CHEMISTRY 130 BL QUIZ 1 (Aldol Reaction/Diels-Alder)
Fall 1998 (10-12-98)

Fill out the following information completely or you will loose 5 points. Please indicate who your TA is or in which section you are. It would be also nice if you could write legible. You have 10 minutes to complete the quiz. Good luck.

First letter of your last name:
Full Name:
UCLA I.D.#:
Section/TA: Zhe   Joe   Thuc   (Alf)

1. Aldol Reaction

a) Why did you have to use ~~absolute ethanol~~ in the Aldol reaction? **Explain briefly. (2 points)**

The presence of water does not allow you to form an enolate, because the enolate is a strong base

$$Enolate^{\ominus} + H_2O \rightleftharpoons Enol + OH^{\ominus}$$

b) Which color does the final product have? What is the melting point (+/- 5 C)? **(2 points)**

color: purple (black)   Melting point: 219-220°C

e) What drive the reaction towards the formation of the Tetrapheylcyclopentadienone? **(3 points)**

1) Entropy driven (2 molecules → 3 molecules)
2) Intramolecular second step.
3) Higher degree of conjugation in product

2) Diels-Alder Reaction

a) Why do you use 1,2-dimethoxyethane and not diethyl ether as solvent? Explain briefly.
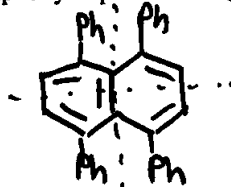   **(3 points)**

The reaction is entropy driven (formation of CO_2, N_2, CO). Higher boiling point of solvent promotes the reaction according to

$$\Delta G = \Delta H - T\Delta S, \quad \Delta S >> 0 \Rightarrow \Delta G << 0$$

b) How many signals in the ^{13}C-NMR spectrum do you expect for 1,2,3,4-Tetraphenyl-naphthalene? How many for 1,4,5,8-Tetraphenylnaphthalene? **(2 points)**
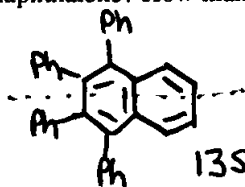
13 Signals

(free rotation)

7 Signals

c) What is the most important change in the IR spectrum, when you go from Tetraphenylcyclo-pentadienone and anthranilic acid to 1,2,3,4-Tetraphenylnaphthalene? (mode + appr. wavenumber) **(2 point).**

The carbonyl stretch at ~1700 cm^{-1} disappears!

2. Predict the products of the following reactions (12 points).

o-phthalaldehyde (benzene ring with two CHO groups) + $CH_3CH_2COCH_2CH_3$ $\xrightarrow{\text{NaOEt}}$ bicyclic dimethyl tropone product **60%**

benzaldehyde (benzene ring with CHO) + $CH_3COCH_2CH_3$ $\xrightarrow[\text{acid catalysis!}]{\text{HCl}}$ $\text{Ph}-CH=C-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ with CH_3 branch **70%**

octahydronaphthalene diene + dimethyl acetylenedicarboxylate (COOMe / COOMe on triple bond) $\longrightarrow$ phenanthrene-type product with COOMe, COOMe

anthracene + maleic anhydride (5-membered ring with two O's and central O) $\longrightarrow$ Diels-Alder adduct (triptycene-like bridged structure with two H's)