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Title: Determination of an Equilibrium Constant

Purpose: To determine the value of K_c by measuring the values of $[I_2]$, $[I^-]$, and $[I_3^-]$ by creating

a two phase system

"Before Lab" questions and information:

1. a. I_2, I^-, I_3^-

    b. I_2

    c. I_2, I^-, I_3^-

2. .01094275 M

3. $1.7098*10^{-4}$ M

Procedure: Place 70 ml of the .02 M I_2 in .2 M KI solution and 40 ml of cyclohexane in a

separatory funnel. Shake the funnel for at least ten minutes. The system will separate into two

different phases, drain the phases separately, discarding the interface of the two. Dispense 15 ml

of the aqueous layer along with 15 ml of .1 M HCl and 15 mL of .1 M KI. Titrate the system

with .006 M sodium thiosulfate until the system is a faint yellow color. Add 4 drops 3% starch.

Titrate until colorless. Repeat with a second trial. Repeat all of the preceding steps with the

cyclohexane layer.

Data Tables and graphs:

Table 1	
Volume of Sodium Thiosulfate Used to Titrate Iodine Solutions	
Trial	**Volume of Sodium Thiosulfate Used to Titrate (ml)**
Aqueous 1	37.7
Aqueous 2	38.1
Cyclohexane 1	19.7

Cyclohexane 2	19.2

After Lab:

1. See attached

2. See attached

3. See attached

4. Since KI would add I^- to the system, which causes a reactant favored reaction. This allows us to more accurately measure the I_2 and I_3^- because the addition of KI forces more reactants to be available in the system. I_2 is volatile and to prevent it from evaporating from the solution, it is turned into I_3^-.

5. a. Too high – The concentration of I_2 in cyclohexane and aqueous solution and I^- are thought to be too low. Conversely, I_3^- is predicted to be much higher. Thus, the predicted value would be far too high.

   b. Indetermined – The I_2 in cyclohexane and aqueous solution are predicted to be too high as is the concentration of both I_2 and I_3. However, the amount that is too high is unknown and thus the effects cannot be determined.

   c. No effect – because of the ratio of $[I_2 \text{ (aq)}]/[I_2 \text{ (cyclo)}] = 64$.

6. See attached

Error Analysis: As with any color changes, the point at which the color change happens is subjective, thus the volume used will be different when titrating. Another source of error could be that some volume of liquid was lost due to some leakage in the separatory funnel stopper. There is also the possibility of cross contamination between the aqueous layer and cyclohexane layer due to improper mixing or separation.

Conclusion: In Determination of an Equilibrium Constant, it was determined through the use of

extraction, the equilibrium constant, K_c, is 642.71. Percent error was found to be 17.18%.