

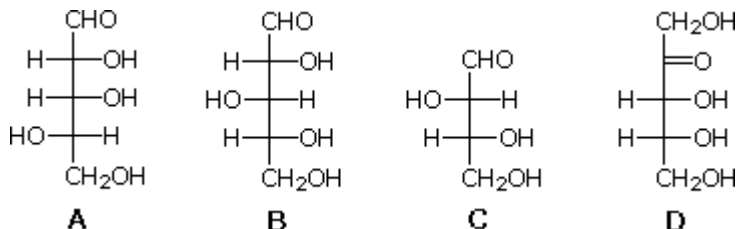
Name

Last name

13/01/2016

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

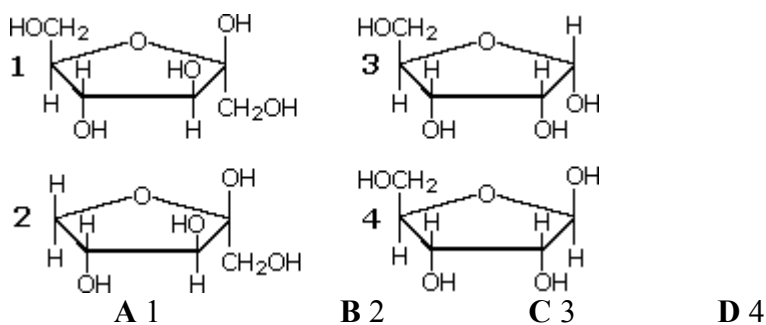
I. Which of the following is a D-aldopentose?



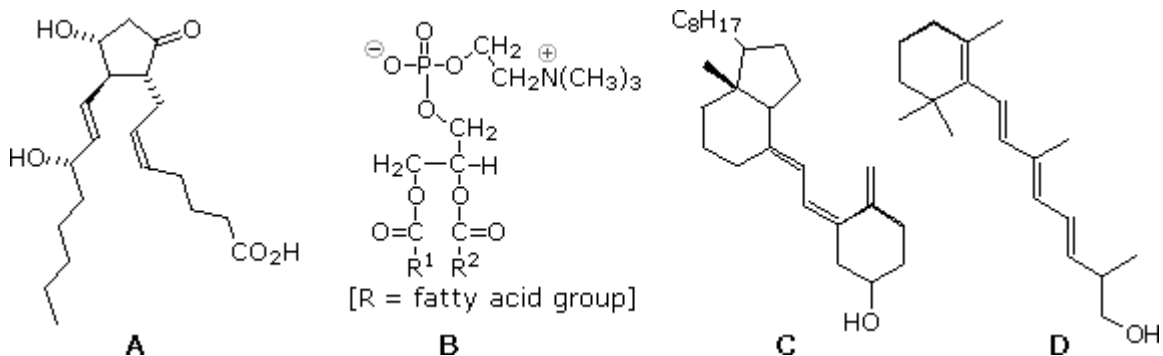
II. If two isomers have been classified correctly as anomers, they may also be called...?

- A) conformers
- B) enantiomers
- C) tautomers
- D) diastereomers

III. Which of the following compounds is a  $\beta$ -aldopentafuranose?



IV. Which of the following is vitamin A?



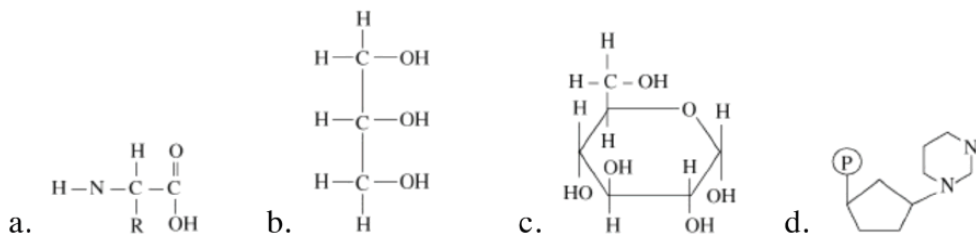
V. What reagent is used in the Edman degradation for N-terminal group analysis of peptides?

- A) phenyl isothiocyanate
- B) di-t-butyl dicarbonate

- C) dicyclohexylcarbodiimide
- D) benzyl chloroformate

- VI. Sanger's reagent, 2,4-dinitrofluorobenzene, reacts with which functional groups in a peptide?
- A) free amino groups
  - B) the phenolic hydroxyl group in tyrosine
  - C) the aromatic heterocyclic rings of histidine and tryptophan
  - D) the sulfide group of methionine

- VII. Which of the following molecules is used in the synthesis of lipids?



