Guided Lesson Notes

Name:_____ **Date:**_____

Chemical Equilibrium

Directions: Complete this study guide as you move through the lesson. By taking notes, you are more likely to remember what you are learning. The completed study guide can be used for practice activities and to prepare for quizzes and exams. Be sure to save each study guide so you can access it when you need it.

Essential Vocabulary

As you encounter these scientific terms in the lesson, enter the meaning and an example (or two) for each. You can even draw a picture. If there are other unfamiliar words you find, enter them in the blank spaces provided.

chemical equilibrium	*equilibrium constant*
closed system	*stress*
Le Chatelier's principle	

Characteristics of Chemical Equilibrium

What does it mean to say that a reaction is reversible?

What is used in a chemical equation to show that the process can go in either direction?

Explain how water in a closed container shows a reversible equation.

How do the forward and reverse reaction rates compare at chemical equilibrium?

Describe why the concentrations of reactants and products remain constant at chemical equilibrium.

The Equilibrium Constant (K)

What are always used to calculate equilibrium constants?

When looking at a graph of concentration vs. time how can you tell the point at which equilibrium is reached?

Complete the table to show how reactants and products compare for different K values.

	Which is present in the largest amount: reactant or product?
High K value	☐ Reactant ☐ Product
Small K value	☐ Reactant ☐ Product

Describe how to find the equilibrium constant for the reaction shown below:

$$2\,SO_2 + O_2 \rightarrow 2\,SO_3$$

Le Chatelier's Principle

What type of system must exist for a reaction to be in chemical equilibrium?

Equilibrium can be disrupted if a system is open to _____.

What does Le Chatelier's principle state?

What remains constant when a reaction shifts, except for when the temperature changes?

Complete the table to describe what will happen to a reaction when the concentration of one of the substances is changed according to Le Chatelier's principle.

	What happens to the reaction?
Increasing the concentration of a substance	
Decreasing the concentration of a substance	

Use the equation below to predict what will happen when the concentrations of reactants or products are changed.

$$N_2 + 3\,H_2 \leftrightarrow 2\,NH_3$$

Complete the following table.

	What direction does the equilibrium shift?	Explain
A reactant (either N_2 or H_2) is added		

	What direction does the equilibrium shift?	Explain
A product is added		

Raising the temperature requires _____ so the reaction will shift in the _____ direction so it can _____.

Lowering the temperature requires _____ so the reaction will shift in the _____ direction to _____.

Complete the table to show whether heat can be considered a reactant or a product for each type of reaction.

	Is heat considered a reactant or product?
Exothermic	
Endothermic	

Complete the table to show the direction of the equilibrium shift for the reaction below:

$$N_2 + 3\ H_2 \leftrightarrow 2\ NH_3 + 22\ kcal$$

	Equilibrium shift (towards reactants or products)	Explain
Increase temperature		
Decrease temperature		

What happens to the pressure of a gas when volume decreases?

Pressure changes can cause an equilibrium shift for reactions involving _____.

Complete the table to show the direction of the equilibrium shift for the reaction shown below:

$$N_{2\,(g)} + 3\,H_{2\,(g)} \leftrightarrow 2\,NH_{3\,(g)}$$

	Equilibrium shift (towards reactants or products)	Explain
Increase pressure		
Decrease pressure		

Explain why there is no shift in equilibrium when a catalyst is added.
