**Name: Period: Seat#:**

**Worksheet #6**

**Directions:** Show all work in a way that would earn you credit on the AP Test! This is always the rule! Grading rubrics posted in the Google Answer Key Drive. Check your work, correct in green pen after you try them yourself in an honest way! Don’t peek at rubrics while you work! **USE BINDER PAPER, STAPLE TO YOUR WORKSHEET**. Clearly label work.

**SET A 27 MINUTE TIMER AND SEE IF YOU FINISH ON TIME!**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2003 | 7. Answer the following questions that relate to the chemistry of nitrogen.1. Two nitrogen atoms combine to form a nitrogen molecule, as represented by the following equation.

2 N(*g*) 🡪 N2(*g*)Using the table of average bond energies below, determine the enthalpy change, ∆H, for the reaction.

|  |  |
| --- | --- |
| Bond | Average Bond Energy(kJ mol-1) |
| N – N | 160 |
| N = N | 420 |
| N ≡ N | 950 |

 |
| 2003B | 3. In another experiment, liquid heptane, C7H16(*l*), is completely combusted to produce CO2(*g*) and H2O(*l*), as represented by the following equation. C7H16(*l*) + 11 O2(*g*) 🡪 7 CO2(*g*) + 8 H2O(*l*)The heat of combustion ∆H°comb, for one mole of C7H16(*l*) is -4.85 x 103 kJ. (c) Using the information in the table below, calculate the vale of ∆H°*f*  for C7H16(*l*) in kJ mol-1

|  |  |
| --- | --- |
| Compound | ∆H°*f* (kJ mol-1) |
| CO2(*g*) | -393.5 |
| H2O(*l*) | -285.8 |

(d) A 0.0108 mol sample of C7H16(*l*) is combusted in a bomb calorimeter. 1. Calculate the amount of heat released to the calorimeter.
2. Given that the total heat capacity of the calorimeter is 9.273 kJ °C-1, calculate the tempertature change of the calorimeter.
 |
| 2006 | CO(*g*) + ½ O2(*g*) 🡪 CO2(*g*)2. The combustion of carbon monoxide is represented by the equation above. (a) Determine the value of the standard enthalpy change, ∆H°rxn, for the combustion of CO(g) at 298 K using the following information. C(*s*) + ½ O2(*g*) 🡪 CO(*g*) ∆H°298 = -110.5 kJ mol-1C(*s*) + O2(*g*) 🡪 CO2(*g*) ∆H°298 = -393.5 kJ mol-1 |
| 2005B | 7. Answer the following questions about thermodynamics.

|  |  |  |
| --- | --- | --- |
| Substance | Combustion Reaction | Enthalpy of Combustion,∆H°*comb*, at 298 K (kJ mol-1) |
| H2(*g*) | H2(*g*) + ½ O2(*g*) 🡪 H2O(*l*) | -290 |
| C(*s*) | C(*s*) + O2(*g*) 🡪 CO2(*g*) | -390 |
| CH3OH(*l*) |  | -730 |

1. In the empty box in the table above, write a balanced chemical equation for the complete combustion of one mole of CH3OH(*l*). Assume products are in their standard states at 298 K. Coefficients do not need to be whole numbers.
2. On the basis of your answer to part (a) and the information in the table, determine the enthalpy change for the reaction C(*s*) + H2(*g*) + H2O(*l*) 🡪 CH3OH(*l*)
3. Write the balanced chemical equation that shows the reaction that is used to determine the enthalpy of formation for one mole of CH3OH(*l*)
4. Predict the sign of the standard entropy change, ∆S° for the combustion of H2(*g*). Explain your reasoning. *\*\*\*NOTE\*\*\* We haven’t learned about entropy yet, you can skip this part.  BUT I bet you could give it a try anyway!* ☺

(e) On the basis of bond energies, explain why the combustion of H2(*g*) is exothermic.  |
| **Reflection:** Use this area to jot down notes about the types of mistakes you made, things you need to restudy, things that tricked you, etc. One of the most important skills to develop in AP Chem is self reflection and not making the same mistakes. The joke is – you should always make NEW mistakes, not the SAME mistakes ☺  |