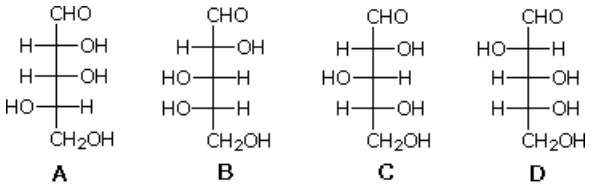
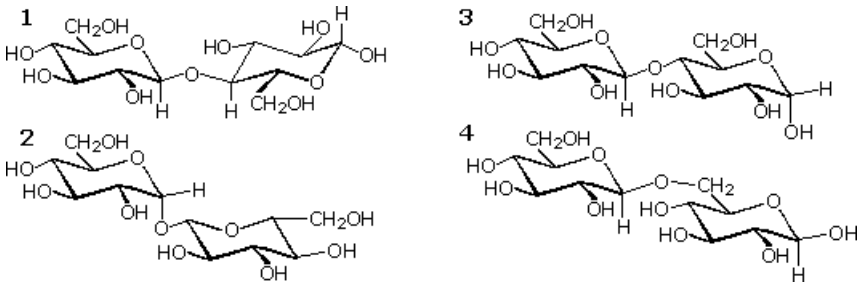
Name **Last name** **18/06/2014**

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

I. Which of the following gives an optically inactive aldaric acid on oxidation with dilute nitric acid?

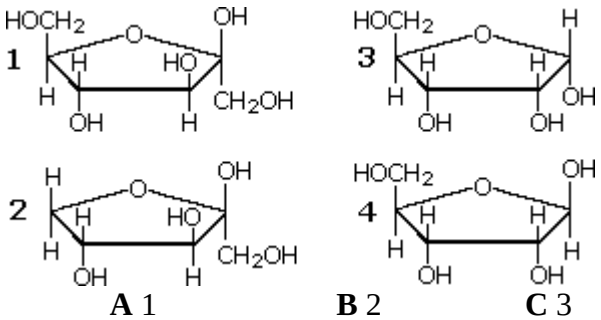


II. Which of the following disaccharides is a nonreducing sugar (does not react with Tollens' reagent)?



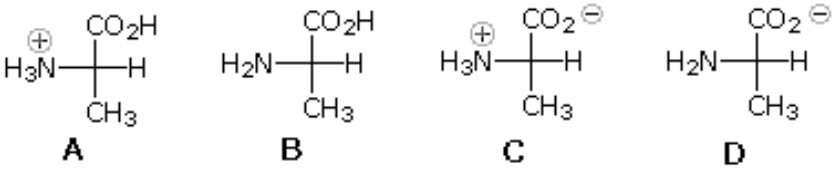
A 1 **B** 2 **C** 3 **D** 4

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



A 1 **B** 2 **C** 3 **D** 4

IV. Which of the following is the major solute species in a solution of alanine at pH=2?



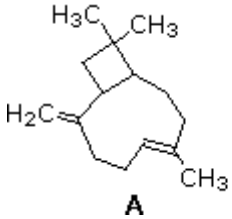
V. The Strecker synthesis of α-amino acids begins with the reaction of an aldehyde with ammonium chloride and potassium cyanide.
This is followed by an acid-catalyzed hydrolysis, that gives the amino acid.
What functional group is hydrolyzed in the second step?

A) an ester
B) an nitrile
C) an amide
D) an imine derivative

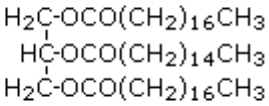
VI. All the common amino acids, save one, react with cold nitrous acid (HNO_2) and evolve nitrogen gas. Which of the following amino acids is that compound?
A) cysteine
B) proline
C) histidine
D) arginine

VII. Fatty acids are important components of many lipids. For which of the following lipid classes or lipid derivatives are fatty acids **not a significant component**?
A) phospholipids
B) triglycerides
C) waxes
D) steroids

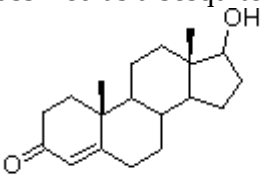
VIII. Which of the following would be classified as a sesquiterpene?



