**Dougherty Valley HS AP Chemistry**

**WORKSHEET #1**

**Thermodynamics – 2nd Law**

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

Show all work

[1] For each system below, indicate whether ΔS and ΔH is a positive or negative value. Then indicate if the reaction is entropy driven,

enthalpy driven, or neither. Will the reaction be spontaneous at high temperatures, low temperatures, always or never? Qualitative,

explain to your table group.

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| [a] NaCl (s) + H2O (*l*) + heat → NaCl (aq) |
| ΔS = | ΔH = | Driven? |
| [b] O2 (g) + H2O (l) → O2 (aq) + heat |
| ΔS = | ΔH = | Driven? |
| [c] CO2 (s) + heat → CO2 (g) |
| ΔS = | ΔH = | Driven? |

[2] Calculate the ΔHrxn, ΔSrxn, ΔSuniverse, ΔGrxn. For each system below, indicate whether ΔS and ΔH is a positive or negative value. Then indicate of the reaction is entropy driven, enthalpy driven, or neither. Quantitative

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| --- | --- | --- | --- |
| **Substance**  | **ΔH˚formation (kJ/mole)** | **ΔS˚formation (J/mole˚K)** | **ΔG˚formation (kJ/mole)** |
| C3H8 (*l*) | -103.8 | 269.9 | -23.5 |
| O2 (g) | 0 | 205.1 | 0 |
| CO2 (g) | -393.5 | 213.7 | 394.4 |
| H2O (g) | -241.8 | 188.8 | -228.6 |
| TiO2 (s) | -939.7 | 49.9 | -884.5 |
| TiCl4 (*l*) | -804.2 | 252.3 | -737.2 |
| C (s) | 0 | 5.7 | 0 |
| Cl2 (g) | 0 | 223.1 | 0 |

\* must solve for temperature first

|  |  |  |  |
| --- | --- | --- | --- |
| $$∆H°= Σ∆H\_{f}^{°} products-Σ∆H\_{f}^{°} reactants$$ | $$∆S°= Σ∆S^{°} products-Σ∆S^{°} reactants$$ | $$∆S\_{universe}= \frac{-∆H}{T}$$ | $$∆G^{°}=∆H^{°}- ∆S^{°}$$ |

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| A) C3H8 (*l*) + 5 O2 (g) → 3CO2 (g) + 4H2O (g) |
| B) TiO2 (s) + C (s) + 2Cl2 (g) → TiCl4 (*l*) + CO­ (g) |