CHEMISTRY 209

Final

60 MINUTES
9 June 1999

Family Name _____
First Name _____
ID Number _____
Section _____

Question 1 [26 marks]
Complete each of the following statements:

I. _____ is a non-reducing sugar

II. The oxidation of toluene with $KMnO_4$ gives_____

III. Two sources of error in melting point determination are_____ and_____

IV. The reaction of toluene with Br_2/NaOH to give benzoic acid is known as the _____ reaction.

V. Colored impurities can be removed from solid by the use of _____

VI. Two or more liquids which form a constant boiling mixture with a fixed composition of the components is known as a _____ mixture

VII. Bromine can be used to test for the presence of a carbon-carbon _____ bond.

VIII. Calcium chloride can be used as a_____ agent to remove water.

IX. A mixture of benzene (bp. 80°C) and toluene (bp. 110°C) can best be separated by _____ distillation.

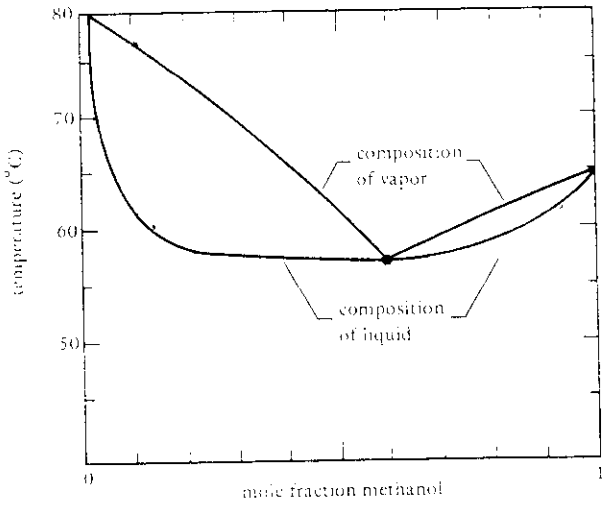
X. Chemical reactions can be monitored for completion by _____ _____.

Question 2 [4 marks]
Explain which has the greater dipole moment, o-nitroaniline or p-nitroaniline. use structures to explain your answer.

Question 3 [24 marks]

A. Estimate from the figure below the boiling point of a mixture of benzene and methanol that is 0.1 mole fraction in methanol. ____ _____
What would be the composition of the vapor in equilibrium with this mixture at the boiling point? _____

B. Estimate from the figure below the boiling point of a mixture of benzene and methanol that is 0.1 mole fraction in benzene. _____
What would be the composition of the vapor in equilibrium with this mixture at the boiling point? _____



C. Benzene and toluene form a solution which is nearly ideal. Given the following data, in a solution containing 0.5 mole fraction of benzene, calculate the composition of the vapor at 80°C:
Vapor pressure of benzene=753 mmHg
Vapor pressure of toluene=290 mmHg

Question 4 [18 marks]

Aspirin can be made by treating salicylic acid with acetic andydride according to the procedure described in the laboratory manual for chemistry 209. Assume the experiment calls for 10 grams of salicylic acid and 20 ml of acetic anhydride:

I. Write a balanced equation for the reaction

II. Calculate the number of moles of salicyclic acid and of acetic anhydride (density 1.08 g/ml) that will be put into the flask.

III. Which of these substances will determine the maximum amount of product that will be produced? That is, which substance is the limiting reagent?

IV. What is the maximum amount (moles and grams) of aspirin that could be formed in the experiment?

Question 5 [16 marks]

Tick the correct answer

Marks will be deducted for ticking an incorrect answer

Which of the following matches the definition of aldohexose?

A is a monosaccharide
B is a disaccharide
C contains a -CHO group
D is a nonreducing sugar
E contains a -CO- group

α-D-glucose and β-D-glucose are:

A tautomers
B anomers
C epimers
D aldohexose

Question 6 [12 marks]

A mixture contains 95% by weight A and 5% by weight B. Assume you must obtain pure A by recrystallization of a 100 gram sample of the mixture.

What is the minimum amount of solvent necessary for the recrystallization? What % of A in the sample should crystallize out upon cooling of the hot solution? Assume the solubilities are:

	Hot		**Cold**
A	10g/100ml	B	2g/100ml
B	10g/100ml	A	2g/100ml