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

![NMR Spectrum Image]

1H, 3H, 9H, 6H, 1H, and 3H peaks are labeled.

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

Use $9H_a$ or $6H_b$ for determination of repeat units.

For $9H_a$: $9H_a = 49\text{ppm} \Rightarrow D_P = 0.44$

Use $3H_c$ or $1H_d$ for determination of repeat units (complicated by chain end).

For $3H_c$: $3H_c = 19\text{ppm} \Rightarrow D_P = 6.33$

$$\frac{H_c}{H_a} = 14.4 \Rightarrow D_P = 14$$

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

Repeat unit is $C_{25}H_{18}N_2O_5$; ignore isotopic abundance.

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

$\frac{1}{2}$ of $67$ g/mol = 6146 g/mol

Total mass = 426 g/mol + 115 g/mol + 3 × 67 g/mol = 6100 g/mol