

Name: _____

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Activity Sheet

Predicting Chemical Reactions

Aim:

To observe a chemical reaction and quantitatively predict the products of the reaction.

Materials:

- 500 mL plastic bottle (no cap needed)
- Graduated cylinder
- Electronic scale
- pH paper
- Vinegar
- 2 pieces of chalk

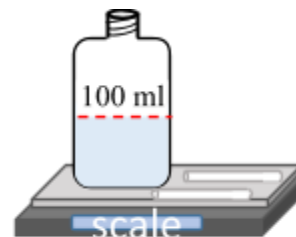


Figure 1. Place chalk and vinegar-filled bottle on the scale.

Lab protocol:

- ___ 1. Use the graduated cylinder to measure 100 ml of vinegar and pour into the bottle.
- ___ 2. Tear off small piece of pH paper and dip in into the liquid in the bottle without leaving the paper inside. Use the pH chart to measure the pH value.

Initial pH:

- ___ 3. Zero the scale (press 'tare') making sure nothing is on the scale. Measure the mass of the two chalk pieces. We will use this mass to predict the change in mass.

Mass of just the chalk pieces:
grams

- ___ 4. Place the two pieces of chalk and the vinegar-filled bottle onto the scale, as shown in Figure 1. **Do not put the chalk in the bottle yet!**

Initial Mass:
grams

- ___ 5. Place the chalk inside the bottle to start the reaction!

While the reaction is taking place, let's predict how much mass will be lost.

When chalk (CaCO_3) and vinegar (CH_3COOH) react what are the products?



Observations of the reaction (might help you predict the products):



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A) For the chalk you weighed, how many moles of CaCO_3 are there? The molar mass of CaCO_3 is about 100g/mol.

$$\text{_____ g} \times \frac{\text{mol CaCO}_3}{100\text{g}} = \text{_____ mol CaCO}_3$$

B) For the amount of vinegar you poured into the bottle, how many moles of CH_3COOH are there? The concentration in vinegar is about $0.83 \frac{\text{mol}}{\text{L}}$ CH_3COOH .

$$\text{_____ mL} \times \frac{\text{L}}{1000 \text{ mL}} \times \frac{0.83 \text{ mol CH}_3\text{COOH}}{\text{L}} = \text{_____ mol CH}_3\text{COOH}$$

C) What is the limiting reactant in this reaction?

D) Based on the balanced equation and limiting reactant, how many moles of CO_2 are produced?

E) What is the mass of CO_2 being produced? The molar mass of carbon dioxide is 44g/mol. Write this predicted change in mass in your results table.

$$\text{_____ mol CO}_2 \times \frac{44 \text{ g CO}_2}{\text{mol}} = \text{_____ g CO}_2$$

F) Do you predict the reaction to be more or less acidic (more or less pH)?

Lab protocol (continued):



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___ 6. Measure the final mass of the experiment.

Final Mass:

grams

___ 7. Fill in the results table below with initial and final mass. Calculate the change in mass.

___ 8. Tear off a piece of pH paper and dip in into the liquid in the bottle without leaving the paper inside. Use the pH chart to measure the pH value.

Final pH:

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___ 9. Rinse out the bottle and clean up your lab area.

Results Table:

Initial Mass (g)	Final Mass (g)	Change in Mass (g)	Predicted Change (g)

Follow up questions

How close was your prediction in change in mass? Explain any errors that you can think of.



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What was the change in pH? Was your prediction correct?

Do you see chalk left inside the bottle? Do you think we can predict how much is it?

Can you think of any other cases where predicting a chemical reaction would be important?



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