Chemistry 2542
Spring 2008; Midterm 2 Exam

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

Printed Name (Last, First) Key

Scores:

Problem 1: 15

Problem 2: 15

Problem 3. 20

Problem 4. 20

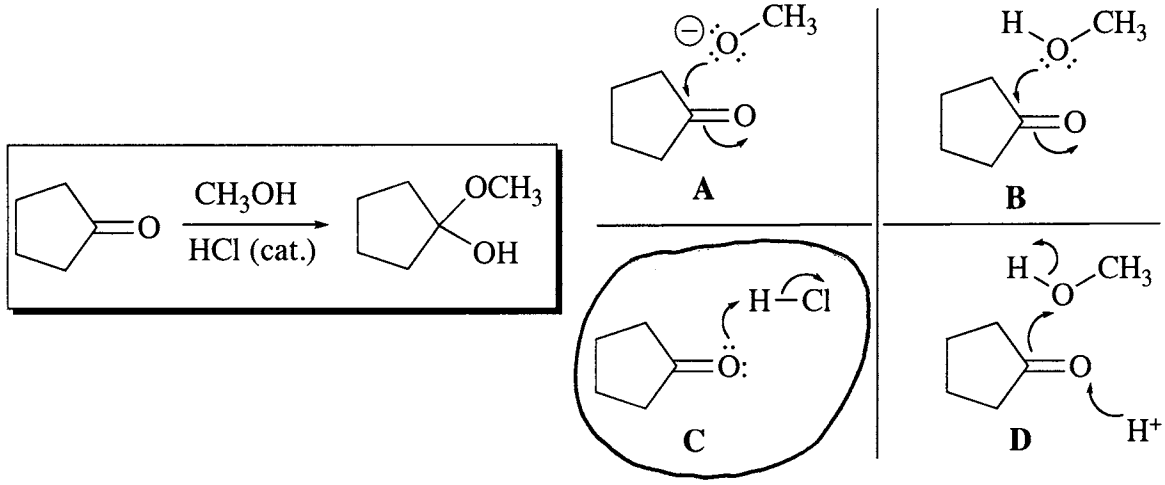
Problem 5. 20

Problem 6. 10

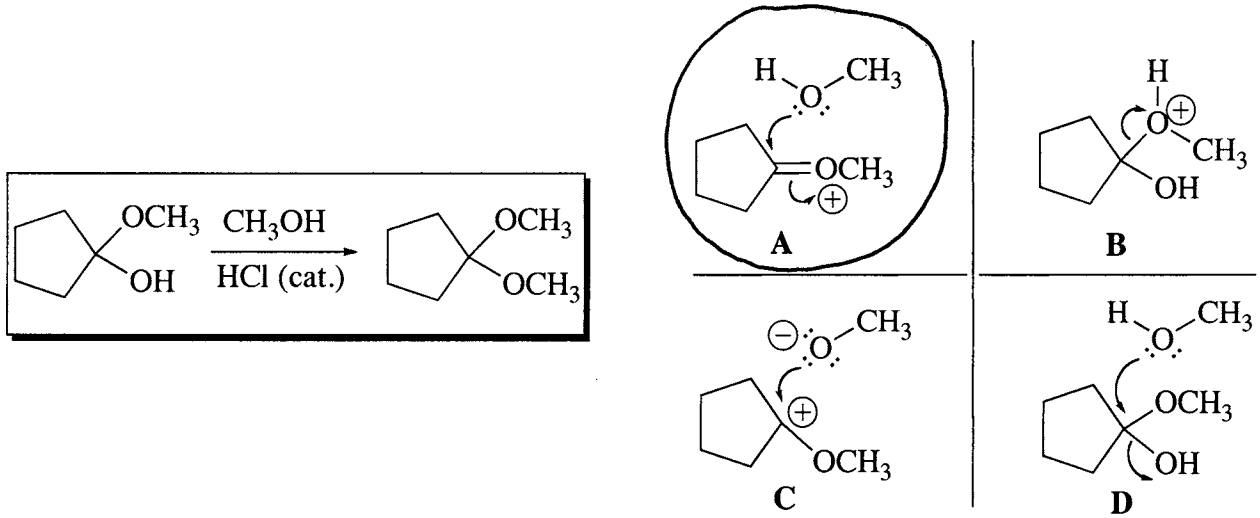
Total: 100

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

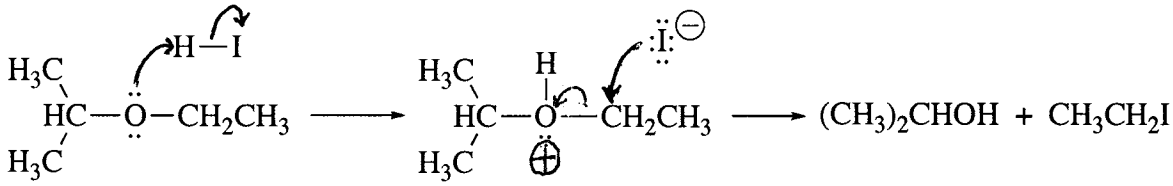
(a) Which one of the following four schemes (**A-D**) gives the best representation of the ***initial step*** of the mechanism of the reaction in the box (circle the correct answer; 5 pts)



