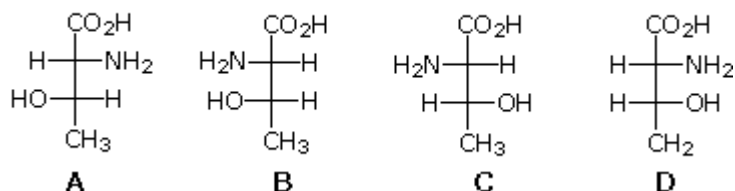
II. Which of the following compounds is a β -ketohexafuranose?



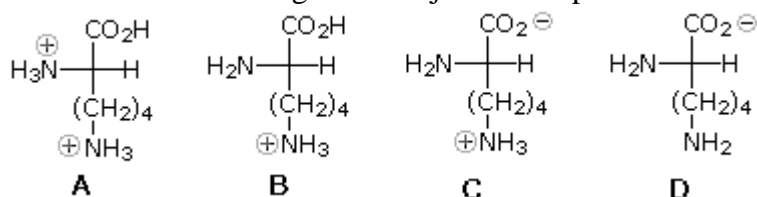
III. If two isomers have been classified correctly as **anomers**, they may also be called...?

- A) conformers
 B) enantiomers
 C) tautomers
 D) diastereomers

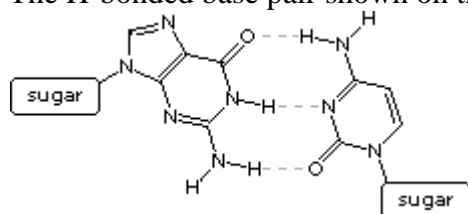
IV. Threonine is (2S,3R)-2-amino-3-hydroxybutanoic acid. Which of the following is threonine?



V. Which of the following is the major solute species in a solution of lysine at pH=10.8?



- VI. Peptides are composed of amino acids joined by amide bonds. Which of the following statements **is not** correct?
- amide groups are more resistant to hydrolysis than are similar ester groups.
 - $p-\pi$ resonance stabilizes the amide bond.
 - stable conformations of peptides are restricted to those having planar amide groups
 - amide groups do not participate in hydrogen bonding interactions
- VII. Which of the following is a general characteristic of those natural products classified as lipids?
- they are generally insoluble in water and soluble in organic solvents.
 - they are generally soluble in water and insoluble in organic solvents.
 - they have the common structural feature of two or more fused carbon rings.
 - they generally have a high weight proportion of oxygen (>40%).
- VIII. Counting both constitutional and stereoisomers, how many isomeric triglycerides incorporating one oleic acid and two stearic acid groups exist?
- one (there are no isomers)
 - two
 - three
 - four
- IX. Which of the following is a pyrimidine base?
- Imidazole
 - Guanine
 - Cytosine
 - Adenine
- X. The H-bonded base pair shown on the right represents which of the following?



