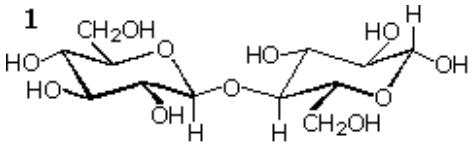
Last Name First name 15/06/2015

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

I. Which of the following disaccharides is the α-anomer of 4-O-(β-D-glucopyranosyl)-D-glucopyranose?

1



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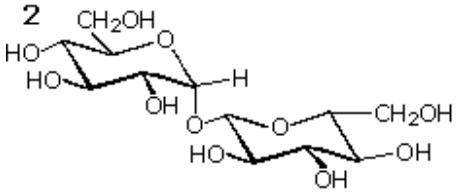

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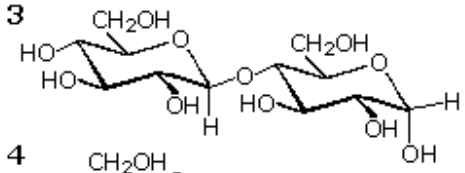

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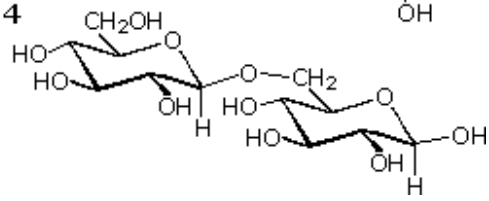


A 1 B 2 C 3 D 4

II. Which of the following is produced when glucose and fructose are chemically joined to form sucrose?

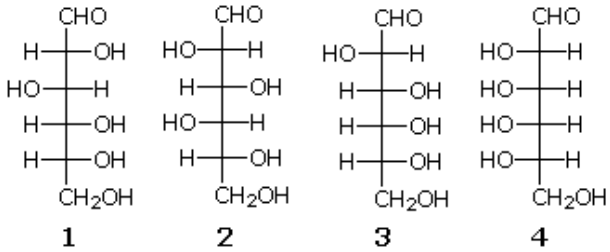
A) water

B) nucleotide

C) peptide bond

D) hydrogen bond

III. **Which two of the following compounds, if any, are epimers?**



A) 1 and 4

B) 1 and 3

C) 2 and 3

D) 3 and 4

IV. Peptides are composed of amino acids joined by amide bonds. Which of the following statements is not correct?

A) amide groups are more resistant to hydrolysis than are similar ester groups.

B) p-π resonance stabilizes the amide bond.

C) stable conformations of peptides are restricted to those having planar amide groups

D) amide groups do not participate in hydrogen bonding interactions

V. 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

VI. Which of the following is not an important secondary structural feature in large peptides and proteins?

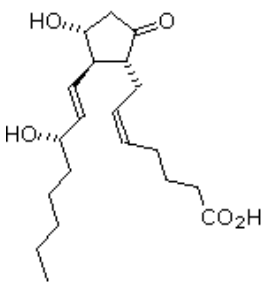
A) the α-helix.

B) the β-turn.

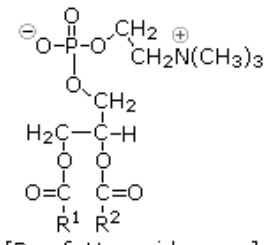
C) chair conformations.

D) the β-pleated sheet.

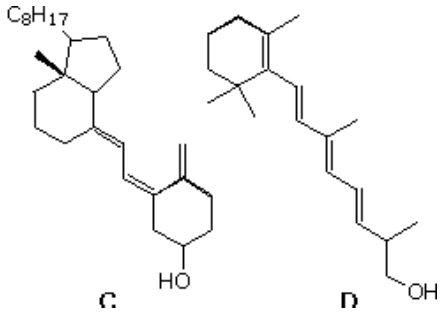
VII. **Which of the following is vitamin A?**



A



B



C D

VIII. 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

IX. The two strands of a DNA double helix held together by:

A) ionic bonds

B) hydrogen bonds

C) nonpolar covalent bonds

D) polar covalent bonds

X. The binding from nitrogenus base and ribose or deoxyribose give:

A) a nucleotide

B) DNA o RNA

C) a nucleoside

D) a nucleic acid

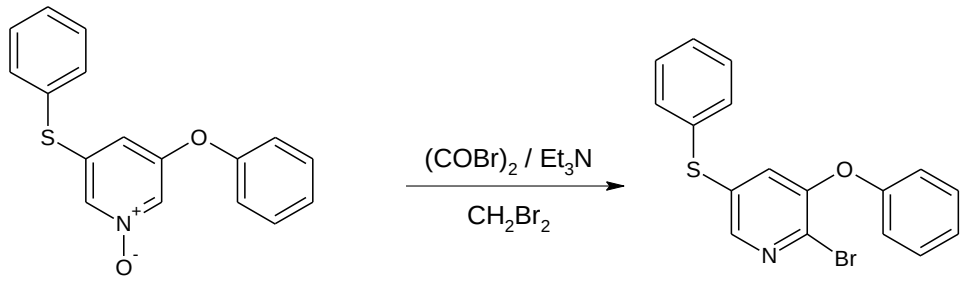
2. **(5 points)** Deduce the structures of the following compounds:

