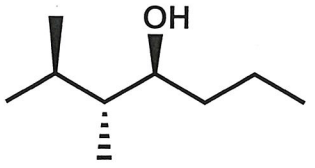
KEY

00031

Name _____

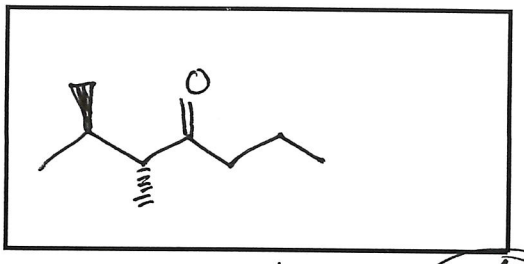
1a) (18 points) Give the products, starting materials or reagents for the following transformations!



Na_2CrO_4

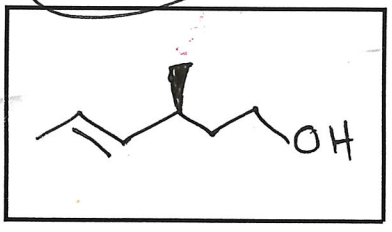
H_2SO_4

+3p



Oxidation +1p

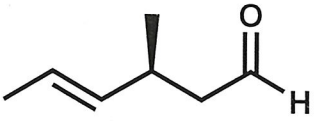
+3p



a 1° alcohol

+3p

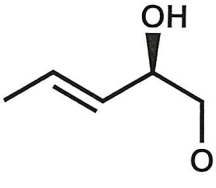
PCC

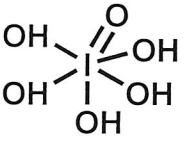


Oxidation +1p

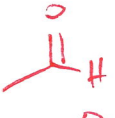
2/3 for loss of C

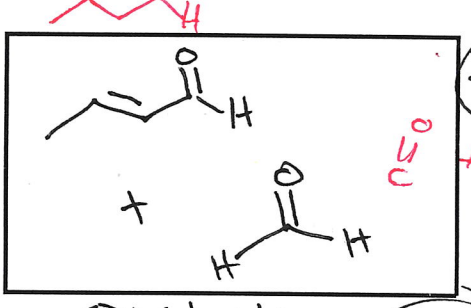
0/3 for + C





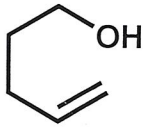
HOAc





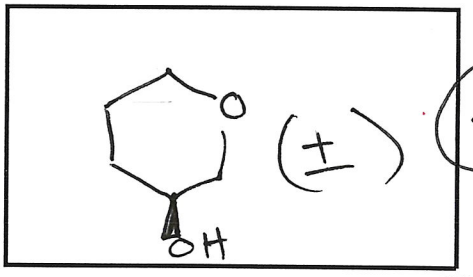
+3p

Oxidation +1p



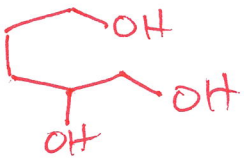
1. mCPBA

2. NaOH, H_2O



+3p

Oxidation +1p

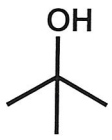


(1pt)

12

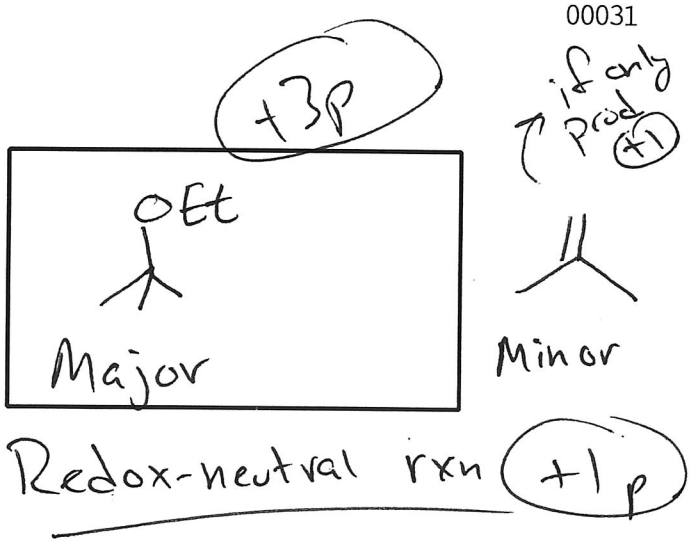
1a) (continued)

00031



1. TsCl

2. EtOH, 55 °C



1b) (5 points) Determine for <u>all</u> of the reactions above, whether you performed an

- Oxidation
- Reduction
- Redox-neutral reaction.

