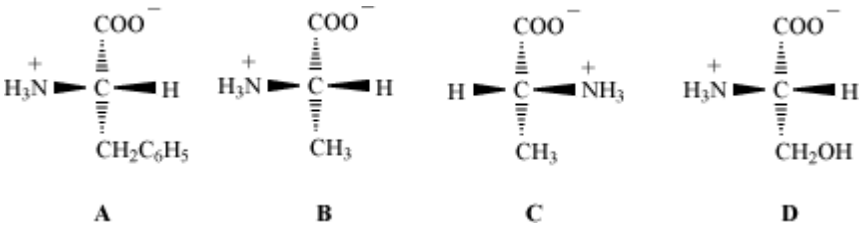
Name Last name 11/02/2015

1. (5 points)

For each multiple choice question, pick the most correct answer

I. Which of the following amino acids is *unlikely* to be found in a natural protein?



A) Amino Acid A
B) Amino Acid B
C) Amino Acid C
D) Amino Acid D

II. Which of the following aminoacid has pKa near neutrality

A) Tryptophan
B) Arginine
C) Histidine
D) Asparagine

III. Sulfur is found in:

A) DNA
B) RNA
C) sugars
D) proteins

IV. 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

V. Carbohydrates consist of carbon, hydrogen and oxygen. Which of the following represents the general formula for carbohydrates?

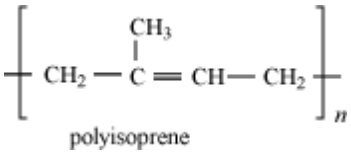
A) $C_xH_{2x}O_x$
B) $CO_{2x}H$
C) $C_xH_xO_x$
D) $C_{2x}H_xO_{2x}$

VI. When comparing proteins and carbohydrates, the following similarities can be identified:

A) both consist of linked monomers via the process of hydrolysis
B) both consist of linked monomers via the process of dehydration synthesis
C) both consist of linked amino acids via the process of hydrolysis
D) both consist of linked sugars via the process of dehydration synthesis.

VII. Natural rubber is a conjugate addition polymer of isoprene (2-methyl-1,3-butadiene) containing *Z*-double bonds and is an elastomer. Gutta percha has the same constitution but

containing *E*-double bonds, and is a plastic. Which of the following statements explains this difference?



polyisoprene

A) Natural rubber is an addition polymer while gutta percha is a condensation polymer.
B) Gutta percha is an isotactic polymer but natural rubber is not.
C) With a *Z* double bond natural rubber's shape is that of a coil or helix - it is an amorphous polymer with elastomeric qualities. In contrast, gutta percha's shape is overall linear, permitting close packing of polymer chains, leading to crystallinity and rigidity.
D) Natural rubber results from radical polymerization whereas gutta percha results from anionic polymerization.

VIII. What kind of molecule is represented by the structure below?
$CH_3CH_2CH_2CH_2CH{=}CHCH_2CH_2CH_2CH_2CH_2CH_2CH_2COOH$

A) a sugar
B) an unsaturated fatty acid
C) a saturated fatty acid
D) a disaccharide

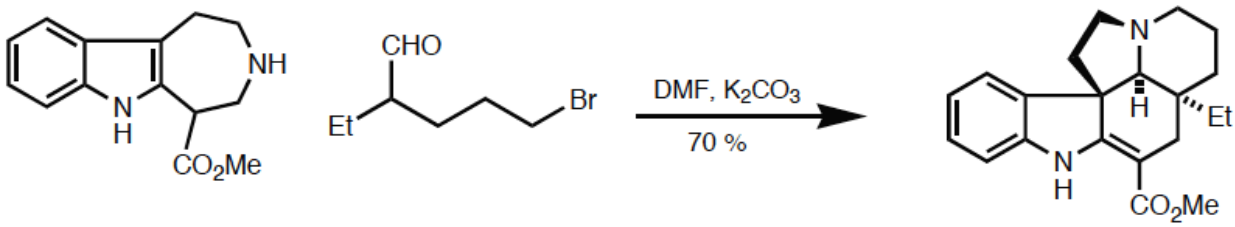
IX. The nucleic acids, DNA and RNA, are polymers. Which are the monomer units of nucleic acids?

