

3.091 Fall Term 2002
Homework Quiz #4B
solution outline

Calculate the energy required to break the strongest bond in Freon 12 (CCl_2F_2).
Bond Energies (kJ/mol): Cl-Cl 240; F-F 160; C-C 350.

use the Pauling formula to calculate bond energies

consider C-Cl

$$E_{\text{C-Cl}} = \sqrt{E_{\text{C-C}} \times E_{\text{Cl-Cl}}} + 96.3(\chi_{\text{C}} - \chi_{\text{Cl}})^2 = \sqrt{350 \times 240} + 96.3(2.55 - 3.16)^2 = 326 \text{ kJ/mol}$$

consider C-F

$$E_{\text{C-F}} = \sqrt{E_{\text{C-C}} \times E_{\text{F-F}}} + 96.3(\chi_{\text{C}} - \chi_{\text{F}})^2 = \sqrt{350 \times 160} + 96.3(2.55 - 3.98)^2 = 433 \text{ kJ/mol}$$

C-F is the stronger bond. It takes 433 kJ/mol to break it.