DEPARTMENT OF MEDICINAL CHEMISTRY
SCHOOL OF PHARMACY
1 HR EXAM

Medicinal Chemistry I — MEDC 501
Dr. Umesh R. Desai — September 20, 2007

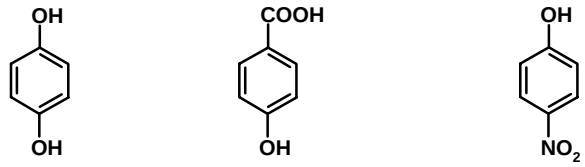
STUDENT NAME **HONOR PLEDGE**

	IV	V	VI	VII
2	C	N	O	F
3	Si	P	S	Cl
4	Ge	As	Se	Br
5	Sn	Sb	Te	I

***Instructions**: Answer all questions. Points are listed on the right hand side.*

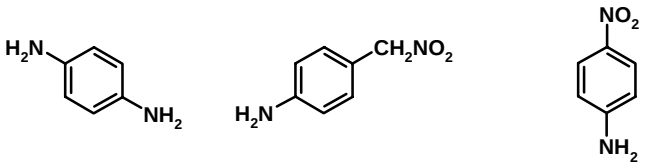
1. Rank the following molecules/ions in each series according to their acidity. If more than one pK_A value exists for a molecule/ion, use the lower pK_A value. Use 1 for most acidic, 2 for next most acidic and so on. (6 pts)

a)



3 **1** **2**

b)

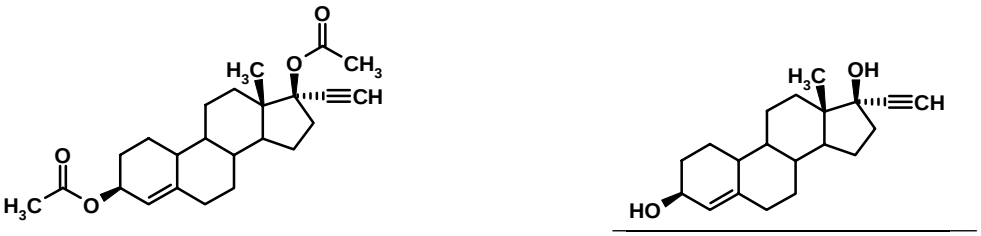


3 **2** **1**

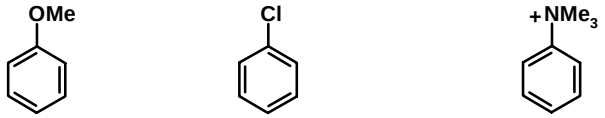
2. The following drugs undergo complete hydrolysis at pH 7.2–7.4. Draw the structure of product(s) formed in appropriate ionic form(s). (8 pts)

a)

b)



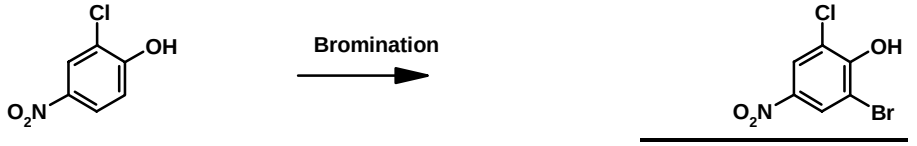
3. Rank the following molecules according to their ability to undergo nitration with HNO_3/H_2SO_4. (6 pts)



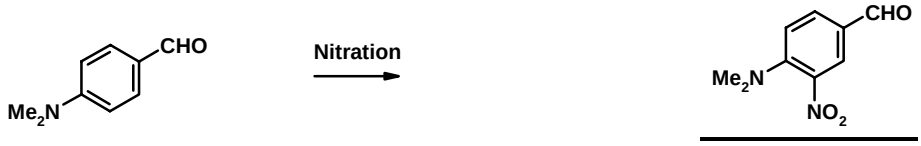
1 **2** **3**

4. Write the structure of the pre-dominant product(s) obtained in the following electrophilic aromatic substitution reactions. (8 pts)

