Chemical equilibrium lab report answers

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Chemical equilibrium lab report answers

Chemical equilibrium reversible reactions lab report answers.

Objectives To observe the effect of applied stress on chemical systems in equilibrium. A reversible reaction is one in which both the conversion of reactants to products (forward reaction) and the conversion of products to reactants (forward reaction) occur simultaneously: Forward reaction: Reverse reaction: Reversible reaction: \[\ce{A + B C + D}\] Consider the case of a reversible reaction in which a concentrated mixture of only \(A\) and \(B\) is supplied. Initially the rate of reaction forward (\ (\ce{A + B -> C + D}\) is fast because the reactive concentration is high. However, as the reaction proceeds, the concentrations of \ (A\) and \ (B\) will decrease. So over time the forward reaction slows down. On the other hand, as the reaction proceeds, the concentrations of \ (C\) and \ (D\) are increasing. Thus, although initially slow, the rate of reaction backwards (\(\ce{C + D -> A + B}\) will increase over time. Eventually a point will be reached where the rate of the forward reaction will be equal to the rate of the backward reaction. When this happens, a state of chemical equilibrium is said to exist. Chemical equilibrium is a dynamic state. At equilibrium, both forward and reverse reactions occur, but the concentrations of \(A\), \(B\), \(C\), and \(D\) remain constant. A reversible equilibrium reaction can be disturbed if stress is applied. Examples of stress include increasing or decreasing chemical concentrations, or changes in temperature. If such stress is applied, the reversible reaction will undergo a change to restore balance. This is known as Le Chatelier's principle. Consider a hypothetical reversible reaction already at equilibrium: \(\ce{A + B C + D}\). If, for example, the concentration of \(A\) increased, the system would no longer be in equilibrium. The rate of reaction forward (\ (\ce{A + B -> C + D}\) would increase briefly in order to reduce the amount of \ (A\) present and cause the system to undergo a net change to the right. Eventually the forward reaction would slow down and the forward and backward reaction rates become equal again as the system returns to a steady state. Using a similar logic, the following changes in concentration are expected to cause the following shifts: Increasing the concentration of \ (A\) or \ (B\) causes a shift to the right. Increasing the concentration of \ (C\) or \ (D\) causes a change to the left. Decreasing the concentration of \ (A\) or \ (B\) causes a change to the left. Decreasing the concentration of \ (C\) or \ (D\) causes a shift to the right. In other words, if a chemical is added to a reversible equilibrium reaction, a passage away from the added chemical occurs. When a chemical is removed from a reversible equilibrium reaction, a shift towards the chemical removedA change in temperature will also cause a reversible reaction to the equilibrium to undergo a displacement. The direction of displacement depends largely on whether the reaction is exothermic or endothermic. In exothermic reactions, thermal energy is released and can therefore be considered a product. In endothermic reactions, thermal energy is absorbed and can therefore be considered a reactor. Exothermic: Endothermic: \[\[\ce{A +} \text{ heat} \ce{ C + D}\] As a general rule, if the temperature is increased, there is a shift away from the side of the equation with "heat". If the temperature has decreased, there is a shift towards the side of the equation with "heat". In this lab, the effect of applying stresses to a variety of chemical systems at equilibrium will be explored. Di seguito sono riportati i sistemi di equilibrio da studiare: Soluzione di cloruro di sodio saturi \[\ce{NaCl (s) -> Na^{+1} (aq) + Cl^{-1} (aq)}\] Soluzione cromatica acidificata \[\underbrace{\ce{2 CrO4^{2-}(aq) }}_{\text{Yellow}} + \ce{2 H^{+1} (aq) } \underbrace{\ce{Cr2O7^{-2}(aq) }}_{\text{Orange}} + \ce{H2O (l) } > Ï Osservando i cambiamenti che si verificano (cambiamenti di colore, formazione precipitata, ecc.) si puÃ² determinare la direzione di un particolare spostamento. These changes can then be explained by carefully examining the effect of applied stress as dictated by Le Chatelier's principle. Material and equipment: 10 small test tubes, test tube rack, test tube holder, Bunsen burner, 2 medium sized beakers (for warehouse solutions), 10 mL graduated cylinder, wash bottle, mixing bar and scoop. Chemicals: solid (NH4Cl) (s), saturated \ (\ce{NaCl}\) (aq), concentrated 12 M\ (\ce{HCl}\) (aq), 0.1 M\ (\ce{FeCl3}\) (aq), 0.1 M (\ce{KSCN\) Safety All acids and bases used in this experiment (\ (\ce{NH3}\), \ (\ce{HCl}\), \ (\ce{HNO3}\) and \ (\ce{NaOH}\) can cause chemical burns. In particular, the concentration of 12 M\ (\ce{HCl}\) is extremely dangerous! If any of these chemicals spill on you, immediately rinse the affected area under running water and inform your instructor. It should also be noted that direct contact with silver nitrate (\ (\ce{AgNO3}\) will cause dark discoloration to appear on the skin. These places will beDissolvency after repeated rinsing in water. Finally, in part 4 it will heat a solution in a tube directly into a flame of the Bunsen burner. If the solution is overheated, it will splash out of the pipe, so be careful not to point the pipe towards anyone during heating. Register all comments on the report form. These should include, but not be limited to, color changes and fall. Note that the volume of the solution is approximate for all the following reactions. Dispose all chemical waste in the plastic container in the hood. Part 1: Saturated sodium chloride solution Place 3-ml saturated \ (\ ce {nacl} \) (AQ) in a small tube. Carefully