

Name

Last name

01/07/2016

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

**I. Which of the following statements is not true about glucose?**

- A. It has four chirality centers.
- B. It has four secondary alcohol groups.
- C. It has one ketone group.
- D. It has one primary alcohol group.
- E. It has six carbons.

**II. Which of the following is not true about D-glyceraldehyde?**

- A. It is a triose.
- B. In the Fischer projection, the OH group bonded to the chirality center is on the right.
- C. It is an aldose.
- D. It is dextrorotatory.
- E. Its chirality center has the S configuration.

**III. What is the name of the C-2 epimer of glucose?**

- A. allose
- B. gulose
- C. galactose
- D. mannose
- E. Altrose

**IV. Which of the following amino acids contains an OH group?**

- A. valine
- B. phenylalanine
- C. asparagine
- D. cysteine
- E. Serine

**V. Histidine contains an imidazole ring that can be protonated. Identify the site of protonation.**

- A. the -NH- nitrogen
- B. the =N- nitrogen
- C. the carbon of the C=N double bond
- D. the C=C double bond carbon that is next to the -NH-
- E. the C=C double bond carbon that is next to the =N-

**VI. Which statement correctly describes the Fischer projection of L-isoleucine?**

- A. COOH on top, ammonium on right, sec-butyl on bottom
- B. COOH on top, ammonium on left, sec-butyl on bottom
- C. COOH on bottom, ammonium on right, sec-butyl on top
- D. COOH on bottom, ammonium on left, sec-butyl on top
- E. b and c

**VII. Which heterocyclic bases are contained in the coenzyme system NAD<sup>+</sup> and NADP<sup>+</sup>?**

- A. adenine and pyrimidine
- B. thymine and pyridine
- C. adenine and pyridine

- D. guanine and pyridine
- E. cytosine and pyridine

**VIII. What is meant by the term "saponification"?**

- A. It is hydroxide ion-promoted hydrolysis of a fat or an oil to form glycol and salts of fatty acids.
- B. It is hydroxide ion-promoted hydrolysis of a fat or an oil to form glycerol and neutral fatty acids.
- C. It is thermal hydrolysis of a fat to form glycerol and neutral fatty acids.
- D. It is hydrogen chloride-catalyzed hydrolysis of a fat or an oil to form glycerol and neutral fatty acids.
- E. It is hydroxide ion-promoted hydrolysis of a fat or an oil to form glycerol and salts of fatty acids.

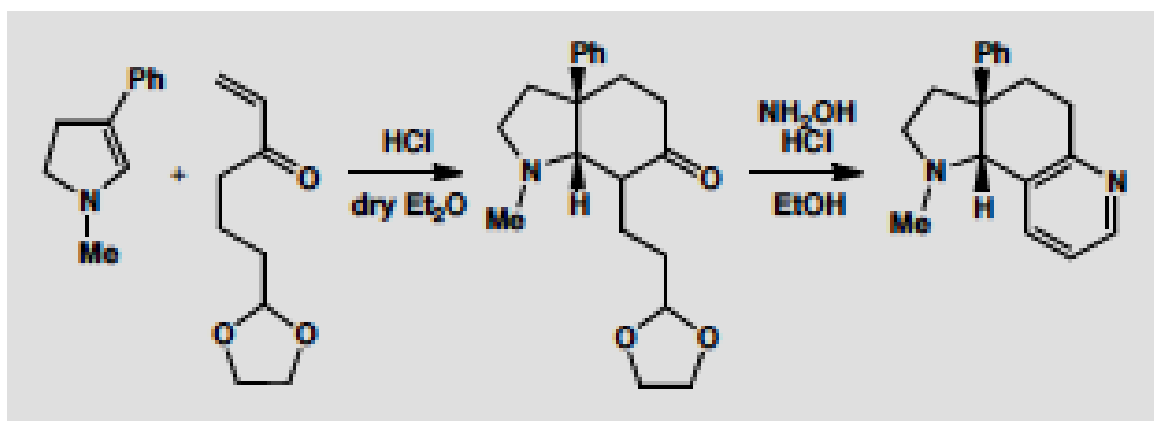
**IX. Are natural triacylglycerols chiral?**

- A. They are chiral if the fatty acids in positions 1 and 2 are different.
- B. They are chiral only if the fatty acids in positions 1, 2, and 3 are different.
- C. They are chiral if the fatty acids in positions 1 and 3 are different.
- D. Yes, because glycerol is chiral.
- E. Fats and oils are not chiral.

