

Name _____

PID _____

CHEMISTRY 252
Final Exam – 200 pts.
Section 703 – Grand Rapids
15 August 2006

- Make sure you have all 12 exam pages
- You will have 3 hours to complete the 6 questions
- Try to make your answers as **clear** as possible. You don't need to be an artist, but if an answer is ambiguous it may be marked incorrect.
- Keep all answers inside the designated boxes.
- Read the directions, and don't be distracted by the large molecules.
- **Good luck!**

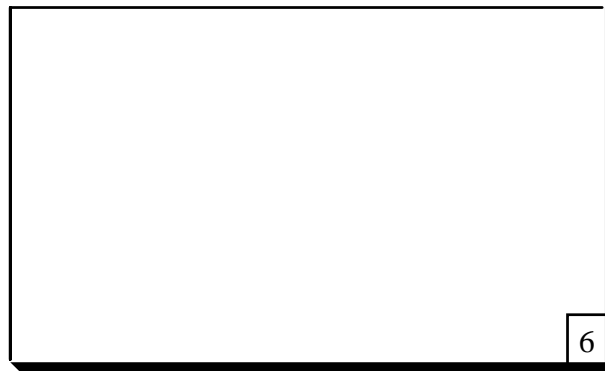
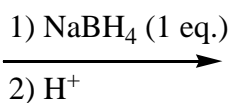
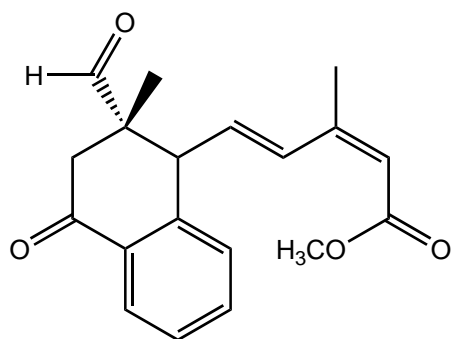
By signing this test, I certify that this is my own work and that my work is in accordance with MSU's policy on academic honesty, as stated in the Academic Freedom Report.

I		51
II		41
III		24
IV		20
V		34
VI		30
Extra		18
Total		200

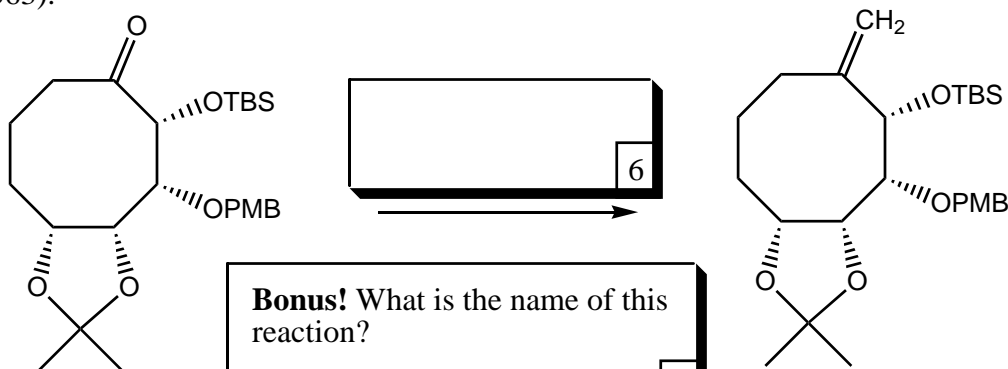
X _____

I. (51 pts.)

a) Synthesis of abscisic acid analogues to regulate aspects of plant growth and development (*Org. Biomol. Chem.* **2006**, *4*, 1400-1412).



