

ENTHALPY

Enthalpy change: The ΔH in kJ mol^{-1} between the reactants and the products.

Exothermic reactions: ΔH is negative. Energy is transferred from the system to the surroundings. This means the surroundings will get warmer.

Endothermic reactions: ΔH is positive. Energy is transferred from the surroundings to the system. This means the surroundings will get cooler.

Enthalpy change diagrams:

Exothermic:

Endothermic:

Standard enthalpy changes:

Standard conditions:

Enthalpy change of a reaction:

Enthalpy change of formation:

Enthalpy change of combustion:

Enthalpy change of neutralisation:

Average Bond enthalpy:

Calculating enthalpy change through bond enthalpies:

To calculate the enthalpy change of a reaction by using bond enthalpy data the formula is:

Single Bonds							
C—H	413	N—H	391	O—H	463	F—F	159
C—C	348	N—N	163	O—O	146		
C—N	293	N—O	201	O—F	190	Cl—F	253
C—O	358	N—F	272	O—Cl	203	Cl—Cl	242
C—F	485	N—Cl	200	O—I	234		
C—Cl	328	N—Br	243			Br—F	237
C—Br	276			S—H	339	Br—Cl	218
C—I	240	H—H	436	S—F	327	Br—Br	193
C—S	259	H—F	567	S—Cl	253		
		H—Cl	431	S—Br	218	I—Cl	208
Si—H	323	H—Br	366	S—S	266	I—Br	175
Si—Si	226	H—I	299			I—I	151
Si—C	301						
Si—O	368						
Multiple Bonds							
C=C	614	N=N	418	O=O	498		
C≡C	839	N≡N	945				
C=N	615			S=O	323		
C≡N	891			S=S	418		
C=O	804*						
C≡O	1076						

Using the data above, calculate the enthalpy change when methane is fully combusted in oxygen:

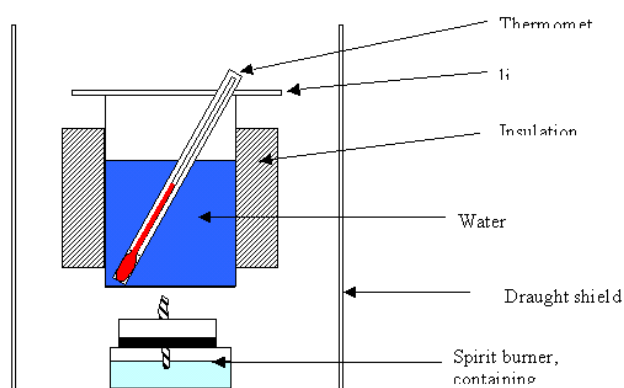
The combustion of water:

Calculating enthalpy changes via experiments or experimental data:

The energy change in a reaction can be calculated using the formula:

Calculating the enthalpy change of combustion from experimental data:

An experiment can be set up as shown below to determine enthalpy change of combustion data for different substances.



If we know the mass of solution being heated, the specific heat capacity and the temperature change we can calculate the energy released in the reaction:

Mass of water =

Temp rise =

If we know the mass of fuel lost we can calculate the enthalpy change of combustion using:

Mass of fuel used =

The enthalpy change of combustion found experimentally often differs from the data booklet value, why?

Enthalpy change of neutralisation calculation:

When 50cm³ of HCl is added to 50cm³ of NaOH the temperature rises by 6.2 C'.

Calculating the enthalpy change of solution of NaOH from graphical data:

