

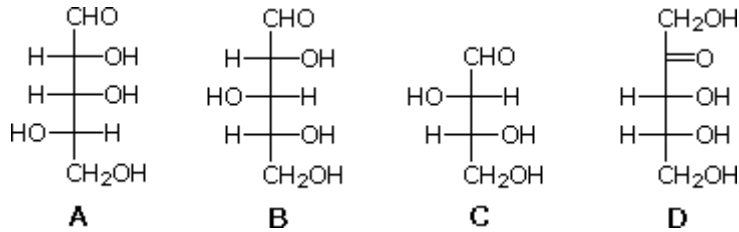
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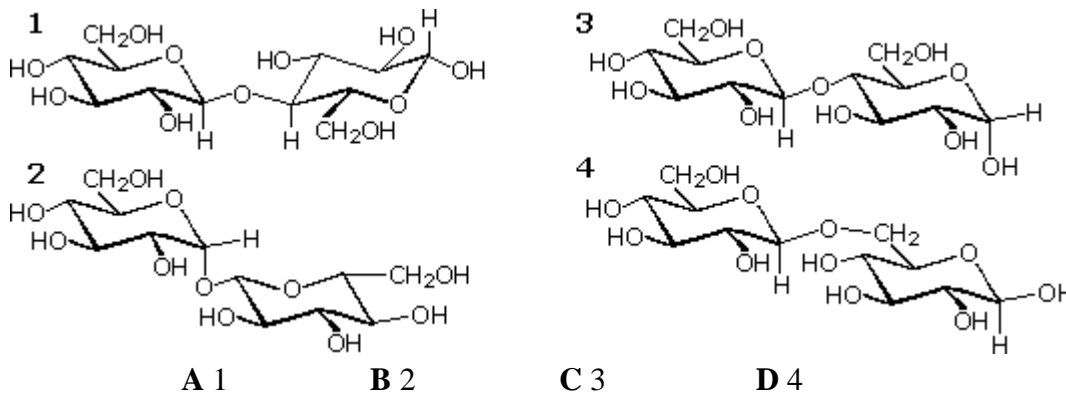
24/09/2014

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

I. Which of the following is a D-aldopentose?



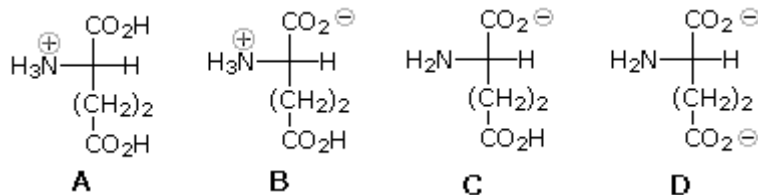
II. Which of the following disaccharides is the α -anomer of 4-O-(β -D-glucopyranosyl)-D-glucopyranose?



III. Both cysteine and methionine are chiral L-amino acids that incorporate a single sulfur. The C-2 configuration is S in methionine, but R in cysteine. Why?

- A) biosynthesis of cysteine proceeds by inversion at C-2.
- B) the sulfur in cysteine prevents zwitterion formation.
- C) the sulfur atom in methionine is remote from C-2 and does not influence the sequence rule.
- D) the sulfur atom in cysteine is remote from C-2 and does not influence the sequence rule.

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



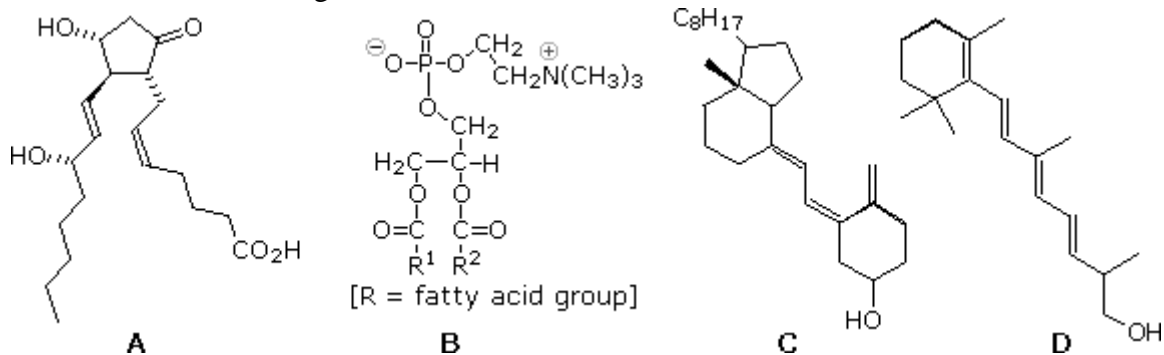
V. Which of the following statements most correctly defines the isoelectric point?

