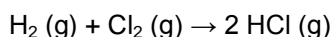


## Contoh soal untuk Perhitungan Panas Reaksi dengan Energi Ikatan

### Problem:

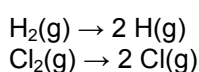
Estimate the change in enthalpy,  $\Delta H$ , for the following reaction:



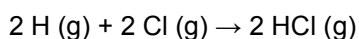
### Solution:

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

**Step 1** The reactant molecules,  $\text{H}_2$  and  $\text{Cl}_2$ , break down into their atoms



**Step 2** These atoms combine to form HCl molecules



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:

$$\Delta H_1 = +(436 \text{ kJ} + 243 \text{ kJ}) = +679 \text{ kJ}$$

Bond breaking requires energy, so we expect the value for  $\Delta H$  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  $\Delta H$  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:

$$\Delta H_2 = -2(431 \text{ kJ}) = -862 \text{ kJ}$$

By applying [Hess's Law](#),  $\Delta H = \Delta H_1 + \Delta H_2$

$$\begin{aligned}\Delta H &= +679 \text{ kJ} - 862 \text{ kJ} \\ \Delta H &= -183 \text{ kJ}\end{aligned}$$

### Answer

The enthalpy change for the reaction will be  $\Delta H = -183 \text{ kJ}$ .

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