

Experiment 12A Investigating Chemical Equilibrium

Analysis of Results:

1) If the molar concentration of NaOH is increased, the number of drops required for the colour change will decrease. A stronger concentration can have a more significant impact on the solution.

2) When the reagent 1.0 M of NaOH was added to the iron(III) thiocyanate equilibrium system, the solution's color changed from orange to yellow and the equilibrium shifted to the left. According to Le Chatelier's principle, when a change is applied to an equilibrium system, the system will counter that change to maintain a new equilibrium. In this case, the 1.0 M of NaOH reacts with the system to reduce the amount of Fe^{3+} present in the solution. This causes the product to break down and create more Fe^{3+} so a new equilibrium is created.

3) If hydrated cobalt (II) ion complex is placed in a refrigerator, the colour will probably turn purple red-ish.

4) The forward reaction is endothermic, because endothermic reactions absorb/take in heat from their surroundings. As we add heat to the reactant side, it starts to have a higher enthalpy compared to the products. The forward reaction rate is also increased when heat is added to the system.

5) NaCl will create additional Cl to the system, meaning that the equilibrium system will shift from high to low. The equilibrium will shift right to the product side.



7) According to Le Chatelier's Principle, when changes occur to a reaction, there will be a counter-act that counters the change to the system. In Part IV, steps 1 to 4, when H^+ are added to the system, the reaction will shift from high to low. $\text{K}_2\text{CrO}_4^{2-}$ with addition H^+ will shift the equilibrium as the colour change from yellow to orange. For $\text{K}_2\text{Cr}_2\text{O}_7^{2-}$ with addition OH^- the equilibrium will shift, and the colour will change from orange to yellow.

8) BaCrO_4 is insoluble. BaCr_2O_7 is soluble.

9) In step 7, there was additional H^+ ions placed in the system before the system reacts with $\text{Ba}(\text{NO}_3)_2$. The H^+ ions shift the system even further away from equilibrium, resulting in no colour changes. Therefore, no precipitate is formed in $\text{K}_2\text{Cr}_2\text{O}_7$ in step 7.

Conclusion:

This lab helps the group to further understand the concept of equilibrium. To confirm Le Chatelier's principles, the group conducted a series of experiments. In part 1, the group observed the effect of altering the pH concentrations in a equilibrium system. By raising or lowering the pH of the equilibrium system, the Thymol Blue in the solution changes color from yellow to blue. This shows the physical shift of the equilibrium as it counters the pH change. In part 2, the group discovers the effect of adding a reagent that, although is not in the equilibrium

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Bassam Z. Shakhashiri



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Government Reports Annual Index ,1979 **Government Reports Index** ,1973 *Government Reports Announcements* ,1972 *Government Reports Announcements & Index* ,1979-11 **Chemical Equilibria** Philip James Hills,1969 Chemical Equilibrium Allen J. Bard,1966 *Chemical Equilibrium* Robert Blanchard Fischer,Dennis G. Peters,1970 *Chemical Equilibrium* William Guenther,1975-12 The present work is designed to provide a practical introduction to aqueous equilibrium phenomena for both students and research workers in chemistry biochemistry geochemistry and interdisciplinary environmental fields The pedagogical strategy I have adopted makes heavy use of detailed examples of problem solving from real cases arising both in laboratory research and in the study of systems occurring in nature The procedure starts with mathematically complete equations that will provide valid solutions of equilibrium problems instead of the traditional approach through approximate concentrations and idealized infinite dilution assumptions There is repeated emphasis on the use of corrected conditional equilibrium constants and on the checking of numerical results by substitution in complete equations and or against graphs of species distributions Graphical methods of calculation and display are used extensively because of their value in clarifying equilibria and in leading one quickly to valid numerical approximations The coverage of solution equilibrium phenomena is not however exhaustively comprehensive Rather I have chosen to offer fundamental and rigorous examinations of homogeneous step equilibria and their interactions with solubility and redox equilibria Many examples are worked out in detail to demonstrate the use of equilibrium calculations and diagrams in various fields of investigation **Principles of Chemical Equilibrium** Kelso B. Morris,1966
Chemical Equilibrium William B. Guenther,1975 **Chemical Equilibrium In a Nutshell** Brian Coleman,2018-06-25
Understanding the math and minutiae of chemical equilibrium can be a tall task for anyone so why not enlist the help of a scientific squirrel to guide you on your journey Join Dr Wash as we dabble in equilibrium constants and other tools needed to predict chemical processes This book focuses on introductory concepts at the high school and early university level focusing on identifying equilibrium calculating K and Q discussing Le Chatelier's principle and tying equilibrium with the field of Thermodynamics Full of step by step instructions and practice questions this book aims to simplify one of the more complex topics found within the field of chemistry *Chemical Equilibrium* Bassam Z. Shakhshiri,1972 *Chemical equilibrium* ,
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