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

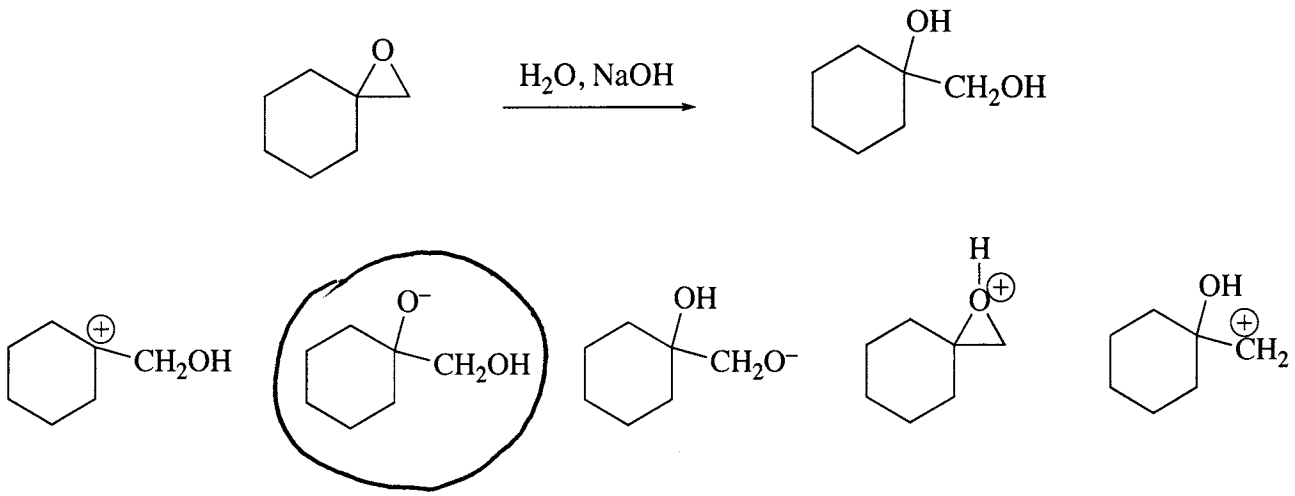


(c) Write **4** curved **arrows** and one **charge** missing in the following mechanism (5 pts; 1 pt each):



2. (15 pts) Answer the following questions.

(a) (5 pts) Circle the structure of the **intermediate** product in this reaction:



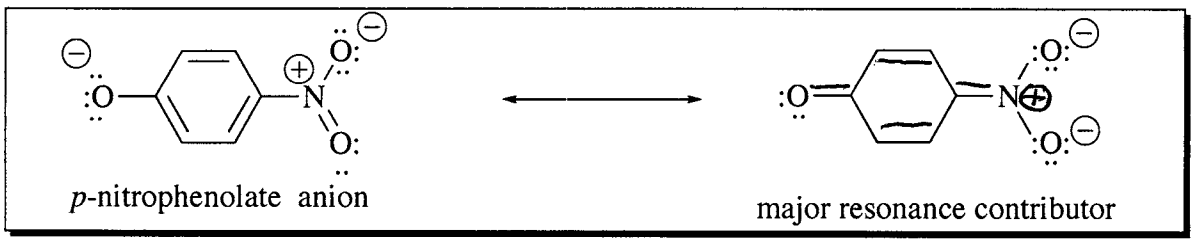
(b) (5 pts) Arrange the following **phenols** in order of increasing acidity (1 pt each box):

(*1*) 2,4-dinitrophenol, (*2*) *o*-nitrophenol, (*3*) *p*-methylphenol, (*4*) 2,4,6-trimethylphenol, (*5*) phenol

[4] < [3] < [5] < [2] < [1]

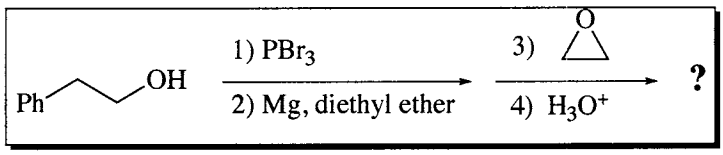
weakest strongest

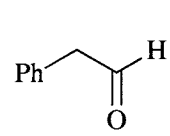
(c) (5 pts) Finish drawing of <u>the important</u> resonance contributor of ***p*-nitrophenolate anion** that explains the **high acidity** of *p*-nitrophenol (1 pt for each of the *five missing fragments*):

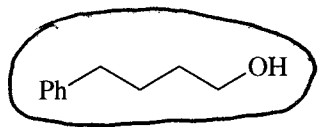


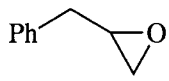
1 pt each bond (4 total)
1 pt for ⊕

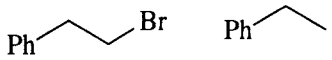
3. (20 pts) Circle the structure of the **major product** in the following reactions (or sequences of reactions (4 pts each):

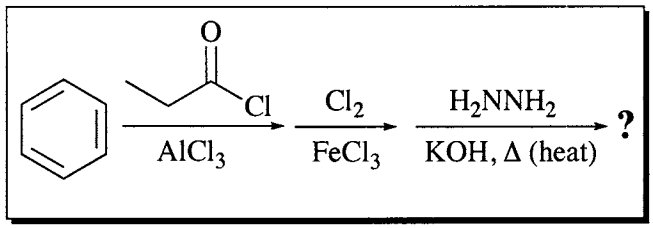








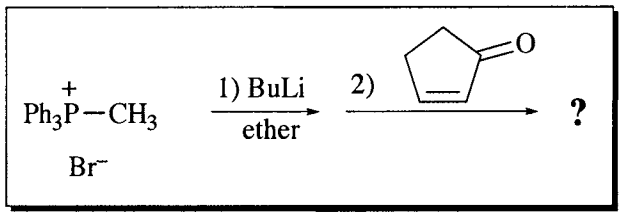


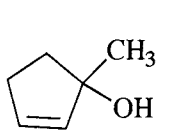


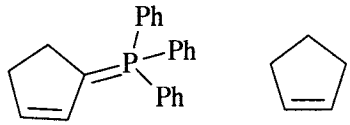
m-chlorobenzoic acid *m*-chloroisopropylbenzene

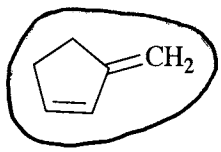
m-chloropropylbenzene *o*-chloropropylbenzene

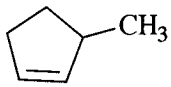
m-chloroacetophenone 2-chloro-1-phenylpropane

