

DEPARTMENT OF MEDICINAL CHEMISTRY
SCHOOL OF PHARMACY

BASIC PHARMACEUTICAL SCIENCE FOR THE PRACTICING PHARMACIST
MEDC 527, Fall 2008

Quiz #4, Dr. Desai, 100 points; November 4, 2008

KEY

NAME (In CAPITAL Letters ONLY)

I affirm that I have not taken aid from anybody for this test. **Please sign**

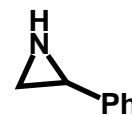
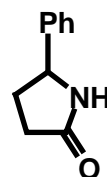
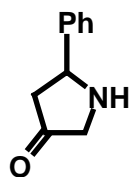
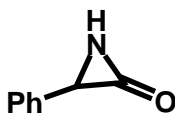
1. Glycated hemoglobin is a reasonable marker of diabetic condition. What is glycated hemoglobin? Why is it a marker of diabetes? What level of glycated hemoglobin in plasma is thought to correspond to hyper-glycemia? (8 pts)

Glycated hemoglobin is a glucose-modified form of hemoglobin. In this, one of the lysine residues of hemoglobin forms a Schiff base with the aldehyde group of glucose present in the plasma.

It is a marker of diabetes because it requires considerably high levels of glucose to generate glycated hemoglobin. This is because the pyranose form of glucose is the dominant form in comparison to the open-chain form and it is the open-chain form that forms the Schiff-base.

A level of 7% glycated hemoglobin is usually considered as a normal level and a level higher than that is a marker of hyper-glycemia.

2. Identify the order of stability of the following molecules at pH 10. Use 1 for most stable and 3 for least stable. (8 pts)



3. Define the following two terms in **one sentence**. (8 pts)

Enantiomers are non-superimposable mirror image stereoisomers

Diastereomers are stereoisomers containing more than one chiral center, which are not related to each other as mirror image isomers.

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4. Penicillin, thienamycin, cephalosporin, penems, and other anti-biotics contain a key heterocyclic ring, which is the major cause for their anti-biotic action. What is the generic name of this heterocyclic ring? What is the role of this heterocyclic ring in the anti-bacterial action of these drugs? Using simple chemical structures, draw a plausible mechanism of action of these anti-biotics. (8 pts)

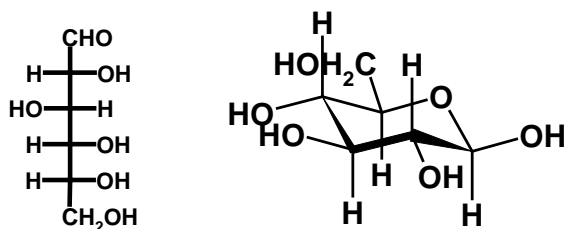
The key heterocyclic ring that is the major cause of antibiotic function is beta-lactam.

The serine protease enzyme important for bacterial growth, penicillin binding protein, reacts with the beta-lactam ring of the antibiotic drugs to form an acyl enzyme intermediate, which is not hydrolysable and hence the enzyme is irreversibly inhibited. Inhibition of the enzyme results in anti-biotic action.

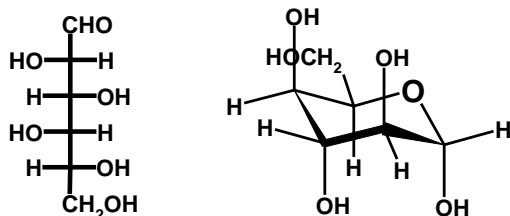
Structures should include beta – lactam ring, Ser-OH (Enzyme) & acyl enzyme intermediate.

5. The open-chain form of D-glucose is as shown below. Draw the **alpha-form** of monosaccharide M2 and **beta-form** of monosaccharide M3 from their open-chain forms. {Use the cyclic structures and write the appropriate substituents.} (10 pts)

