

**Chemistry 2522**  
**Summer 2005; Final Exam**

This exam has 6 problems on 8 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) \_\_\_\_\_

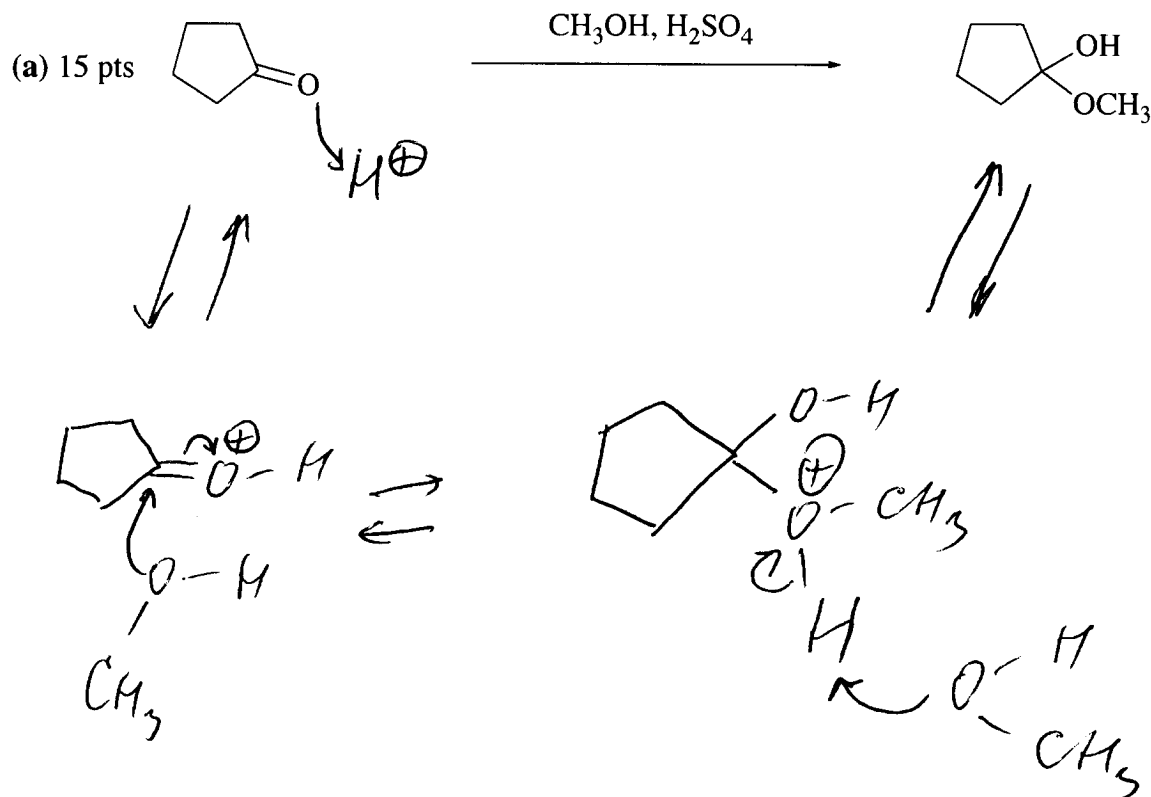
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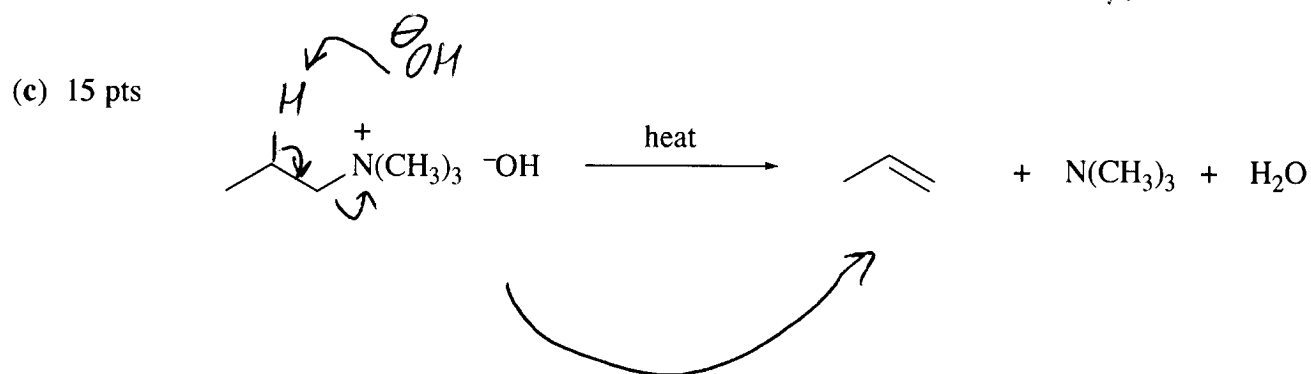
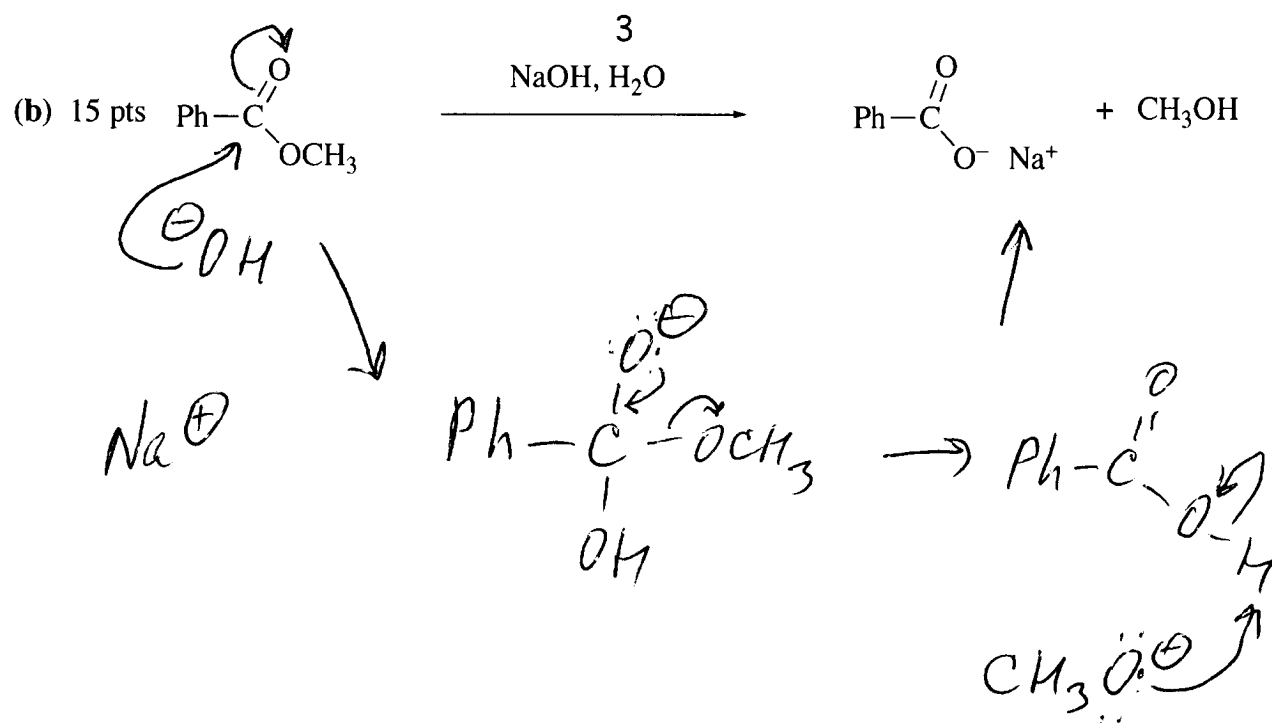
Scores:

