Last Name First name 27/05/2015

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

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

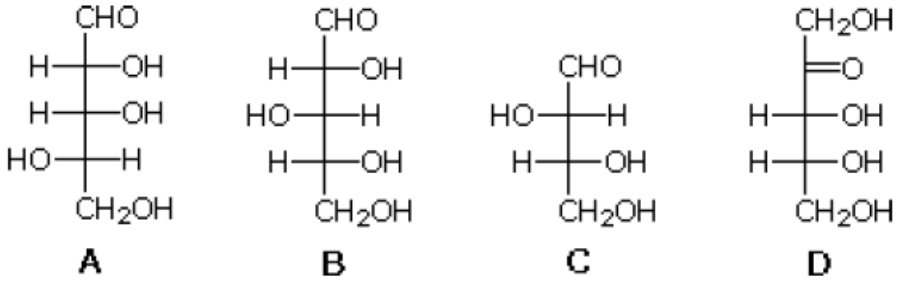
A) conformers

B) enantiomers

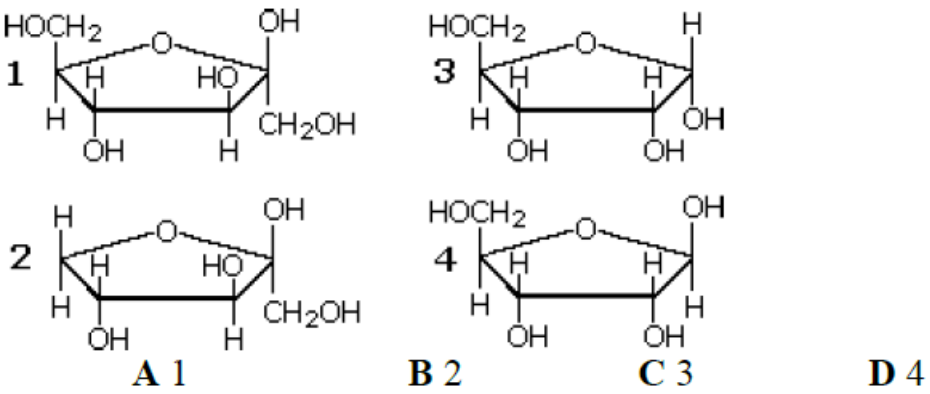
C) tautomers

D) diastereomers

II. Which of the following is a D-aldopentose?



III. Which of the following compounds is a β-aldopentafuranose?



IV. A tripeptide is composed equally of L-valine, L-tyrosine and L-alanine (one molecule of each). How many isomeric tripeptides of this kind may exist?

A) three

B) four

C) six

D) eight

V. All the common amino acids, save one, react with cold nitrous acid (HNO_2) and evolve nitrogen gas. Which of the following amino acids is that compound?

A) cysteine

B) proline

C) histidine

D) arginine

VI. Cholesterol is a/an:

A) saturated fat

B) unsaturated fat

C) steroid

D) essential oil

VII. All the statements regarding peptide bond are true except

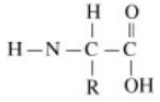
A) Peptide bond is a co-valent bond

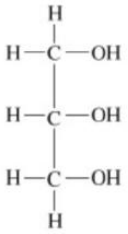
B) Peptide bond is rigid and planar

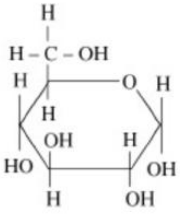
C) Peptide bond has partial double bond character

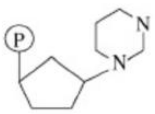
D) Peptide bond is formed by non-condensation reaction

VIII. Which of the following molecules is used in the synthesis of lipids?

a. 

b. 

c. 

d. 

