Last Name First name 06/07/2015

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

I. Tri-peptide consists

A) 3 amino acids and 3 peptide bonds

B) 2 amino acids and 3 peptide bonds

C) 3 amino acids and 2 peptide bonds

D) 3 amino acids and 4 peptide bonds

II. Which of the following aminoacid has pKa near neutrality

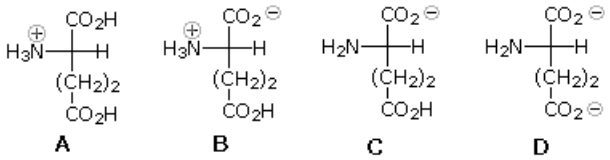
A) Tryptophan

B) Arginine

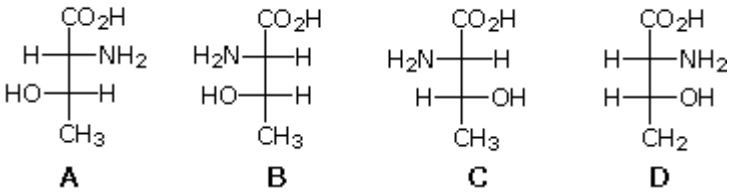
C) Histidine

D) Asparagine

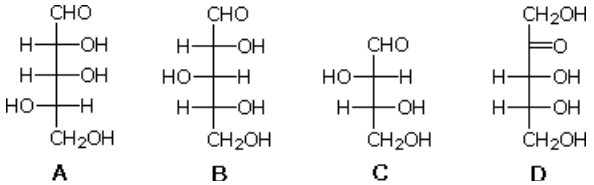
III. Which of the following is the major solute species in a solution of glutamic acid at pH=4.0?



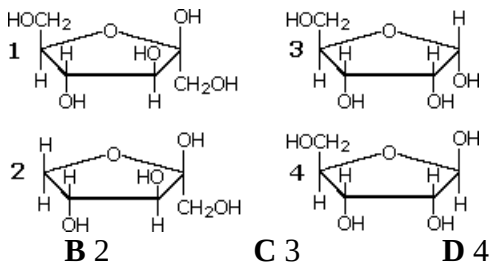
IV. Threonine is (2S,3R)-2-amino-3-hydroxybutanoic acid. Which of the following is threonine?



V. **Which of the following is an L-saccharide?**



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



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

VII. Lipid bilayers are created from

A) phospholipids

B) triglycerides

C) fatty acids

D) glycerol

VIII. Which of the following is a general characteristic of those natural products classified as lipids?

A) they are generally insoluble in water and soluble in organic solvents.

B) they are generally soluble in water and insoluble in organic solvents.

C) they have the common structural feature of two or more fused carbon rings.

D) they generally have a high weight proportion of oxygen (>40%).

