Finding the ratio of mole of reactants in a chemical reaction

Profession

Title: Finding the Ratio of Mole of Reactants in a Chemical Reaction Purpose of Lab: To find the coefficients of two chemical reactants that appears in a balanced chemical equation using the continuous variations method. Pre Lab Questions:

1. 2AgNO3(aq) + K2CrO4(aq) > 2KNO3(aq) + Ag2CrO4(s)
2. There is enough to make a valid conclusion because, on the graph, one can clearly see that the two lines intersect. Thus, one can also determine the mole ratio. The mole ratio is approximately 2: 1 (AgNO? to K? Cr?). Procedure: 1. Obtain 175mL of the bleach solution in a clean 400mL beaker and 175mL of Solution B in another beaker. 2. Measure the temperature of both solutions and record. The solutions should be at the same temperature. If they are not, you will need to make a correction for the temperature difference.
3. Using a clean 10mL graduated cylinder, measure 5. 0m: of NaClO and pour the solution into a Styrofoam cup. Using a clean 50mL graduated cylinder, measure 45. 0mL of Solution B and add this to the Styrofoam cup.
4. Stir with a thermometer, and record the maximum temperature reached of the final solution in your data table. Pour the solution out, rinse the cup and thermometer, and repeat steps 1-4 using a different ratio of the two substances, always keeping the volume at 50. 0mL.
5. Continue testing various ratios until you have at least three measurements on each side of the one that gave the greatest temperature difference.
6. Plot your data on a graph,? T? vs. Reactant volume (mL).

7. Draw two best fit straight lines, and determine where they intersect. Be sure to include the points at the 0: 50mL and 50: 0mL rations. If at any point do not fall close to the lines, repeat these measurements.

Find the stoichiometric mole ration of reactants from the line of intersection on the graph.

Data: Initial Temp of both:

Na2SO 3 (mL)	NaClO (mL)	Max. Temp. (?)
45. 0mL	5. 0mL	28. 9
5. 0mL	45. 0mL	27. 5
25. 0mL	25. 0mL	42. 3
40. 0mL	10. 0mL	33. 4
10. 0mL	40. 0mL	30. 9
30.	20.	43. 5

0mL	0mL	
20. 0mL	30. 0mL	38. 6

Conclusion: In this lab, we found the coefficients of two chemical reactants that appeared in a balanced chemical equation using the continuous variations method. The mole ratio turned out to be 1: 1.

One can be able to find the correct mole ratio after plotting the results on a graph that showed the trend of change in temperature. Theory: The theory of this experiment was continuous variation because it gives the stoichiometric ratios for the correct chemical equation if one does them correctly. Error Analysis: Instead of keeping just one initial temperature for all the tests, to make it more accurate, we could have measured the initial temperature of the solutions before each reaction. The exactness of the thermometer could have altered our results.

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Also, there was an error in measuring the reactants using graduated cylinders. This most likely happened because graduated cylinders are not the most accurate way to measure a liquid. Post Lab Questions: 1. Different temperature changes occur when mixing different volumes of the two reactants. The experiment was made so the volume of solution and the total number of moles of reactants was a constant for all of the experiments, since temperature change was directly proportional to the number of reactants. Therefore, the optimum ratio is the ratio of the volume of reactants.

1. It consumed the greatest amount of reactants, formed the greatest amount of products, and generated the most heat and maximum temperature change
2. A constant volume of reactants must be kept in all trials so that the subsequent changes in temperature can be compared. They are proportional to the number of reactants consumed in the reaction.
3. Yes. The concentrations of the two solutions must be the same in order for the stoichiometric mole ratio of the reactants to be accurate after the results of the trial are graphed because molar concentration is moles of solute divided by liter of solution. A limiting reagent is reactants in a chemical reaction that will be completely gone before all other reactants in the reaction are used up. This will also cause the reaction to stop.
4. Both measurements limit the precision of the data. The measurement of temperature limits the precision of the data to 3 significant figures. The thermometer used was able to be read to the tenths of a degree. On the other hand, the measurement of volume limits the precision of the data to 2 significant figures. The graduated cylinders used, only could measure volume to the nearest mL and anything after that was an estimate.
5. The limiting reagent along the upward sloping line of the graph is Na?SO?. The limiting reagent along the downward slope line is NaClO.
6. Other physical properties that could be used in the method of continuous variation, besides temperature change, could be a color

change, the mass of a precipitate that forms, and/or the volume of a gas produced.

7. It is more accurate to use the point of intersection of the two lines to find the mole ratio rather than the ratio associated with the greater temperature change because one most likely did not use the exact mole ratio. Thus, the point of intersection is more likely an average. Also, the maximum amount of each reactant might not have been used to get the highest temperature; the highest temp wouldn't necessarily have the highest mole to more ratios.
8. The average of the temperatures would be used as the initial temperature.

Graph: Calculations: The intersection point was at approximately 28. 6 mL Na? SO3? and 21. 4 mL NaClO. Moles Na? SO3? = 0. 5 M(. 0286 L) = . 0143 moles Na? SO3? Moles NaClO = 0. 5 M(. 0214 L) = . 0107 moles NaClO . 0143 moles Na? SO3? /. 0107 = 1. 34 moles Na? SO3? which rounds to the nearest whole number, 1 . 0107 moles NaClO/. 0107 = 1 mole NaClO. The stoichiometric mole ratio is 1: 1 for the reactants. The actual stoichiometric mole ratio for the reaction is 1: 1.