IX. The nucleic acids, DNA and RNA, are polymers. Which are the monomer units of nucleic acids?

A) Ribose or deoxyribose

B) Nucleotides

C) Purines

D) Nucleosides

X. Which of the following is a pyrimidine base?

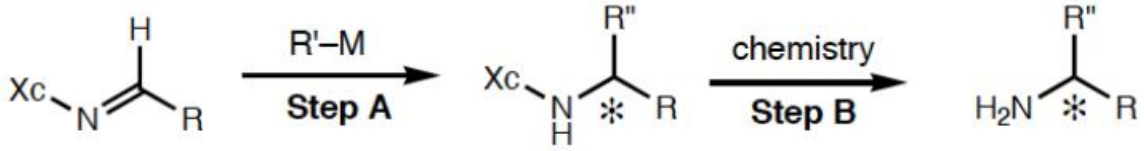
A) Imidazole

B) Guanine

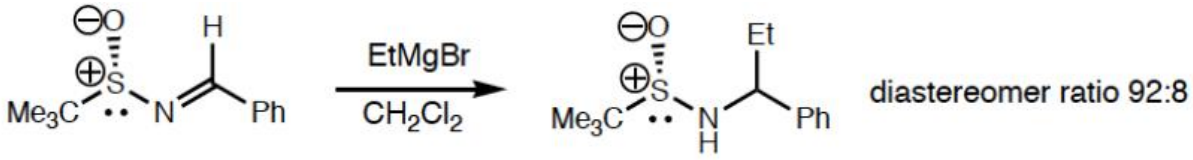
C) Cytosine

D) Adenine

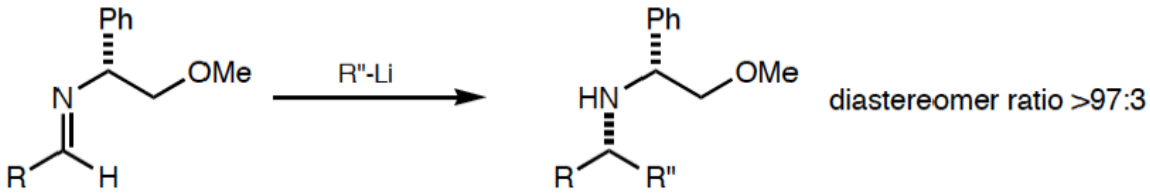
2. (5 points) Chiral auxiliaries (Xc) are routinely employed to control the absolute stereochemistry of the addition or organometallic reagents to imines (Step A). A design requirement of these controllers is that they may be readily cleaved after the addition step (Step B). In the two parts of this question posed below are presented two well-established chiral controllers that employ chelate organization as an integral part of the chirality transfer process.



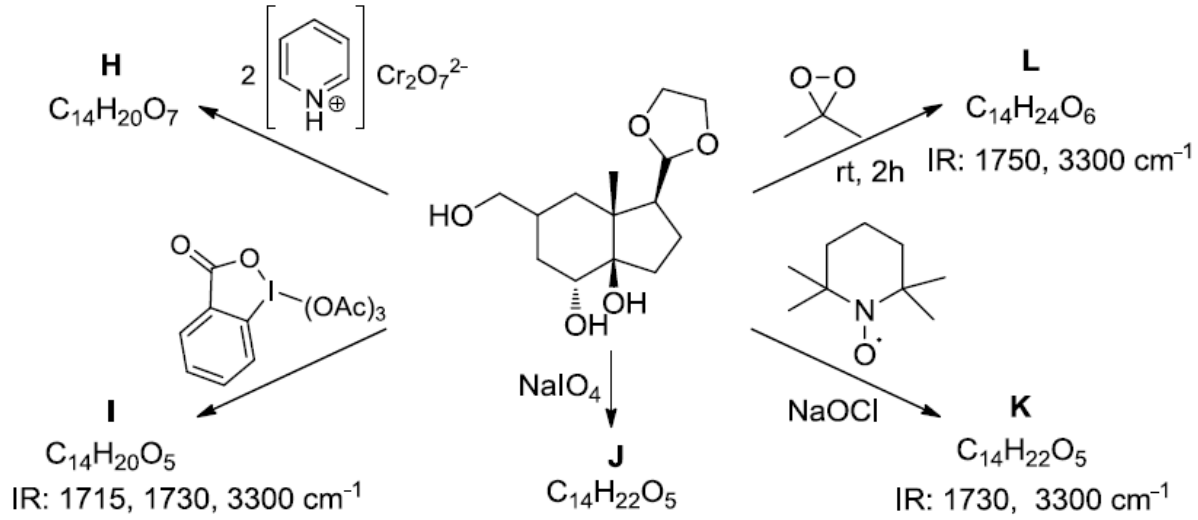
Part A. Provide a mechanism for the following transformation reported by Ellman and co-workers. (Tet, 1999, 8883). Include a clear transition state representation that predicts the major product diastereomer. Clearly illustrate the absolute stereochemistry of the product.



