Mole ratio write up assignment

Drew Moyer Mrs. Haire IB Chemistry Experiment 6 Mole Ratio in a Chemical Reaction Background: Mole ratios of reactants are often times figured out by the use of the other products in a chemical equation. However, in the instance that the products' mole ratios are unknown, it can be determined through the experiment. This method is called continuous variations. In this lab, I determined the mole ratio between Sodium Hypochlorite and Sodium Thiosulfate by using continuous variations of ratios in a given volume. This reaction was exothermic so I measured the heat that was produced from the reaction.

Hypothesis: The reaction with the proper mole ratio will reach the highest temperature and this is due to the reaction being balanced and theoretically having no limiting reactants. Research Question: How is the method of continuous variation applied to determine the mole ratio of two separate reactants with unknown products? Aim: The purpose of this lab is to determine the mole ratio of two reactants in a chemical reaction by using continuous variation. Variables: Independent Variable: Ratio of reactants Dependent Variable: Temperature change Controlled Variable: Total number of moles of reactants

Apparatus: Protective Goggles Thermometer Graduated Cylinder Sodium Hypochlorite (NaClO), solution Calorimeter Sodium thiosulfate (Na2S2O3), solution Distilled Water pipettes Method: It is important to wear protective goggles and gloves at all time, because these chemicals can cause damage if they come in contact with your skins or yes. 1. Acquire a beaker that contains NaClO solution and another beaker with Na2S2O3. 2. Measure the temperature of both the NaClO solution and the Na2S2O3 and record the

data 3. Measure out 5. 0 mL of NaClO and then pour it into the calorimeter 4. Measure out 45. 0 mL of Na2S2O3 and pour it into the calorimeter quickly closing the lid to reduce heat loss. 5. Stir the contents of the calorimeter with the temperature gently and record the highest temperature of the mixture in the data table. 6.

Pour the solution into the sink and rinse, and dry the calorimeter and the thermometer to eliminate leftover solution from previous trial. 7. Repeat these steps 2-5 times with a different ratio of solution, keeping to total volume at 50 mL 8. Continue testing the various ratios until the maximum temperature if found. Data: Initial Temperature of NaClO: 23. 9 oC Na2S2O3: 23. 8 oC Volume of NaClO(mL)| Volume of Na2S2O3(mL)| Max Temperature(oC)| 5. 0| 45. 0| 27. 0| 10. 0| 40. 0| 29. 0| 20. 0| 30. 0| 35. 5| 30. 0| 20. 0| 42. 0| 40. 0| 10. 0| 45. 0| 45. 0| 5. 0| 34. 5| Graph 1 Conclusion and Evaluation:

By using the method of continuous variation, I measured the change in temperature, which allowed me to find the most effective mole ratio by from the ratio with the highest temperature. From the data collected the mole ratio of Sodium Hypochlorite and Sodium Thiosulfate is approximately 4: 1 But there are sources of error in this lab. For example, there was contamination between trials due to leftovers in the calorimeter following a rinse. Also I was not the only one using those solutions so if any prior groups accidently used the wrong pipette they would have contaminated the whole solution.

There are human errors in the lab too, such as, readings of the thermometer and the best-fit line graph. The main source of error would be from the Styrofoam calorimeter, allowing some heat loss, which would reduce the maximum temperature. There is also the instances in-between mixing the solution and putting on the cover of the calorimeter. If I were to attempt this lab again or revise it, I would take care of my own solution so I can remove the chances for error. Also I would attempt to remove the main source of error, the calorimeter, by using a more suitable means of measurement that can contain the heat better.