<u>Write your answers underneath each product.</u>

23 pts total

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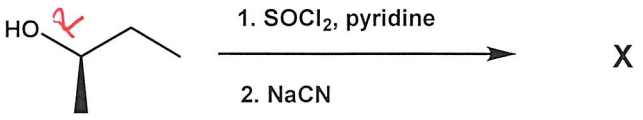
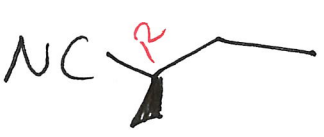
2) (15 points in total)

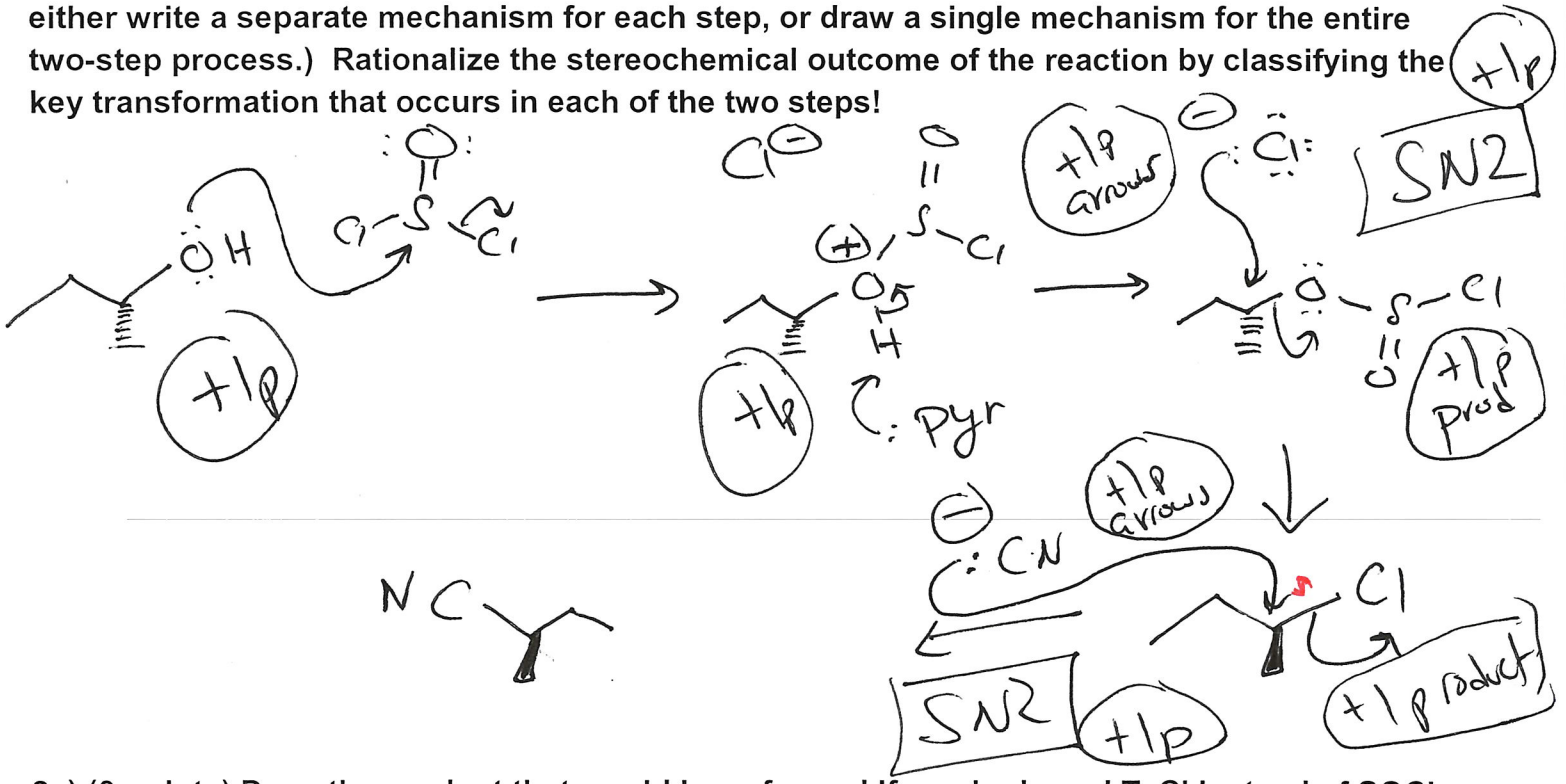
The following two-step reaction sequence gives a product X that contains cyanide, but does not contain a chloro-substituent or double bond!