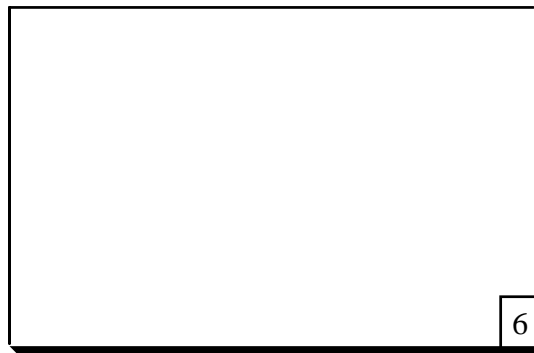
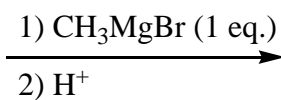
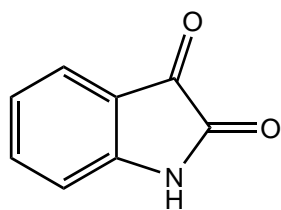
b) Synthetic route to new glycosidase inhibitors (anti-viral and anti-cancer) (*J. Org. Chem.* **2006**, *71*(12), 4353-4363).



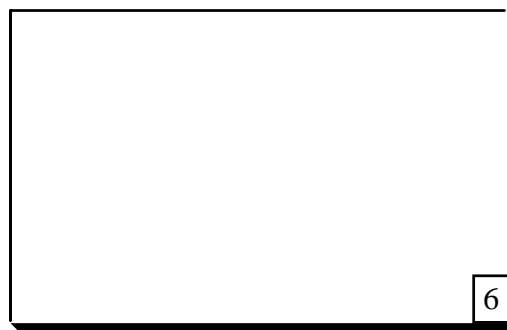
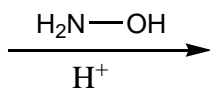
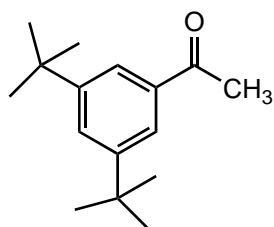
Bonus! What is the name of this reaction?

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c) Synthesis of HIV-1 protease inhibitors for antiretroviral AIDS therapy (*Bioorg. Med. Chem. Lett.* **2006**, *16*, 1869-1873).

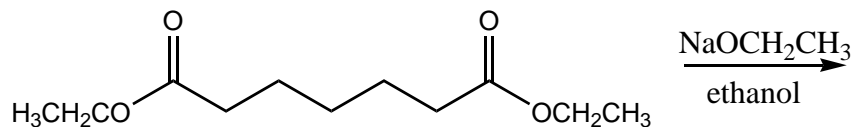


d) Development of retinoid X agonists for regulating gene expression (*Bioorg. Med. Chem. Lett.* **2006**, *16*, 2352-2356).



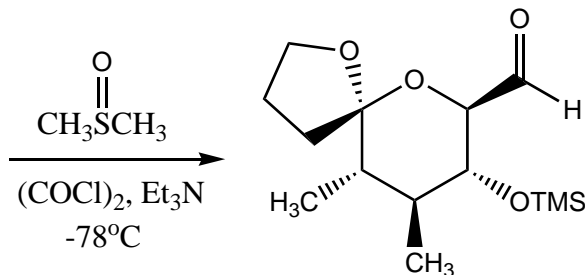
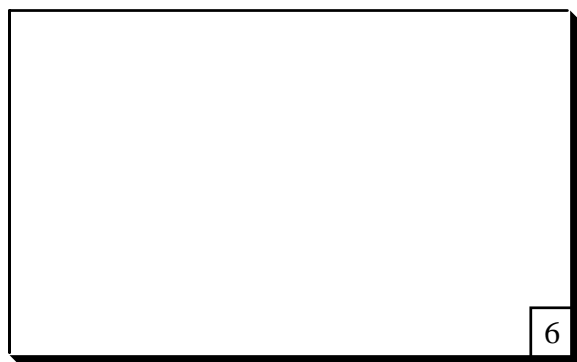
I. continued.

e)



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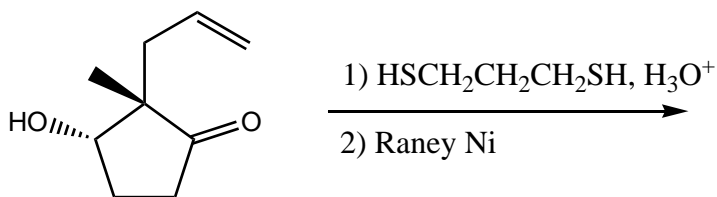
f) Synthesis of part of the neurotoxin *Ciguatoxin CTX3C* (*Tetrahedron Lett.* **2005**, 46, 8279-8283).



