Krug Chemistry – Deep Run Daily Planning Guide

Date of Lesson: Q4 Day 1 – Unit 10 Quiz, Bond Energy, Hess's Law

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

- **What factors determine the speed of a chemical reaction?**
- **What factors affect equilibrium?**
- **How does the amount of activation energy affect a chemical reaction?**
- **What are the similarities and differences between exothermic and endothermic reactions?**
- **What factors affect the equilibrium constant?**

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?** Breaking reactant bonds is endothermic (+ΔH) and forming product bonds is exothermic (-ΔH). Hess' Law explains that the overall ΔH rxn is equal to the sum of all the steps of the 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. Chemical systems desire to be in a state of equilibrium and will adjust as needed to maintain the lowest energetic state.

***How will I know I've learned it?** I will calculate the Bond Energy of a reaction. I will use Hess' Law to calculate the total enthalpy for a multistep reaction.

Differentiation strategies:

Unit 10 Quiz

Bond Energy Worksheet

Hess's Law Worksheet

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; small group testing

Daily Plan/Sequence of Instruction:

Students will take Unit 10 Quiz to assess understanding of equilibrium and kinetics.

Teacher will remind students that breaking bonds is endothermic (+ΔH) and forming bonds is exothermic (-ΔH). This means a chemical reaction is a two-step process, where $H_{breaking}$ is positive and $H_{forming}$ is negative. According to Hess' Law, the combination of each step equals the total overall enthalpy of reaction (ΔH_{rxn}). Therefore, Bond Energy is equal to $H_{breaking} + H_{making}$:

$\Delta H_{rxn} = \Delta H_1 + \Delta H_2$

$\Delta H_{rxn} = (+\Delta H_{broken}) + (-\Delta H_{formed})$

$\Delta H_{rxn} = \Delta H_{broken} - \Delta H_{formed}$

Teacher will demonstrate how to do one or two practice problems on the Bond Energy and Hess' Law Worksheets. Students will complete the rest of the worksheets to check for understanding. Teacher will assist as needed.

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

Unit 10 Quiz – (summative)

Bond Energy Worksheet – (summative)

Hess' Law Worksheet – (summative)

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

Yes – students scored 80% or higher on the Unit 10 Quiz, and completed the Bond Energy and Hess' Law worksheets will little to know assistances.

No, remediation required to proceed – if students score below 65% on the Unit 10 Quiz, teacher will contact parents and guardians; tutoring will be available during One Lunch

Teacher Reflection: Assign the **Unit 10 Thermodynamics PowerPoint** and **SOL Book Lesson 12 Causes of Chemical Reactions** for homework. Also recommend that students read information about **NON-REVERSIBLE** reactions at https://courses.lumenlearning.com/cheminter/chapter/nonreversible-reactions/.