- VIII. Lipid bilayers are created from:

- A) phospholipids
- B) triglycerides
- C) fatty acids
- D) glycerol

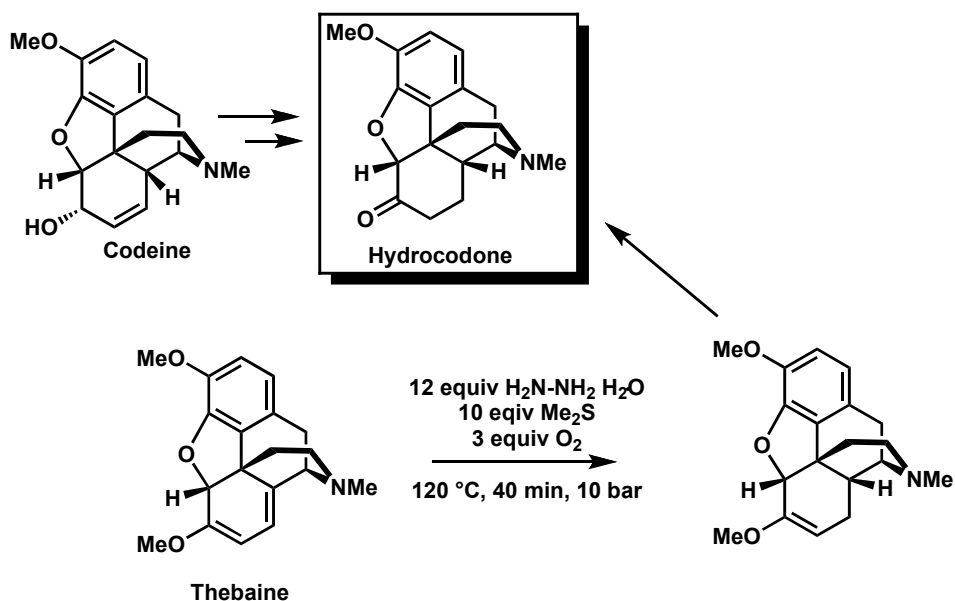
- IX. The two strands of a DNA double helix held together by:

- A) ionic bonds
- B) hydrogen bonds
- C) nonpolar covalent bonds
- D) polar covalent bonds

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

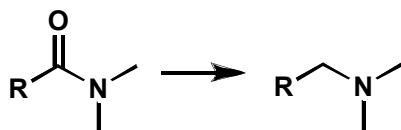
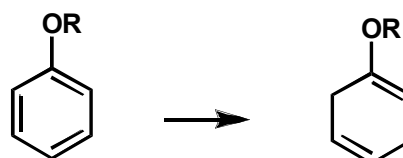
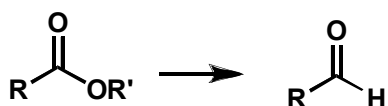
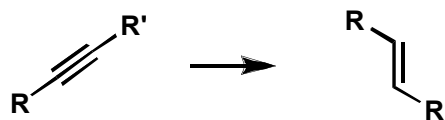
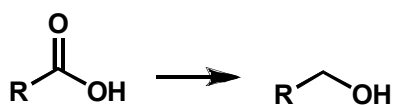
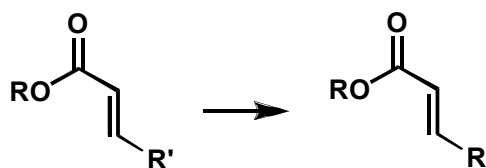
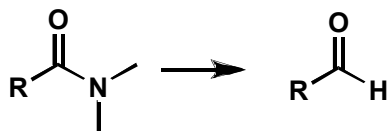
- A) ribose
- B) phosphate
- C) cytosine
- D) adenine

- 2) (4 points) Hydrocodone, a high value active pharmaceutical ingredient (API), is usually produced in a semisynthetic pathway from morphine, codeine or thebaine. The latter alkaloid is an attractive precursor as it is not used as a remedy itself. The key step in this production route is a selective olefin reduction forming 8,14-dihydrothebaine which can be subsequently hydrolyzed to yield hydrocodone. Unfortunately, standard hydrogenation procedures cannot be applied due to severe selectivity problems. A transfer hydrogenation using in situ generated diimide is the only known alternative to achieve a selective transformation. Propose a mechanism for the following transformation.

