

Chemistry 2542

Fall Semester 2012; Midterm 2 Exam

November 14, Wednesday, 11:00 to 11:50 am

This exam has 5 problems (100 pts) on 7 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) _____

Your graded exams will be available Friday, November 16, before class.

Good Luck!

Chemistry 2542
Fall 2012; Midterm 2 Exam

This exam has 5 problems on 7 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) _____

Scores:

Problem 1: _____

Problem 2: _____

Problem 3: _____

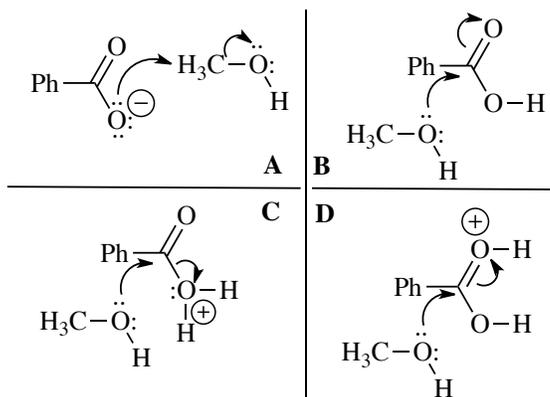
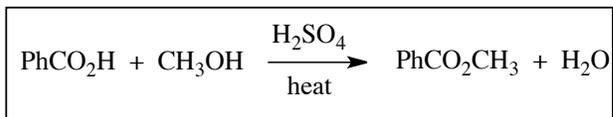
Problem 4: _____

Problem 5: _____

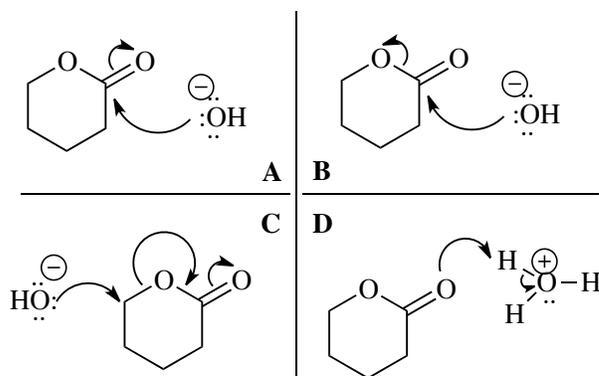
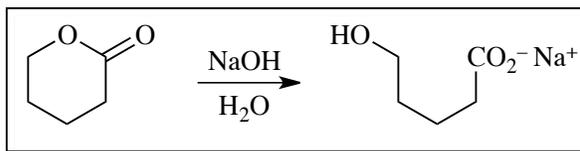
Total: _____

1. (15 pts) Answer the questions on mechanisms of the following reactions.

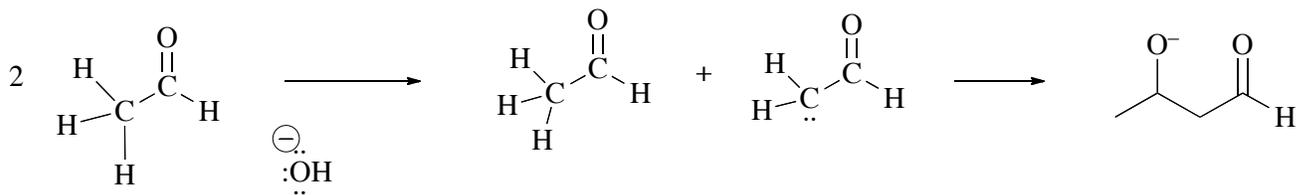
(a) Which one of the following four schemes (A-D) represents a step in the mechanism for the **esterification** reaction shown in the box (circle the correct answer; 5 pts)



(b) Which one of the following four schemes (A-D) gives the best representation of a step in the mechanism of the **saponification** reaction shown in the box (circle the correct answer; 5 pts):

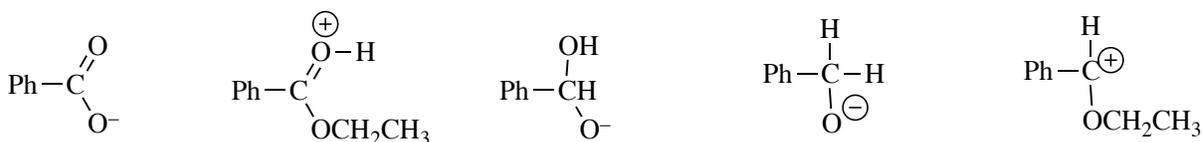
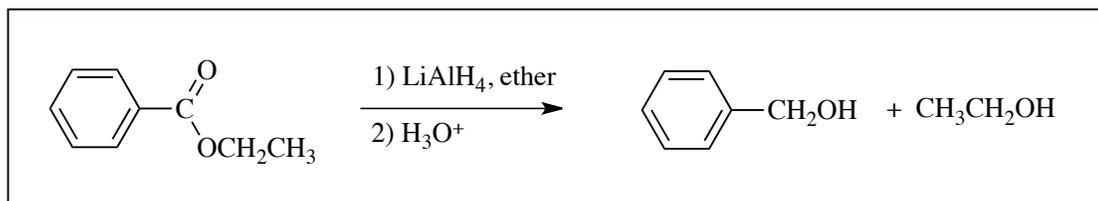