oxidation reduction neither

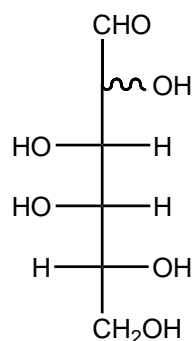
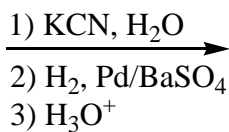
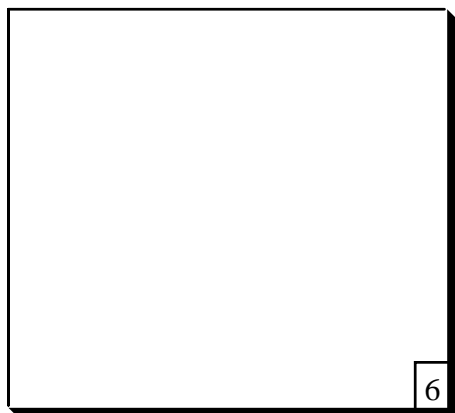
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g) New techniques for synthesis of clavirolides, possible anti-cancer pharmaceuticals (*Tetrahedron Lett.* **2005**, 46, 8431-8434).



6

i)

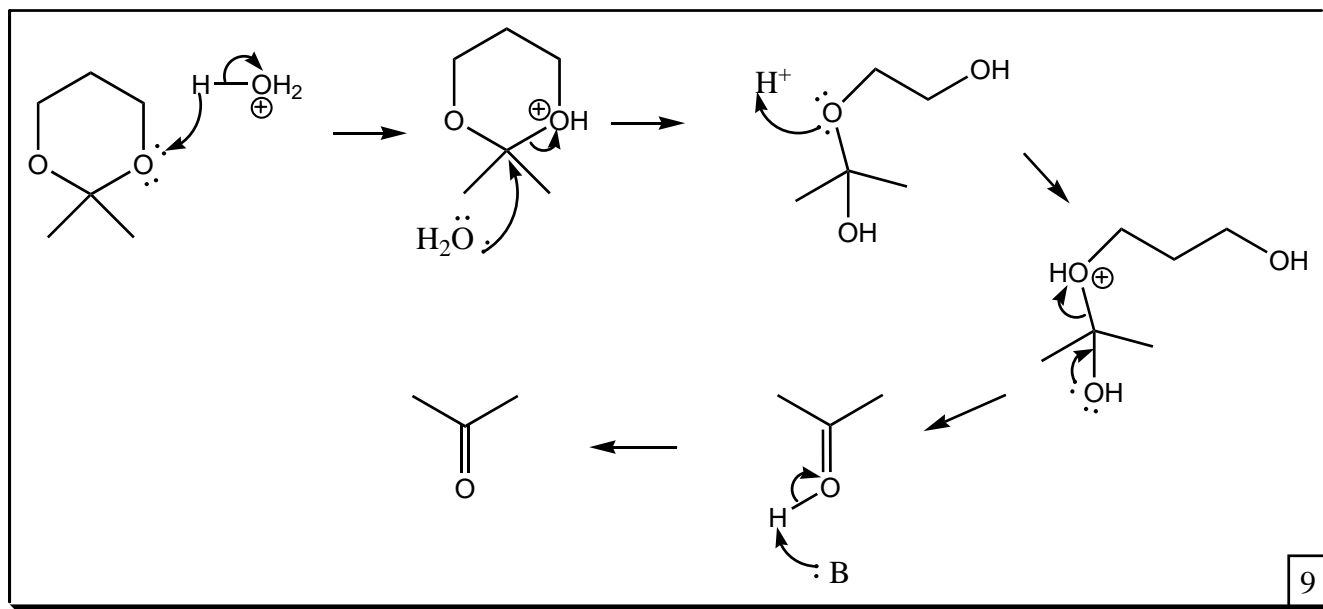


Bonus! Name this reaction:



II. Mechanisms (41 pts.)

a) Below is a mechanism for removal of a cyclic acetal. It has some mistakes. Circle **three** of the mistakes, then explain each in the boxes below.