1. 45
2. 15
3. 9
4. 52
5. 39
6. 40

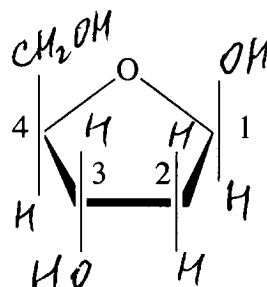
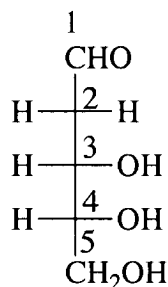
Total: 200

1. (45) Using **curved arrows** and showing the structure of the **intermediates**, write **mechanisms** that account for the products in the following reactions:





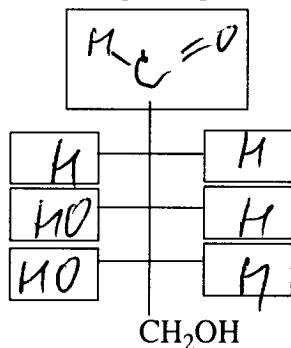
2. (15) (a) Finish drawing of the Haworth projection formula of 2-Deoxy-D-ribose in the form of  **$\beta$ -D-furanose** ( $\beta$ -2-Deoxy-D-ribofuranose). [make sure to place **all** missing -H and -OH groups at the end of each bond!] (8 pts; 2 pts each carbon atom)



$\beta$ -2-Deoxy-D-ribose

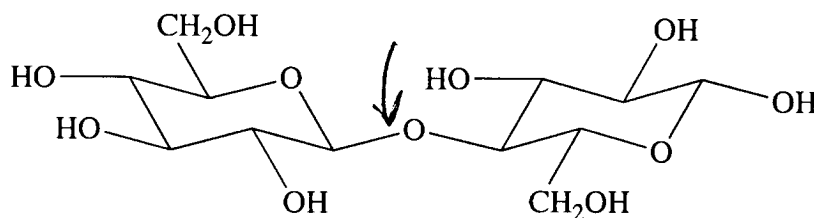
$\beta$ -2-Deoxy-D-ribofuranose

(b) Finish drawing of Fischer projection of 2-Deoxy-L-ribose (7 pts; 1 pt each box):



2-Deoxy-L-ribose

3. (9) The structure shown below is cellobiose, the product of the hydrolysis of cellulose:



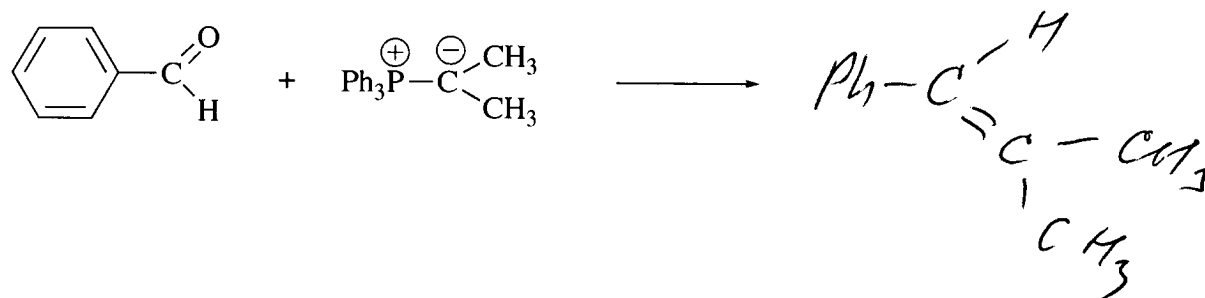
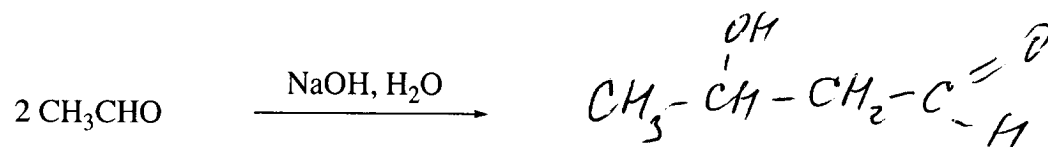
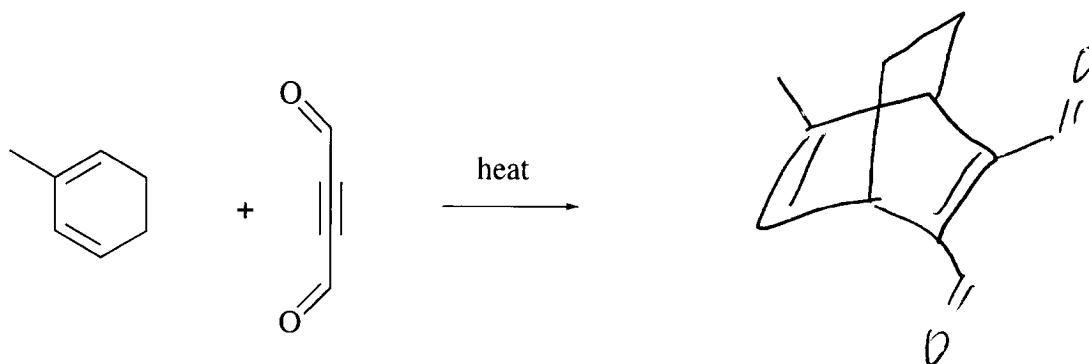
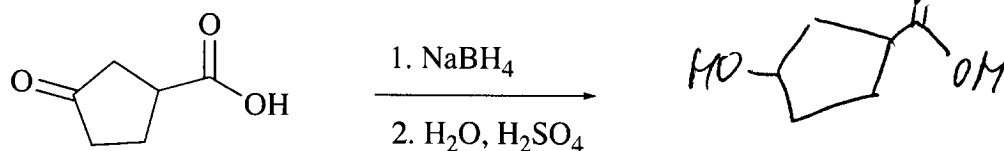
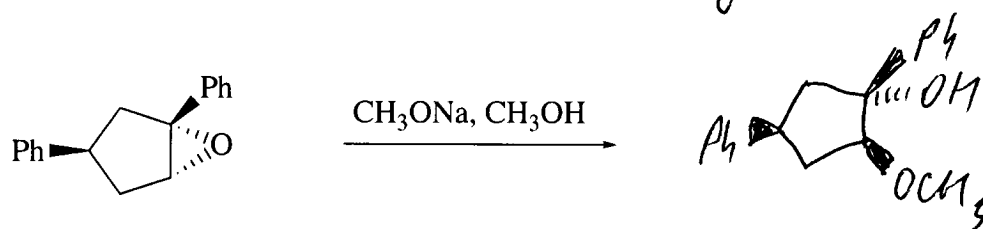
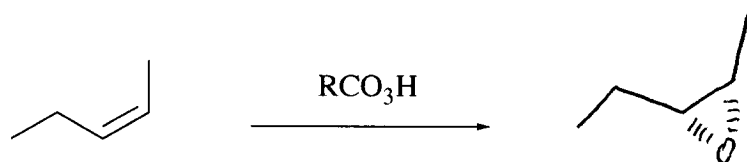
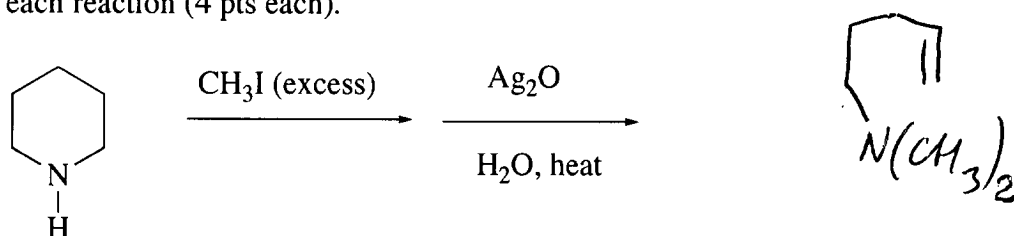
(a) (5) Using an arrow symbol ( $\longrightarrow$ ) show the **glycosidic** linkage in this disaccharide. What type of glycosidic linkage is it?

