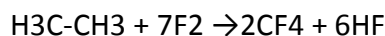


Answer on Question #63403, Chemistry / General Chemistry

Use average bond energies to estimate the energy change (in kJ/mol) for the reaction (all bonds are single bonds except as noted):



Solution:

Bond enthalpies (in kJ/mol): C-C (347); C-H (413); H-H (432); F-F (155); C-F (485); H-F (565).

Hess' Law for bond enthalpies is:

$$\Delta H = \sum E_{\text{reactant bonds broken}} - \sum E_{\text{product bonds broken}}$$

On the reactant side, we have these bonds broken:

$$\Sigma [\text{one C-C bond} + \text{six C-H bonds} + \text{seven F-F bonds}]$$

$$\Sigma [347 + (6 \times 413) + (7 \times 155)] = 3910 \text{ kJ/mol}$$

On the product side, we have these bonds broken:

$$\Sigma [\text{eight C-F bond} + \text{six H-F bonds}]$$

$$\Sigma [(8 \times 485) + (6 \times 565)] = 7270 \text{ kJ/mol}$$

Using Hess' Law, we have:

$$\Delta H = 3910 - 7270 = -3360 \text{ kJ/mol}$$

Answer: -3360 kJ/mol

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