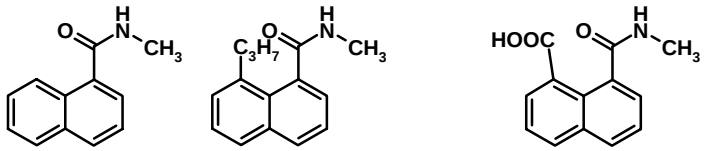
a)



b)

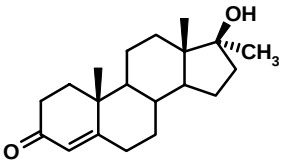


5. Rank the following molecules according to their ability to hydrolyze faster in water at pH 6.0. Use 1 for fastest hydrolysis, 2 for next fastest and so on. (6 pts)

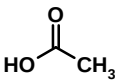


2 **3** **1**

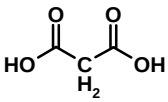
6. 17α-methyltestosterone (structure below) is an androgenic agent. A scientist wants to make it more water soluble to prepare for an intravenous injection. Of the three acids available to you – acetic acid, succinic acid and citric acid (structure below) for converting the drug into its ester form, which would be most preferable to rapidly solubilize 17α-methyltestosterone? Circle the answer. (3 pts) What should be the pH of the solution? (3 pts) (total 6 pts)



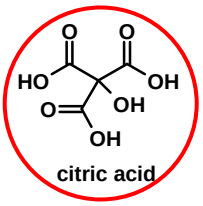
17a-methyltestosterone



acetic acid



succinic acid



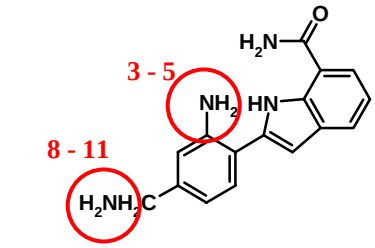
citric acid

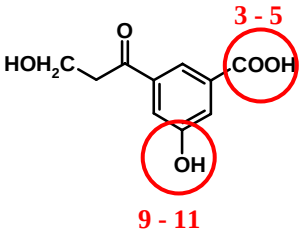
The pH of the solution should be **6 - 8**.

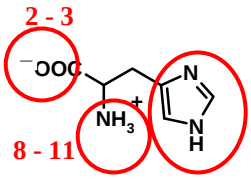
7. According to the Arrhenius equation, the factors that determine the rate of a chemical reaction include **concentration, temperature, activation energy, and probability of productive attack/orientation of collision/probability of appropriate attack**. (4 pts)

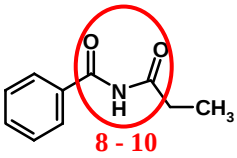
8. The reason why carboxylic acid amides are more stable to basic hydrolysis than carboxylic acid ester is **the lone pair on nitrogen atom of the amides conjugates with the carbonyl group thus forming a resonance structure in which the C – N bond carries a partial double bond character, which is absent in carboxylic acid esters.** (4 pts)

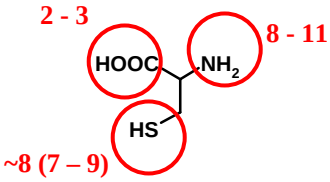
9. Circle ionizable functional group(s) in the following compounds and write the expected pK_A value by its side. If the compound does not have an ionizable functional group (pK_A between 0 and 14), write either neutral or N/A. **Note: -1 point for every wrong answer.** (10 pts)





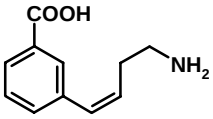




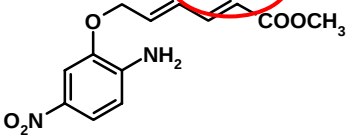


10. Indicate whether the following compounds would be soluble or insoluble (circle the appropriate word) at pH 7.0. (16 pts)

