**Dougherty Valley HS AP Chemistry**

**WORKSHEET #5**

**Bonding – Bond Energies**

**Name: Date: Period: Seat #:**

Table 9.9 • Some Average Single- and Multiple-Bond Energies (kJ/mol)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | H | C | N | O | F | Si | P | S | Cl | Br | I |
| H | **436** | **413** | **391** | **463** | **565** | **318** | **322** | **347** | **432** | **366** | **299** |
| C |  | 346 | 305 | 358 | 485 |  |  | 272 | 339 | 285 | 213 |
| N |  |  | **163** | **201** | **283** |  |  |  | **192** |  |  |
| O |  |  |  | 146 |  | 452 | 335 |  | 218 | 201 | 201 |
| F |  |  |  |  | **155** | **565** | **490** | **284** | **253** | **249** | **278** |
| Si |  |  |  |  |  | 222 |  | 293 | 381 | 310 | 234 |
| P |  |  |  |  |  |  | **201** |  | **326** |  | **184** |
| S |  |  |  |  |  |  |  | 226 | 255 |  |  |
| Cl |  |  |  |  |  |  |  |  | **242** | **216** | **208** |
| Br |  |  |  |  |  |  |  |  |  | 193 | 175 |
| I |  |  |  |  |  |  |  |  |  |  | **151** |

|  |  |  |  |
| --- | --- | --- | --- |
| Multiple Bonds | | | |
| N=N | 418 | C=C | 602 |
| N≡N | 945 | C≡C | 835 |
| C=N | 615 | C=O | 732 |
| C≡N | 887 | C≡O | 1072 |
| O=O (in O2) | 498 |  |  |

|  |  |  |
| --- | --- | --- |
| Table 6.2 • Standard Enthalpies of Formation (kJ/mol) | | |
| C2H6(g) | ethane | -84.7 |
| H2O(g) | water vapor | -241.8 |
| CO2(g) | carbon dioxide | -393.5 |

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| 1. Write the balanced chemical equation for the complete combustion of ethane, C2H6(g). |

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| 1. Draw structural formulas (shortcut Lewis structures) for each of the species. |

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| 3. Calculate the energy needed to break the bonds in the reactants. \_\_\_\_\_\_\_\_ |
| Calculate the energy released as the bonds in the products are formed. \_\_\_\_\_\_\_\_ |

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| 1. What is the ΔHcombustion based on bond energies? \_\_\_\_\_\_\_\_\_\_\_\_ |

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| 1. Calculate the ΔHcombustion using the thermochemical data from above and/or Appendix of your textbook. |