Part B. The following stereoselective transformation has been reported by Fujisawa (Chem.Lett. 1991, 1555). Given the stereostructure of the product, rationalize the stereochemical outcome.

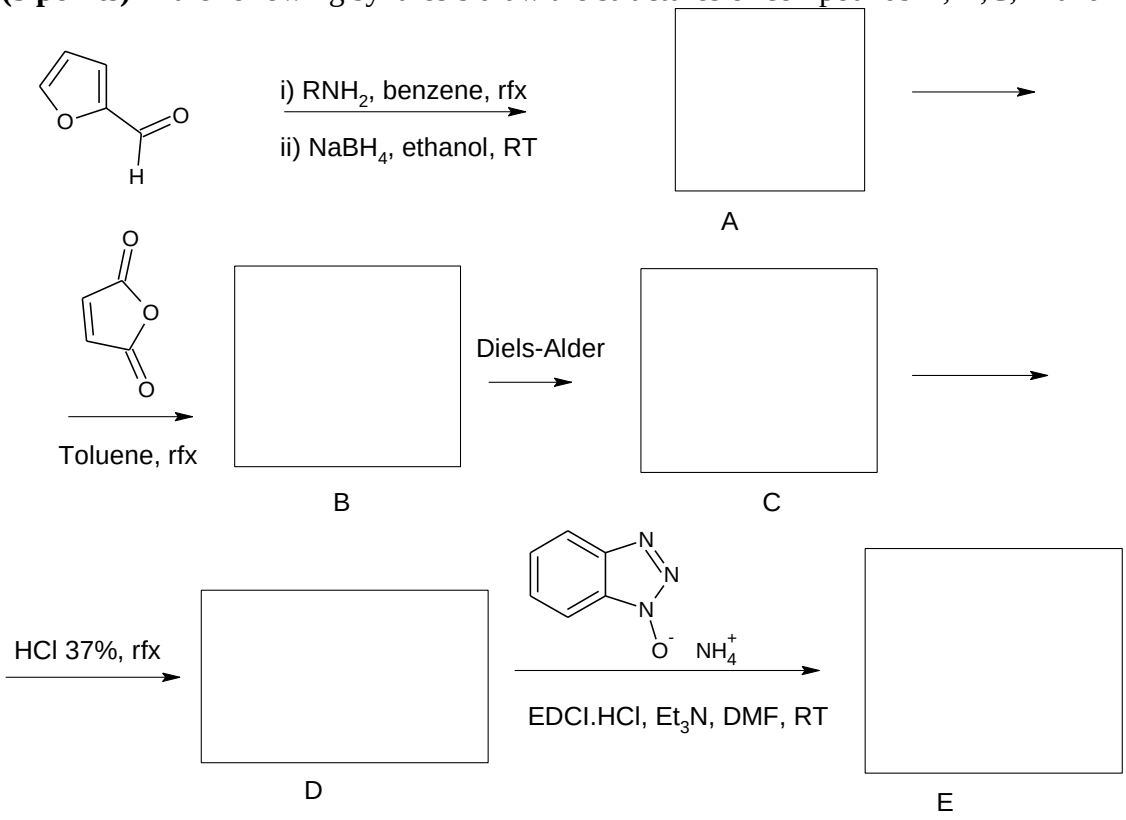


3. **(5 points)** In the following scheme examples of the chemoselective oxidation of the same substrate with different oxidants affording different reaction products are given.