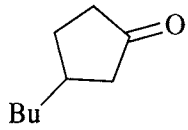


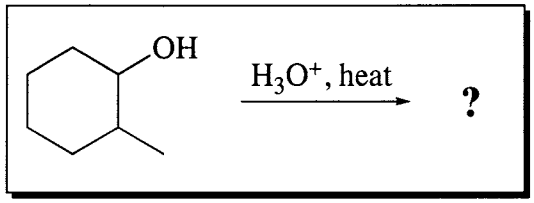








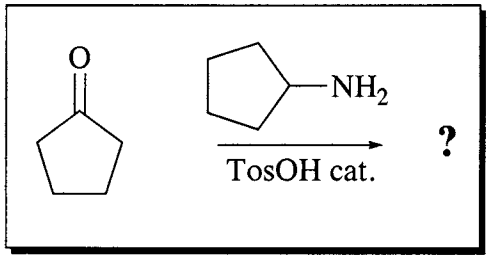


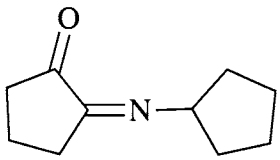


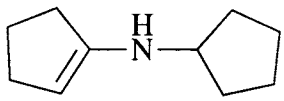
1-methylcyclohexene 3-methylcyclohexene

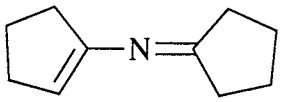
methylenecyclohexane 2-methylcyclohexanone