- A) the pH at which all molecular species are ionized and that carry the same charge.
- B) the pH at which all molecular species are neutral and uncharged.
- C) the pH at which half the molecular species are ionized (charged) and the other half unionized.
- D) the pH at which negatively and positively charged molecular species are present in equal concentration.

VI. Peptide bond formation from protected amino acid reactants is often carried out with which reagent?

- A) p-toluenesulfonyl chloride
- B) di-t-butyl dicarbonate
- C) dicyclohexylcarbodiimide
- D) benzyl chloroformate

VII. Which of the following is vitamin A?



VIII. Phospholipid contains

- A) hydrophilic heads and hydrophobic tails
- B) long water-soluble carbon chains
- C) positively charged functional groups
- D) both (b) and (c)

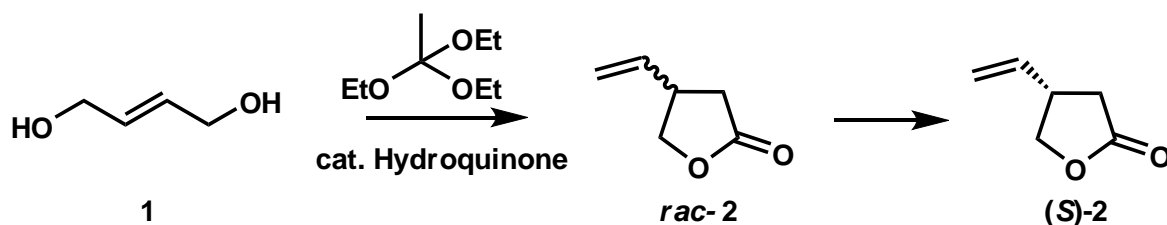
IX. Which of the following is not a component of RNA?

- A) adenine
- B) phosphate
- C) cytosine
- D) thymine

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

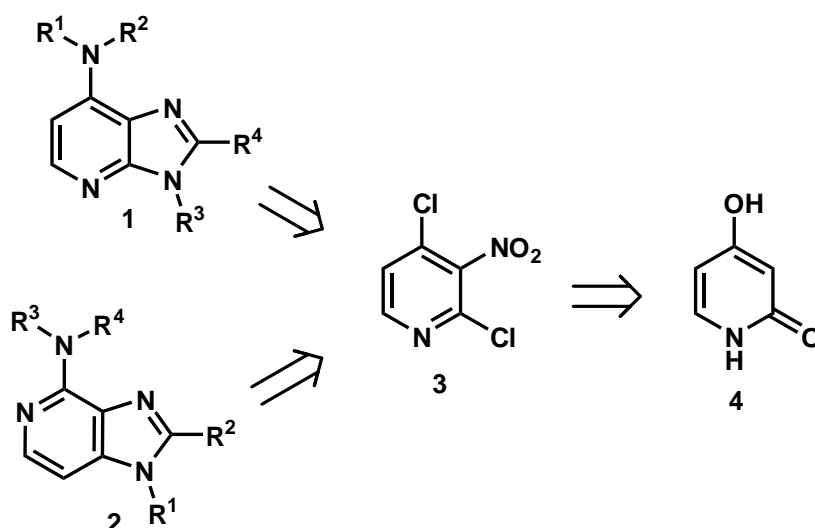
- A) a nucleotide
- B) DNA o RNA
- C) a nucleoside
- D) a nucleic acid

2) (5 points) In the four steps synthesis of (S)-Taniguchi Lactone, provide a mechanism for the transformation of **1** in **rac-2** and explain how you can obtained the enantiopure compound (S)-**2** from the racemic Taniguchi Lactone **rac-2**.

