Contoh soal untuk Perhitungan Panas Reaksi dengan Energi Ikatan

Problem:

Estimate the change in enthalpy, ΔH, for the following reaction:

H_2 (g) + Cl_2 (g) → 2 HCl (g)

Solution:

To work this problem, think of the reaction in terms of simple steps:

Step 1 The reactant molecules, H_2 and Cl_2, break down into their atoms

H_2(g) → 2 H(g)
Cl_2(g) → 2 Cl(g)

Step 2 These atoms combine to form HCl molecules

2 H (g) + 2 Cl (g) → 2 HCl (g)

In the first step, the H-H and Cl-Cl bonds are broken. In both cases, one mole of bonds is broken. When we look up the single bond energies for the H-H and Cl-Cl bonds, we find them to be +436 kJ/mol and + 243 kJ/mol, therefore for the first step of the reaction:

ΔH1 = +(436 kJ + 243 kJ) = +679 kJ

Bond breaking requires energy, so we expect the value for ΔH to be positive for this step.
In the second step of the reaction, two moles of H-Cl bonds are formed. Bond breaking liberates energy, so we expect the ΔH for this portion of the reaction to have a negative value. Using the table, the single bond energy for one mole of H-Cl bonds is found to be 431 kJ:

ΔH_2 = -2(431 kJ) = -862 kJ

By applying Hess's Law, $\Delta H = \Delta H_1 + \Delta H_2$

ΔH = +679 kJ - 862 kJ
ΔH = -183 kJ

Answer

The enthalpy change for the reaction will be ΔH = -183 kJ.

Reference: http://chemistry.about.com/od/workedchemistryproblems/a/bondenergyexmpl.htm