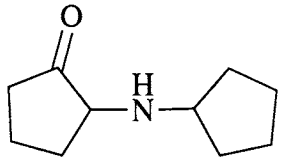
1-methyl-1,2-epoxycyclohexane

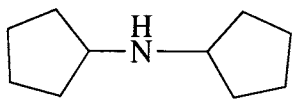


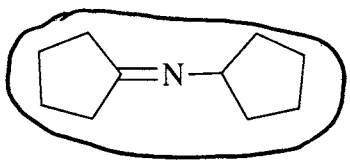






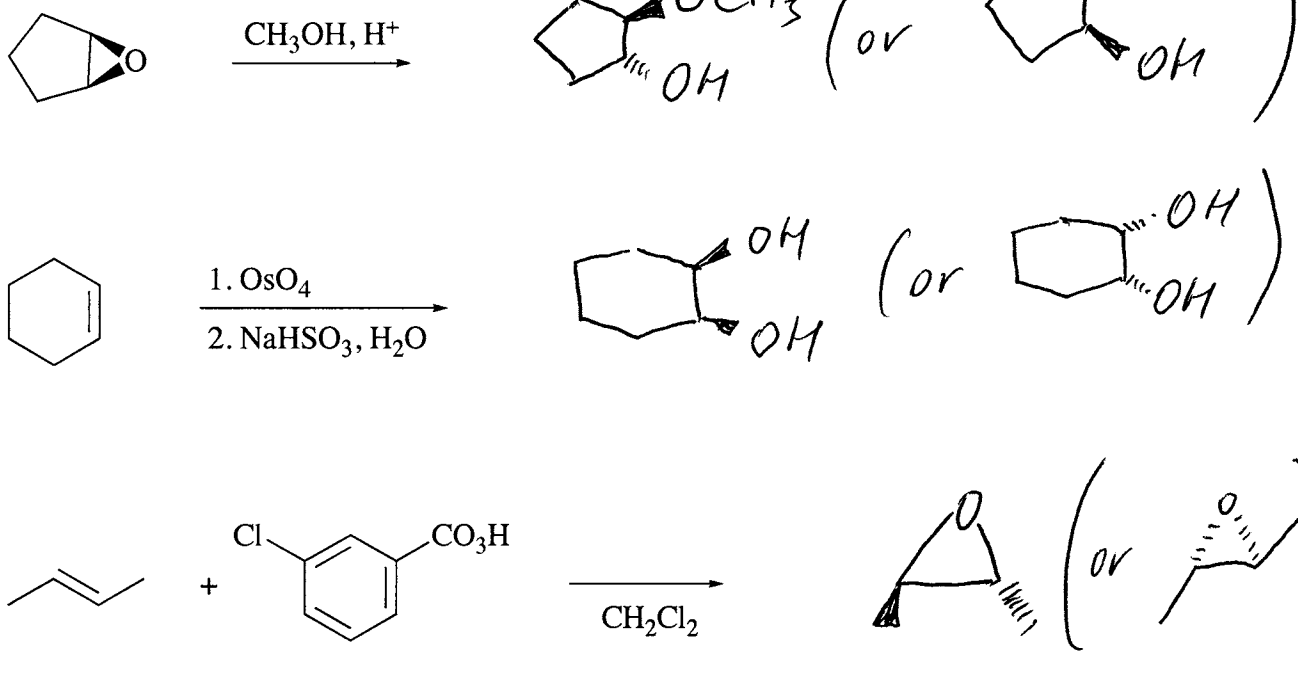




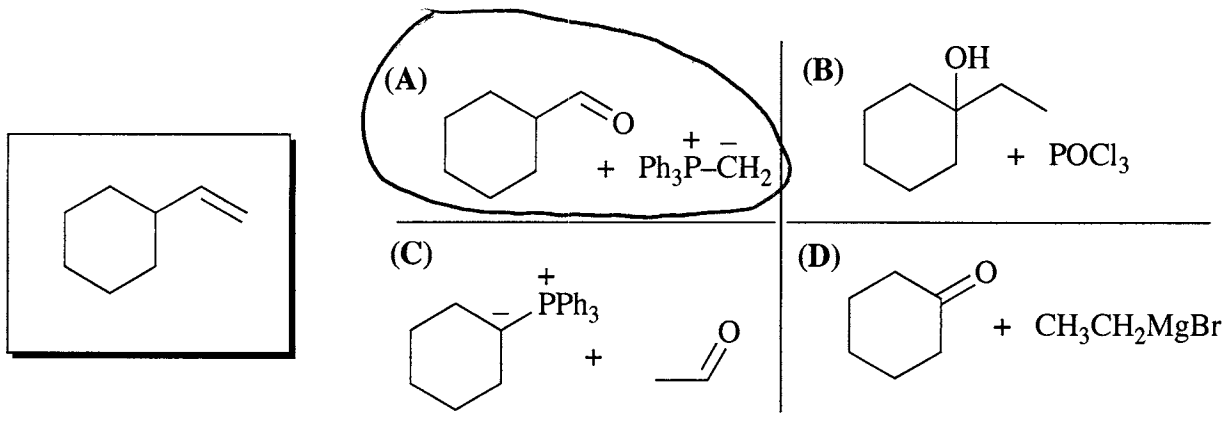


4. (20 pts) Answer the following questions:

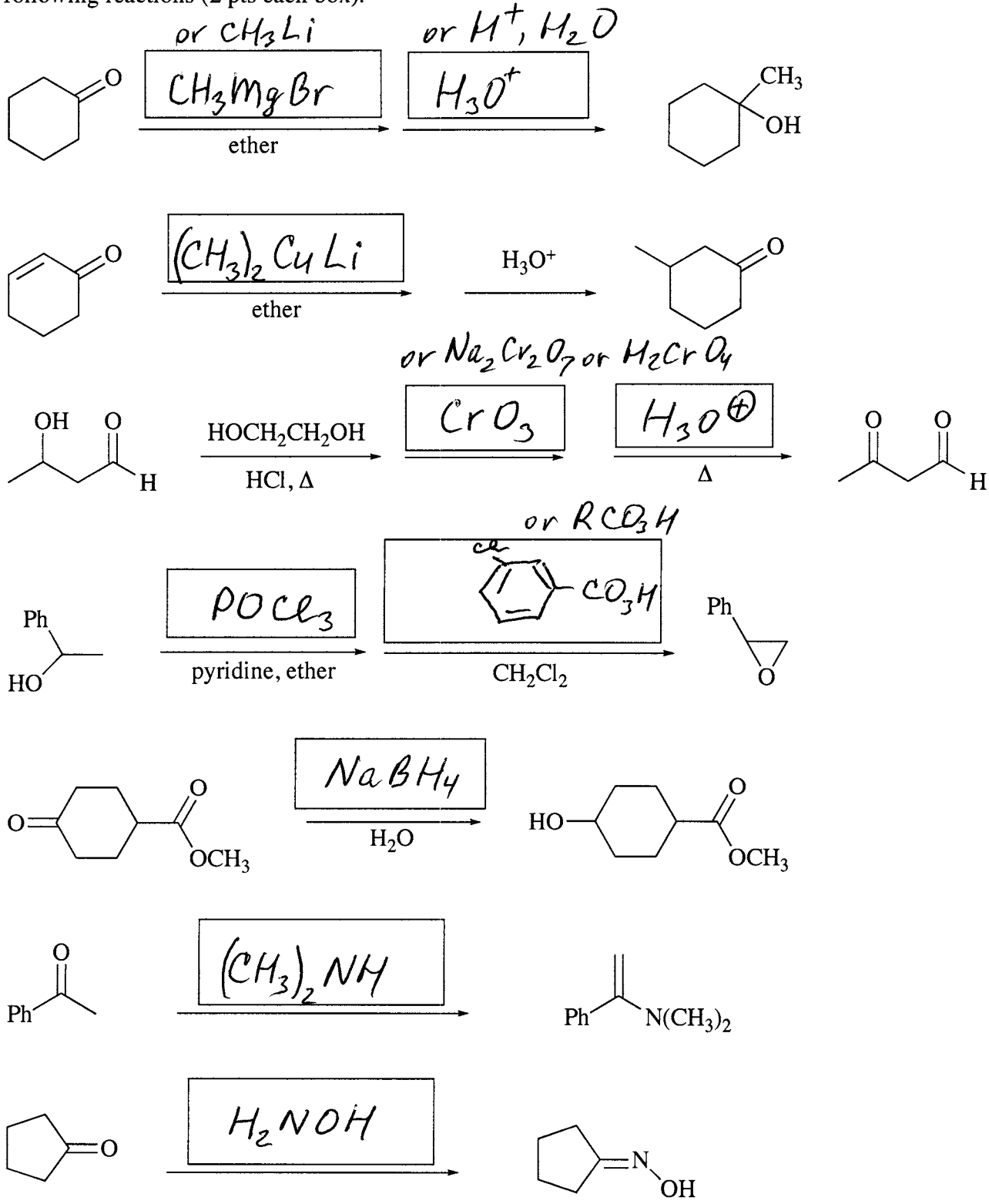
(a) (15 pts) Draw the structure of the main product for each the following **stereoselective** reactions (5 pts each reaction; -2 pts for wrong stereochemistry).



(b) (5 pts) What pair of reactants is required to synthesize the compound in the box (circle the answer):

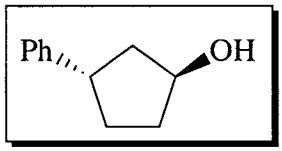


5. (20 pts) Place in each box the molecule of a reagent that is required to perform each of the following reactions (2 pts each box):



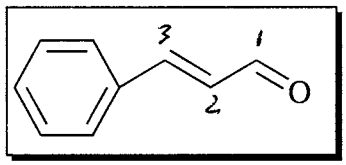
6. (10 pts) Answer the following questions on the IUPAC nomenclature:

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



3-hydroxycyclopentylbenzene *cis*- 3-hydroxycyclopentylbenzene

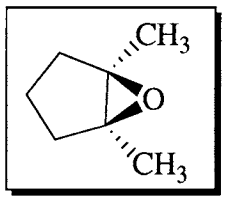
cis-3-phenyl-1-cyclopentanol *trans*-3-phenyl-1-cyclopentanol



(E)-4-phenyl-2-butenal *(Z)*-4-phenyl-2-butenal

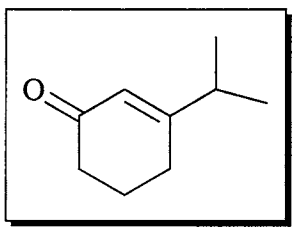
(E)-3-phenyl-2-propenal *(Z)*-3-phenyl-2-propenal

(E)-3-phenyl-2-propenone *(Z)*-3-phenyl-2-propenone



cis-1,2-dimethylcyclopentane epoxide *cis*-1,2-dimethylcyclopentanone

1,2-dimethyl-1,2-epoxycyclopentane *cis*-1,2-dimethyloxycyclopentane



1-isopropyl-3-oxocyclohexene 1-isopropyl-3-oxo-1-cyclohexene

1-isopropylcyclohexen-3-one 3-isopropyl-2-cyclohexenone

(b) Finish drawing of ***benzyl alcohol*** in the provided box (2 pts):