AP Chemistry Daily Videos: 6.7 Bond Enthalpies

Daily Video #1

1. Give a brief explanation of the difference between endothermic and exothermic processes in regards to bonds and energy. (She has a really good analogy for the difference, write them down if it helps you!)

2. What is bond energy? When is it negative vs. positive?

3. What is different about the H-H bond energy when they are broken vs. formed? What is the same?

4. When you look at the average bond energy chart, what happens as you move from C-C to C=C to C≡C bonds?

5. What is ΔH_{rxn}? Give the equation for calculating ΔH and label it in regards to signs.

6. Looking at this data, first calculate ΔH, thinking carefully about if bonds are broken/formed and how many bonds you have. After you have calculated, determine the best graph and sketch it below. Is it endo or exothermic? How do you know?

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

Bond	Bond Energy (kJ/mol)
H–H	430
Cl–Cl	240
H–Cl	430

7. Big takeaways?

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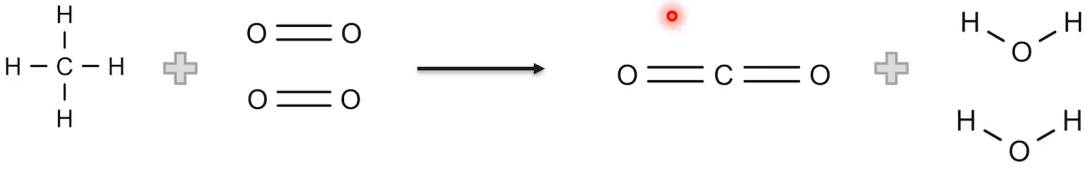
[Daily Video #2]

1. Given $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$ and the general Lewis Structures below, determine what type of bonds and how many of each type you have, if the bonds are broken or formed (+ or -) and calculate the enthalpy of the reaction.



Bond	Bond Energy, kJ/mol
H – C	414
O = O	498
C = O (in CO_2)	799
O – H	464

2. Pause the video at 3:42, attempt the problem, then evaluate how you did and identify any errors. Hint!! Draw the Lewis Structures of your reactants and products for yourself first!

$$2\ H_2O_2(aq) \rightarrow 2\ H_2O(\ell) + O_2(g) \qquad \Delta H^\circ = -196\ \text{kJ/mol}_{rxn}$$

The decomposition of $H_2O_2(aq)$ is represented by the equation above.

Assume that the bond enthalpies of the oxygen hydrogen bonds in H_2O are not significantly different from those in H_2O_2. Based on the value of ΔH° of the reaction, which of the following could be the bond enthalpies (in kJ/mol) for the bonds broken and formed in the reaction?

A)

O—O In H_2O_2	O=O In O_2	O—H
300	500	500

B)

O—O In H_2O_2	O=O In O_2	O—H
150	500	500

C)

O—O In H_2O_2	O=O In O_2	O—H
500	300	150

D)

O—O In H_2O_2	O=O In O_2	O—H
250	300	150

STOP

Pause the video and try this problem on your own first, ***without a calculator!***

Image source: Topic Question 6.7; taken from: AP Classroom