State University of New York at Stony Brook
Department of Chemistry

CHE 322, Organic Chemistry II **Exam III** **April 19, 2004**
Form 1

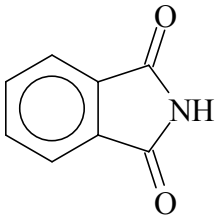
Please answer all questions specifically, concisely, and readably in the spaces provided on the answer sheet, which you will turn in. Think before writing. Include stereochemistry wherever relevant. Use the fronts and backs of the question pages for scratch work. Your Student Identification Number must be **written** and **coded** on the answer sheet, and your printed name and signature must be included at the upper right. Since the answer sheets will not be returned, we suggest that you record your answers on the question pages for comparison with the posted answers. Grades will be posted on Blackboard.

The first ten questions are multiple-choice. They are worth five points each. Enter your choices (only one per question) in spaces 1-10 of the answer sheet.

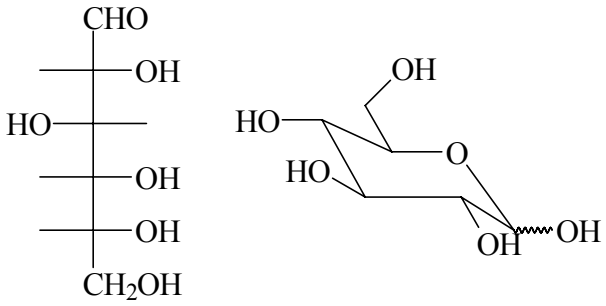
Some useful information:

A furanose is a five-membered ring, and a pyranose is a six-membered ring

Phthalimide =

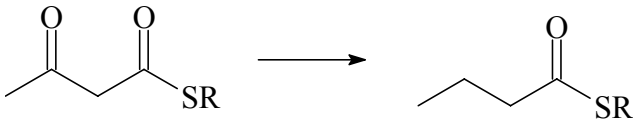


D-Glucose =

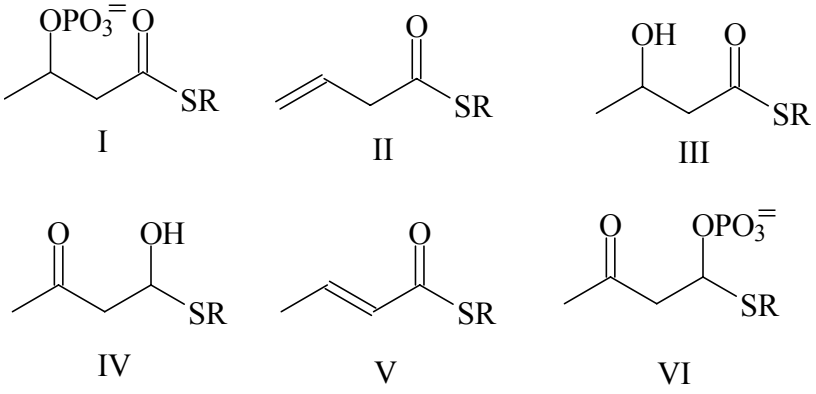


The pK_a of a typical primary ammonium ion, RNH_3^+, is 10.6. The pK_a of imidazolium ion is 6.0.

1. In the biological synthesis of fatty acids, acetoacetyl-ACP undergoes reduction to butanoyl-ACP:

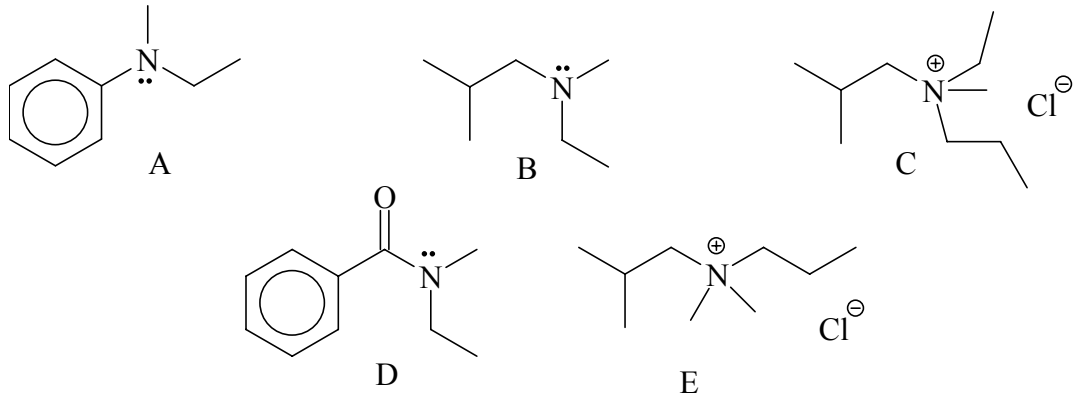


Which **two** of the following are intermediates in this conversion?



