**Organic Chemistry Laboratory I Final Exam December 11, 2014**

**Your Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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1. A student spotted a mixture of benzophenone and biphenyl on a TLC plate. She then developed the TLC plate in hexane and obtained the following result: (10 pts)

 TLC Plate after Hexane

Biphenyl

Benzophenone

* 1. Label the spots on the plate **above** to indicate which is benzophenone and which is biphenyl. 5 pts
	2. Fill in **below** what the developed plate would have looked like if the student had run the plate in **acetone** (2-propanone) instead of hexane. 5 pts

Biphenyl

Benzophenone

1. A student reacted 0.010 moles of bromobenzene with 0.010 moles of magnesium. He then added 0.005 moles of benzophenone. He ultimately obtained 0.001 moles of product, triphenylmethanol. (10 pts)
	1. What was his percent yield? 5 pts 100 (1 mmol / 5 mmol ) = 20%
	2. If the molecular weight of his product was 260, what was his experimental yield in grams? 5 pts

0.001 mol x 260 g/mol = 0.260 g

1. In the nucleophilic substitution reaction, you compared the rate of reaction of octyl bromide with two nucleophiles, iodide and chloride, and determined that the rate of the iodide reaction was faster. (15 pts)
	1. Explain how you determined which reaction was faster. 8 pts
	2. Why was the iodide reaction faster? 7 pts
2. The refractive index of each reaction mixture was measured and compared to a graph that plotted refractive index versus percent product. The reaction that had a greater percent product was determined to be the faster reaction.
3. Iodide is a stronger nucleophile in a protic solvent (chloride is more solvated).
4. A student is assigned to recrystallize 1 g of an unknown compound in ethanol. How should the student go about figuring out the proper amount of ethanol to use? (10 pts)

Put the unknown solid in a flask.

Add a little bit of ethanol to the flask. Warm the flask and bring the ethanol to a boil. Check to see if there is any undissolved solid remaining.

Repeat the steps of above paragraph until all the solid JUST dissolves.

1. Grignard Experiment (15 pts)
	1. In the Grignard experiment, you used *anhydrous* diethyl ether. What is *anhydrous* ether? Why was it used? 7 pts
	2. What was the purpose of heating your glassware with a Bunsen burner? 4 pts
	3. Explain why crushing the Mg with a stirring rod can help start the Grignard reaction. 4pts
2. Anhydrous ether is ether in which the dissolved water has been removed. Anhydrous ether must be used because water destroys the grignard reagent.
3. To remove any water coating the inner walls of the glassware.
4. More surface area is exposed/the outer coating of MgO gets scraped off.
5. Which of the following two compounds, fluorene or fluorenone, would be more soluble in methanol? Explain why, making sure to discuss **intermolecular forces** in your explanation. (10 pts)



Fluorenone is more soluble.

Both fluorene and fluorenone can interact with the nonpolar part of the methanol (the methyl group) via London dispersion forces (Van Der Waals interactions), but only the fluorenone can H bond to the methanol’s OH group. This strong intermolecular force will make fluorenone more soluble in methanol.

1. A student distilled a mixture of two unknowns whose boiling points differed by about 40oC. The student monitored the boiling point of the distillate and graphed her data (see below). (10 pts)
2. Circle the region of the graph in which the most pure material was distilling over. Explain why you believe this region represents the purest distillate.
3. Was the student conducting simple distillation or fractional distillation? Justify your answer.
	1. The region in which the temperature changes the least in the most pure region.
	2. The student was conducting simple distillation. The graph shows a steady increase in temperature throughout the distillation where the two compounds are not really resolved. This is because simple distillation is not effective enough to adequately separate two compounds whose boiling points differ by only 40 degrees.
4. What color change took place when Bromine was added to your 4-methylcyclohexene product? What chemical reaction was responsible for this color change? (10 pts)

The Bromine color (colored reddish or yellow) disappeared leaving a colorless solution.

Bromine reacted with the alkene to create a dibromide.

1. Which of the following conformers would you expect to be lower in energy? Why? (10 pts)



Different possible answers will be accepted:

1. The conformer on the right is lower in energy because it does not have a Cl – CH3 gauche interaction like the conformer on the left has. The Cl – CH3 gauche interaction raises the energy of the conformer on the right because Cl and CH3 are the largest groups.
2. The conformer on the right is lower in energy because it possesses on 1 gauche interaction whereas the conformer on the right possesses 2.