Biology
Mr. Ulrich

Name:_____

Lab #:_____Block:_____

Jelly-Side Down?

The Premise:

Is this a true story or what?:

> *It is a busy Monday morning. Your toast just popped out of the toaster. You butter it. You are putting grape jelly on it. Then it happens. As you are picking up the toast up, it slides off the table and lands jelly side down on the floor!* **!%!#@#$!** *Another typical Monday.*

Why does toast always seem to land jelly side down? Or does it always land jelly side down? How could you find out? Complete the following activity to see how scientists conduct experiments to find out information about the natural world and to find out if your toast really does land jelly side down.

Scientists are interested in explaining how the natural world works. They observe things in the world that they do not understand and they ask questions. Scientists design experiments to find answers to their questions. Scientists provide results of the experiments to other scientists by writing reports, called papers, which are put into science magazines, called journals. Other scientists, and the general public, read the papers and decide if the scientist's experimental work and conclusions were correctly interpreted. Over the years scientists have come up with a standard procedure, called the scientific method, for designing experiments.

The scientific method is a set of scientific processes that scientists use to solve problems observed in the world around them. Each problem uses a different set of processes, or uses the processes in a different order, to solve the problem. It is the job of a scientist to assemble a plan using the processes to solve a problem. Scientists generally pose problems, predict answers to the problem, probe the problem by experiments and "persuade" (inform) others by writing papers describing the results of the experiment. This 4-P Approach to Problem Solving is described in this activity.

The Procedures:

P-1: Posing

As scientists observe the natural world they see things that they do not understand. They pose questions about the observations they make. Posing questions is the first step of the scientific method. Write a question concerning the following observation:

Observation:

Often, when toast slides off a table it seems to tend to land jelly-side down.

Question: *It's helpful to keep in mind that you want to be able to answer your question. Write it below.*

P-2: Predicting

The questions posed in step one are reworded into what scientists call a hypothesis, which is a statement, that is a possible answer to the question and be tested. A hypothesis can be described as a testable prediction, and states in advance the result that is expected to be obtained from testing the hypothesis. Predictions are often written as "if and then" statements. Write a hypothesis for the jellied toast observation. Change your question concerning the jellied toast into an if / then prediction.

Observation:

Often, when toast slides off a table it seems to tend to land jelly-side down.

Question: *Re-write it below. Edit it if you need to.*

Hypothesis:

P-3: Probing

The third step of the scientific method is probing, which involves designing a controlled experiment to test the prediction concerning the hypothesis. Experiments may be simple or contain many parts and processes depending on the nature of the prediction to be analyzed.

Controlled experiments are based on the comparison of a control group with an experimental group. The control group and the experimental group are identical except for the one factor being tested for in the experiment. This factor is called the independent variable. The independent variable is the factor in an experiment that the scientist changes or manipulates. The dependent variable is the factor that changes as a result of what the scientist does to the independent variable. Controlled experiments usually change only one variable at a time so the scientist knows what is being changed and what is being tested. Information, called data, is collected as the experiment is completed. After completing an experiment the scientist analyzes the data. Conclusions about the posed question are then drawn from the analyzed data.

Design a controlled experiment testing your jellied toast hypothesis. Write the outline of this experiment on this and the next page. Include more than just a diagram of your experimental design. Add additional sheets if necessary.

Have the instructor check the above experimental plan. _____.

Conduct the experiment. Record the data on a separate sheet of paper:

P-4: Persuasion (Information)

To persuade (inform) other scientists that their experimental conclusions are correct, scientists write papers explaining the results of their experiment. These papers are published in scientific magazines or journals. Other scientists read the papers and make comments on the experiment and the results. If they disagree with the way the experiment was designed or the results they can do the experiment themselves and write their own paper, trying to persuade others that they are correct. This way scientists check on each others work making sure that all results and conclusions are accurate.

Write the results of your experiment in the form of an experimental paper as outlined below and be prepared to defend your results orally with the instructor (That's me).

Outline of an experimental paper:

I Summary – Not more than one paragraph

II Background – Observations that led up to study. One paragraph. Include the hypothesis here

III Materials and Methods – The "whats" and the "hows" of the experiment.

IV Data – What did you find out? Include tables and graphs whenever possible.

V Conclusion – What can you tell from the data? How does the data relate to your hypothesis and predictions? Suggestions for further study?