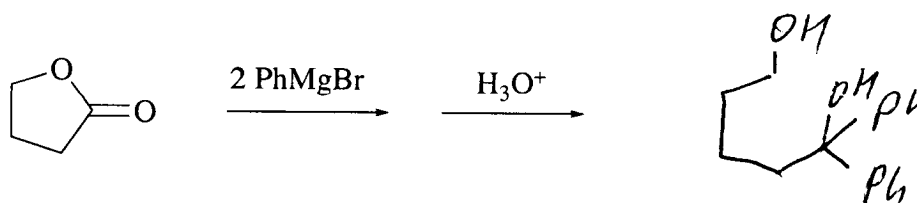
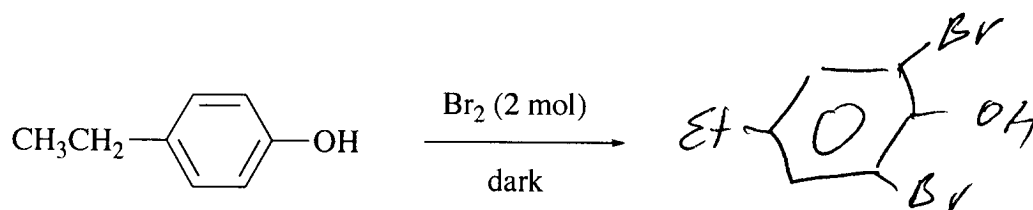
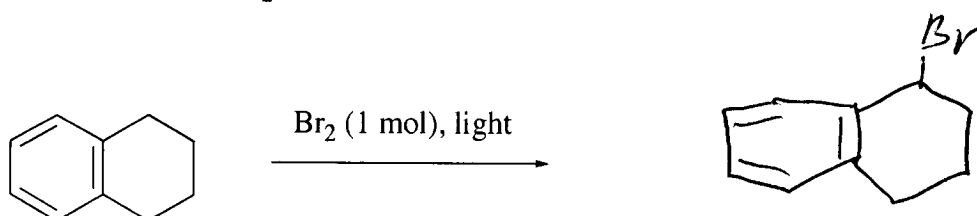
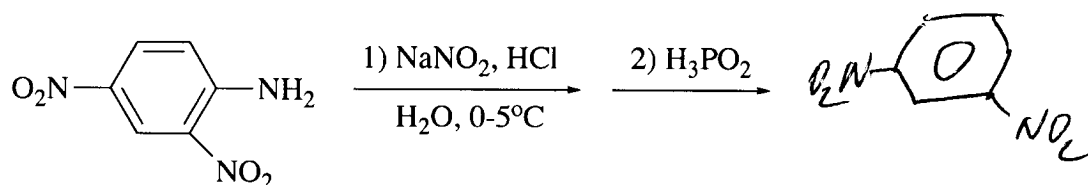
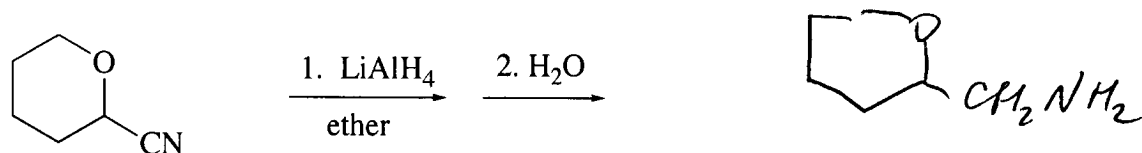
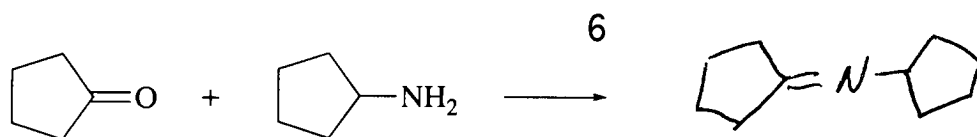
Answer  $\beta$ -glycosidic

(b) (4) Is cellobiose a **reducing** sugar or not?