(c) Write **4** curved **arrows** and one **charge** missing in the mechanism for the **aldol condensation** (5 pts; 1 pt each):



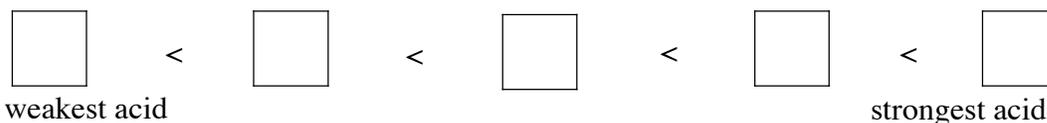
2. (15 pts) Answer the following questions.

(a) (4 pts) Circle the structure of the **intermediate product** for the reaction in the box:

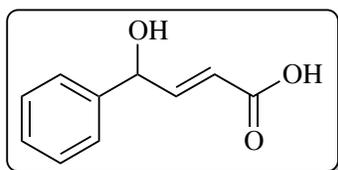


(b) (5 pts) Arrange the following compounds in order of increasing acidity (place a number **1-5** in the appropriate box, 1 pt each box):

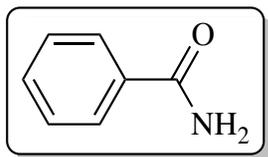
(1) 3-fluoropropanoic acid (2) 2-fluoropropanoic acid, (3) propanoic acid, (4) propane, (5) 1-propanol



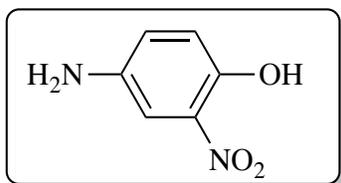
(c) (6 pts) Circle the correct **IUPAC name** of the compounds in the boxes (2 pts each):



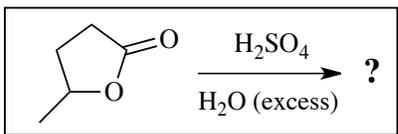
(Z)-4-hydroxy-5-phenyl-2-pentenoic acid (E)-4-hydroxy-5-phenyl-2-pentenoic acid
 (Z)-4-hydroxy-4-phenyl-2-butenic acid (E)-4-hydroxy-4-phenyl-2-butenic acid
 (Z)-4-oxo-1-phenyl-2-butenediol (E)-4-oxo-1-phenyl-2-butenediol



1-amino-2-phenylethanal amidobenzene benzamide
 2-phenylacetamide benzoylamine phenylformamide



4-amino-2-nitrophenol 4-hydroxy-2-nitroaniline
 2-nitro-4-anilinophenol 2,4-diaminophenol
 2-nitro-4-aminobenzol 3-amino-2-hydroxynitrobenzene

3. (28 pts) Circle the **major product** in each of the following reactions (4 pts each):