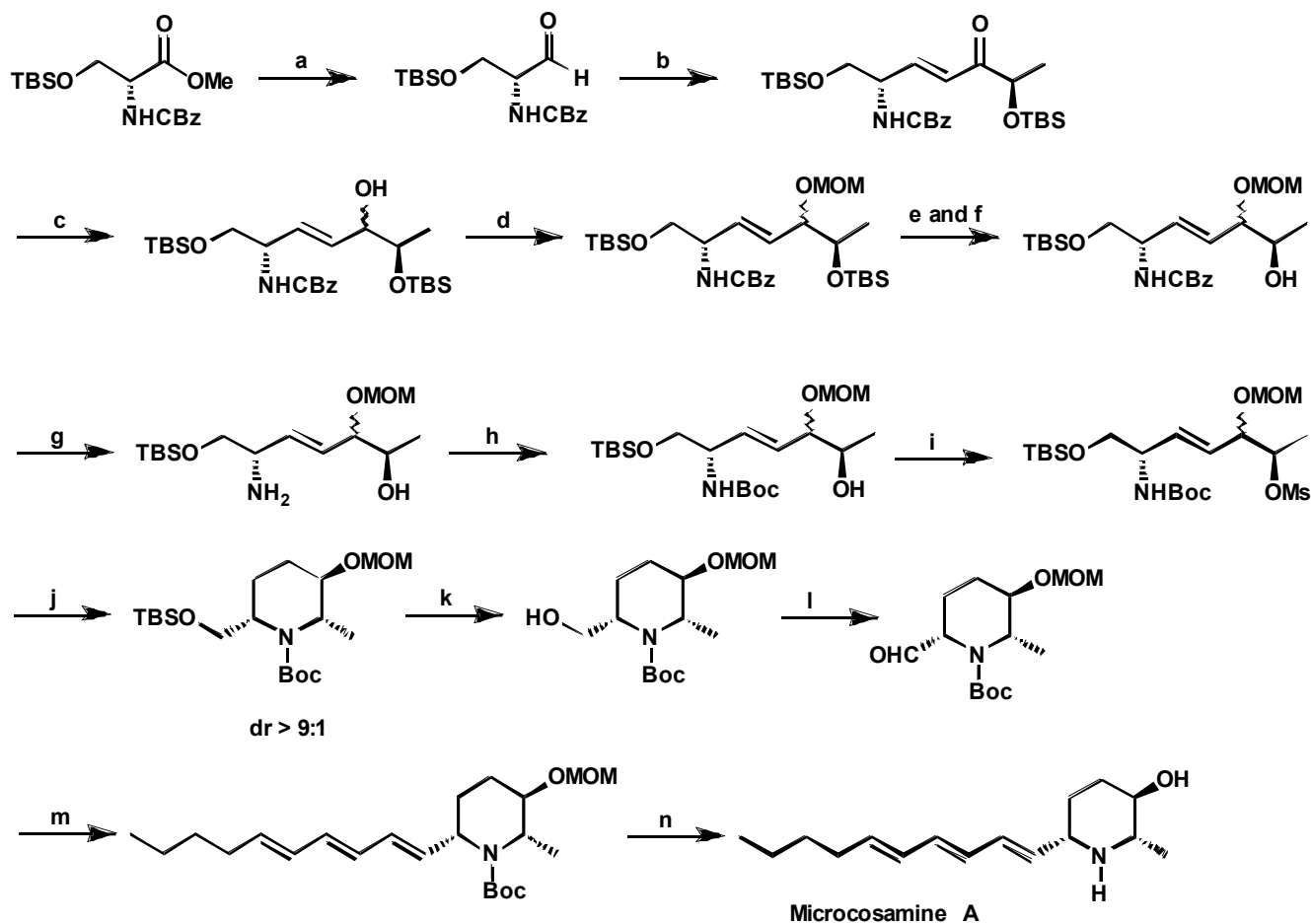


3) (5 points) Match all applicable reduction reactions and reagents listed here to the following transformations:

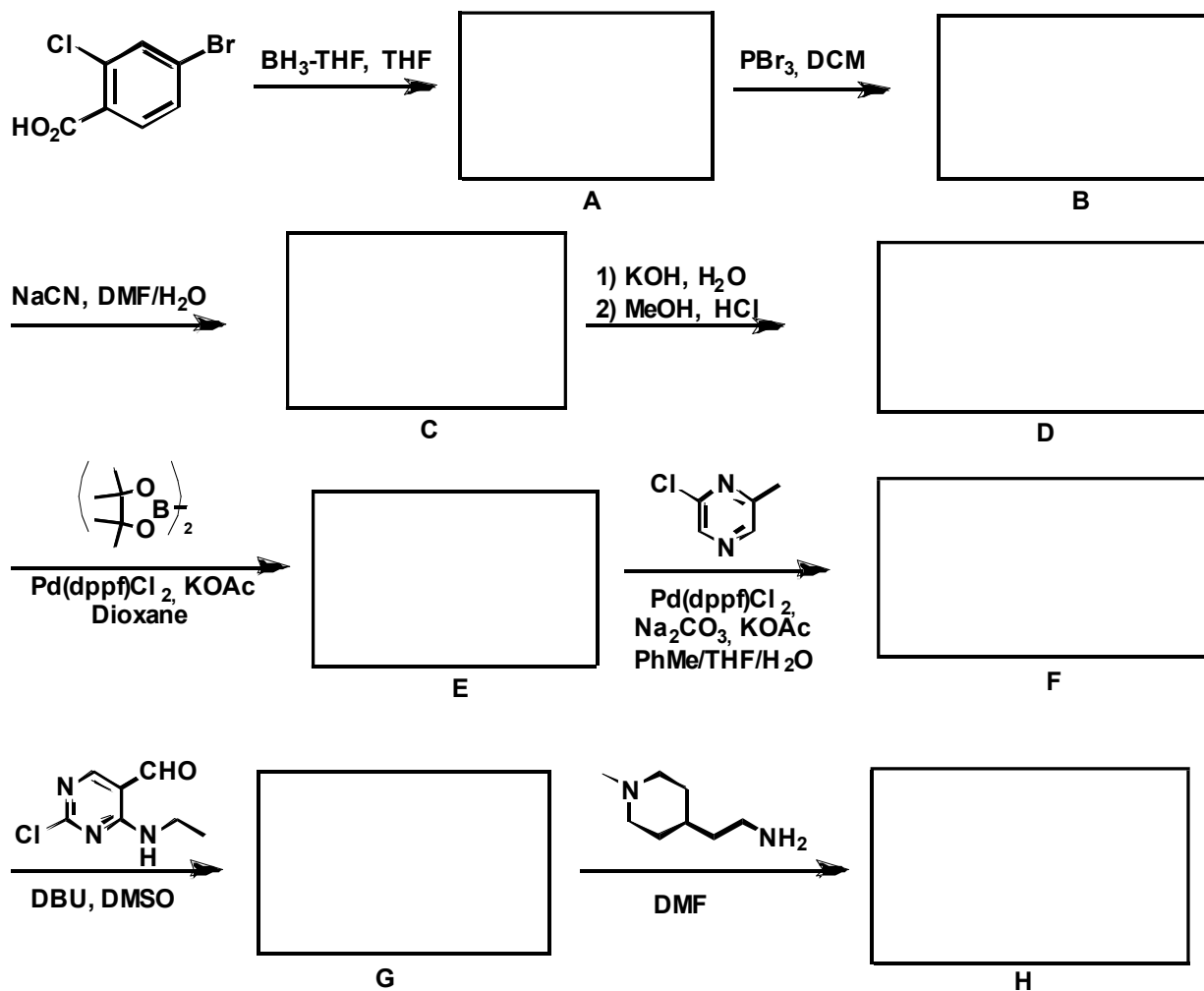
- |                         |                      |                        |                         |
|-------------------------|----------------------|------------------------|-------------------------|
| a. Birch Reduction      | b. Red-Al            | c. Raney Nickel        | d. Super Hydride        |
| e. DIBAL                | f. Cathecol Borane   | g. L-selectride        | h. Barton Deoxygenation |
| i. LiAlH <sub>4</sub>   | j. NaBH <sub>4</sub> | K. Na, NH <sub>3</sub> | l. BH <sub>3</sub> ·THF |
| m. Pd-C, H <sub>2</sub> | n. LiBH <sub>4</sub> |                        |                         |



4) (5 points) Provide the missing reagents in the following total synthesis of a piperidine alkaloid, microcosamine A.



5) (5 points) Compound H is a selective PaK1 inhibitor. Write down the structural formulae of compounds A-H



- 6) (6 points) Propose a synthesis of the spiro lactam below (1) from the starting materials shown (A and B) and any other reagents, catalyst, etc.

