Krug Chemistry – Deep Run Daily Planning Guide

Date of Lesson: Q4 Day 2 – Enthalpy, Entropy, and Gibb's Free Energy

Topic /Big Questions: (Question Stems & Question Creation Chart)

- **How do chemists calculate the amount of heat required for a chemical reaction to occur?**
- **How do chemists calculate the amount of randomness in a chemical reaction?**
- **What is the maximum amount of work done by a system during a chemical reaction?**

State SOL	Unpacking the Standards (Video explanation shown at 3:18)
CH. 7	CH.7 The student will investigate and understand that thermodynamics explains the relationship between matter and energy. Key ideas include a) heat energy affects matter and interactions of matter; b) heating curves provide information about a substance; c) reactions are endothermic or exothermic; d) energy changes in reactions occur as bonds are broken and formed; e) collision theory predicts the rate of reactions; f) rates of reactions depend on catalysts and activation energy; and g) enthalpy and entropy determine the extent of a reaction.

Visible Learning (For the three items with asterisks*, think from a student perspective. Use simple language)

***What am I learning today?** Enthalpy is a measure of the heat absorbed or released in a chemical reaction. Entropy is a measure of the randomness of the reactants and products. Gibb's Free Energy is a measure of the amount of work done by the system. Enthalpy, Entropy, and Gibb's Free Energy are used to determine the spontaneity of a chemical reaction.

***Why is it important?** Thermodynamics is the branch of science that deals with the relationship of heat and other forms of energy. Chemical systems undergo three main processes that use thermal energy: phase changes, heating/cooling, and chemical reactions.

***How will I know I've learned it?** I will calculate the Enthalpy, Entropy, and Gibb's Free Energy values and use this information to determine whether a reaction is exothermic or endothermic. I will use this information to determine the spontaneity of the reaction.

Differentiation strategies:

Thermochemistry Class Worksheet

Chem Worksheet 16-5

ThermoChem Homework

Unit 10 Test Review

Accommodations and/or modifications are being met for students with IEP's/504's.

Small group activities; frequent checks for understanding; materials available on Schoology;

Daily Plan/Sequence of Instruction:

Teacher will remind students how to use the specific heat equation: $Q = m\ c\ \Delta T$. Teacher will show students how to find the $\Delta H_{formation}$ in order to calculate the Enthalpy using ΔH_{rxn} = Products – Reactants. Teacher will explain that when products have more kinetic energy than reactants, the reaction increases in Entropy. The randomness of a reaction is calculated by using ΔS_{rxn} = Products – Reactants. Even though the entropy of each substance is positive the overall Entropy of the reaction can be negative if the products contain less randomness than the reactants. Teacher will offer assistance as needed. Teacher will explain that Enthalpy (ΔH) is measured in kilojoules, while Entropy (ΔS) is measure in joules. Teacher will explain how to convert to kilojoules in order to calculate Gibb's Free Energy. $\Delta G = \Delta H - (T \cdot \Delta S)$

Students will complete the Thermochemistry Worksheets to check for understanding.

Assessments (List all formative/summative assessments used to check for understanding during this lesson. Summative assessments may occur during a different class period.):

Thermochemistry Worksheet – (summative)

Chem Worksheet 16-5 – (summative)

Hess' Law Worksheet – (summative)

Unit 10 Test Review – (summative)

After assessing today's lesson are you and your students comfortable moving forward with your next objective?

Yes – students completed the worksheets with little to know assistance

No, remediation required to proceed – tutoring is available during One Lunch

Teacher Reflection: The Unit 10 Test Review will be a quick turnaround if you give it today. If students are a bit slow getting started, it may be better to give it to them on earlier. Then they will have time to get tutoring during One Lunch.