Mistake 1:

3

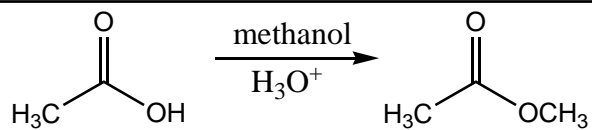
Mistake 2:

3

Mistake 3:

3

b) Draw the complete, step-wise, curved-arrow mechanism for the following transformation:



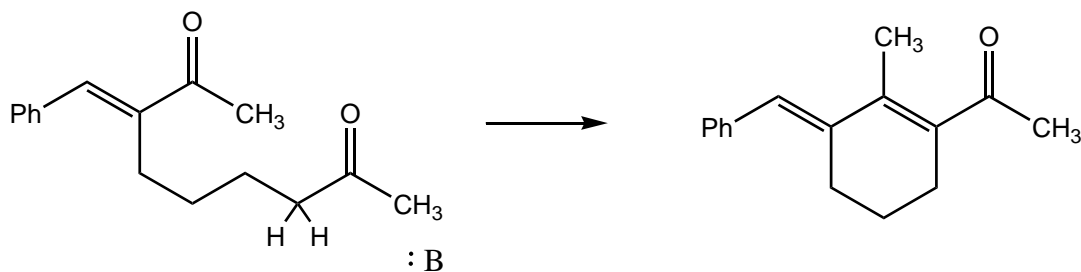
10

II. continued

c) Why is acid needed for the reaction in part (b)?

3

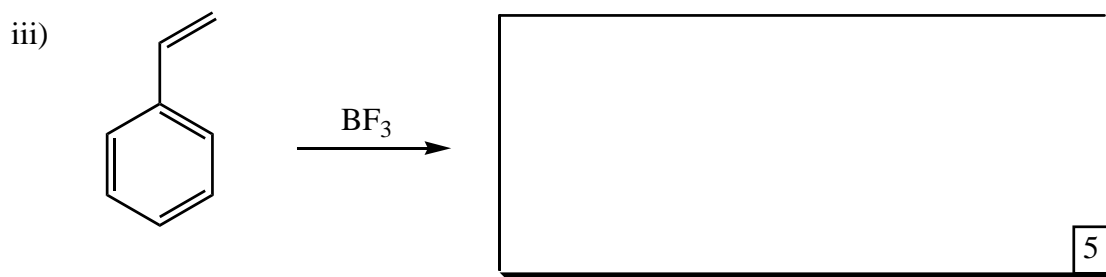
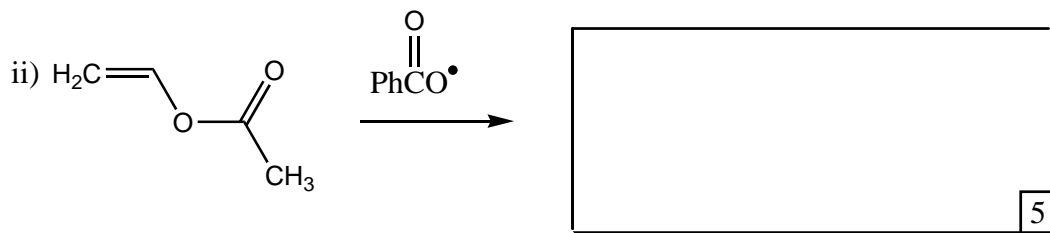
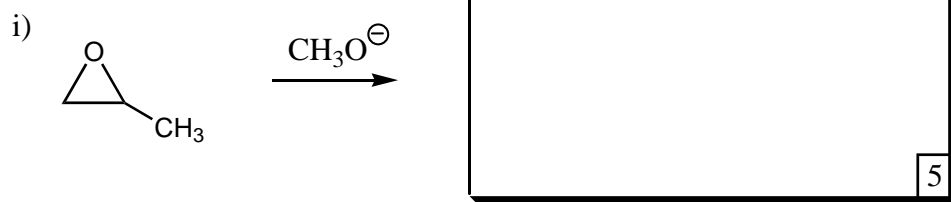
d) Draw the complete, step-wise, curved-arrow mechanism for the following intramolecular aldol condensation (*Tetrahedron Lett.* **2006**, 47, 1833-1837).