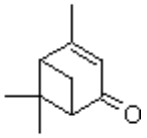
A



B



C

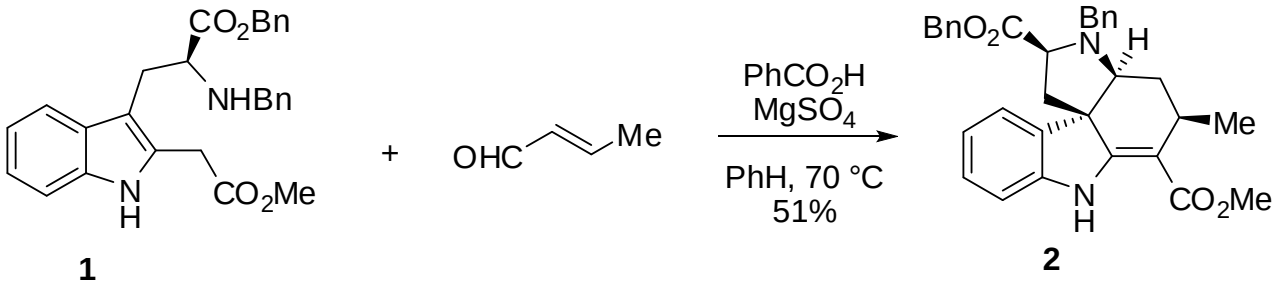


D

IX. Which of the following is not a common component of both DNA and RNA?
A) ribose
B) phosphate
C) cytosine
D) adenine

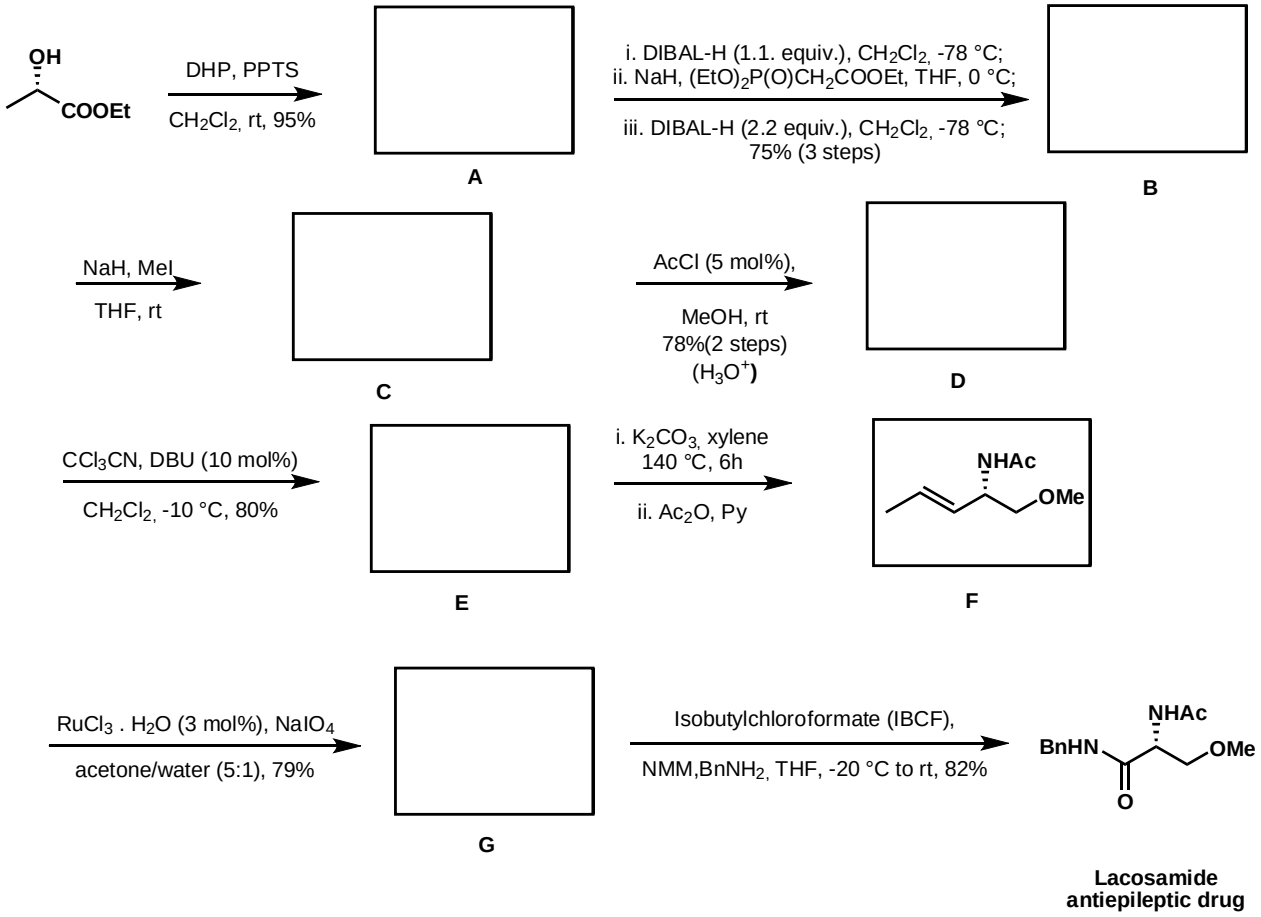
X. Which of the following is purine base?
A) guanine
B) indole
C) cytosine
D) thymine

2) (5 points) Kuehne reported an efficient synthesis of the ABCD ring system of strychnos alkaloids via the conversion of the amino diester **1** to the tetracycle **2**. Provide a mechanism for this transformation.

