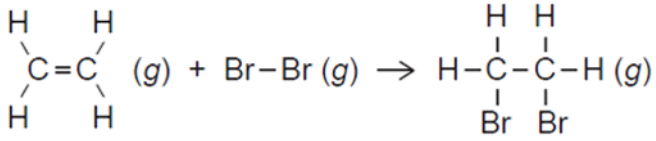
Writing Excellence answers to **Bond enthalpy** questions

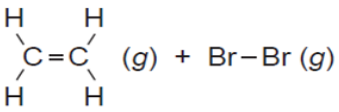
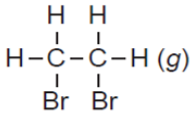
Bond enthalpy QUESTION

Question: Ethene gas, $C_2H_{4\,(g)}$, reacts with bromine gas, $Br_{2(g)}$, as shown in the equation below.
Calculate the enthalpy change, $\Delta_rH°$, for the reaction between ethane and bromine gases, given the average bond enthalpies in the table below. Show your working and include appropriate units in your answers.



Bond	Average bond enthalpy/kJ mol^{-1}
Br–Br	193
C–C	346
C=C	614
C–Br	285
C–H	414

ANSWER

1. list types of bonds for reactants (bonds broken) and products (bonds formed) AND number of each, in a table. Watch for double or triple bonds as these are separate (Draw Lewis structures if not given)	Bonds broken (reactants) 				Bonds formed (products) 			
2. write bond type for each reactant (bonds broken) and product (bonds formed). Watch for double and triple bonds as they are different. Cross off on lewis diagram as you go	Bond type	number	enthalpy	Total enthalpy	Bond type	number	enthalpy	Total enthalpy
3. write the number of each bond type beside 4. multiply bond enthalpy by number of each bond	C=C	1	614	614	C-C	1	346	346
	C-H	4	414	1656	C-H	4	414	1656
5. total reactant bond enthalpy and total product enthalpy	Br-Br	1	193	193	C-Br	2	285	570
6. total enthalpy and calculate enthalpy change *(sign, units and 3sgf)* $\Delta_rH°$ = ΣBond energies(bonds broken) – ΣBond energies(bonds formed) *bond broken (reactants) enthalpy total minus bond formed enthalpy (products) = enthalpy change, $\Delta_rH°$*	Total Enthalpy (bonds broken)			2463kJ	Total enthalpy (bonds formed)			2572kJ
	Total enthalpy = 2463 – 2572 = **-109kJ mol^{-1}**							
7. you may have to rearrange equation if enthalpy for a bond is required $\Delta_rH°$ = ΣBond enthalpy (bonds broken) – ΣBond enthalpy (bonds formed)	Not needed							

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.