

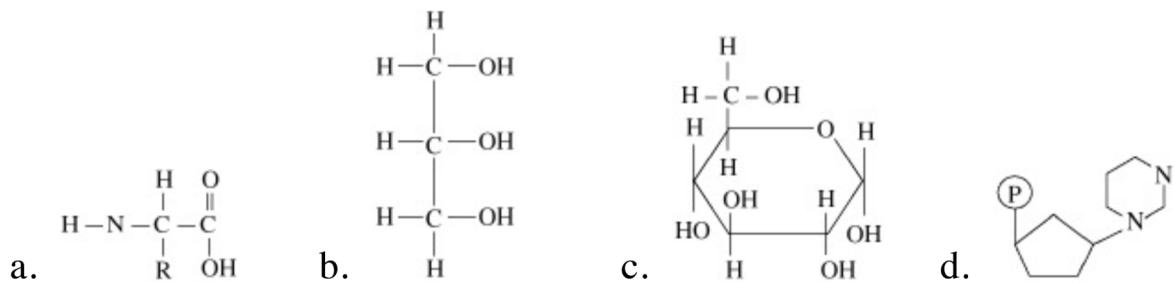
Name

Last name

14/01/2015

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

- I. **Which of the following is produced when glucose and fructose are chemically joined to form sucrose?**
A) water
B) nucleotide
C) peptide bond
D) hydrogen bond
- II. **The bonding of a glucose molecule and a maltose molecule would result in a**
A) triglyceride
B) disaccharide
C) phospholipid.
D) polysaccharide
- III. **What reagent is used in the Edman degradation for N-terminal group analysis of peptides?**
A) phenyl isothiocyanate
B) di-t-butyl dicarbonate
C) dicyclohexylcarbodiimide
D) benzyl chloroformate
- IV. **Which of the following statements is true for phenylalanine in an aqueous solution at $\text{pH} = \text{pI}$?**
A) the nonpolar, neutral species $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$ is the most abundant solute.
B) the concentrations of $[+]$ and $[-]$ charged molecular ions are equal.
C) racemization is rapid.
D) this condition is impossible, since pH can never equal pI .
- V. **Tri-peptide consists**
A) 3 amino acids and 3 peptide bonds
B) 2 amino acids and 3 peptide bonds
C) 3 amino acids and 2 peptide bonds
D) 3 amino acids and 4 peptide bonds
- VI. **Which of the following factors has the least influence on the secondary and tertiary structures of proteins?**
A) the achiral nature of glycine units.
B) steric hindrance of bulky side-chains on the peptide backbone.
C) hydrogen bonding of $\text{C}=\text{O}$ to $\text{N}-\text{H}$ groups located near each other in space.
D) conformational restriction imposed by proline units.
- VII. **Which of the following statements about glyceryl tripalmitate, 1,2,3-propanetriol tris(hexadecanoate), is not true?**
A) it is reduced to 1-hexadecanol by lithium aluminum hydride
B) it is achiral
C) it has a higher melting point than glyceryl trioleate
D) it adds bromine
- VIII. **Which of the following molecules is used in the synthesis of lipids?**



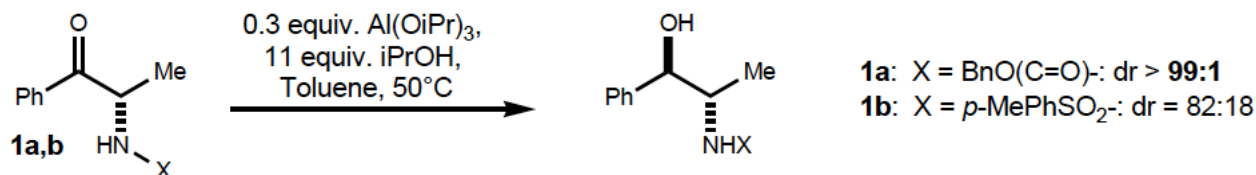
IX. What is the complementary RNA sequence for the DNA segment AATCAGTT?

- A) AAUCAGUU
- B) CCAUCGAA
- C) AACUGAAU
- D) UUAGUCAA

X. Which of the following is not a component of a nucleotide?

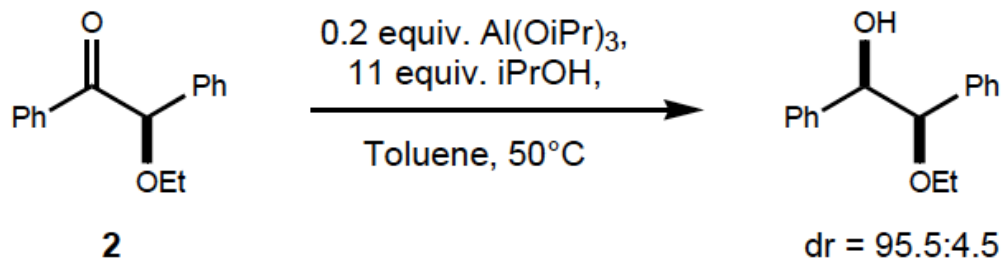
- A) sugar
- B) phospholipid
- C) phosphate group
- D) nitrogenous base

2. (5 points) The Merck Research Laboratories have recently reported the following preparation of ephedrine analogues:



Part A: Explain the reactions of **1a-b** using clear 3D-drawings. Discuss the role of the nitroge substituents. Note that **no racemization** was observed during the reaction!