A) Ribose or deoxyribose
B) Nucleotides
C) Purines
D) Nucleosides

X. Lipid bilayers are created from:

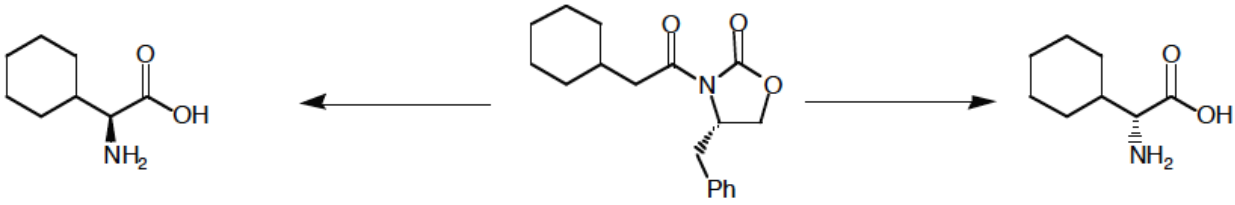
A) phospholipids
B) triglycerides
C) fatty acids
D) glycerol

2. (5 points) Martin Kuhne has described a biomimetic approach to the construction of the aspidosperma alkaloid skeleton (J.Org. Chem. **1978**, 43, 3705). One of the reactions developed in his laboratory is illustrated below. Provide a detailed mechanism for the illustrated transformation.



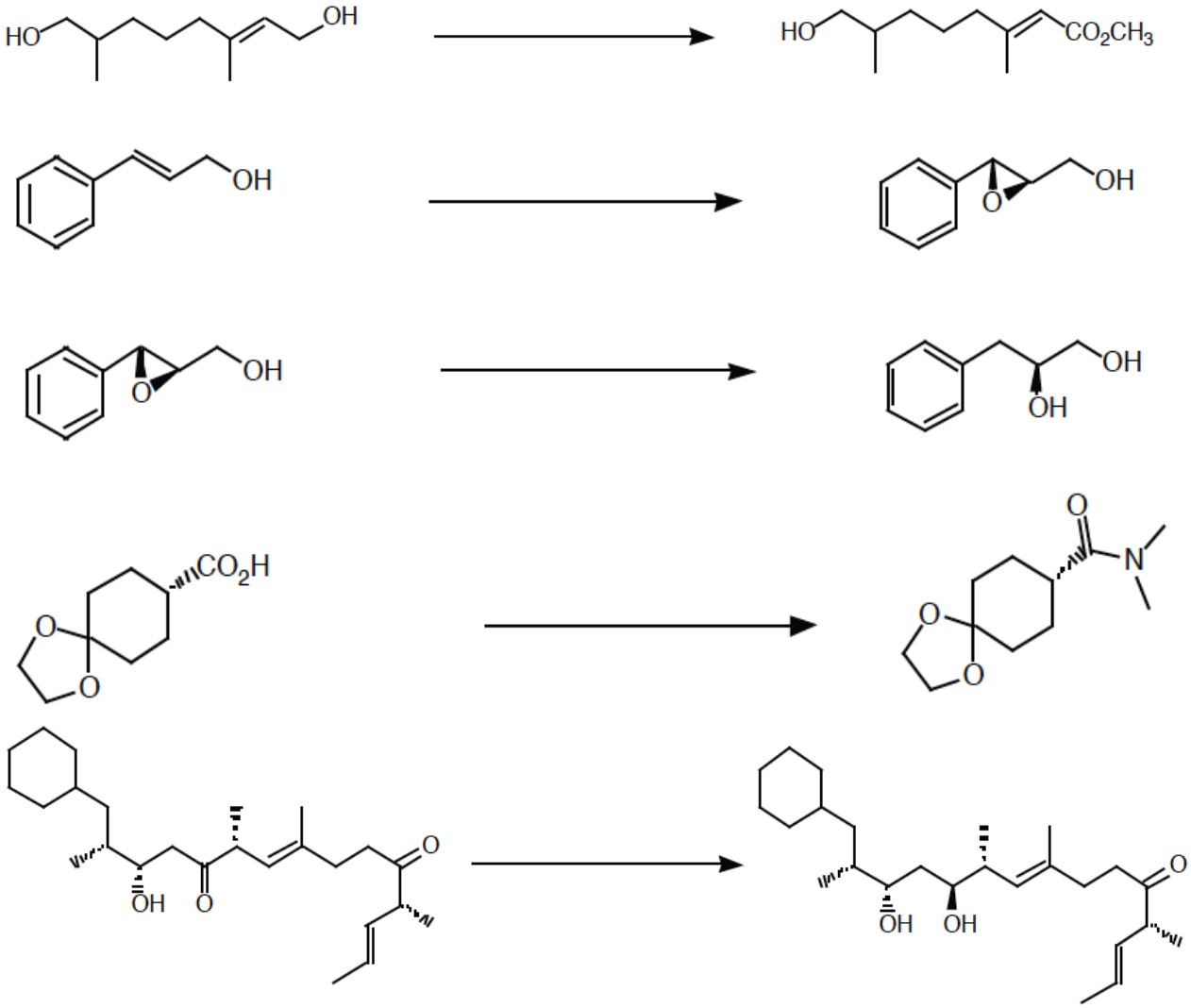
3. (6 points)
a) The amino acids shown below are more hydrophobic analogues of valine. Both enantiomers can be prepared from a common chiral oxazolidinone precursor shown below. Provide all reagents and

