

Organic Chemistry Laboratory I Final Exam December 10, 2015

Your Name _____

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1. In the nucleophilic substitution experiment, you ran the reaction using an aqueous solution of nucleophile (iodide or chloride ion). Explain how the results of the experiment would have differed if you had used acetone as the solvent instead. (10 pts)

chloride rxn would have been faster than iodide

- 2a. Describe how the apparatus of fractional distillation differs from that of simple distillation. (5 pts)

extra column with spores or packing material to create extra surface area

1 credit
2 both rxns are faster

- 2b. Explain how the apparatus of fractional distillation is able to achieve a more effective purification than the simple distillation apparatus. (10 pts)

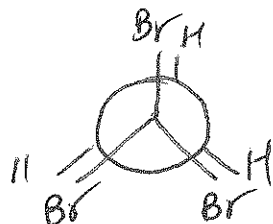
temp gradient + extra surface area
allowed for repeated condensation & vaporization cycles (multiple distillations)
thereby further purifying product beyond one single simple distillation

3. A student ran the dehydration reaction on 4-methylcyclohexanol. She then tested for the presence of unsaturation by adding 5 drops of product to 1 mL of bromine solution and observed the presence of a yellowish brown solution. Explain her observations. (10 pts)

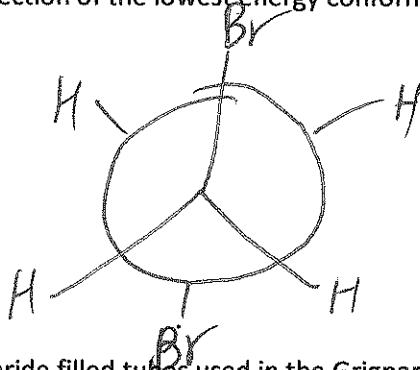
even though bromine reacts with product, bromine color is still observed because bromine is in excess



- 4a. Draw a Newman projection of the highest energy conformation of 1,1,1-tribromoethane. (7.5 pts)



- 4b. Draw a Newman projection of the lowest energy conformation of 1,2-dibromoethane. (7.5 pts)



- 5a. Why were calcium chloride filled tubes used in the Grignard experiment? (5 pts)

to remove moisture from the air so that air entering the apparatus is free of moisture

- 5b. Give one reason as to why it is hard to get a Grignard reaction started. (5 pts)

Mg is insol
Mg is coated with MgO
Mg is in large pieces (low surface area)
moisture destroys grignard reagent

6. A student attempted to recrystallize his semicarbazone derivative from the oxidation experiment:

He placed his impure derivative in a small flask, added 10 mL of ethanol and heated the solution to boiling on a steam bath. After observing all his derivative dissolve, the student removed the flask from the steam, allowed it to cool to room temperature and then placed it in an ice bath. The student allowed the flask to sit in the ice for 10 minutes, but did not observe any crystal formation.

What went wrong with this student's experiment? What should he have done differently? (10 pts)

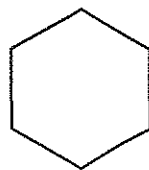
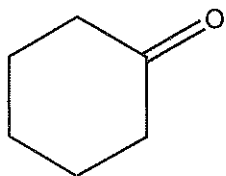
too much EtOH
add min., boiling solvent

7. In thin layer and column chromatography, the stationary phase is always hydrated alumina (Al_2O_3) or hydrated silica gel (SiO_2), while the mobile phase can be a variety of organic solvents. Explain why varying the organic solvent used does not affect the order of separation (elution) in thin layer and column chromatography. (10 pts)

because hydrated silica/alumina is highly polar and it has strong attractive force (H bonding) to solutes, it determines/dictates elution sequence.

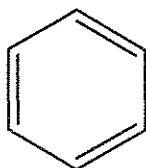
Solvent can only slightly speed or ~~not~~ not speed up polar solutes

8. Can the following two compounds be separated by extraction? Why or why not? (10 pts)



No. Both too similar in solubility — both are H_2O insol + organic sol.

9. Explain why n-hexane is more soluble in benzene than it is in methanol (CH_3OH). Be sure to discuss intermolecular forces in your explanation. (10 pts)



benzene

