

## Disturbing a Chemical Reaction at Equilibrium

Name \_\_\_\_\_  
Laboratory Instructor \_\_\_\_\_

**Objective**  
In this laboratory experiment you will explore how a chemical reaction at equilibrium responds to disturbance and you will learn to use LeChatelier's principle to predict the response.

**Introduction**  
Many chemical reactions, such as heating sugar to form caramel, go only in one direction—from reactants to products or from sugar to caramel. Many chefs, who have heated too strongly, have wished they knew how to reverse this reaction and cause some caramel to re-form sugar, but this is impossible. This is an **irreversible reaction**.

$$\text{sugar} + \text{energy} \longrightarrow \text{caramel}$$

**Reversible reactions** are different because the products react to re-form the original reactants. An example is the reaction between iron(III) ions,  $\text{Fe}^{3+}_{(aq)}$ , and thiocyanate ions,  $\text{SCN}^{-}_{(aq)}$ , to form monothiocyanatoiron (III) ions,  $\text{Fe}(\text{SCN})^{2+}_{(aq)}$ .

$$\begin{array}{ccc} \text{Fe}^{3+} + \text{SCN}^{-} & \rightleftharpoons & \text{Fe}(\text{SCN})^{2+} + \text{energy} \\ \text{Colorless} \quad \text{Colorless} & & \text{Amber} \end{array}$$

The double arrowheads indicate that this reaction is **reversible**. As  $\text{Fe}(\text{SCN})^{2+}$  ions form in the forward reaction, some of them dissociate in the reverse reaction to reform  $\text{Fe}^{3+}$  and  $\text{SCN}^{-}$  ions. These two **opposing reactions** occur simultaneously, and when their **rates are equal**,  $\text{Fe}^{3+}$ ,  $\text{SCN}^{-}$ , and  $\text{Fe}(\text{SCN})^{2+}$  ions are in **chemical equilibrium**. Energy is the heat released (during the forward reaction) or absorbed (backward reaction).

Many times it will be important to disturb a chemical reaction that is in equilibrium. For instance, your ultimate goal may be to have a maximum conversion of reactants to products. This will not occur if the reaction is in equilibrium. You must disturb the reaction. LeChatelier's principle governs the response of an equilibrium subject to a disturbance: If a stress is applied to a reaction mixture at equilibrium, reaction occurs in the direction that relieves the stress. The word 'stress' in this context means a change in concentration, pressure, volume, or temperature. You will apply stress in the form of concentration and temperature to a reaction mixture at equilibrium and predict in which direction the reaction will be favored.

**Procedures:**

NITRIC ACID (0.01 M  $\text{HNO}_3$ ) IS THE SOLVENT FOR BOTH IRON (III) NITRATE SOLUTIONS USED IN THIS EXPERIMENT. IT IS A CORROSIVE ACID. IF YOU SPILL ANY ON YOUR BODY OR CLOTHES, WASH IT OFF IMMEDIATELY.

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It is possible, however, to disturb that equilibrium by changing conditions. For example, you could increase the concentration of one of the products, or decrease the concentration of one of the reactants, or change the temperature. When a change of this type is made in a reaction at equilibrium, the reaction is no longer in equilibrium.

### 15.12: Disturbing a Reaction at Equilibrium- Le Châtelier ...

Answer to Disturbing Equilibrium LAB 7 Questions for Disturbing Equilibrium Table 7.1 Well number, contents Color A1, indicator+(1...

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Lab Report Disturbing Of Equilibrium Le Chatelier S Principle. Chemical Equilibrium: Le Châtelier's Principle Abstract This experiment entitled "Chemical Equilibrium" aims to help students to investigate the effects of concentration and temperature upon the position of equilibrium in a cobalt chloride solution, Co(H<sub>2</sub>O)<sub>6</sub><sup>2+</sup>. In this experiment, cobalt crystal is dissolved with distilled water and ethanol which the initial colour is purple-pinkish and a few drops of concentration of HCl is ...

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For example, if the process explained earlier is at equilibrium, we can disturb the equilibrium by adding a bunch of compound A to the reaction. To minimize the effects

of the added compound, the equilibrium will shift in a way that will decrease the amount of compound A—namely, it will produce more of compound C. Likewise, by adding more of compound C, the equilibrium will be pushed toward the left, making more of A and B.

### Chemistry: Disturbing Equilibria: Le Châtelier's Principle

We can perturb the equilibrium position of Reaction  $\text{ref}\{6\}$  by the addition of some  $\text{aq}\}$ . The addition of  $\text{aq}\}$  will cause the equilibrium position of Reaction  $\text{ref}\{6\}$  to shift right in accordance with Le Chatelier's Principle. This right shift in the equilibrium position of Reaction  $\text{ref}\{6\}$  will also result a corresponding decrease in the concentration of  $\text{B}$  ...

### 3: Le Chatelier's Principle (Experiment) - Chemistry ...

The lab discusses the equilibrium using Le Chatelier's Principle. Equilibrium equation shows when the rate of reactants equal to the rate of products. When temperature or concentration are changed, the stress is placed on either of the reactant or products side. To relieve the stress, the equilibrium shifts left or right.

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