

Krug Chemistry – Deep Run Daily Planning Guide

Date of Lesson: Q3 Day 21 – Le Chatelier & Alka-Seltzer Labs

Topic /Big Questions: (Question Stems & Question Creation Chart)	
<ul style="list-style-type: none"> • What factors determine the speed of a chemical reaction? • What factors affect equilibrium? 	
State SOL CH. 7	Unpacking the Standards (Video explanation shown at 3:18) CH.7 The student will investigate and understand that thermodynamics explains the relationship between matter and energy. Key ideas include <ul style="list-style-type: none"> 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? Le Chatelier’s Principle explains that a chemical reaction will shift forward or reverse in favor of reaching equilibrium.	
*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 understand how concentration, temperature, and pressure affect the equilibrium of a chemical reaction.	
Differentiation strategies: Alka-Seltzer Lab – (effect of surface area) Le Chatelier Principle Lab – (effect of temperature) Nitrogen Dioxide and Dinitrogen Tetroxide CER – (effect of temperature and pressure) Cobalt Catalyst Reaction (effect of catalyst)	

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:

Students will work with partners or in groups to execute the first two labs watch the following demonstrations. The purpose of the labs and demo is to investigate the factors that change the rate or direction of chemical reactions. Notes on these concepts are available in Schoology Unit 10 Notes folder. In lieu of guided notes, teacher will use the labs to guide the students in creating a model of how these factors affect reactions and in identifying the CER for each lab.

Lab#1: The Effect of Surface Area Lab

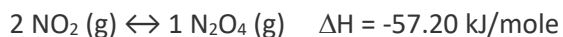
Students will be given a stop watch, small plastic cups, a mortar and pestle, and packets of **Alka-Seltzer**. Students will compare the reaction times of a whole tablet, two half tablets, two whole tablets, and a crushed tablet to observe which reacts faster. Teacher will ask guided questions relating to particle size, number of collisions, rate of collisions, and surface area.

Lab #2: The Effect of Temperature Lab

Students follow the directions in the Le Chatelier Lab to create an acid-base reaction. Then they will investigate how changing the temperature affects the direction of the reaction. Teacher will ask questions to help students determine whether reaction was endothermic or exothermic. Teacher will ask questions as to how adding heat or removing heat will affect the direction of the reaction.

Lab#3: The Effect of Temperature and Pressure Demonstration

Teacher will use a sealed glass tube containing nitrogen dioxide and dinitrogen tetraoxide to demonstrate the effect of temperature and pressure on a gas reaction. Teacher will explain that nitrogen dioxide is a deep red-orange gas that is poisonous but not flammable. Dinitrogen tetraoxide is colorless.



Teacher will ask guided questions until students understand that the reversible reaction between NO_2 and N_2O_4 is exothermic on forming N_2O_4 and endothermic on forming NO_2 . Le Chatelier predicts that heating the mixture will favor the formation of NO_2 . Teacher will ask students if they remember the relationship between pressure and temperature according to Gay Lussac's Law. Teacher will ask guided questions to help students understand that temperature and pressure are directly proportional. This means when heat is added the temperature increases and more collisions occur, which increases the pressure. According to Le Chatelier, when gas pressure increases, the reaction will favor the side with less moles (N_2O_4). Video example: <https://www.youtube.com/watch?v=j1ALRRos-AA>
- Dynamic Equilibrium between Nitrogen Dioxide and Dinitrogen Tetraoxide

Lab#4: The Effect of a Catalyst Demonstration

If ingredients are available, teacher will use pink cobalt chloride as a catalyst to speed up the reaction of hydrogen peroxide and potassium sodium tartrate. If not available, teacher will show the following videos:

<https://www.youtube.com/watch?v=MznbWBL3JxE> – Cobalt (Honors Level)

<https://www.youtube.com/watch?v=5neg2HVajoA> – (College Prep Level)

Teacher will emphasize the fact that the reaction would eventually occur even without the catalyst, but it would happen very slowly. Teacher will emphasize that the color change indicates the presence of products being formed. Teacher will indicate that the pink color at the end is the cobalt catalyst because it was not consumed in the reaction.

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

Alka-Seltzer Lab – (summative)

Le Chatelier Lab – (summative)

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

Yes – students participated, recorded observations in lab notebooks, and understand how these factors affect chemical reactions

No, remediation required to proceed – if students do not participate, teacher will contact parents and guardians; if students are absent, they can make up the lab during lunch or copy notes from a classmate.

Teacher Reflection: Assign the **Unit 10 Equilibrium and Kinetics PowerPoint** for homework.