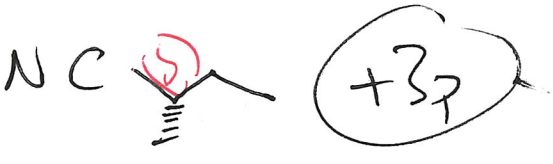
2a) (4 points) Draw the reaction product X with the correct stereochemistry!



2b) (8 points) Write a reaction mechanism (curved arrows) for this two-step process! (You can either write a separate mechanism for each step, or draw a single mechanism for the entire two-step process.) Rationalize the stereochemical outcome of the reaction by classifying the key transformation that occurs in each of the two steps!



2c) (3 points) Draw the product that would have formed if you had used TsCl instead of $SOCl_2$ in the first step.

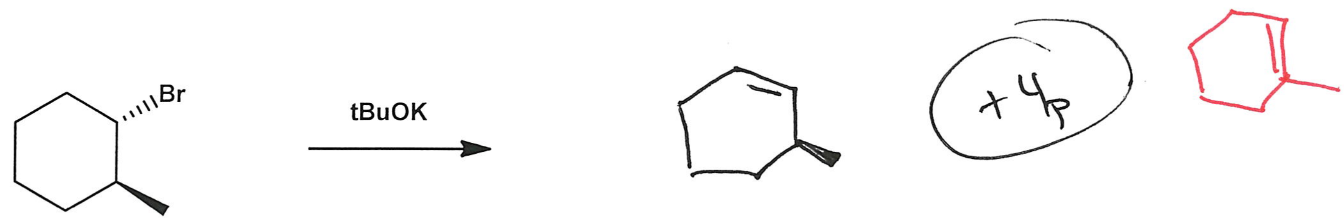


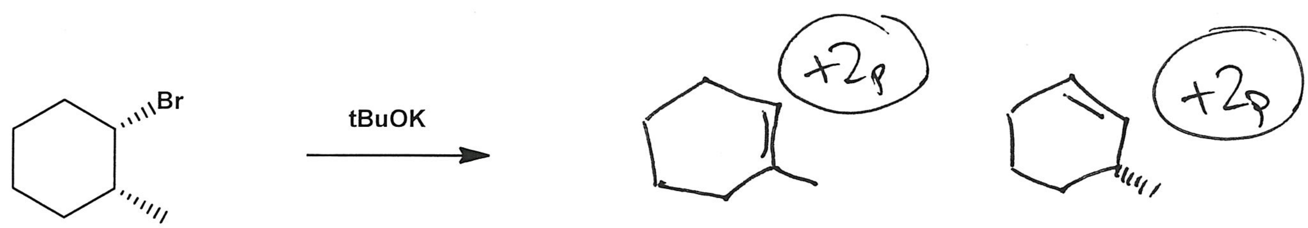
1 pt if only add TsCl (no NaCN)