add 12 m \ (\ ce {hcl} \) ({hcl}) (AQ) Drop-sage to the solution in the test tube until a distinct change occurs. Register your comments. Place 3-ML of 0.1 m \ (\ ce {k2cro4} \) (AQ) in a small tube. Add a quantity equal to 6 m \ (\ ce {hno3} \) (AQ) to this solution. Register your comments. Now add 10% \ (\ Ce {naoh}}}) (AQ) Drop-Wise until the original color is returned. Register your comments. Here the added sodium hydroxide is effectively the removal of acid hydrogen ions from the balance system by a neutralization reaction: \ [\ CE {H {+ 1} (AQ) + OH {- 1} (AQ) -> H2O (L) } \] Instructor Prep: at the beginning of the laboratory prepares an aqueous ammonia stock solution. Add 4 concentrated drops 15 m \ (\ ce {nh3} \) (AQ) and 3 drops of phenolfthalein in a 150 ml beak (medium), raise it with 100 ml of distilled water and mix with a shake rod. Label the beak and place it on the reception. The whole class will then use this stock solution in Part 3. Place 3-ML of the prepared escort solution in a small tube. Add an average scoop of \ (\ ce {nh4cl} \) powder to the solution in this test tube. Register your comments. Part 4: Cobalt (II) Chloride Solution Place 3-ML of 0.1 m \ (\ CE {cocl2} \) (AQ) in 3 small samples. Label these 1-3 tubes. The solution in test n. 1 remains intact. It is a control for comparison with other pipes. To the solution in test tube no. 2, carefully add 12 m \ (\ ce {hcl} \) ({hcl} \) (AQ), until a distinct color change occurs. Register your comments. To the solution in the test tube n. 3, first add a medium scoop of solid \ (\ ce {nh4cl} \). Then heat this solution directly into the flame of the Bunsen burner (moderate temperature). Hold the test tube n. 3 firmly with the test tube support and the wapper back and forth through the flame (to prevent overheating and â€ œboppareâ) for about 30 seconds, or, until a distinct change occurs. Register theobservations. Then cool the solution in the test tube #3 Back to the room temperature keeping it under the running tap water, and record your observations again. Instructor Prep: at the beginning of the laboratory prepare a solution of iron stock (III) Thiocianato. Add 1 ml of 0.1 m \ (\ ce {fecl3} \) (AQ) and 1-ML of 0.1 m \ (\ ce {kscn} \) (AQ) to a becher of 150 ml (mid), top with 100 ml distilled water and mix with a stirring bar. Label the beak and place it on thedesk. The whole class will then be using this mother solution in part 5. Place 3 mL of the mother solution prepared in 4 small tubes. Label such tests 1-4. The solution in test n. 1 remains intact. It is a control for comparison with other pipes. To the test tube # 2, add 1 ml of 0.1 M \ (\ {ce FeCl3} (aq). Register your comments. To the test tube # 3, add 1 ml of 0.1 M \ (\ {ce KSCN} (aq). Register your comments. To the test solution # 4, add 0.1 M \ (\ {ce AgNO3} \) (aq) drop to drop until all color disappears. A precipitated light may also appear. Register your comments. Here the added silver nitrate is effectively removing ions from the balance system through a precipitation reaction: (aq) + SCN {- 1} (aq) -> AgSCN (s)} \]. Consider the reversible reaction: What happens at reaction rates forward and reverse when the balance is obtained? What happens to reagent (\ (A \) and \ (B \)) and product (\ (C \) and \ (D \) when balance concentrations are obtained? The principle of Le Chatelier states that if a stress is applied to a reversible reaction to balance, the reaction will undergo a shift in order to restore balance. Consider the following reversible esothermic reaction to balance: What direction (left or right) would the following stresses the system in turn? decrease concentration of an increase in concentration of B lower temperature In this laboratory you can explore the effect of the Le Chatelier principle on different chemical systems to balance. These are provided in the Theory section. Consider the third system will be studied: the aqueous aqueous solution. Write the balanced equation for this reversible reaction. We suppose added some excess ammonium ions to this system to balance. In what direction would a change occur? What color change could wait to observe? List all the equipment you intend to use in this laboratory. Equilibrium System: Note the addition of \ (\ {ce HCl} \): In what direction did this effort cause the shift balance system? Left or Right Which ion caused the shift? Explain. Equilibrium System: Note the addition of \ (\ {ce HNO3} \): In what direction did this effort cause the shift balance system? Left or Right Which ion caused the shift? Explain. Notes on addition of \ (\ ce {NaOH} \): In what direction did this stress cause the shift balance system? Left or Right Which ion caused the shift? Explain. Equilibrium System: Note the addition of \ (\ {ce NH4Cl} \): In which direction he didStress causes the shift balancing system? Left or Right Which ion caused the displacement? Explain. Equilibrium System: Observations adding \ (\{ce HCl}\): In which direction did this stress cause the equilibrium system of shift? Left or Right Which ion caused the displacement? Explain. Remarks on heating: In which direction did he warm up the balance system to change? on the basis of these results, this reaction (as written) esothermic or endothermic: explain: balance system: observations on addition of \(\ce{FeCl3}\): in which direction this stress caused the change of the balance system? left or right which ion caused change? Explains. observations on addition of \ (\ce{KSCN}\): in which direction this stress caused the change of the balance system? left or right which ion caused change? Explains. observations on addition of \(\ce{AgNO3}\): in which direction this stress caused the change of the balance system? left or right which ion caused change? Explains. Explains.

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