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Science, Physics

CJ Tavner 2/04/2013 Chemistry Lab: Equilibrium and LeChatelier's Princinple Objective: Put stresses on the systems; observe how the equilibrium's systems react to a stress. Materials and Procedures: A. Materials 1. NaCl(s) 2. KSCN, 0. 002M 3. Bromythymol blue indicator solution 4. AgNO3, 0. 1 5. CoCL2 x 6H2O(s) 6. HCl, 12M 7. HCL, 0. 1M 8. NaOH, 0. 1M 9. Fe(NO3)3, 0. 2M 10. C2H5OH(l) 11. Na2HPO4(s) 12. Test tubes 13. Beaker 14. Stirring rod 15. Test tube rack 16. Graduated cylinders 17. Funnel, filter paper, and holder for funnel B. Procedure: 1. Equilibrium in a Saturated Solution You will investigate the equilibrium in saturated sodium chloride solution: NaCl(s) ((Na+(aq) + Cl-(aq) Pour some solid NaCL into a test tube and fill the tube about ¾ full of distilled water. Cork and shake to form a saturated solution. If all the NaCl dissolves, pour some additional NaCl in the tube and shake until a saturated solution with some excess solid is obtained. Filter the solution into a second test tube. To this saturated solution of NaCl, add some Cl- ions in the form of concentrated HCl. Record and explain the results. 2. An Acid-Base Indicator Equilibrium Acid-base indicators are large organic molecules that can gain and lose hydrogen ions to form substances that have different colors. The reaction of the indicator bromthymol blue can be illustrated as follows: HIn(aq) ((H+(aq) + In-(aq) In this reaction HIn is the neutral indicator molecule, and In- is the indicator ion after the molecule has lost a hydrogen ion. Equilibrium reactions can easily be forced to go in either direction. Reactions like this are said to be reversible. Fill a small test tube about half-full of distilled water. Add several drops of bromthymol blue indicator solution. Add 5 drops of 0. 1M HCl and stir. This will increase the amount of H+ in solution. Next add 0. 1M NaOH drop by drop with stirring

until no further color change occurs. Adding OH- ions causes the H+ ion concentration to decrease as the ionscombine to form water molecules. Again, note the color. 3. A Complex Ion Equilibrium An equilibrium system can be formed in solution with the following ions: Fe3+(aq) + SCN(aq) ((FeSCN2+(aq) The iron ion and the thiocynate ion are both colorless; however, the ion that forms from their combination, the FeSCN2+ ion, is colored a dark red-brown. It is the color of this ion that will indicate how the equilibrium is being affected. Pout about 25mL of 0. 0020M KSCN solution into a beaker. Add 25mL of distilled water and 5 drops of 0. 20M Fe(NO3)3 solution. Swirl the solution and note the following: color of both, and color of resulting ion. You will stress the equilibrium system that has resulted in several ways. Pour equal amounts of the solution from the beaker into 4 test tubes. The solution in the first test tube will be the reference solution. To the second test tube add 2-3 crystals of solid KSCN. Describe To the 3rd add 6 drops of Fe(NO3)3 solution. Stir and describe. To the 4th add small crystals of Na2HPO4 a few at a time. Stir and note the results. 4. An Equilibrium with Cobalt Complex Ions. Measure about 10mL of ethanol into a beaker. Examine Cobalt II chloride color. Dissolve a small amount in the beaker of ethanol. Should be purple. Add concentrated HCl if its pink Put 2mL of the alcoholic cobalt solution into each of 3 small test tubes. To 1 add 3 drops of distilled water, add 3 drops to each of the other test tubes. The first is the control. To the second test tube, add 5 drops of HCl 12M one drop at a time with stirring. Note results. Put the remainder of cobalt solution into a 4th test tube. Add 10 drops of 0. 1M silver nitrate solution, one drop at a time. Note the color. Obtain a sealed pipet containing some alcoholic cobalt chloride-

water system. Note its color. Immerse large end into hot water about 60 degrees celcius. Chill in an ice bath. Note the color 5. Disposal: Solutions from part 1, 2, and 3 can be safely washed down the sink with excess water. Dispose of the solutions containing cobalt from part 4 using disposal method #27 C. Safety 1. Hydrochloric acid is very hazardous (nuetrilize with baking soda) 2. Wear splash goggles 3. Ethanol is flammable. 4. Silver nitrate causes stains on skin and clothing wash with soap and water immediately. Analysis