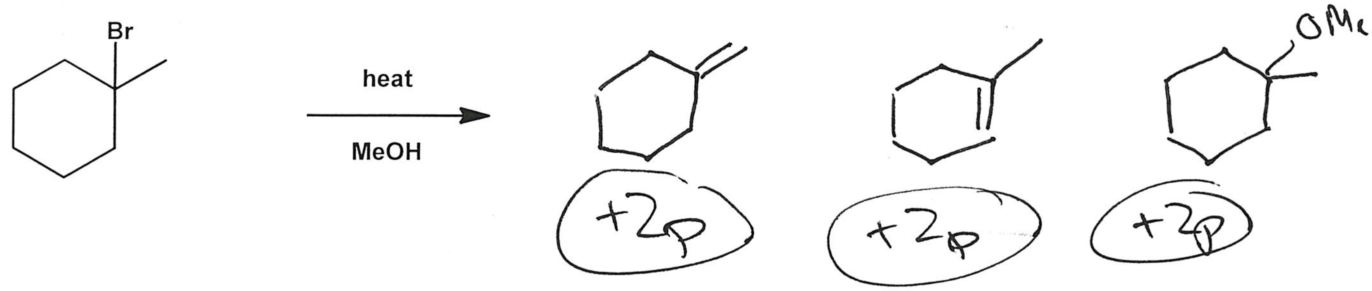
15 pts total

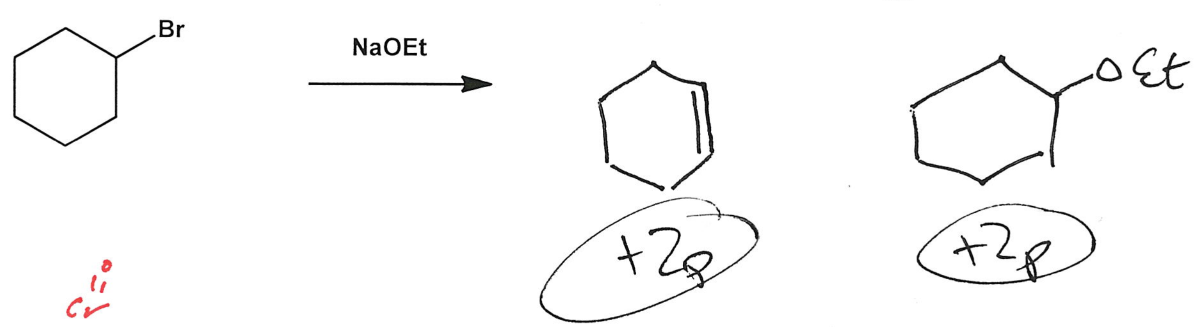
Name ____________________

3. (22 points) Draw <u>ALL</u> (!) reaction products of the following reactions!









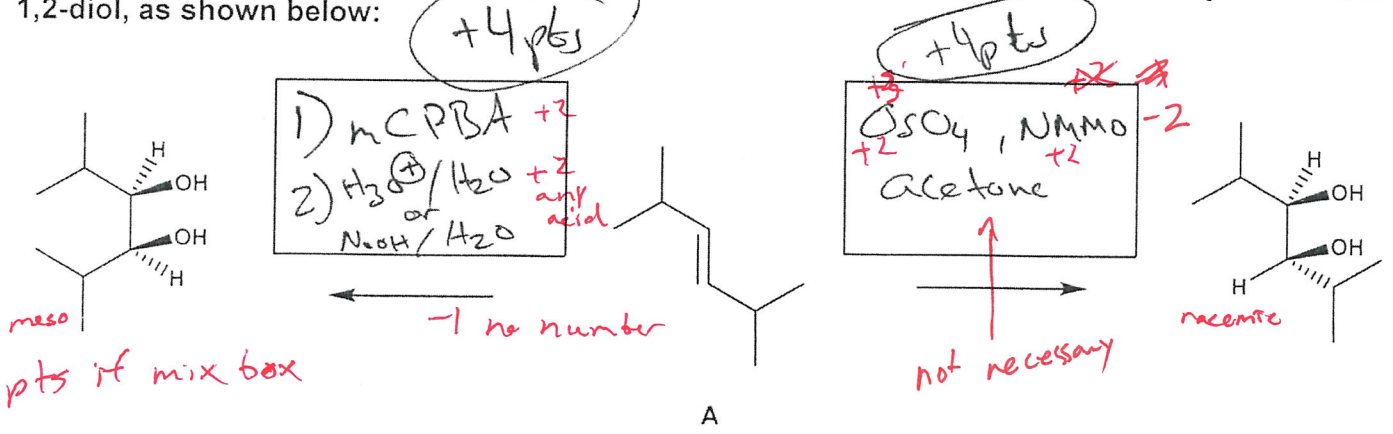
15
11

CrO_3 / $K_2Cr_2O_7$

22pts

Name _____ 00031

4) (10 points in total) (*E*)-2,5-Dimethyl-hex-3-ene (A) can be converted into both a *syn* and *trans* 1,2-diol, as shown below:



-1 no number

½ pts if mix box

not necessary

A

½ pts for correct reagents in wrong Boxes

a) (8 points) Draw in the boxes above the correct sequence of reactions needed to produce each product from A.

