Phoenixville Area School District Understanding by Design (UbD) Science Femplate

Grade Level &/or HS Subject: 11 / Chemistry

Unit Name: Kinetics and Equilibrium

Stage 1 Desired Results				
Overarching	Transfer			
NGSS & PA	Students will be able to independently			
Standards:				
DA: (Chamical	• Ask questions and/or define problems			
PA. (Chemical Boastions 2):	• Plan and/or carry out investigations			
Apply scientific	• use their learning to analyze and interpret data according to computational thinking			
nrinciples and	• obtain, evaluate and communicate information (supported by evidence)			
evidence to				
provide an				
explanation about	Meaning-Making			
the effects of	Students will understand that chemical processes their rates and whether or not	ESSENTIAL OUESTIONS		
changing the	energy is stored or released can be understood in terms of the collisions of	Students will keep considering all the		
temperature or	molecules and the rearrangements of atoms into new molecules, with consequent	possible factors that can affect the rate of		
concentration of	changes in the sum of all bond energies in the set of molecules that are matched by	chemical reactions (i.e. concentration,		
the reacting	changes in kinetic energy. (PS1.B:Chemical Reactions)	temperature, use of catalyst, etc.)		
particles on the				
rate at which a	Students will understand that in many situations, a dynamic and condition-	Students will keep considering what		
reaction occurs.	dependent balance between a reaction and the reverse reaction determines the	stresses exist that change the equilibrium		
US DS1 5. Apply	numbers of all types of molecules present. (PS1. B:Chemical Reactions)	position of a system (i.e. favors products		
no-Poi-o: Apply		or favors reactants)		
principles and	Students will understand that claims can be supported by using mathematical			
evidence to	representations of phenomena. (SEP: Using Mathematics and Computational	Students will keep considering that		
provide an	Thinking)	antioxidants can slow down the oxidative		
explanation about		processes that occur in our environment		
the effects of		and in biological organisms.		
changing the				
temperature or				
concentration of				
the reacting				
particles on the				

rate at which a	Knowledge and Skills Acquisition		
reaction occurs.	UNDERSTANDINGS	Students will be skilled at:	
HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.	 Students will know how to construct a rate law which mathematically describes the rate of a reaction which factors affect the rate of a chemical reaction how concentration, temperature and pressure affect the position of equilibrium systems 	• using mathematical models which can be used to predict relationships between components in a system.(SEP: Developing and Using Models)	
	 mathematical relationships of the equilibrium constant relate to the position of equilibrium how to interpret the magnitude of the solubility constant and relate it to the solubility of a compound when precipitation will occur, according to solubility rules and changes in concentration. That hills and valleys in a reaction mechanism progress curve can be interpreted as different rates and energies. The speed of a chemical reaction can be related to the value of the specific rate constant for a reaction 	• Students will be skilled at planning and conducting an investigation collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of the data needed to produce reliable measurements and consider limitations on the precision of data (e.g., number of	
of science apply: LS PS E&SS		trials), and refine the design accordingly. (SEP: Planning and Carrying Out Investigations)	
	KEY VOCABULARYReaction rateReversible reactionCommon ion effectActivation energyChemical equilibriumFirst-order reactionCollision theoryLe Chatelier's PrincipleIntermediateCatalyst / InhibitorEquilibrium constantMechanismEquilibrium constantReaction QuotientElementary step(ratedetermining step)IntermediateIntermediate	 Students will be skilled at creating a computational simulation of a chemical process. Abstract and quantitative reasoning (MP.2) Using units as a way to understand problems and guide the solution of multi-step problems; choosing/interpreting units consistently in formulas; choosing and interpreting the scale and the origin in graphs and displays (HSN-Q.A.1) 	

		Choosing a level of accuracy appropriate to limitations on measurement when reporting quantities (HSN-Q.A.3)
Free lang 4 mag	Stage 2 – Evidence	
Evaluative Criteria	Assessment Evidence	
Lab report rubric	PERFORMANCE TASK(S):	Differentiation Considerations:
 Rubric for presentation Proficiency point values Student performance checks 	Students will interpret reaction progress mechanism graphs to identify key points of a chemical reaction. This will provide information to determine which parts of the reaction are slow, fast, and important to the overall success of a reaction. Students will carry out investigations and apply information collected about rates of reaction to case studies involving real world scenarios of rates of reaction, such as the spoiling of food, the development of mold over time, the decomposition of household products and medicine, etc. Students can use this information to present their findings to the class and provide solutions to the prevention of unwanted natural phenomena. Students will carry out investigations that simulate real world equilibria reactions, such as reversible reactions that occur in our bodies, i.e. acidosis/alkalosis, using different stresses as temperature, pressure and concentration changes to interpret those results. Students will solve various types of problems, collaboratively and individually, with varying amounts of stresses to determine in which direction a reaction will shift. The analyses of these problems can be related to chemical reactions that happen in our environment and be able to predict these changes if those stresses would occur.	 Choice of problems (scaffolding, chunking) Consideration of role in groupwork and group presentation Consideration of how groups are formed Supplementary guided worksheets Modified rubrics

What criteria will	OTHER EVIDENCE:	Differentiation Considerations:
 be used in each assessment to evaluate attainment of the desired results? Point values Proficiency scores Lab report rubrics 	 student performance checks Graphing exercises of data lab reports problem sets teacher summatives (quizzes) common summatives (tests) 	 Scaffolded questions Modified assessments Modified lab report rubrics Modified proficiency score baseline Enrichment questions:(e.g. How would a first-order graph for a reaction look different for a reaction that is reversible? (<i>It never reaches zero concentration</i>)