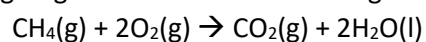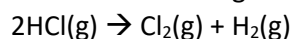Video worksheet – thermochemical equations – bond energies (year 10)

1. Calculate an estimated value for the enthalpy change (ΔH) of the following combustion reaction based on the bond energies given in the table on the right.

    $$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

    Single Bond Energies (kJ/mol of bonds)

	H	C	N	O	S	F	Cl	Br	I
H	436								
C	413	346							
N	391	305	163						
O	463	358	201	146					
S	347	272	—	—	226				
F	565	485	283	190	284	155			
Cl	432	339	192	218	255	253	242		
Br	366	285	—	201	217	249	216	193	
I	299	213	—	201	—	278	208	175	151

    Multiple Bond Energies (kJ/mol of bonds)

C=C 602	C=N 615	C=O 799
C≡C 835	C≡N 887	C≡O 1072
N=N 418	N=O 607	
N≡N 945	O=O 498	

2. Calculate an estimated value for the enthalpy change (ΔH) of the following reaction based on the bond energies given in the table on the right.
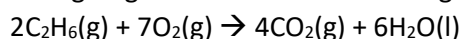
    $$2HCl(g) \rightarrow Cl_2(g) + H_2(g)$$

3. Calculate an estimated value for the enthalpy change (ΔH) of the following combustion reaction based on the bond energies given in the table on the right.

    $$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(l)$$

4. Calculate an estimated value for the enthalpy change (ΔH) of the complete combustion reaction of ethene (C_2H_4) in oxygen gas using the bond energies given in the table on the right.