Laboratory 1 - Stoichiometry

Purpose: To predict the amount of Carbon dioxide gas that should be produced in a chemical reaction; then calculate the % yield.

Materials:

0.050 mol Baking Soda ($NaHCO_3$)

50g Vinegar (CH_3COOH)

2 styrofoam cups

Balance

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Procedure: In this lab, baking soda will react with an excess of vinegar. This helps ensure 100% actual yield for the reaction. In the space below, calculate how much sodium hydrogen carbonate we will need for this lab:

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Procedure: In order to predict the amount of CO_2 that will be produced by the reaction, we must balance the equation for the reaction:

$$NaHCO_3 + CH_3COOH \rightarrow CO_2 + H_2O + NaCH_3COO$$
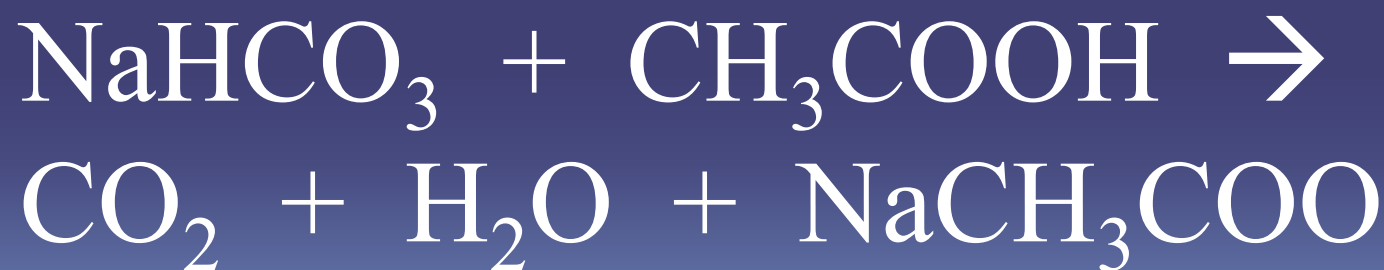
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Procedure: Calculate the amount of carbon dioxide that would theoretically be produced based on the amount of baking soda used.

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Procedure (cont.):

1) Find and record the mass of cup A.

2) With cup A still on the scale, weigh out the correct mass of baking soda into the cup. Carefully record your results.

3) Place cup B on the scale, weigh and record approximately 50.0 g of vinegar. Carefully record your results.

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Procedure (cont.):

4) Slowly add vinegar to cup A until the reaction has stopped. DO NOT add all of the vinegar, just enough to complete the reaction. Be careful not to let the cup overflow as this will ruin your experiment.
5) Reweigh and record both cup A and B. Calculate the mass of CO_2 that escaped.

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a. Mass of Cup A _____ g

b. Mass of Cup A and baking soda _____ g

c. Calculate mass of baking soda (b - a) _____ g

d. Mass of Cup B with vinegar _____ g

e. Mass of Cup B after reaction _____ g

f. Calculate mass of vinegar poured into Cup A

(d – e)_____ g

g. Mass of Cup A after reaction _____ g

h. Calculate mass of product after reaction

(g – a) _____ g

i. Calculate baking soda + vinegar (c + f) _____ g

j. Calculate mass of CO_2 lost (i - h) _____ g

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Results

1. How does predicted amount of CO_2 produced compare to the actual amount?

2. Calculate the percent yield.

$$\frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% = \text{percent yield}$$

3. Calculate percent error.

$$\frac{(\text{actual yield - theoretical yield})}{\text{theoretical yield}} \times 100\% = \text{percent error}$$

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Conclusions (5 points)

What happened? Was anything surprising? If you think the result you achieved was not what you expected, what are the possible sources of error?

What did you learn from this experiment? If you were to do it again would you do it differently?