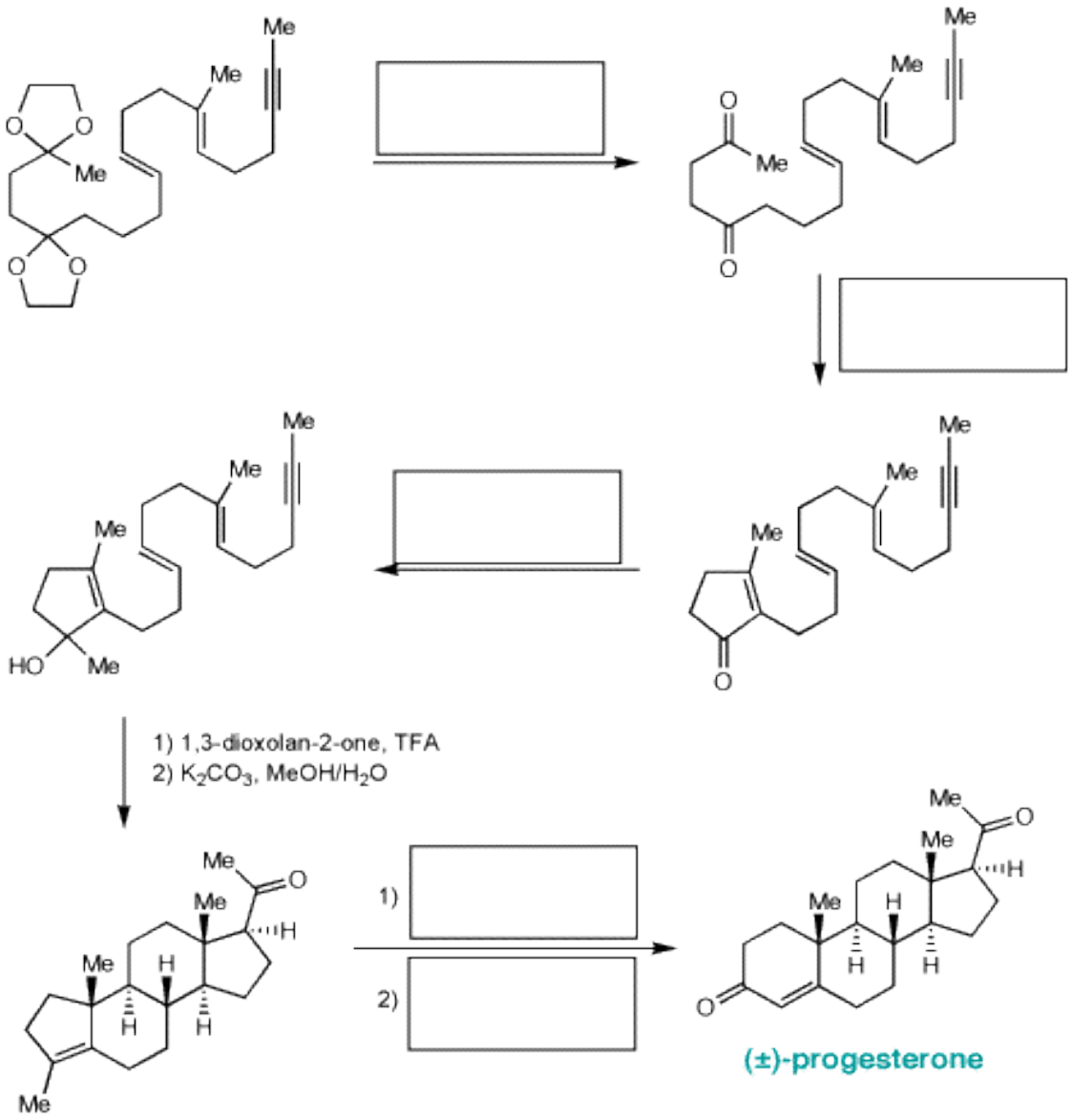


1 **2**

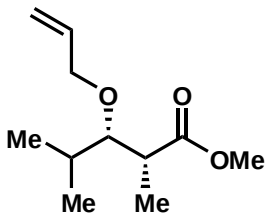
3) (6 points) In the synthesis of Lacosamide, you are asked to propose the structure of compounds A, B, C, D, E and G



4) (5 points) Please fill in the missing reagents in the synthesis of progesterone



5) (5 points) Propose an efficient synthesis of methyl (2R,3S)-O-allyl-2,4-dimethylpentanoate making use of any of the starting materials given below an any additional reagents your synthetic route many require



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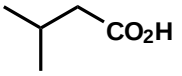

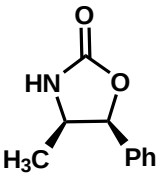

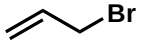

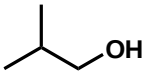

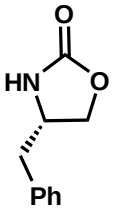

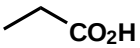

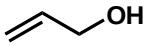

6) (4 points) For the benzodiazepine depicted below please provide:
1) Retrosynthetic disconnections (to get to the proposed main starting materials);
2) Forward synthesis (with reagents and conditions, NO MECHANISM!)