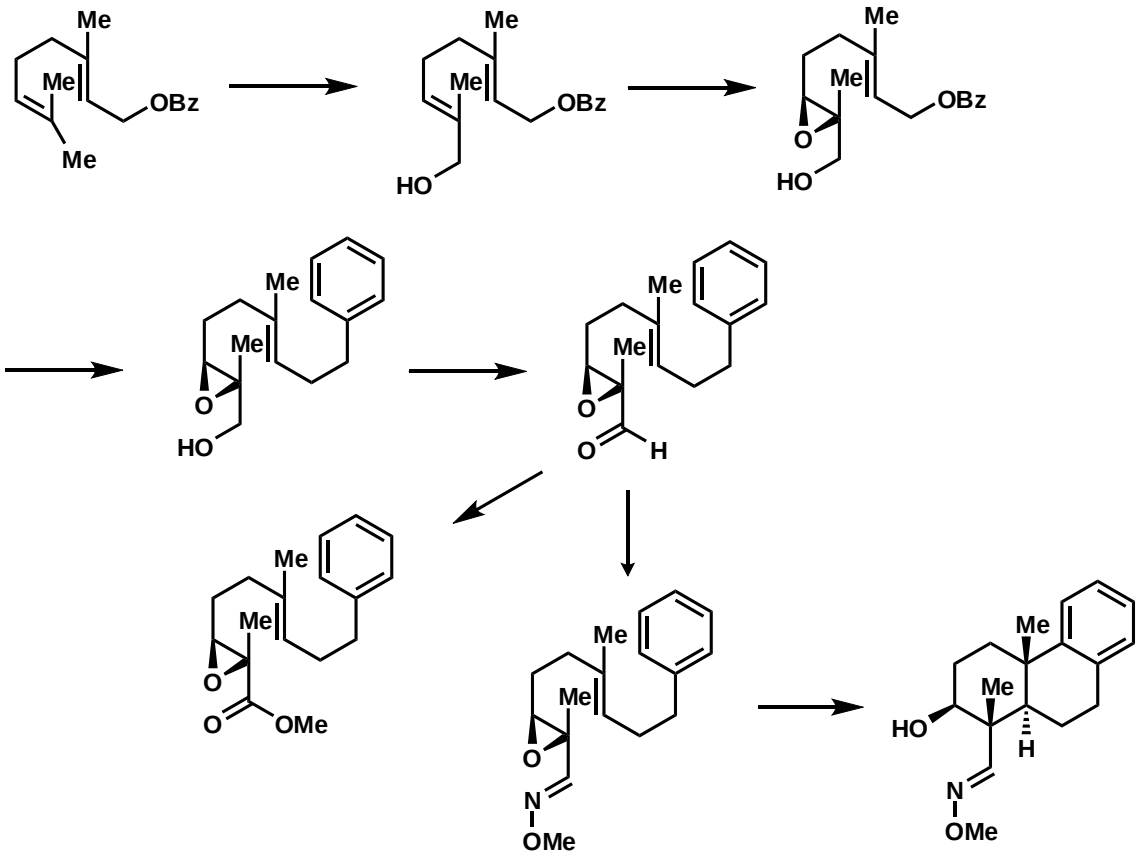


Compounds **I**, **J**, and **K** react with $Ag(NH_3)_2OH$ solution producing the metallic silver precipitation. Compound **H** could be formed by oxidation of **J**. The treatment of 1.44 g of **L** with metallic sodium produces 0.224 L (P = 1 atm, T = 273 K) of hydrogen gas.
Write the structural formula of compounds **H**–**L**.

4. **(5 points)** In the following synthesis draw the structures of compounds A, B,C, D and E.



5. **(5 points)** Please fill in the missing reagents in the synthesis.



6. **(5 points)** For the two compounds depicted below please provide:
   1) Retrosynthetic disconnections
   2) Forward synthesis (with reagents and conditions, NO MECHANISM!);