1-hydroxy-3-methylcyclopentanone

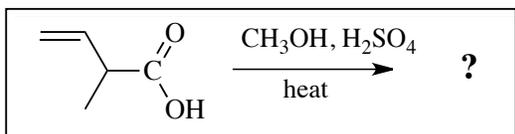
4-hydroxy-4-methylpentanoic acid

4-hydroxypentanoic acid

5-hydroxy-4-methylpentanoic acid

4-hydroxy-4-methylpentanoic acid

4-methylcyclopentanecarboxylic acid



2-methyl-3-butenoic acid

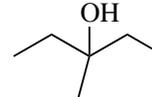
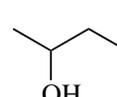
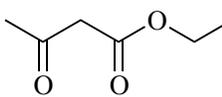
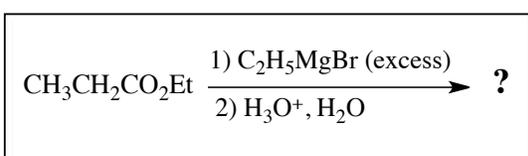
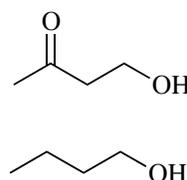
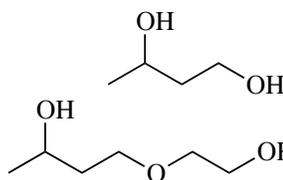
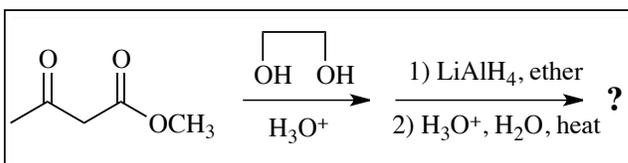
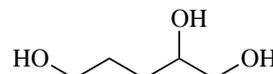
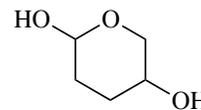
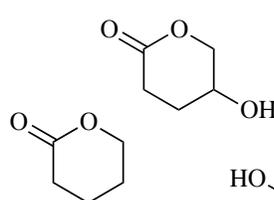
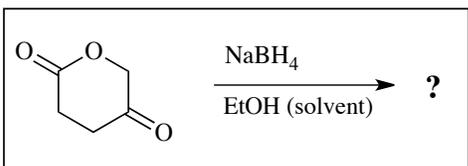
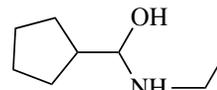
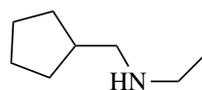
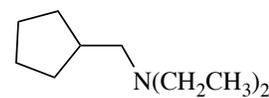
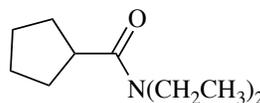
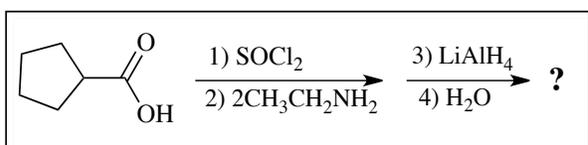
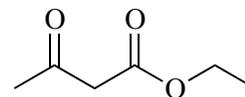
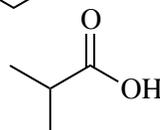
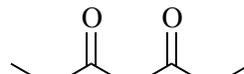
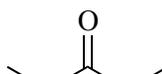
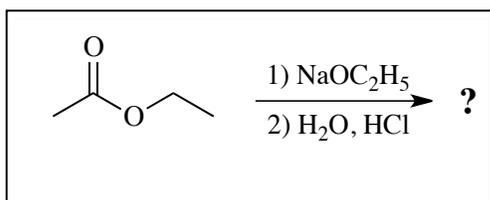
(Z)-2-methyl-2-propenoate

2-methyl-3-buten-1-ol

methyl 2-methyl-3-pentenoate

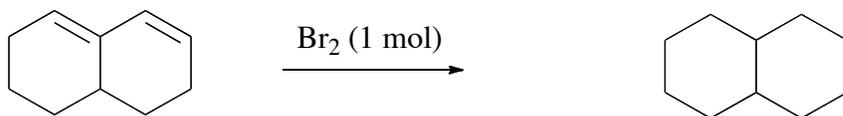
2-methyl-3-buten-1-ol

methyl 2-methyl-3-butenoate

CH₃CH(OH)C₃H₇CH₃CO₂C₃H₇(CH₃)₃COH

4. (24 pts) Answer the following questions:

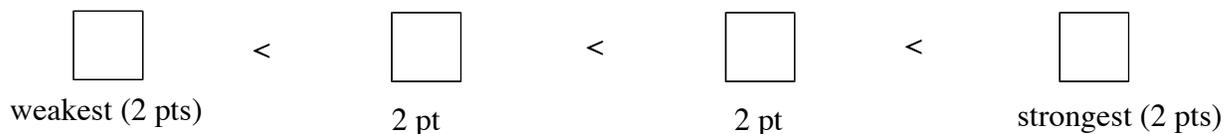
(a) (6 pts) Finish drawing the structure of 1,4-addition product in the following reaction by showing appropriate substituents and missing bonds (2 pts each missing part):



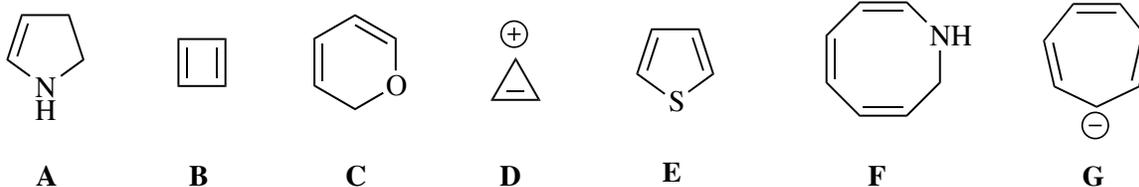
1,4-addition product

(b) (8 pts) Arrange the following **phenols** in order of **increasing acidity** (2 pts each box):

(1) 2,4,6-trimethylphenol, (2) 2,4,6-trinitrophenol, (3) phenol, (4) *o*-nitrophenol



(c) (5 pts) Which of the compounds shown in the boxes are **aromatic**? (put all appropriate letters A-G in the provided box; no partial credit)



Aromatic molecules:
(place appropriate letters A-G in the box)



(d) (5 pts) Which is the most **acidic** hydrocarbon (circle one molecule)?