10

III. Polymers (24 pts.)

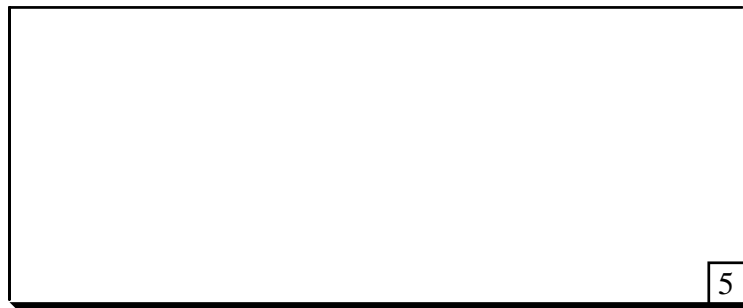
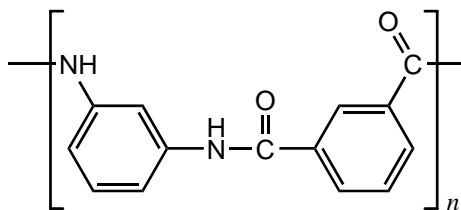
a) Draw the polymers resulting from chain-growth polymerization of the following molecules. Include the initiator for 1 bonus point.



b) Draw the monomers that react to form the following step-growth polymer.

Polymer

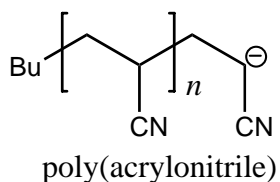
Monomers



Bonus! What is the commercial name of this polymer?



c) How would you terminate the following polymer (circle one)?