A. I and II
B. II and III
C. III and V
D. II and V
E. IV and VI

2. Which one of the nitrogen compounds below can be resolved into enantiomers at room temperature?



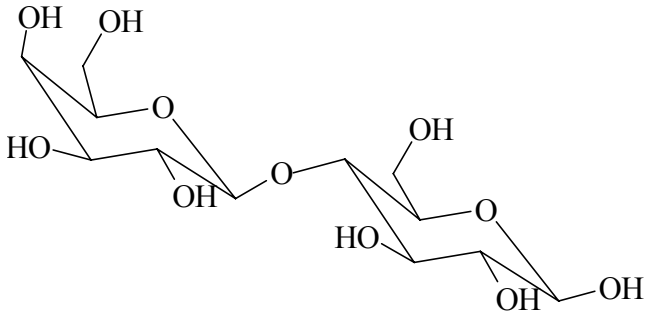
3. Which reagent or combination of reagents would be most effective for converting a secondary alkyl bromide RX to the amine RNH_2?

A. $NaNO_3$ followed by lithium aluminum hydride
B. NaN_3 followed lithium aluminum hydride
C. $NaNH_2$
D. Aqueous NH_3
E. Potassium phthalimide followed by heating with hydrazine.

4. The Hofmann rearrangement of an amide, $RCONH_2$, to an amine, RNH_2, is brought about by treating the amide with bromine in aqueous sodium hydroxide. Which of the species below is NOT an intermediate in the Hofmann rearrangement?

   A. $RCONBr_2$
   B. RN=C=O
   C. RCONHBr
   D. RCONBr-
   E. RNHCOOH.

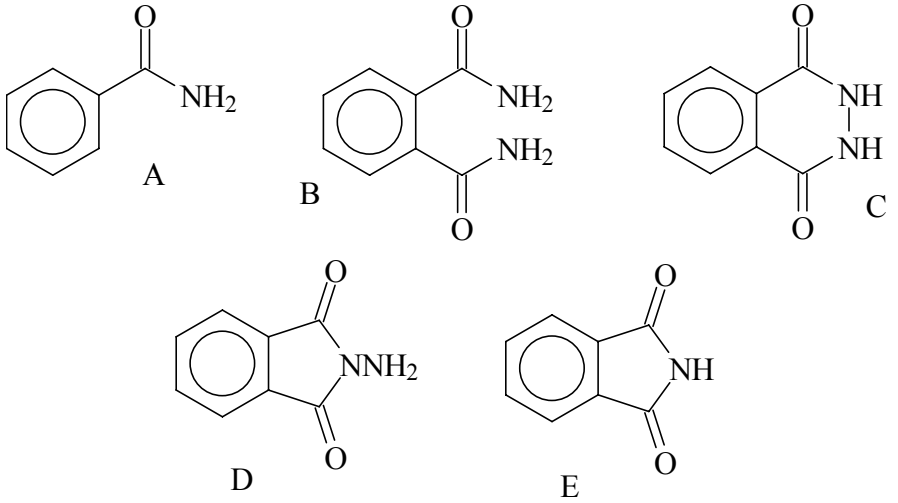
5. The following is the structure of lactose:



   Which statement about lactose is NOT true?

   A. Lactose is a disaccharide.
   B. Hydrolysis of lactose will yield two L-sugars.
   C. Hydrolysis of lactose will yield one mole of D-glucose and one mole of another D-sugar.
   D. Hydrolysis of lactose will not yield any D-glucose.
   E. Hydrolysis of lactose will yield two moles of D-glucose.

6. Which of the nitrogen compounds shown below is the strongest acid?



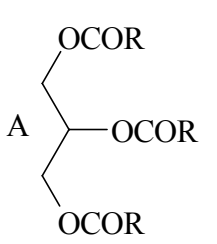
7. Which of the following cannot exist?

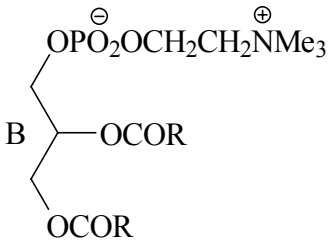
   A. An aldotetrose in pyranose form.
   B. An aldotetrose in furanose form.
   C. An aldopentose in pyranose form.
   D. An aldopentose in furanose form
   E. A ketohexose in pyranose form.