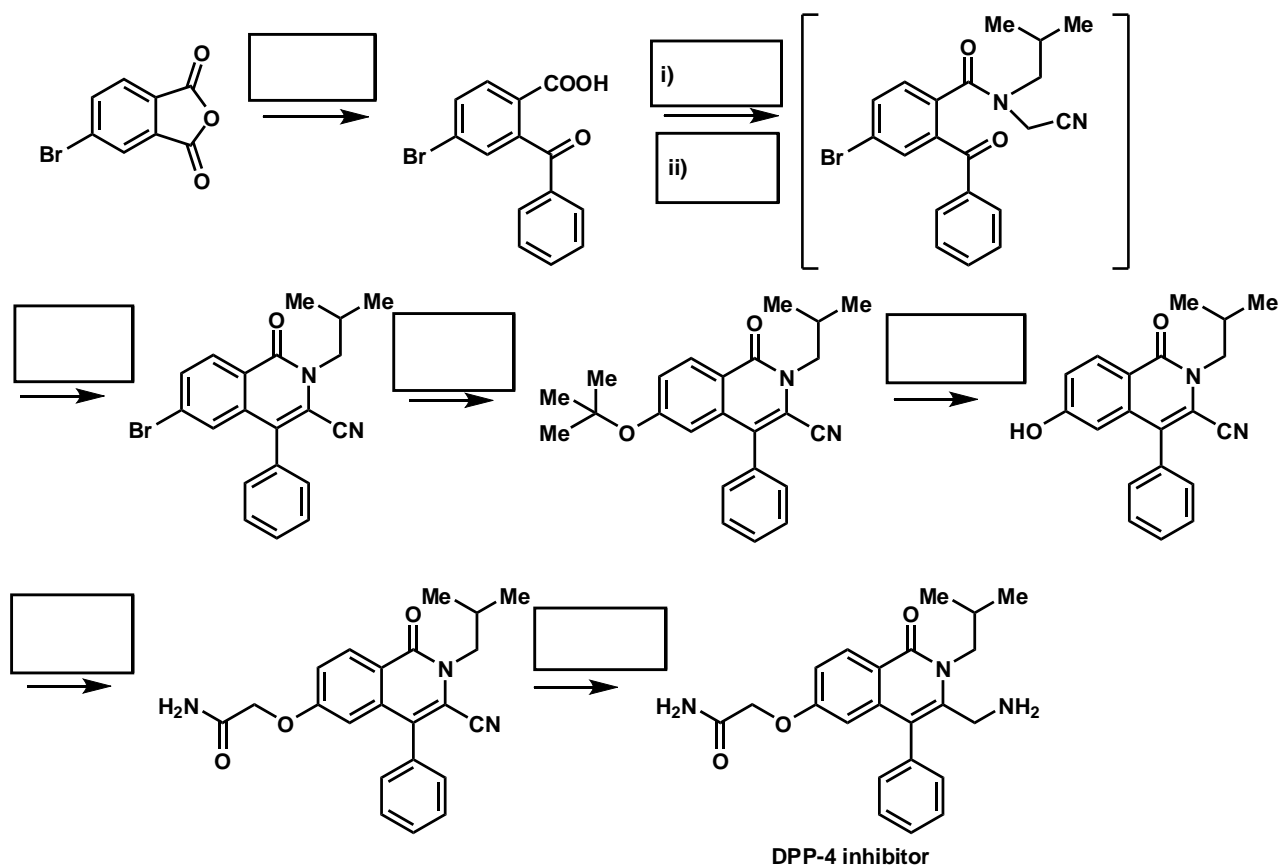


3) (6 points) Imidazopyridine derivatives such as 1-deaza-9H-purines (like 19 and 3-deaza-9H-purines (like 2) represent privileged structures in medicinal chemistry and they have various pharmacological and interesting properties.

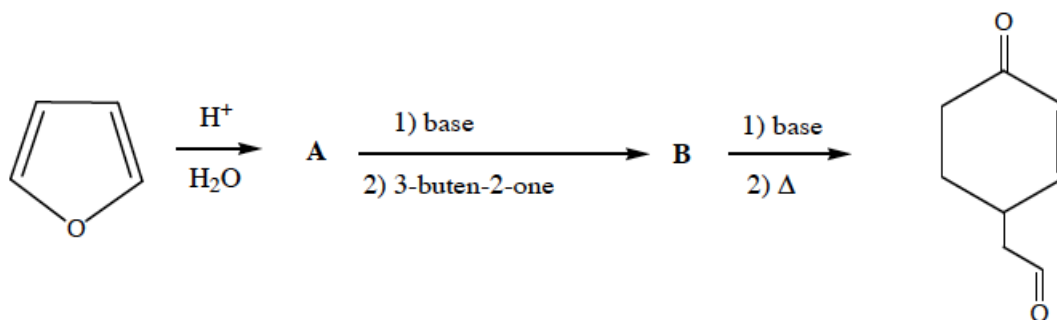
A) Provide a synthesis for deazapurines 1 and 2 starting from 2,4-dichloro-3-nitropyridine 3. Use only the functional group reactivity and maintain the generic formula, for example RNH₂. In addition, provide a two-step synthesis for 2,4-dichloro-3-nitropyridine starting from 4-hydroxy-2-pyridinone 4.



4) (4 points) Please fill in the missing reagents in the synthesis of DPP-4 inhibitor.



5) (4 points) Propose the structure of compounds A, B and provide the mechanism for this synthesis.



6) (6 points) For the three molecules depicted below please provide:

- 1) Retrosynthetic disconnections (to get to the proposed main starting materials);
- 2) Forward synthesis (with reagents and conditions, NO MECHANISM!);

Hint: think about functional group tolerance of the reactions you want to use (for some reactions you may have to use protecting groups).

