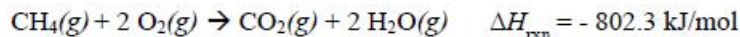


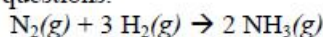
### Bond Enthalpy problems

- 1) Using only the information given in the thermochemical equation below, make a comparison between the sum of the bond enthalpies of the reactants and the sum of the bond enthalpies of the products. Explain why one value is greater than the other.

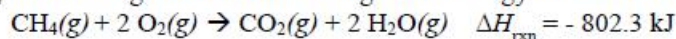


- 2) The following questions pertain to the bonds between the carbon atoms in  $\text{C}_2\text{H}_6$  and  $\text{C}_2\text{H}_4$ .
- Draw visual representations that show the relative differences in bond lengths between the carbon atoms in  $\text{C}_2\text{H}_6$  and  $\text{C}_2\text{H}_4$ .
  - Which carbon-carbon bond contains the least amount of potential energy? Justify your answer.
  - Which carbon-carbon bond requires the greatest input of energy in order to be broken? Justify your answer.
- 3) Determine the enthalpy change,  $\Delta H_{\text{rxn}}$ , that occurs when two gaseous oxygen atoms combine to form a gaseous oxygen molecule ( $2 \text{O}(g) \rightarrow \text{O}_2(g)$ ) using the table of average bond energies.

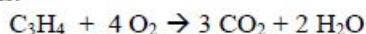
- 4) Use the chemical equation below and the table of average bond energies to answer the following questions.



- Draw Lewis structures for all three species represented in the reaction above.
  - Calculate the enthalpy change,  $\Delta H_{\text{rxn}}$ , that occurs in the reaction.
  - Draw a symbolic representation that demonstrated the flow of energy between the system and the surroundings.
  - Is the process endothermic or exothermic?
- 5) Use the thermochemical equation for the combustion of methane and the table of average bond energies to find the average bond energy in a C – H bond.



- 6) Use the chemical equation and the table of average bond energies to answer the following questions.



- Draw Lewis structures for all four species represented in the reaction above.
- Calculate the enthalpy change,  $\Delta H_{\text{rxn}}$ , that occurs in this reaction.

- 7) Use the chemical equation and the table of average bond energies to answer the following questions.



- Draw Lewis structures for all four species represented in the reaction above.
- Calculate the enthalpy change,  $\Delta H_{\text{rxn}}$ , that occurs in this reaction.

Bond	Average Bond Enthalpies
O – C	351 kJ/mol
O = C	799 kJ/mol
O – O	142 kJ/mol
O = O	499 kJ/mol
C – C	348 kJ/mol
C = C	612 kJ/mol
C $\equiv$ C	960 kJ/mol
H – H	436 kJ/mol
H – C	412 kJ/mol
H – O	467 kJ/mol
N – N	193 kJ/mol
N = N	418 kJ/mol
N $\equiv$ N	941 kJ/mol
N – H	393 kJ/mol