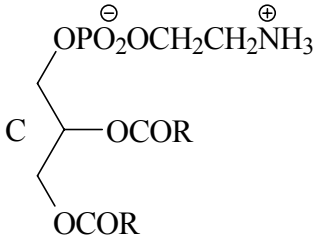
8. Cellulose lacks nutritive value for humans because:

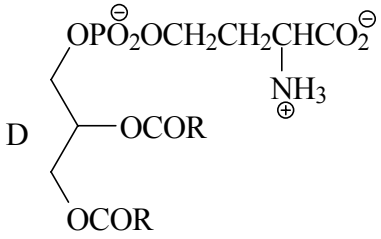
   A. The molecules possess such a high molecular weight.
   B. We lack the enzymes that catalyze the hydrolysis of the α-glycosidic linkages.
   C. We lack the enzymes that catalyze the hydrolysis of the β-glycosidic linkages.
   D. It passes through the digestive tract so rapidly.
   E. The products of its digestion are excreted without utilization.

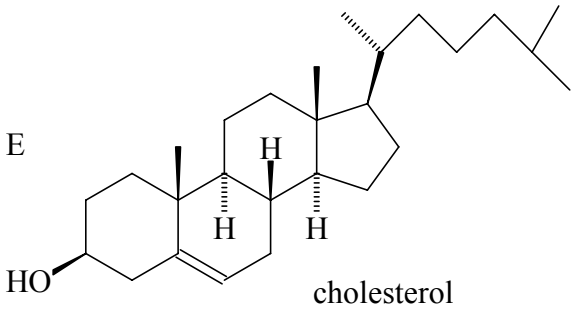
9. Which one of the following would NOT constitute a structural component of a cell membrane? (In all cases R represents a long aliphatic chain with zero, one or two *cis* double bonds.







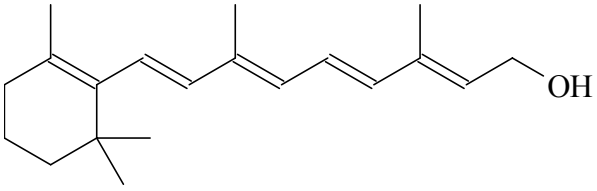




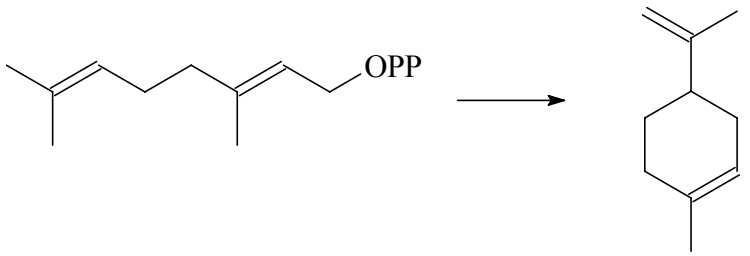
cholesterol

10. How many isoprene units are in Vitamin A?

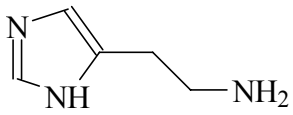
    A. 2
    B. 3
    C. 4
    D. 5
    E. 6



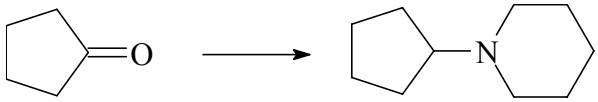
11. (10 points) Show a mechanism for conversion of geranyl pyrophosphate to limonene:



12. (10 points) What is the principal form in which histamine exists in the blood at pH 7.4? The pK_a's of histamine are 6.0 and 10.1.

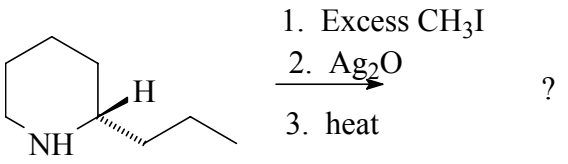


13. (10 points) Suggest an efficient reaction sequence for carrying out the synthesis shown below. (You may also use appropriate primary or secondary amines as reagents.)



14. (10 points) Draw the Fischer projection structure of (L)-glucose.

15. (10 points) What is the principal product expected from treatment of the toxic alkaloid coniine with excess methyl iodide, then silver oxide, then heating (Hofmann elimination)?



16. BONUS (10 points) Draw the structure of β-(D)-glucofuranose.