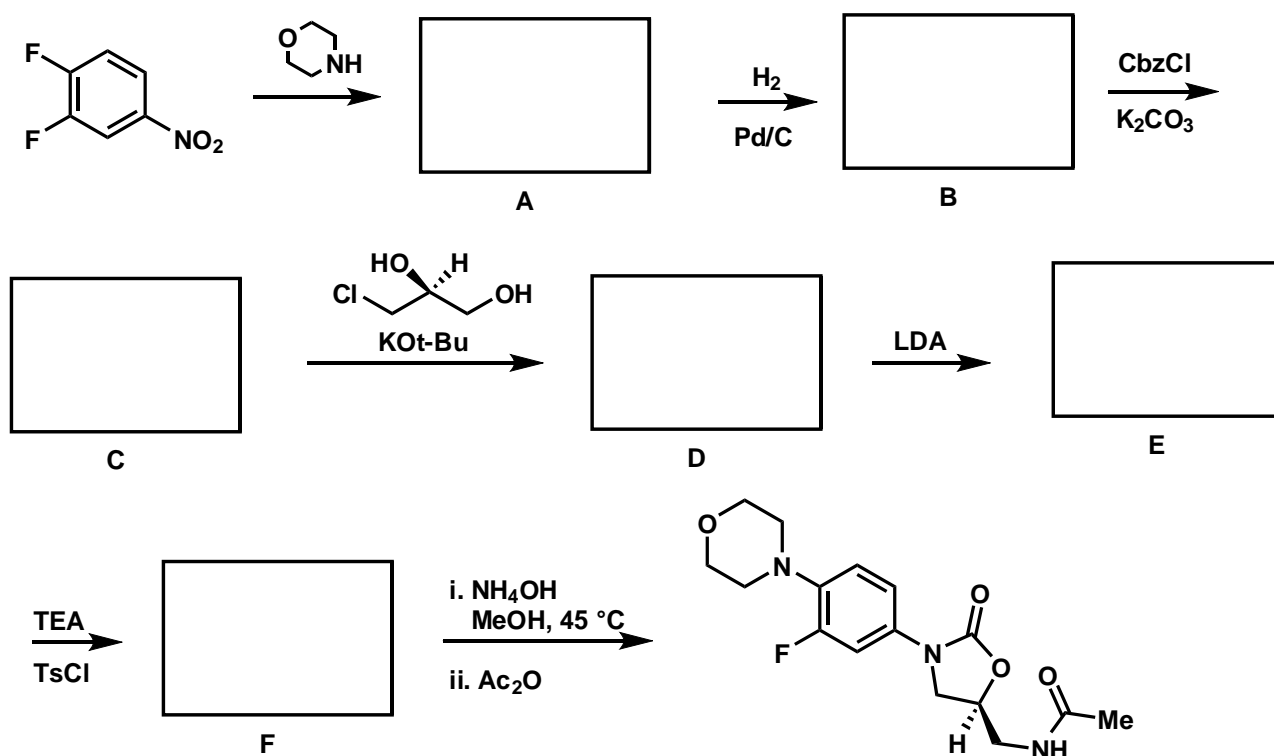
- adenine-thymine
- guanine-cytosine
- adenine-cytosine
- adenine-guanine

2) (5 points) The mechanism for the substitution of 3-substituted indoles at the C-2 position has been debated for sometime. During Healthcock's synthesis of Lysergic acid the following observation was made. The starting material was derived from tryptophan and is optically pure. But the product of the cyclization was found to be optically inactive (racemic). (*Tetrahedron Lett.* 1993, 439-440)