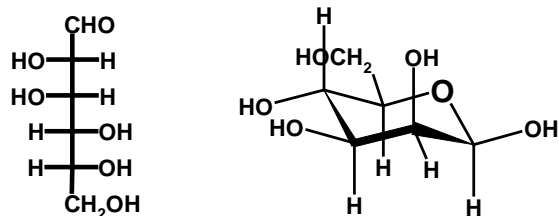
Monosaccharide M1



Monosaccharide M2

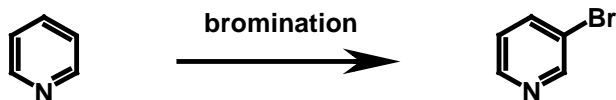
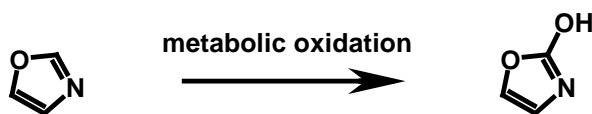
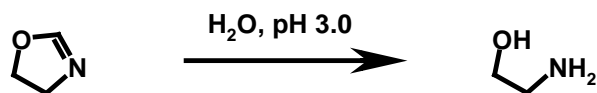
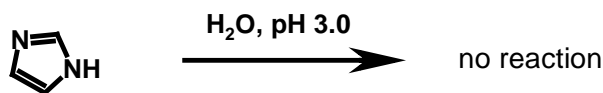


Monosaccharide M3

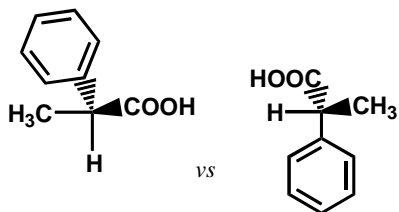


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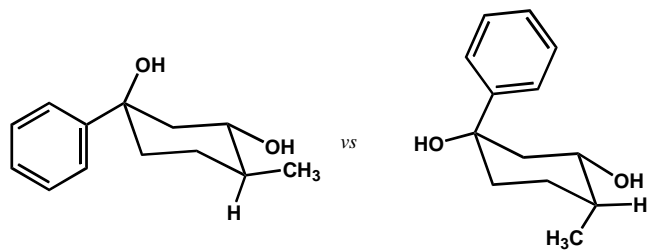
6. Following molecules are exposed to reaction conditions as shown below. Draw the structure of the major product (if any) expected from the reaction. Draw the structure of product in appropriate charge form. **NOTE: The structure of only one major product is to be drawn. No points will be given if there is more than one structure for any reaction.** (12 pts)



7. Which of the following terms best describes each pair of compounds shown below: (16 pts).
- Conformational isomers
 - Enantiomers
 - Diastereomers
 - Meso compounds
 - Positional isomers
 - Functional group isomers
 - All of the above
 - None of the above

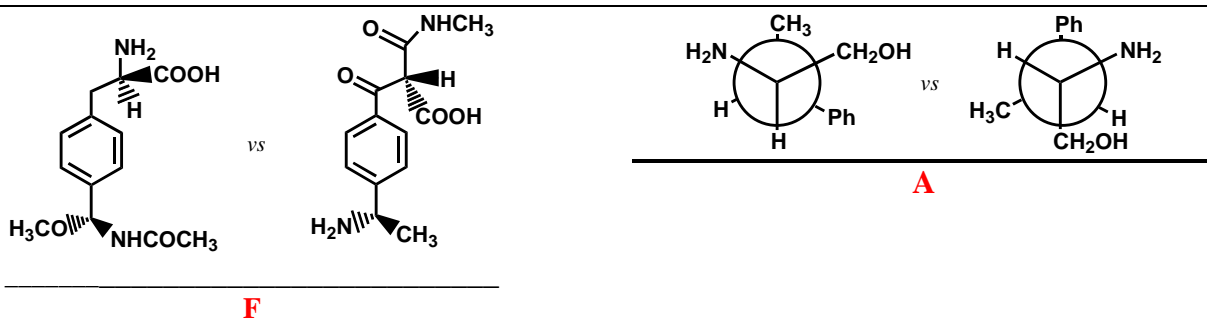


B

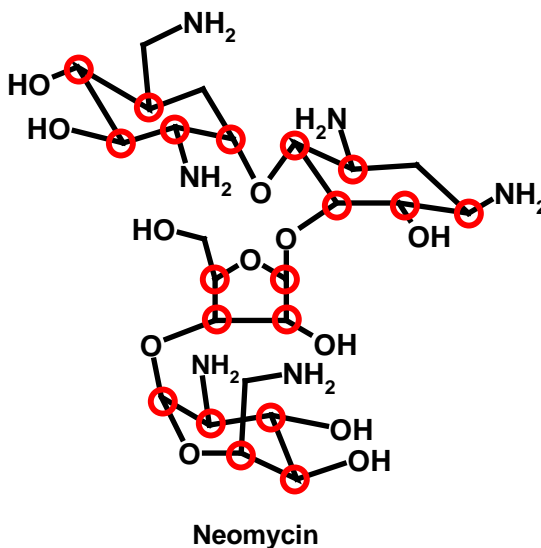
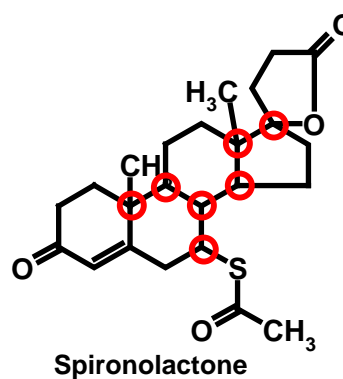
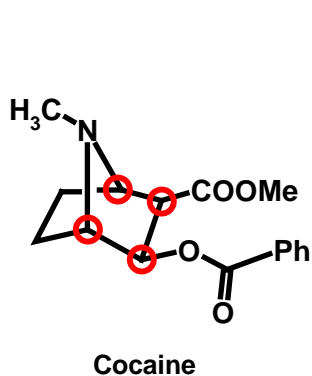


