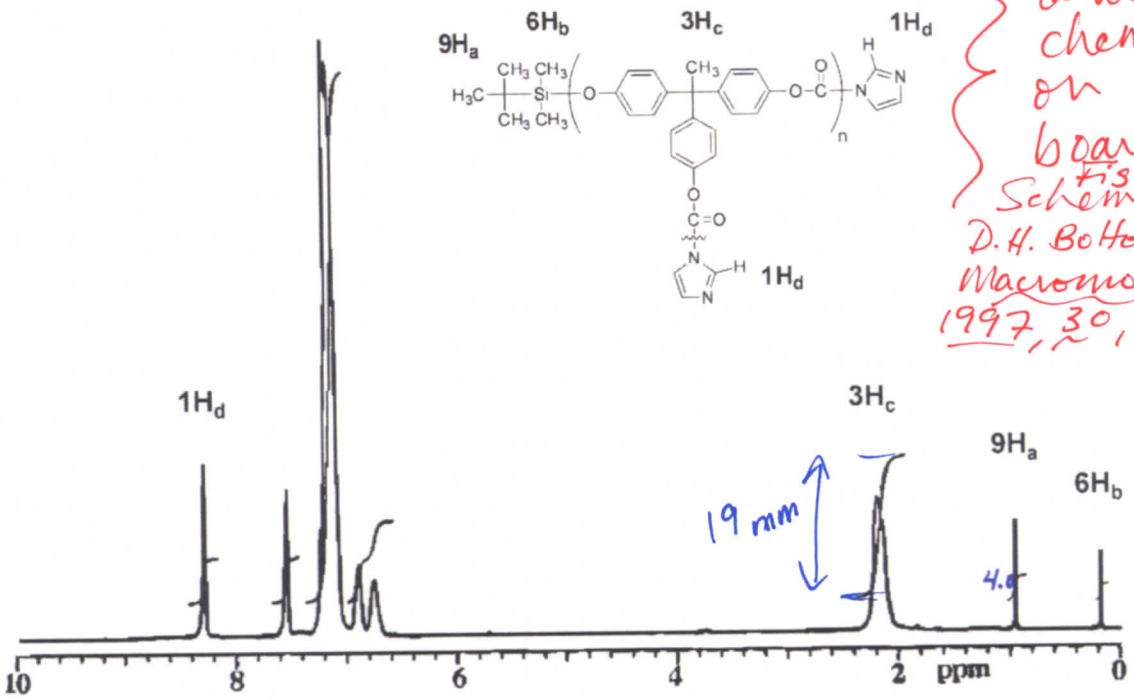
2011
Exam II
Chem 466

Name: ANSWER KEY [printed]

2. For the polycarbonate structure and ^{1}H NMR spectrum given:

NTS: draw this chemistry on board + show Figure 1 + Scheme 3 of D.H. Bolton + K.L. Wooley Macromolecules 1997, 30, 1890-1896



[you can see that $3H_c$ is actually $(3n)H_c$ and $1H_d$ is actually $(1n+1)H_d$]

(a) Determine the degree of polymerization. [15 points]

use $9H_a$ or $6H_b$ for det'm of chain end relative #

for $9H_a$: $9H_a = 4.0\,mm \Rightarrow H_a = 0.44$

use $3H_c$ or $1H_d$ for det'm of repeat units (H_d complicated by 1 chain end too)

for $3H_c$: $3H_c = 19\,mm \Rightarrow H_c = 6.33$ $\quad \frac{H_c}{H_a} = 14.4 \Rightarrow DP_n = 14$

(b) Calculate the number-average molecular weight. [10 points]

repeat unit is $C_{25}H_{18}N_2O_5$; ignoring isotopic abundances,

repeat unit mass = 426 g/mol

chain ends are $C_6H_{15}Si$, mass = 115 g/mol

$C_3H_3N_2$, mass = 67 g/mol

$M_n = 14(426\,g/mol) + 115\,g/mol + 67\,g/mol$

$= 6146\,g/mol$

w/2 sig figs

$\Rightarrow 6100\,g/mol$