**Chemical Reactions in the Kitchen**

**Physical Science**

**Problem:** *Choose a question relating to some aspect of chemical reactions in cooking that your group can investigate. Make sure your question clearly identifies the independent and dependent variables in your investigation. e.g. How does (independent variable) affect (dependent variable)?*

**Hypothesis:** *Make an educated guess at the answer to your question. Your hypothesis should be testable, linked to solving the problem, and explain how changing the independent variable will affect the dependent variable.*

**Rationale:** *Defend your hypothesis. Explain why you think what you think. Use your existing knowledge of physics to back up your claims. You should also support your ideas with other people’s work on the same topic.* ***(Yes, you have to do some research!)*** *Be sure to properly cite other people’s work and relevant resources including texts, internet resources, etc. List cited sources in the bibliography at the end of the lab report.*

**Materials:** *List the materials you used, including amounts. Be specific. Sketches may also aid your description of materials or techniques used.*

**Procedure:** *Describe precisely the steps involved in the experiment. Sketches (created in a computer program or by hand) of the experimental setup should be included. Steps should be accurately listed out as 1, 2, 3, etc. Your procedure should be clear and specific enough so that someone else could exactly repeat your experiment.*

**Data and Observations:** *Include labeled data tables of measurements (with proper units!), observations, and any notes you made during the lab. Data and observations should also be discussed in paragraph format. (Yes, this is redundant, but that is the nature of scientific report writing.)*

**Analysis of Results:** *Explain how factors in the experiment other than the independent variable were controlled. Analyze the data to show what it means. Calculations (including how they were done) and graphs of data must be shown. Graphs should have the independent variable on the x axis and the dependent variable on the Y axis. Each graph should also contain a title and labeled axes (including units), Visual images allow scientists to see relationships quickly without scanning through large data tables. Make sure your visuals are well labeled and include the proper units. Each visual should also be discussed in the text with an explanation as to what it means, including relationships that are evident in the data.*

**Conclusions:** *Do your results support, refute, or not apply to your hypothesis? Be sure your conclusion includes a brief restatement of your original hypothesis. Remember that one experiment does not prove your hypothesis right or wrong.*

**Extensions:** *Explain any sources of error in this experiment and how they could be improved upon in the future. Did you find anything surprising? Explain. Describe anything that was a problem in the lab, and how it may be improved in the future. Make suggestions for future research to be done on this topic – often answering one question simply raises more questions.*

**Bibliography:** *Properly cite any references/resources you used.*

***Some Ideas for Possible Questions to Investigate:***

1. *How does the type of leavening agent affect the height and texture of a cookie? (Compare baking soda, baking powder, cream of tartar, etc.)*
2. *How does the type of flour used affect the height and texture of a cupcake? (Compare all purpose, whole wheat, bread flour, gluten free, etc.)*
3. *How does the type of sweetener affect the flavor, texture, and diameter of a cookie? (Compare brown sugar, white sugar, corn syrup, honey, artificial sugar, etc)*
4. *How does the type of fat affect the flavor and hardness of caramel candy? (Compare shortening, butter, margarine, oil, light margarine, etc).*
5. *How does the application of heat affect the time needed to brown and the diameter of a cookie? (Compare oven temperatures, or type of ovens: microwave, convection, and conventional)*
6. *How does the amount of mixing (time in mixer or number of stirring strokes) affect the flavor, texture, and diameter of a cookie?*
7. *How does the type of marinade used affect the moisture and texture of a strip of chicken breast?*
8. *How does the tenderizing technique used affect the moisture or texture of a strip of a chicken breast? (Compare pounding, tenderizer products, etc)*
9. *How does the type of growing and harvesting technique of wild rice affect its flavor or texture?*
10. *Come up with your own question in the format:*

*How does \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ affect \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?*