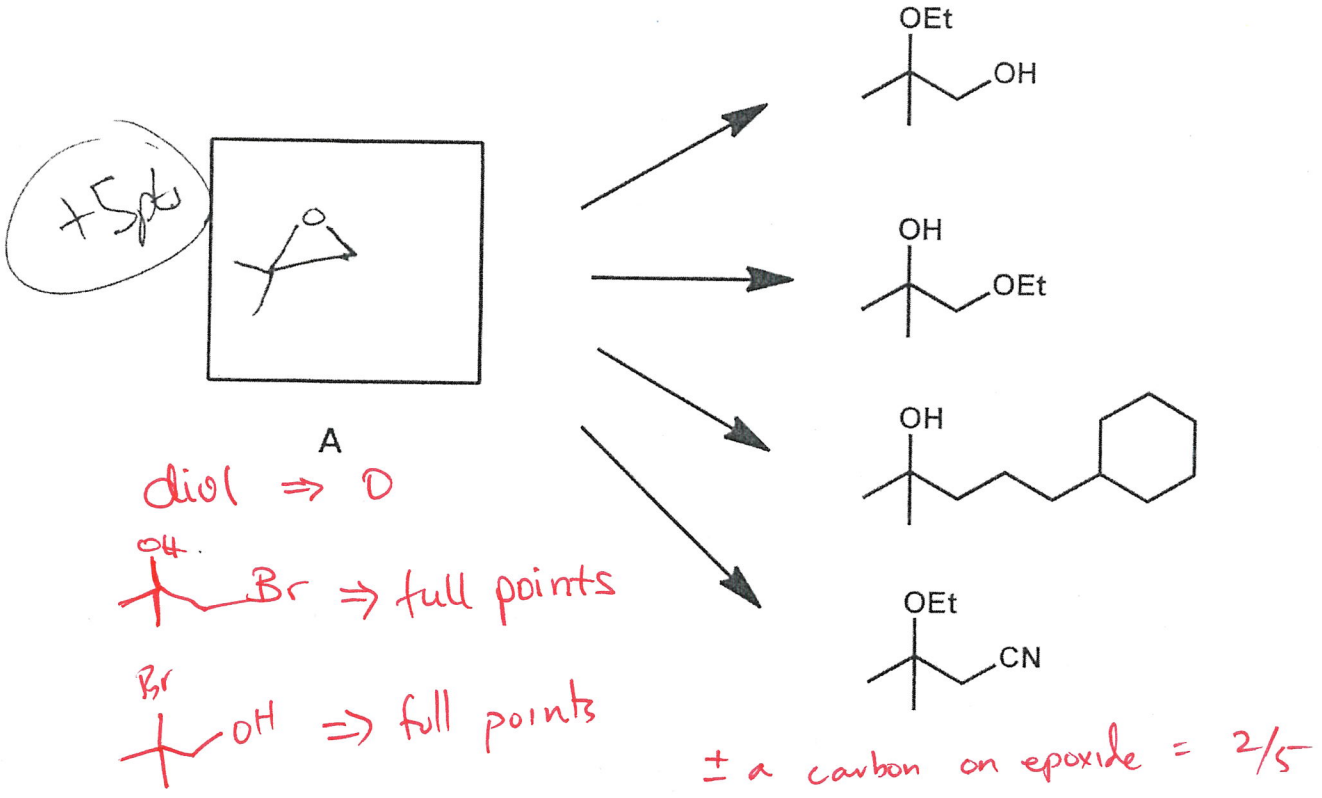
b) (2 points) Which of these two reaction sequences delivers a racemate?

OsO_4, NMMO, acetone +2 pts

full pts for indicating racemic prod

Name _____

5) (30 points in total) One very useful synthetic building block (i.e. starting material) A can be used to synthesize the following compounds. A does not contain a double bond!



+5pts

diol ⇒ 0

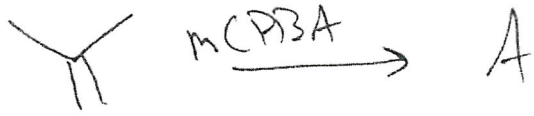
OH
Br ⇒ full points

Br
OH ⇒ full points

± a carbon on epoxide = 2/5

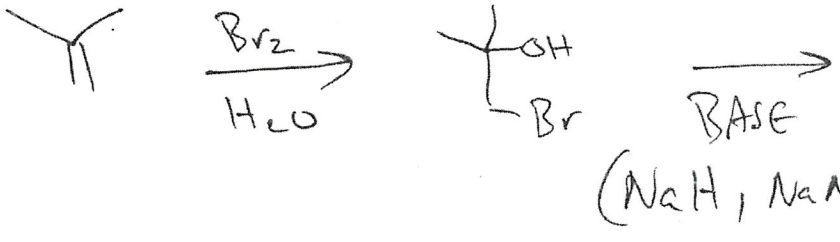
a) (5 points) Draw A in the box above! (It is not necessary to identify the reagents needed to produce the four products shown.)

b) (8 points) Propose two different ways to synthesize A, based on the reactions you have learned in class. Draw the starting material(s) you would use, as well as the reaction sequence needed to transform them to A.



+4 pts

2/4 for slightly incorrect



+4 pts

Credit given if answer to A is wrong but correct synthesis is given.

Name _____

c) (17 points) Propose a multi-step synthesis of compound C starting from compound B! You can use any reactions you have learned so far. Try to design a synthesis that uses the least possible number of reactions, and also try to choose reactions that are as selective as possible for a single product (i.e., does not give a mixture of products). Draw each intermediate product formed in this multi-step synthesis, with each reagent clearly shown over its own arrow. There is no need to show the reaction mechanism.