   a) ($C_{15}H_{13}NO$) Obtained by reacting 2-benzyloxy-6-nitrotoluene with DMF/DMA then treating the resulting product with H2/Pt.

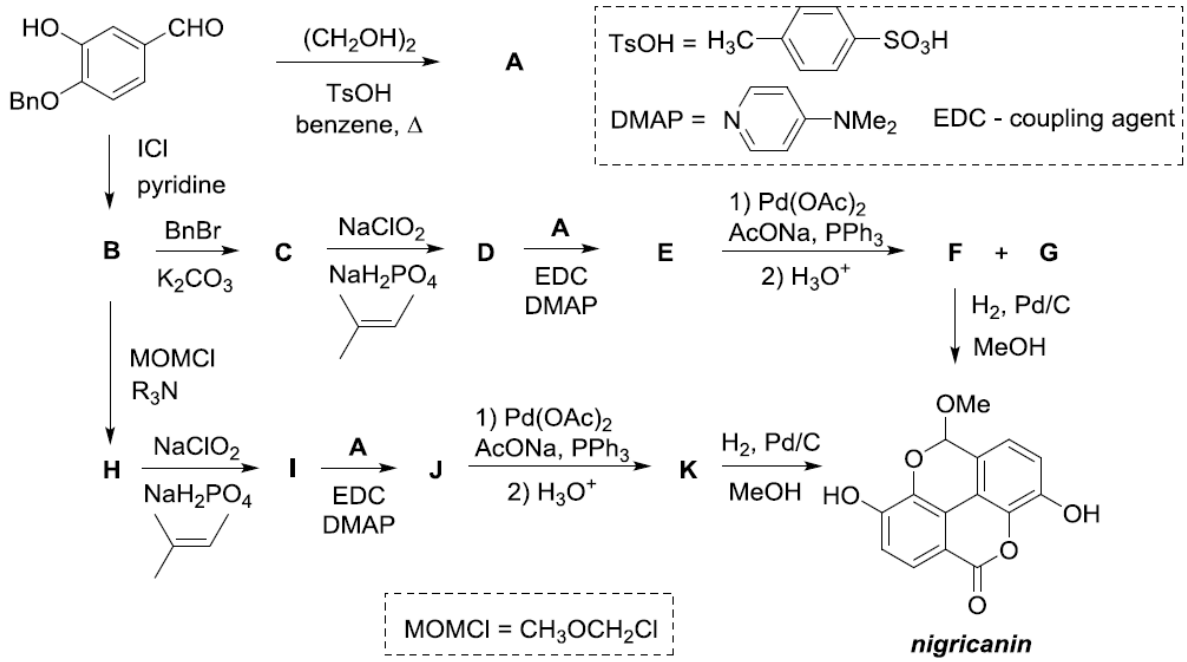
   b) ($C_{10}H_{12}O_2S$) Obtained upon treatment of cyclohexanone with POCl3/DMF followed by methyl 2- mercaptoacetate.

   c) ($C_5H_6N_2O_2$) Major product obtained upon treatment of 2-methylpyrrole with Ac_2O/HNO_3

3. **(4 points)** Give a reasonable mechanism for the following transformation.