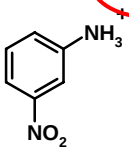
A) Soluble, Insoluble



B) Soluble, Insoluble

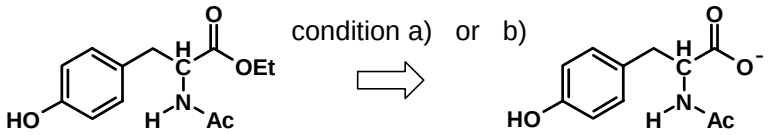


C) Soluble, Insoluble



D) Soluble, Insoluble

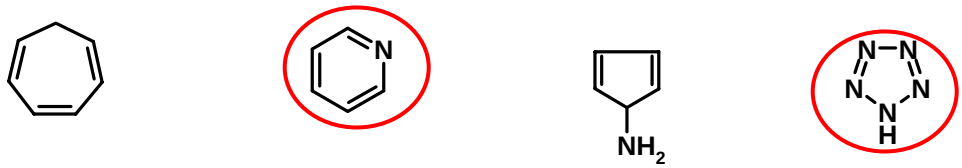
11. Which of the following hydrolytic reactions will be faster? Circle either a) or b) (4 pt)



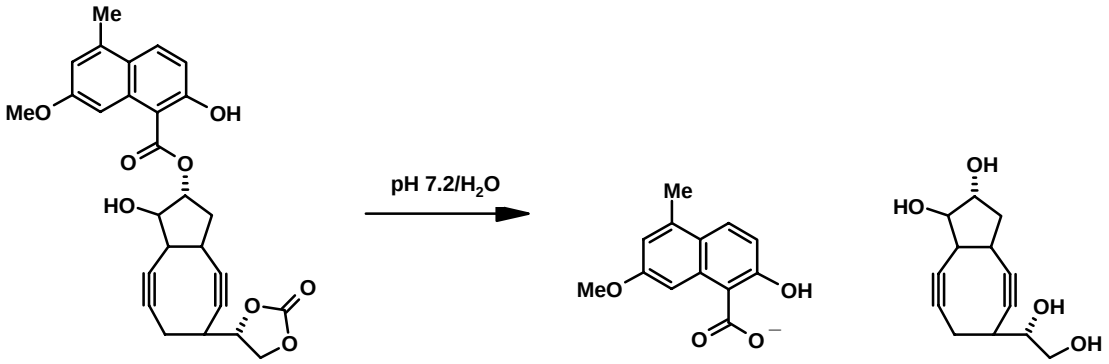
a) pH 12, OH^-/H_2O

b) Chymotrypsin, pH 7.2

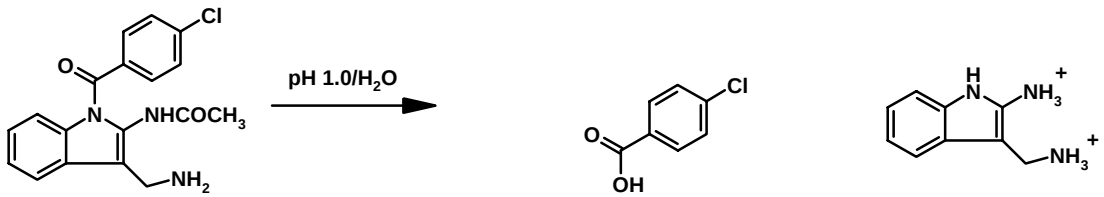
12. Circle the molecules from below that are aromatic? **Please note: -2 point for every wrong molecule identified.** (4 pt)



13. Draw the structures of the products **A** through **F** in the following hydrolytic reactions. Draw each product in its appropriate ionized form. **Please note: Formation of a small molecule, e.g., CO_2, NH_3, CH_3COOH, etc. is not to be considered as a product.**



(7 pts)



(7 pts)

(4 pts)