

Calculations using standard enthalpies of formation ($\Delta_f H^\ominus$)

Use the standard enthalpies of formation ($\Delta_f H^\ominus$) given in the table to calculate the following:

1. The enthalpy of solution of hydrogen bromide gas.
2. The enthalpy of hydrogenation of benzene to cyclohexane.
3. The enthalpy of decomposition of calcite (calcium carbonate) to quicklime.
4. The heat evolved when quicklime is slaked.
5. The heat evolved when calcium carbide is decomposed by water to form ethyne and calcium hydroxide.
6. The enthalpy change when phosphorus trichloride reacts with excess chlorine to form the pentachloride.
7. The enthalpy change for the oxidation of sulphur to sulphur dioxide.
8. The heat evolved in the second stage of the Contact Process, in which sulphuric acid is formed by reacting sulphur trioxide with water.
9. The enthalpy change for the production of bromoethane and water from ethanol and aqueous hydrogen bromide.
10. The heat evolved when bromine adds to ethene.

Compound	$\Delta_f H^\ominus / \text{kJ mol}^{-1}$	Compound	$\Delta_f H^\ominus / \text{kJ mol}^{-1}$
$\text{H}_2\text{O}_{(l)}$	-285.6	$\text{CaO}_{(s)}$	-634.9
$\text{CO}_{2(g)}$	-393.1	$\text{Ca}(\text{OH})_{2(s)}$	-985.6
$\text{C}_2\text{H}_{2(g)}$	+226.5	$\text{CaCO}_{3(s)}$	-1205.7
$\text{C}_6\text{H}_{6(l)}$	+82.8	$\text{SO}_{2(g)}$	-296.6
$\text{C}_6\text{H}_{12(l)}$	-123.0	$\text{SO}_{3(g)}$	-394.8
$\text{C}_2\text{H}_{4(g)}$	+52.2	$\text{H}_2\text{SO}_{4(l)}$	-810.5
$\text{C}_2\text{H}_5\text{OH}_{(l)}$	-277.4	$\text{PCl}_{3(g)}$	-306.1
$\text{C}_2\text{H}_5\text{Br}_{(l)}$	-85.3	$\text{PCl}_{5(g)}$	-398.6
$\text{C}_2\text{H}_4\text{Br}_{2(l)}$	-80.7	$\text{HBr}_{(g)}$	-36.2
$\text{CaC}_{2(s)}$	-62.7	$\text{HBr}_{(aq)}$	-101.8