

11. Bond enthalpies and average bond enthalpies at 298 K

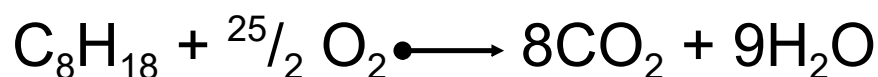
Single bonds (kJ mol^{-1})

	Br	C	Cl	F	H	I	N	O	P	S	Si
Br	193	285	219	249	366	178		201	264	218	330
C	285	346	324	492	414	228	286	358	264	289	307
Cl	219	324	242	255	431	211	192	206	322	271	400
F	249	492	255	159	567	280	278	191	490	327	597
H	366	414	431	567	436	298	391	463	322	364	323
I	178	228	211	280	298	151		201	184		234
N		286	192	278	391		158	214			
O	201	358	206	191	463	201	214	144	363		466
P	264	264	322	490	322	184		363	198		
S	218	289	271	327	364					266	293
Si	330	307	400	597	323	234		466		293	226

Multiple bonds (kJ mol^{-1})

C=C 614	C≡N 890	N≡N 945
C≡C 839	C=O 804	N=O 587
C=C 507 (in benzene)	C=S 536	O=O 498
C=N 615	N=N 470	S=S 429

Calculate the enthalpy of combustion for octane



$$\Delta H = \Sigma \text{ bond energies broken} - \Sigma \text{ bond energies made}$$

$$= (18\text{C-H} + 7\text{C-C} + \frac{25}{2}\text{O=O}) - (16\text{C=O} + 18\text{O-H})$$

$$= (18 \times 414 + 7 \times 346 + \frac{25}{2} \times 498) - (16 \times 804 + 18 \times 463)$$

$$= 16099 - 21198 = -5099 \text{ KJ mol}^{-1}$$