Part B: After subjecting ether **2** to the same conditions, the *syn*-product was obtained with high selectivity. Provide a 3D transition state drawing that explains this selectivity.

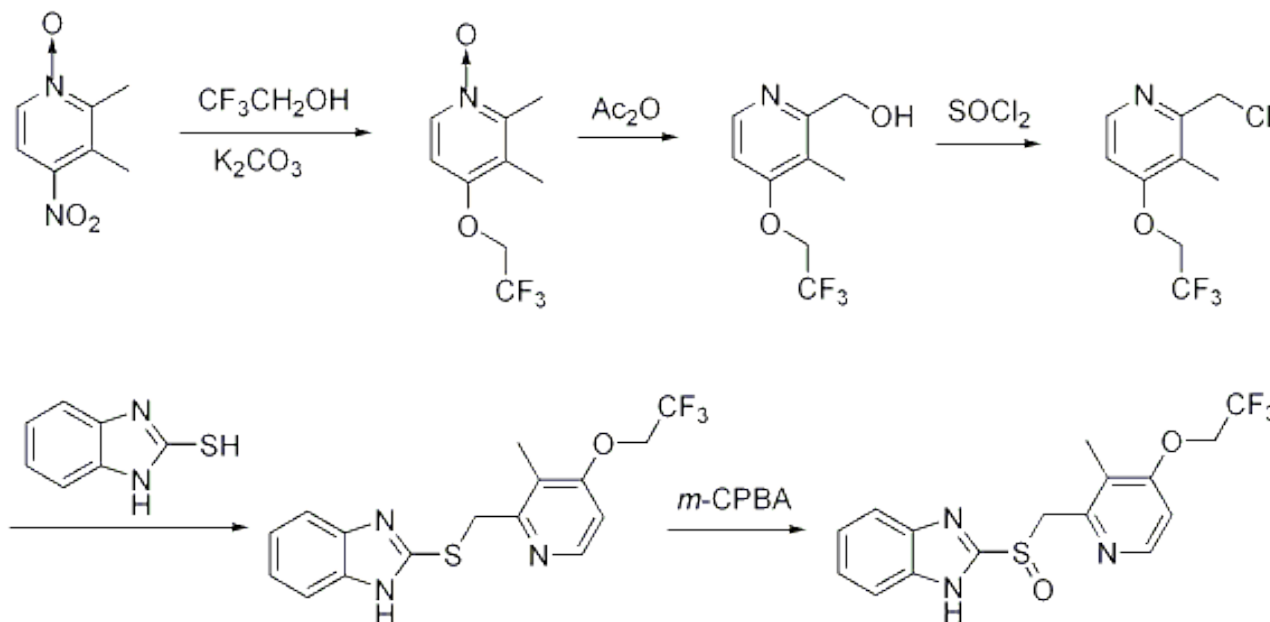


3. (5 points) In the figure below is reported the synthesis of Lansoprazole a proton-pump inhibitor (PPI) which inhibits the stomach's production of gastric acids. It is manufactured by a number of companies worldwide under several brand names.

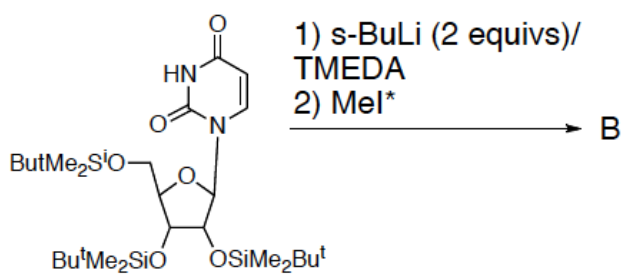
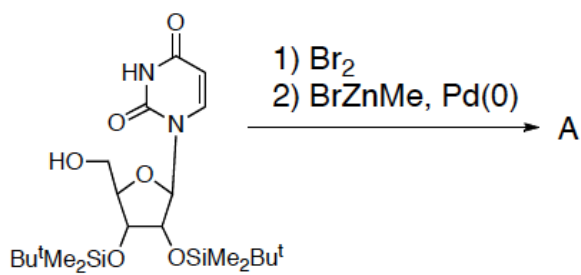
a) Explain how and why the first step can occur.

b) Provide the mechanism for the second step.

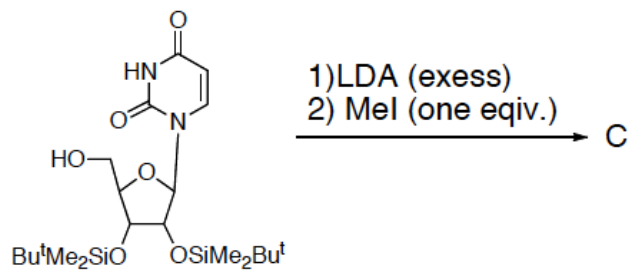
c) It is sold as a racemic 1:1 mixture of the enantiomers. Explain.



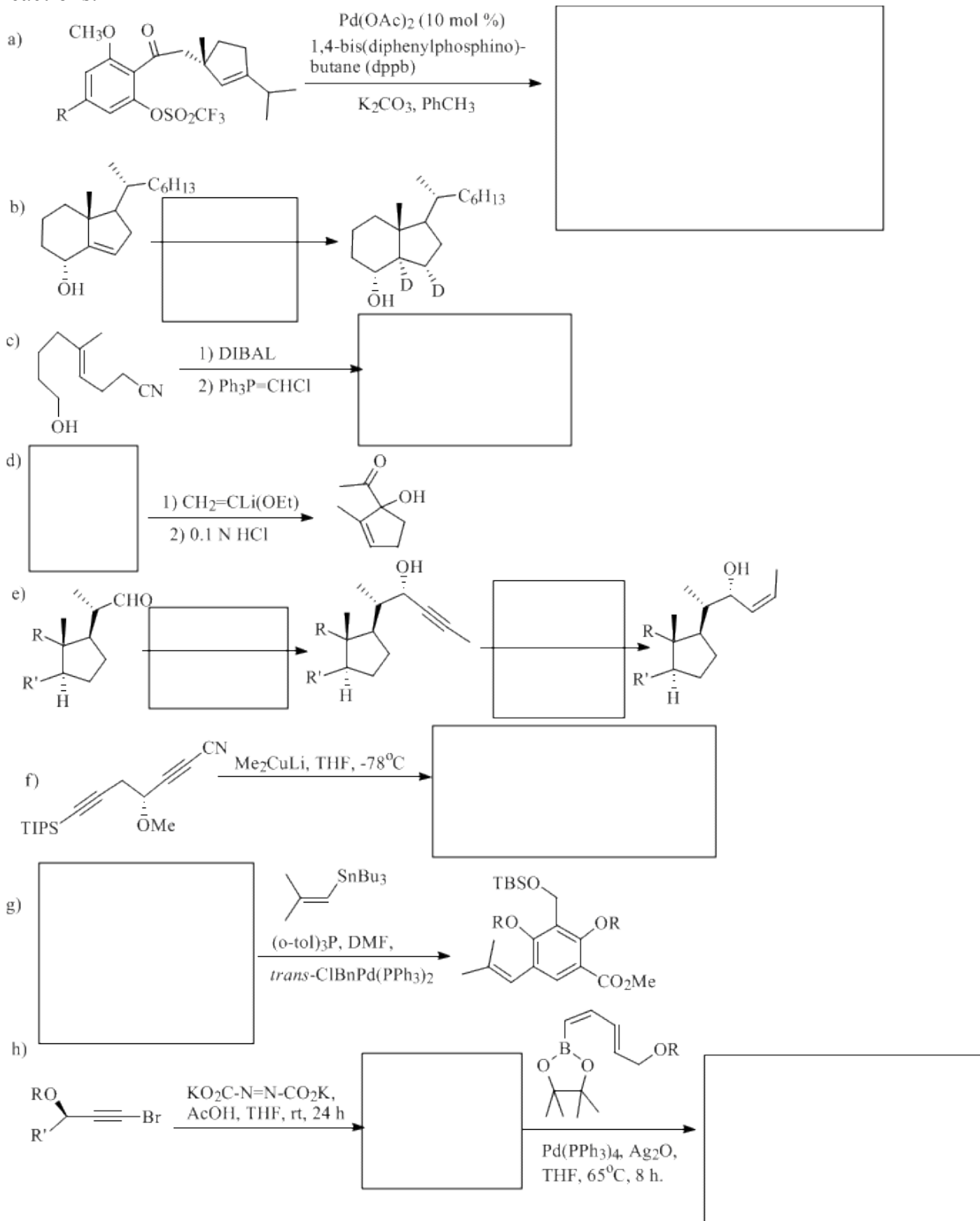
4. (5 points) Which compounds are formed in the reactions below?



* alternative a: 1 equiv. MeI
alternatibe b: ≥ 2 equuivs MeI



5. (5 points). Provide the necessary starting material, reagent or product to complete the following reactions.



6. (5 points) Devise a novel synthetic strategy to A, shown below, from a commercially available starting material. Your primary focus should be on the efficient construction of the carbon skeleton. Stereochemical concerns should be secondary.

