Raisbeck Aviation Invitational Dec, 2017 **Chemistry Lab** **TEAM #: C-_____ (Names: _____ _____)**

Part I: Thermodynamics (40 points) **ANSWER KEY**

"lab calculation" metal in a water bath. Calculate, predict metal ?

1. The thermodynamic quantity to express the degree of disorder in a system is: (2 pts)

   A. enthalpy B. entropy ** C. bond energy D. internal energy

2. Convert normal human body temp, 98.6°F, to Celsius and Kelvin. (4 pts)

   37 deg. Celsius , 310.15 Kelvin

3. If someone has a temperature of 308 kelvin, do they have a fever? (2 pt)

   No (that's less than 95F)

4. Write the term from the options below that matches each definition. (10 pts)

   Heat capacity Calorie Heat of fusion Heat of formation
   Joule Exothermic Endothermic Heat of vaporization

The amount of energy needed to melt a given mass of a solid at its melting point temperature.	Heat of fusion
A reaction or process accompanied by or requiring the absorption of heat.	Endothermic
The energy that must be added to the liquid substance to transform a quantity of that substance into a gas.	Heat of vaporization
A reaction or process accompanied by the release of heat.	Exothermic
The heat released or absorbed when a pure substance is formed from its elements, at constant pressure.	Heat of formation
The energy needed to raise the temperature of 1 gram of water through 1 °C	Calorie
The work done on an object when a force of one newton acts on that object through a distance of one meter	Joule
The amount of heat needed to raise the temperature of a pure substance by one degree.	Heat capacity

5. Circle the options to make the statement correct: (10 pts)
   - If a chemical reaction absorbs heat from its surroundings, it has a **positive / negative** ΔH at constant pressure and is **endothermic / exothermic**.
   - In an **endothermic / exothermic** reaction, products are generally more stable (stronger bonds) than reactants.
   - Heat of reaction is calculated by multiplying the **specific heat capacity / heat of formation** by the **volume / mass** of the solution by the change in temperature.

6. Calculate ΔH (in kJ) for the third reaction: (2 pts)

$2S\ (s) + 3O_2\ (g) \rightarrow 2SO_3\ (g)$ ΔH = -790 kJ
$S\ (s) + O_2\ (g) \rightarrow SO_2\ (g)$ ΔH = -297 kJ
$2SO_2\ (g) + O_2\ (g) \rightarrow 2SO_3\ (g)$ ΔH = _____ kJ.

A. 196 B. -1384 C. -196 ** D. -543

7. You have 48.82 g of pure lead. The lead is placed in a beaker of water and heated to boiling. The water will boil at ___100C____ (1 pt). The lead is pulled out and immediately placed in a new beaker with 50mL of 24 °C water. The temperature of the water is monitored until it is no longer changing, so the lead presumed to have the same temperature as the water. This temperature reading is now 26.8°C.

   To calculate the specific heat of lead we use the equality: ___q_{lead}__ = ___q_{water}__ (1 pt).
   The change in temperature of the water was: _____ (1 pt).
   The change in temperature of the lead was: _____ (1 pt).
   The specific heat of water is: __4.184 J g^{-1} $°C^{-1}$ (need units)_____ (1 pt)

   Using this information find the specific heat of lead, show your work for full points. (3 pts)

   (48.82 g) (73.2 °C) (x) = (50.0 g) (2.8 °C) (4.184 J g^{-1} $°C^{-1}$)

   Specific heat of lead:__ 0.164 J g^{-1} $°C^{-1}$_____

   The actual specific heat of lead is 1.60 J/g°C. Calculate your percent error. (2 pts)

   (0.16-0.164) / .16 x 100% = 2.44%