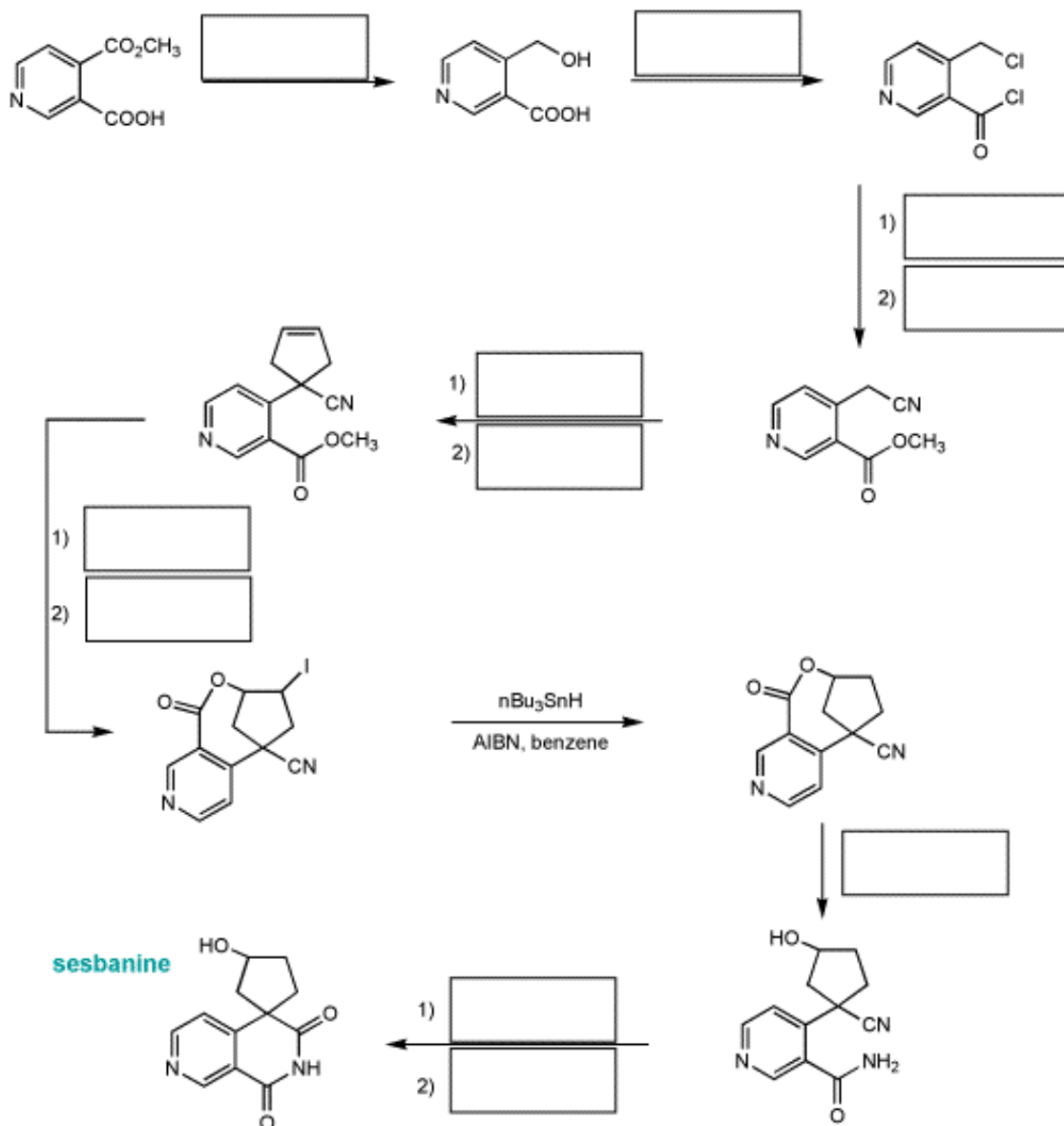


Provide a mechanism that is consistent with the above observations.

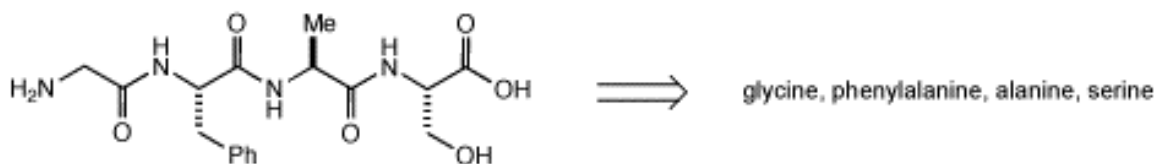
3) (6 points) In the synthesis of Linezolid (active against gram-positive and gram-negative bacteria with potency in the 2-4 $\mu\text{g/mL}$) you are asked to propose the structure of compounds A, B, C, D, E and F. (Pharmacia/Pfizer, *ACIEE*, 2003, 42, 2010).



4) (5 points) Please fill in the missing reagents in the synthesis of sesbanine (*J. Org. Chem.* 1980, 45, 1176)



5) (5 points) Propose an efficient synthesis of the following tetra-peptide using starting materials given below and any additional reagents your synthetic route may require. Note. A convergent synthesis will be scored higher than a linear sequence.



6) (4 points) For the benzodiazepine depicted below please provide:

- 1) Retrosynthetic disconnections (to get to the proposed main starting materials);
- 2) Forward synthesis (with reagents and conditions, NO MECHANISM!)