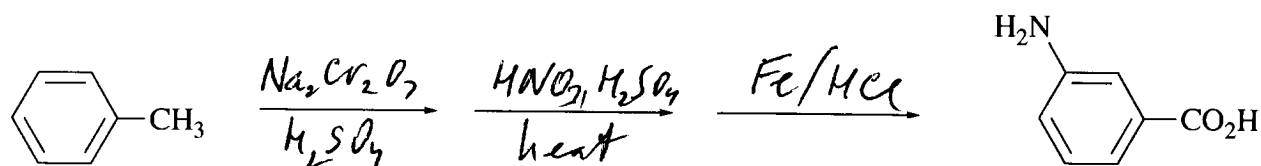
Answer Reducing

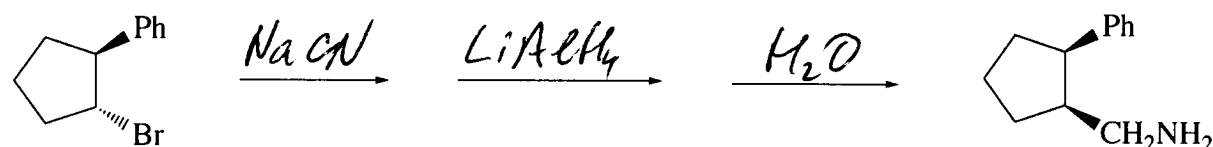
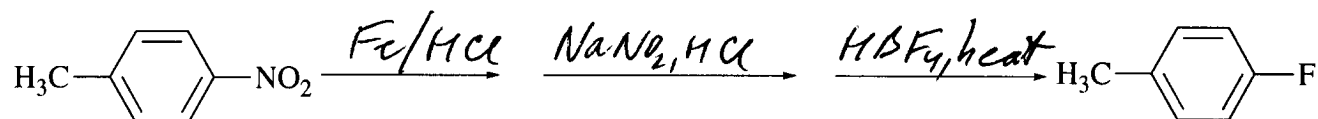
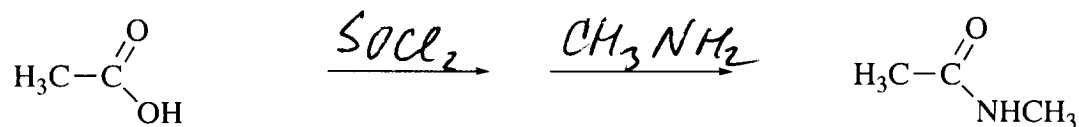
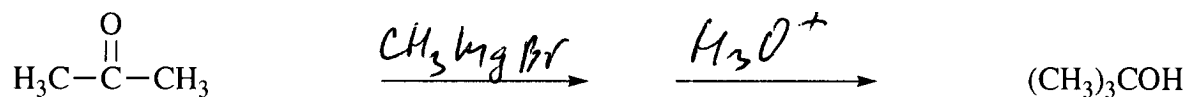
4. (52) Complete the following equations by drawing structures of the **major** product(s) expected in each reaction (4 pts each).





5. (39) Give the **reagents on the arrow** that can be used to convert the reactant to the indicated product in high yield (3 pts each reagent).





6. (40, 5 pts each) For each of the following questions (a)-(h) **circle** the item that is the correct answer.

(a) Which of the following compounds has the highest **acidity**?

water phenol ammonia ethanol benzene ethylamine sodium benzoate aniline

(b) Which of the following compounds is the strongest **base**?

aniline methane methanol *o*-ethylphenol phenol *p*-ethylaniline methylamine

(c) Which one of the following compounds is the **most reactive** in the **Electrophilic Aromatic Substitution** reaction?

aniline 1,3,5-trinitrobenzene benzoic acid bromobenzene chlorobenzene benzene

(d) Which one of the following compounds has the **highest** reactivity in the **nucleophilic acyl substitution**?

benzamide ethyl acetate acetamide *N*-methyl formamide succinimide benzoyl bromide

(e) Which one of the following species is **aromatic**?

cyclopropene    cyclobutadiene    cyclopentadiene    cyclopentadienyl cation    cyclohexadiene  
 cycloheptatriene    cycloheptatrienyl anion    cyclopropenyl anion    cyclooctatetraene  
 cyclohexene    cyclopentene    ethylene    acetylene    cyclopentadienyl anion

(f) Which one of the following compounds has the **highest boiling point**?

ethane    methyl acetate    propanoic acid    acetyl chloride    1-butyne    propanone    butane

(g) How many **stereoisomers** (including enantiomers) has a molecule of *aldohexose* in the *pyranose* form?

one    two    three    four    five    six    seven    eight    nine    ten    sixteen    thirty two    sixty four

(h) Which of the following compounds will have the *characteristic IR* peak at about  $1700\text{ cm}^{-1}$  and four signals in the  $^1\text{H NMR}$  spectrum?