IX. Which of the following is not a component of a nucleotide?

A) sugar

B) phospholipid

C) phosphate group

D) nitrogenous base

X. Which of the following is not a common component of both DNA and RNA?

A) ribose

B) phosphate

C) cytosine

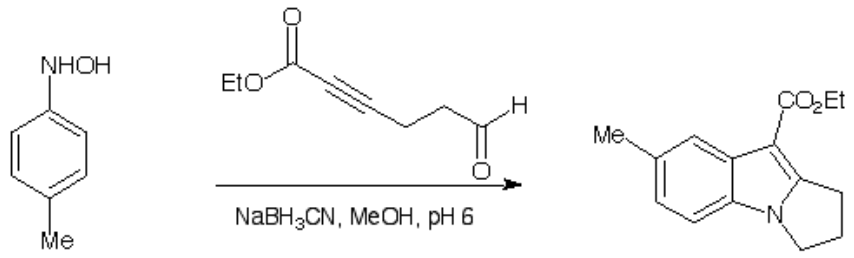
D) adenine

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

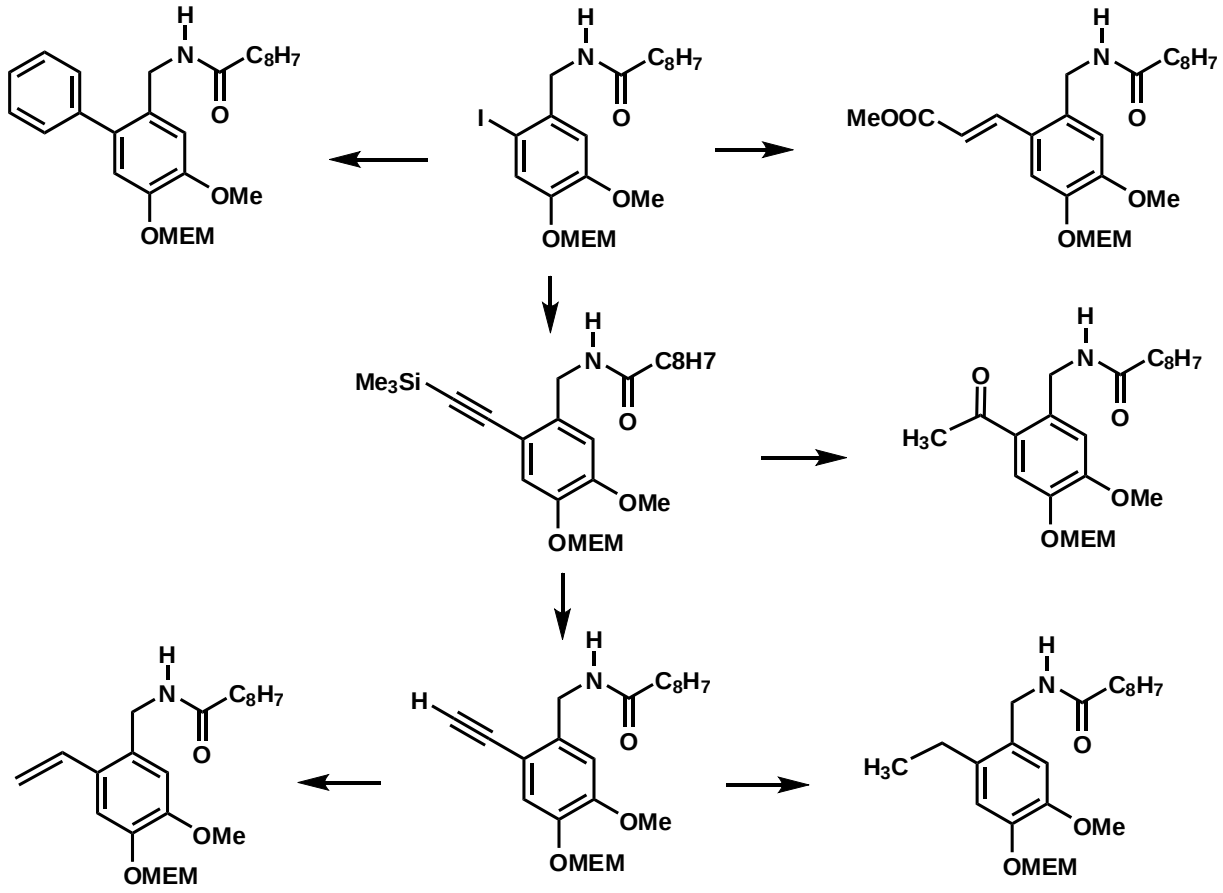
a) ($C_9H_8N_2O_2$) Formed when 2-methyl-5-nitropyridine is reacted with bromoacetone and subsequent treatment with $NaHCO_3$.

b) ($C_9H_7NO_3$) From 4-fluoronitrobenzene with $Me_2C{=}NONa$ then HCl/heat.

3. (4 points) Provide a mechanism for the following reaction.

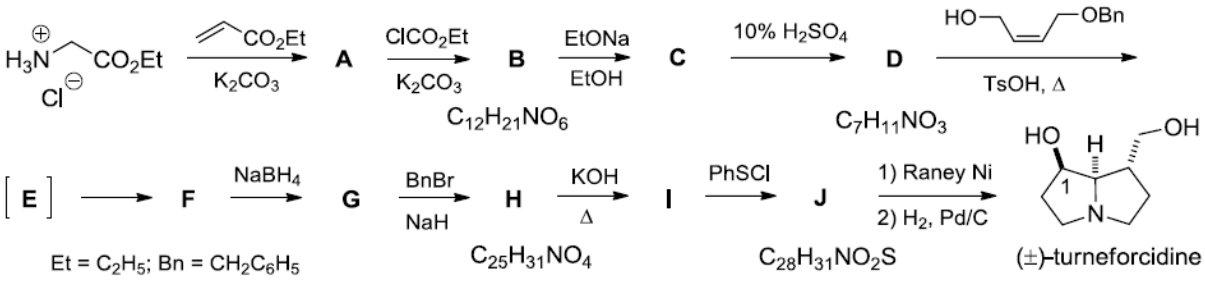


4. **(5 points)** Please fill in the missing reagents in the following reaction.



5. (5 points) Pyrrolizidine alkaloids and their unnatural analogues occupy the important place in organic chemistry due to a broad variety of physiological activities. Polyhydroxylated pyrrolizidines form a sub-class of these alkaloids, members of which are often referred to as aza-sugars (or imino sugars) and inhibit various glycosidases that can be useful for the treatment of diabetes, influenza, HIV and other diseases. The synthesis of dihydroxypyrrolizidine alkaloid, (±)-turneforcidine, is given in the Scheme 1. In this scheme **E** is an unstable intermediate which spontaneously undergoes the Claisen rearrangement producing **F**. Decipher this scheme. Write down the structural formulae of compounds A–J

Scheme 1.



6. (6 points) For the two compounds depicted below please provide:

1) Retrosynthetic disconnections
2) Forward synthesis (with reagents and conditions, NO MECHANISM!);