show all intermediates for the synthesis of both enantiomers. Also, label the amino acid products as either the D- or L-enantiomer.

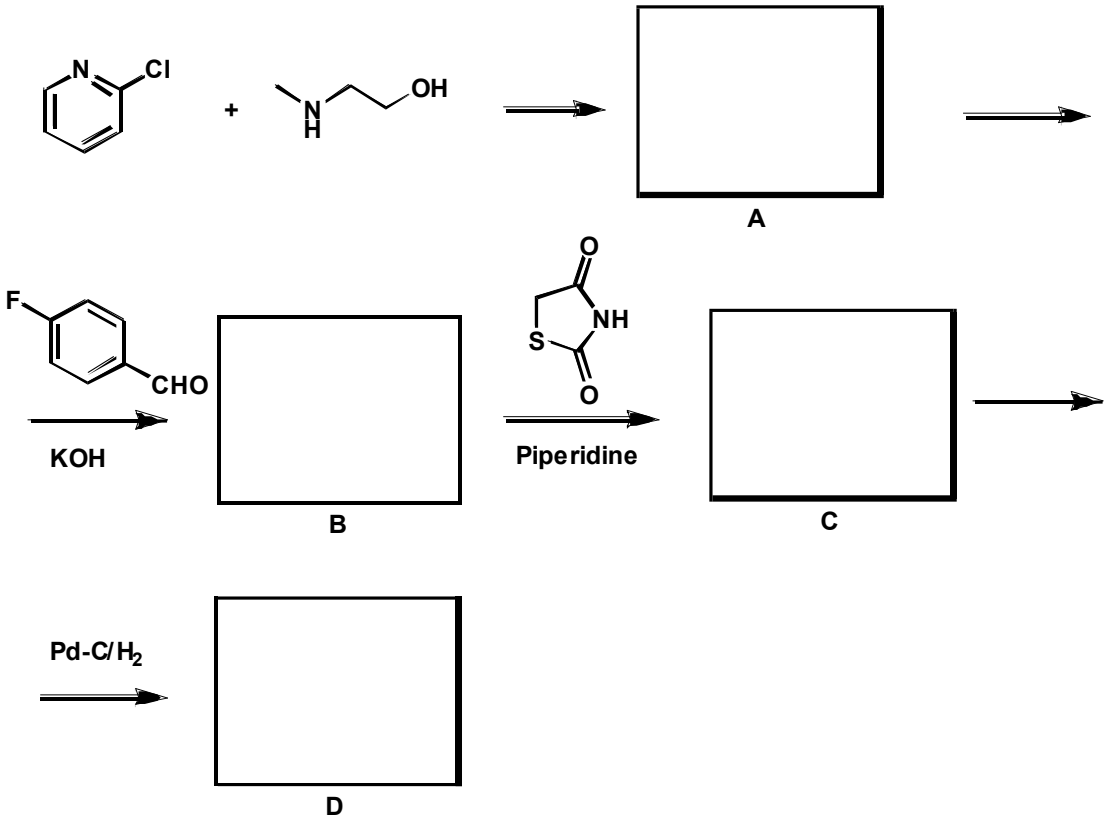


b) Draw suitable reagents for incorporation of the following amino acids using solid phase peptide synthesis. Do not abbreviate any part of the structure unless you have already drawn it once.
a. lysine b. serine c. glutamic acid d. phenylalanine

4. (5 points) Give the reagent(s) necessary to carry out the following transformations. The stereochemistry of the products and reactants is as shown.



5. (5 points) Draw the structures of A, B, C D for the synthesis of Rosiglitazone (trade name Avandia, GlaxoSmithKline) an antidiabetic drug.



6. (4 points) Starting from cyclohexanone, provide a feasible synthesis target shown. Give all reagents and intermediates.