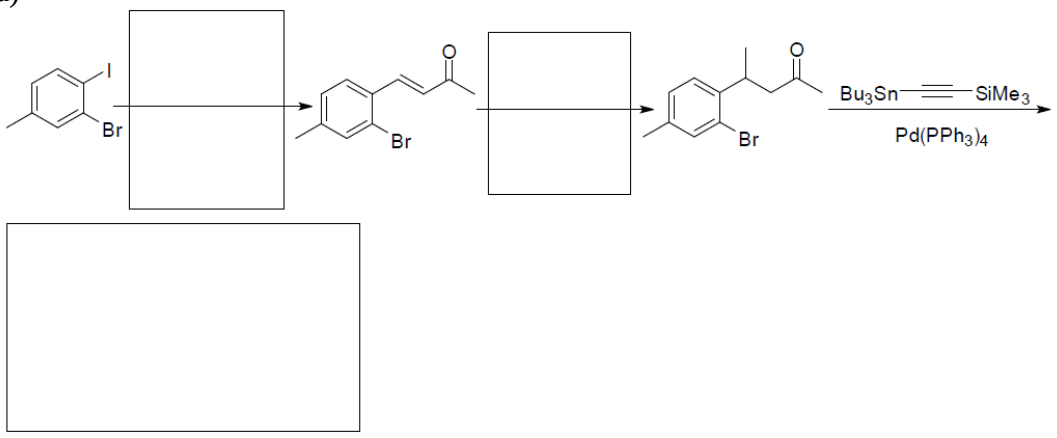


4. **(5 points)** Ellagic acid and its family exhibit antioxidant, anti-cancer, and other types of biological activity. Very recently, the first total synthesis of nigricanin, one of the ellagic acid congeners, was described (Scheme below). Decipher this scheme. Write down the structural formulae of compounds A–K accounting for the facts that F and G are isomers; molecular formulae of D and E are $C_{21}H_{17}IO_4$ and $C_{37}H_{31}IO_7$, respectively.



5. **(5 points)** Provide the necessary information, reactants, reagents or products, to complete the following reactions.

a)



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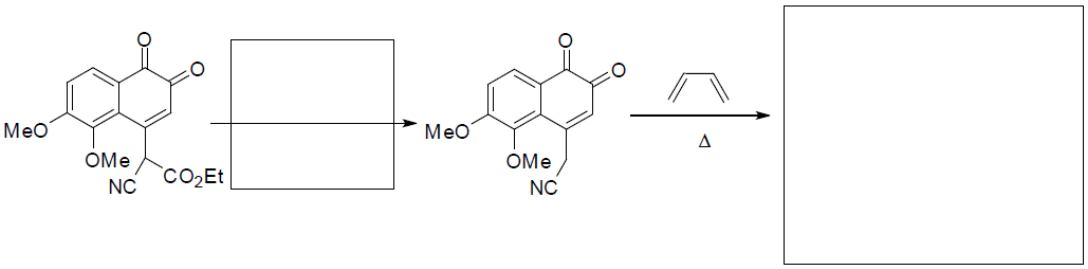
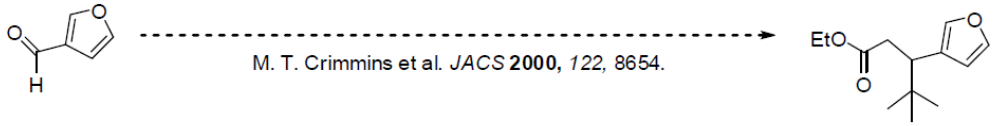
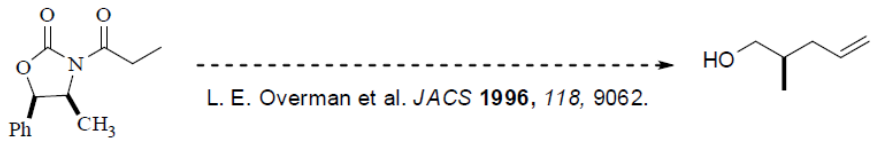


6. **(6 points)** Provide a series of synthetic reactions to transform the starting material to the product shown.

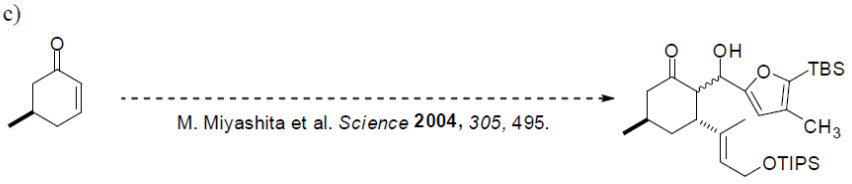
a)



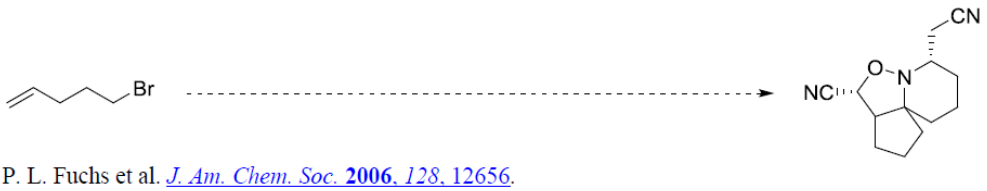
b)



c)



d)



P. L. Fuchs et al. *J. Am. Chem. Soc.* **2006**, *128*, 12656.