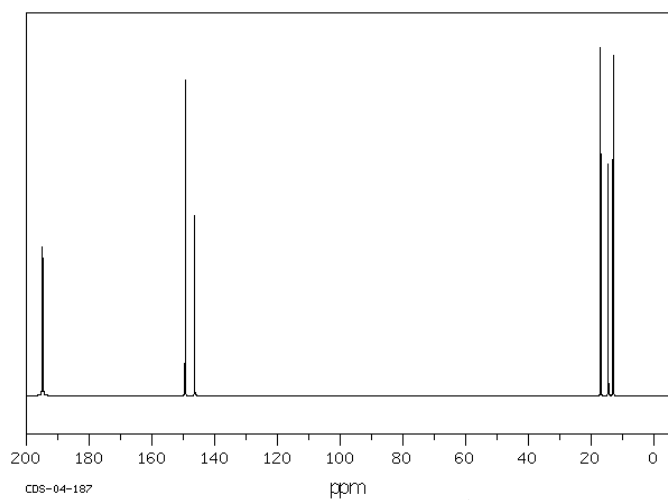
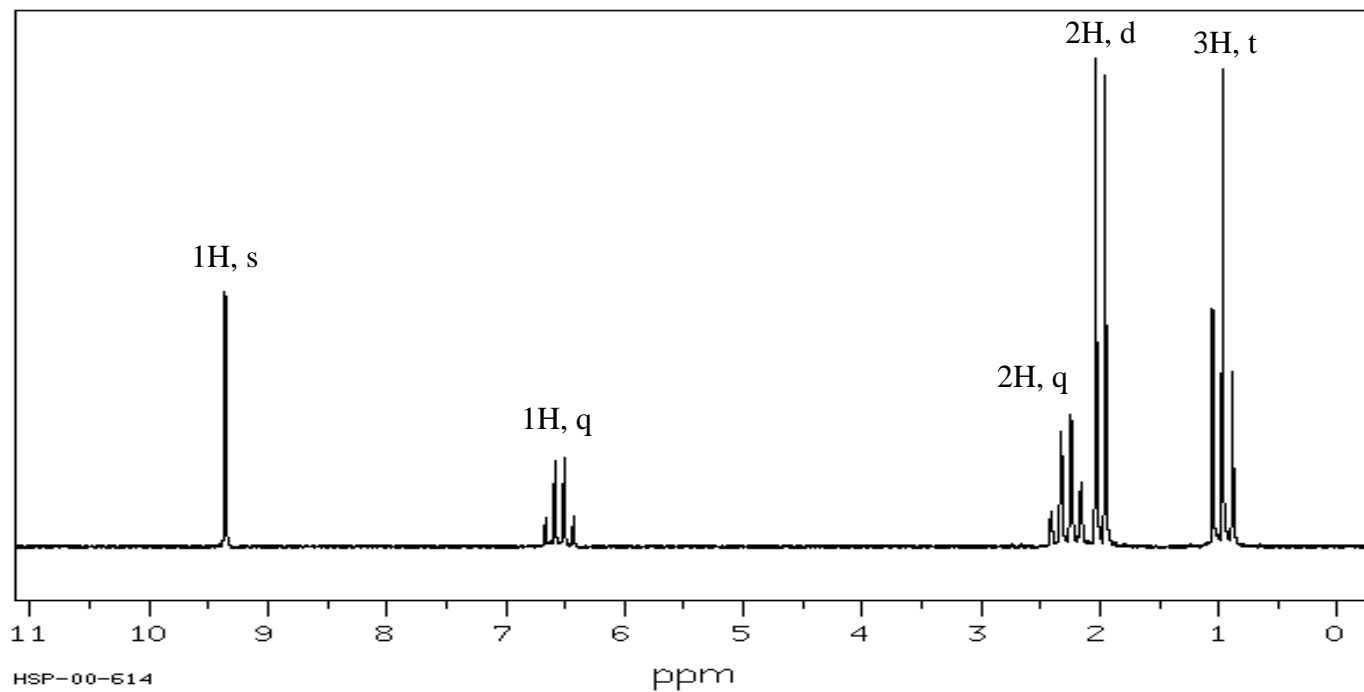


- a) Add acid to protonate it.
 - b) Do nothing; it will terminate itself by disproportionation.
 - c) Do nothing; it will terminate itself by proton loss.
 - d) Add strong base to deprotonate it.
 - e) None of these would terminate this polymer.

4

IV. Spectroscopy (20 pts.)

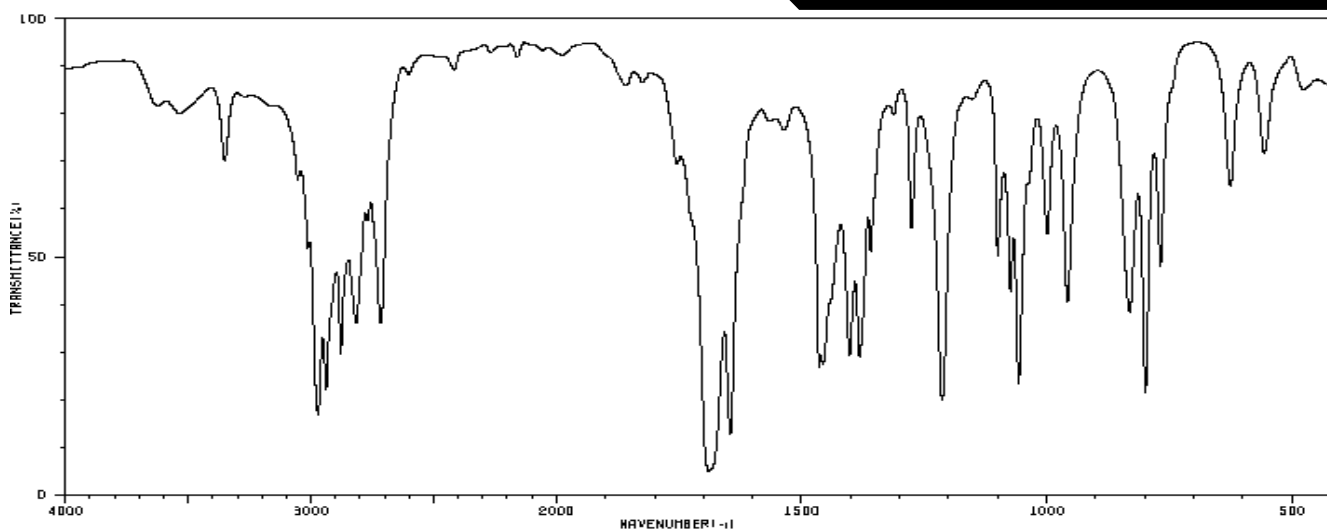
a) Determine the structure of the unknown $C_6H_{10}O$ compound whose spectra are shown below.