**X. Which is the systematic name of isoprene?**

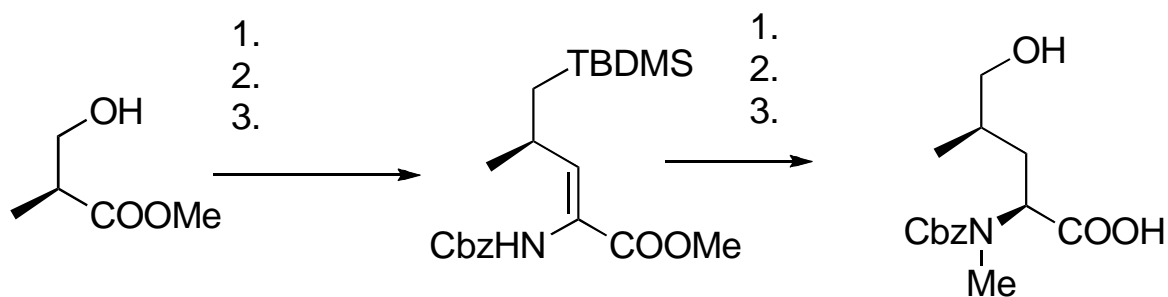
- A. 3-methyl-1,2-butadiene
- B. 1,3-pentadiene
- C. 2-methyl-1,3-butadiene
- D. 2-methyl-1,2-butadiene
- E. 3-methyl-1,3-butadiene

**2. (5 points) Give mechanisms for these reactions used to prepare a fused pyridine. Why is it necessary to use a protecting group?**

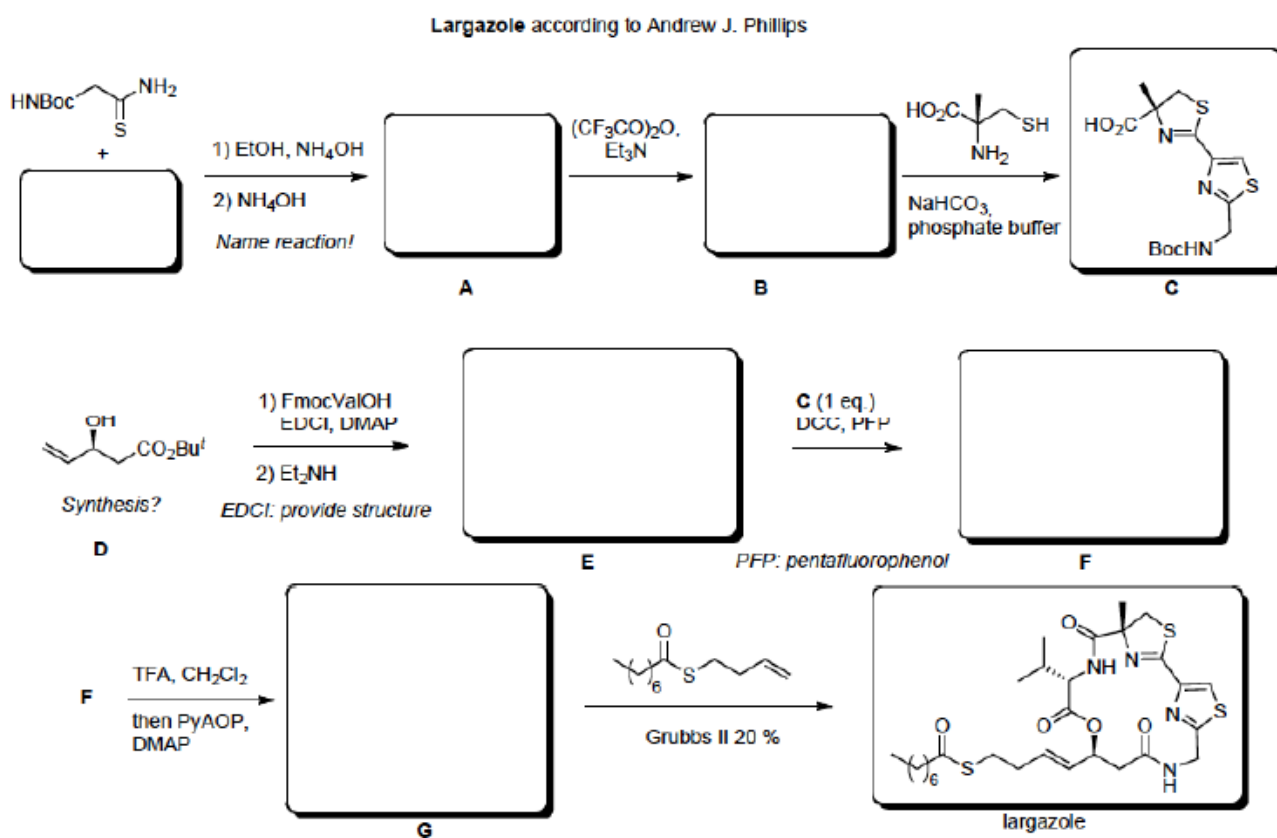


**3. (3 points) Draw the structures and explain the difference of the pKa-values of the side chain functional groups of Lysine, Arginine and Histidine. What are their names?**

4. (6 points) Provide the missing reagents in the following synthesis.



5. (6 points) Complete the empty box and answer to the questions:



6. (5 points) Dimethyl pyranone 1 was a key intermediate required for the synthesis of an asset within a industry portfolio. Below a retrosynthesis of dimethylpyranone 1 is reported. Provide a forward synthesis of 1 with the enantiomeric ester 3 serving as the starting material.

