CHM 2123 — Pre-Lab Document

A study in pink and blue – Investigating the dihydroxylation mechanism of a cyclic alkene

Student(s) Name(s) and Number(s) : _____

Date: _____
Teaching Assistant: _____
Lab Period _____

COMMENTS

- Your completed pre-lab is submitted electronically *via Brightspace*.
- This pre-lab exercise can be completed individually or in pairs, with your assigned lab partner, to each student's preference. If done in pairs, each student must submit an identical copy of the pre-lab. Make sure to include both your names and student numbers above. Both students will receive the same marks and comments.
- **This pre-lab exercise is due 48 h after the beginning of your respective lab section on the week of September 28th.** o(For instance, a student in the 8:30 section on Tuesday morning should submit by Thursday at 8:30). Do not trust Brightspace's due date: since every students share the same Brightspace page, the due date found online is for the last section of the week.
- You only need to answer **Question 1 or 2**, depending on the reaction that was assigned to you.

- Answer the questions directly in the space provided.
- Late penalty is 20%/day, starting the moment the report is due and going up every 24h.

Point distribution

(Question 1		/7)
	OR	
(Question 2		/7)
Question 3		/4
Question 4		/2
Question 5		/3
Question 6		/2
Question 7		/2
Question 8		/2
Question 9		/3
TOTAL		**/25**

1)

If you are doing the permanganate-based dihydroxylation, fill the following reagent table. (**7 pts**)

Reagents	**Cyclohexene**	**$KMnO_4$**	**NaOH**
Molar Mass (g/mol)	**82.14**	**158.03**	**40.00**
Concentration / Density	**0.811 g/mL**	**--**	**0.1 M**
Volume (mL)		**--**	**20**
Mass (g)			**--**
mmols	**5.0 mmol**	**6.5 mmol**	**2.0 mmol**
Equivalents	**1.0 eq**		

a) How much methanol is required for the reaction?

b) To acidify the mixture at the end of the reaction, you want to add a three-fold excess of HCl in regards to the NaOH you initially added to the reaction. A 3M HCl solution will be provided: what volume will be required?

2)

If you are doing the *Oxone* (Dimethyldioxirane)-based dihydroxylation reaction, fill the following reagent table. (**7 pts**)

Reagents	Cyclohexene	Oxone
Molar Mass (g/mol)	**82.14**	**307.38**
Concentration / Density	**0.811 g/mL**	**--**
Volume (mL)	**0.51**	**--**
Mass (g)	**0.41**	**4.0**
mmols	**5.0 mmol**	**13.0 mmol**
Equivalents	**1.0 eq**	**2.6 eq**

a) How much acetone is required for the reaction?

5mL of acetone is required.

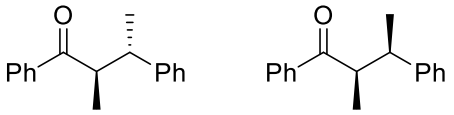
b) How much water is required to dissolve *Oxone*?

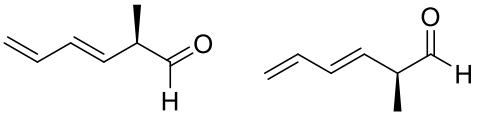
10.4mL of water is required to dissolve the oxone.

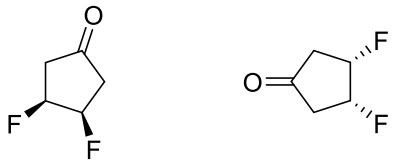
c) Assume that a drop of 12.5 M HCl is approximately 50 μL (or 0.05 mL). How many drops of concentrated acid should you add to the reaction mixture?

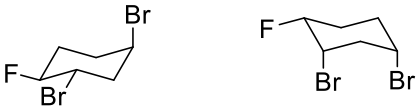
Approximately 20 drops of the concentrated acid should be added to the reaction.

3) Which of the following pair(s) of molecules should you be able to distinguish by TLC? For the pair(s) you cannot separate, provide a short answer as to why. (**4 pts**)

a) 

b) 

c) 

d) 

A and D are diastereomers.
B is an enantiomer.
C are meso compounds.

4) How would you normally visualize a TLC plate? Why is this method not applicable in the experiment at hand? (**2 pts**)

The TLC does not have the ability to use the p-conjugated system process so it cannot be lit under the UV light.

5) How will you visualize the TLC plate at the end of the experiment? Give a short description of the process involved. (**3 pts**)

The TLC plate is dipped in an acidic solution: p-anisaldehyde. It is removed and then dried off and heated on a foil. The TLC then produces coloured spots.

6) Define and distinguish **enantiomers** and **diastereomers**. (**2 pts**)

Enantiomers: Stereoisomers, non-superimposable mirror each other. They have the same chemical formula.

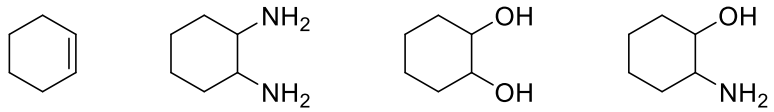
Diastereomers: Stereoisomers, not mirror images of each other, non-superimposable, and have some of the chiral images flipped.

7) For the first step of Mechanism 2 (Permanganate reaction) **or** Mechanism 5 (*Oxone* reaction) (pick one, based on the reaction you were assigned) as shown, identify both the nucleophile and the electrophile. (**2 pts**)

Nucleophile: The pi bond of the alkenes.

Electrophile: the dioxirane oxygen.

8) Rank the relative order of elution of the following sets of compounds, from the slowest eluting compound to the fastest, and explain your assignment. (**2 pts**)



1 **2** **3** **4**

3, 4, 2, 1

Alcohol is more polar than amines so they move slower.

9) For your respective reaction (Permanganate **or** Oxone), provide a short description on how you would expect the different species in solution at the end of the reaction to partition during the liquid-liquid extraction step. Explain your prediction. (**3 pts**)