C

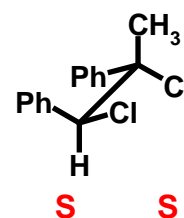
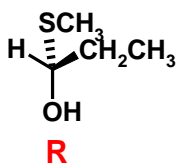
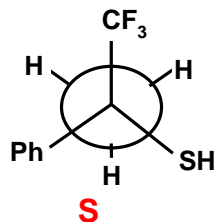
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8. Circle chiral centers in the following molecules. If there are no chiral centers in a molecule, write **NONE**. Note: Each chiral center should contain only one atom. Minus one point for identifying centers that are not chiral centers. (10 points)

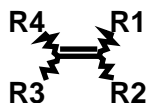


9. Identify the chirality of the chiral centers shown in the following molecules. Use 'R' or 'S' nomenclature. (8 points)



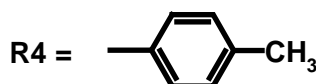
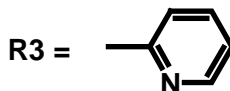
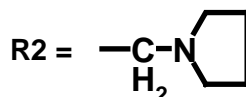
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10. The trans form of triprolidine is 1000-times more potent as an anti-histaminic agent than its cis isomers. Triprolidine has the following generic structure. Draw the cis and trans forms of this molecule. (8 points)

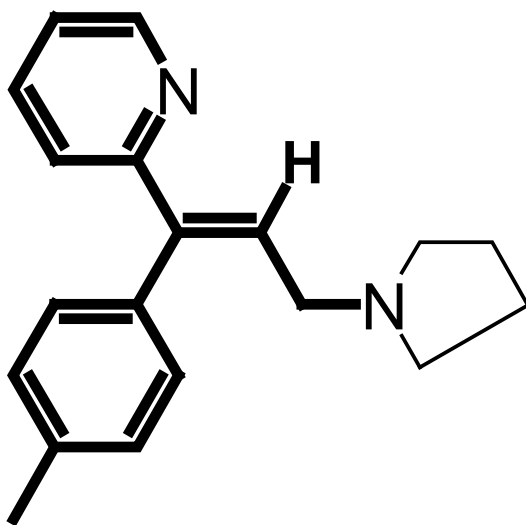


where R1, R2, R3, and R4 are ::

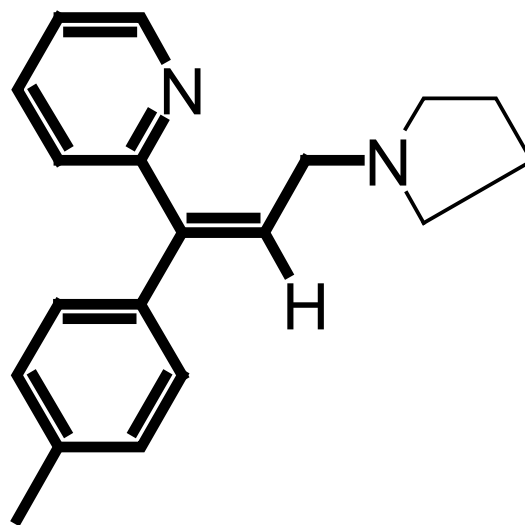
R1 = H



Note: Use the structures shown below and draw appropriate groups to show trans and cis structures



Trans



Cis

11. Can the following objects exhibit enantiomerism? Write Yes (Y) or No (N) in the space provided. (4 points)

_____ **Y** _____

A right handed screw

_____ **N** _____

A necklace of 11 spherical black beads

_____ **Y** _____

Rubik's cube with a different color for each side, i.e., a six-sided cube with different color for each side

_____ **Y** _____

A human being's left hand

_____ **Y** _____

Statue of Liberty