structure of $C_6H_{10}O$ 10

Bonus! Name the structure:

2



b) Circle your answers to the questions below:

i. Which spectroscopic method is best for determining molecular weight?

$^1\text{H-NMR}$ $^{13}\text{C-NMR}$ MS IR UV-Vis 4

ii. Which spectroscopic method is best for determining the existence of a carbonyl group in the molecule?

$^1\text{H-NMR}$ $^{13}\text{C-NMR}$ MS IR UV-Vis 4

iii. Molecular fragments must contain an unpaired electron (radical) to be detected by mass spectrometry.

true false 2

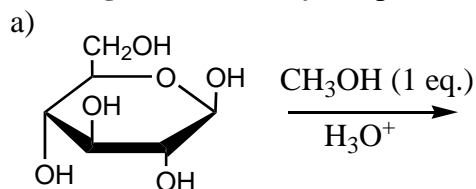
Maybe you should take a break now and get some candy....



son, i found this in
your room... have you
been building up blocks
but leaving one column
open so you can clear
four lines at once with
the tall skinny block?
i think we both know
that strategy won't work
past like level twelve

<http://toothpastefordinner.com>

V. Bioorganic chemistry (34 pts.)

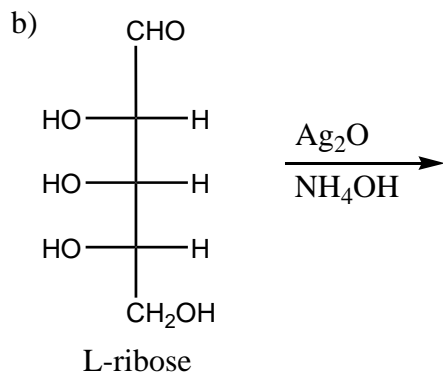


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Is this a reducing sugar?

yes
no

2



5

Bonus! After whom is this reaction named?

2

c) Propose a synthesis of the peptide **proline-alanine-phenylalanine** from the amino acids. You must draw the structures of the amino acids throughout.

10

d) Draw the following structures:

glycine at pH = 2

4

α -L-glucopyranose

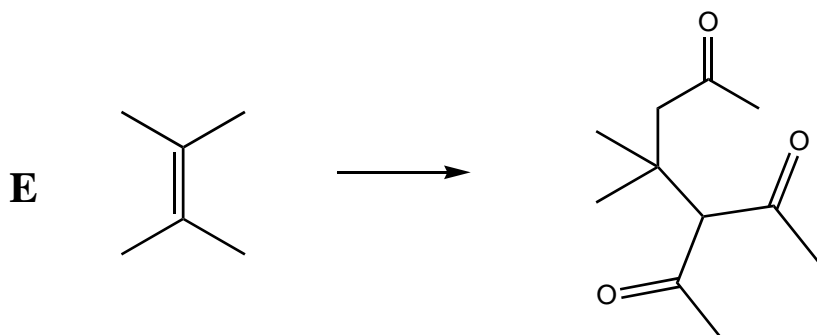
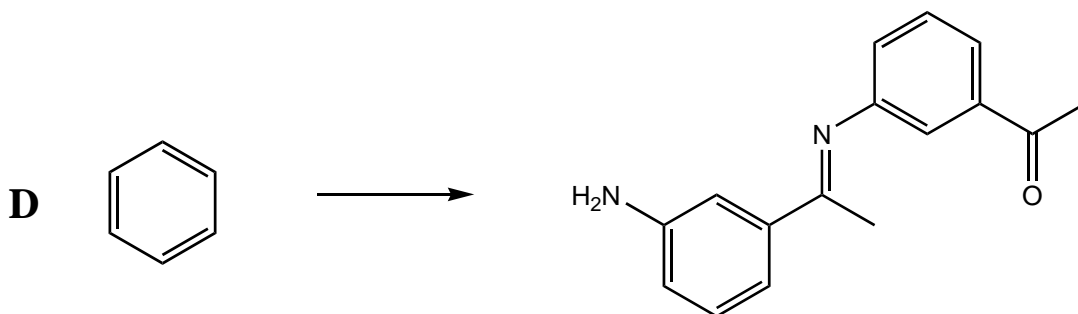
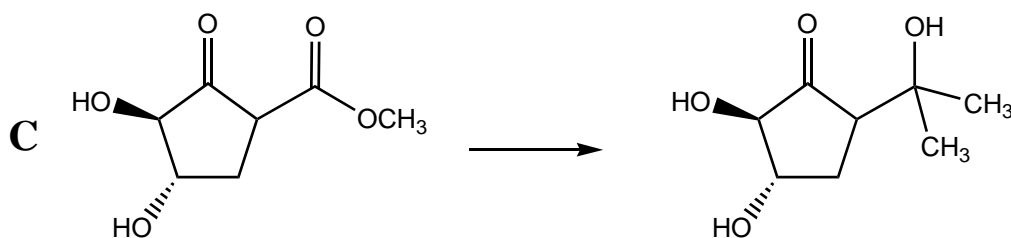
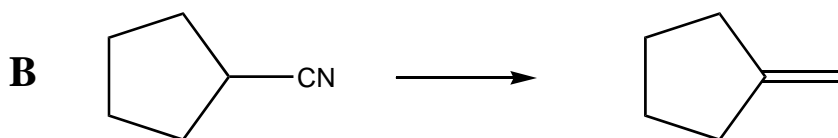
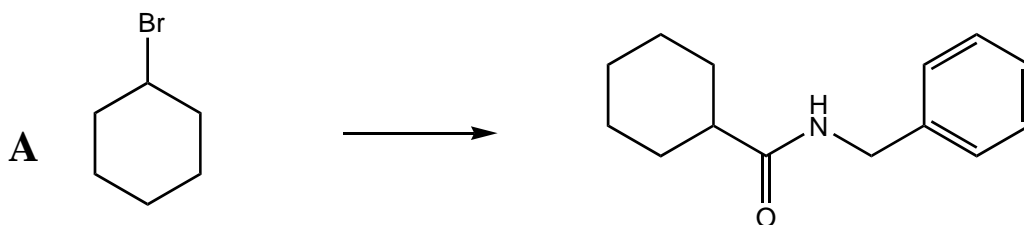
4

β -D-fructofuranose

4

VI. Synthesis (30 pts.)

Pick **three** of the following transformations and devise a synthesis for each. You do not get extra credit for completing more than 3 syntheses.



VI. (continued)

Synthesis 1. (circle your choice) **A B C D E**

10

Synthesis 2. (circle your choice) **A B C D E**

10

VI. (continued)

Synthesis 3. (circle your choice) **A B C D E**

10

Extra Credit!

Use the names of reactions you have learned in this class to fill in the following phrases (1 pt. each).

Example: Are you sure? I could have Swern it was a girl.

1. Larenz Tate was so hot in the 1997 movie *Love* _____.
2. Did you hear? Joe got 7 years + no parole for _____ convenience stores.
3. I couldn't do anything. He _____ the cards.
4. The Tigers look alright so far, but nothings _____ with those guys.
5. I know he was ugly but he _____ good presents.