

Future Honors Biology Students,

I am very excited that you will be joining us at the high school next year. Below I have included a list of your summer assignments that are part of this packet.

1. Complete the Experimental design practice worksheets
2. 10 Science cartoons
3. Experiment and report

On the first day of class items 1 and 2 need to be returned. The results from your experiment must be e-mailed to me by August 1, 2011.

If you have any questions students you may email me at Melissa.green@bufordcityschools.org. Please identify yourself in the subject line and include honors biology.

I look forward to a great freshman year of Honors Biology.

Melissa Green
Honors Biology
AP Biology

Experimental Design- Explain

Read the paragraph and answer the questions.

Chris wanted to test the effect of diet pills on how tall the tomato plants in his garden would grow. He took two pots, filled them with dirt from the same bag, and planted four tomato plants in each. He watered one planter with tap water, and he watered the other planter with tap water mixed with dissolved diet pills. The plants were in the same location to ensure they got the same amount of sunlight, and the water was measured so that each pot received the same amount of water. He measured their height at the end of each week for eight weeks, and averaged the height of the four plants in each pot. He then graphed the results to show how the diet pills affected the height of the plants.

1. What is the independent variable of this experiment?

2. What is the dependent variable of this experiment?

3. What is the control?

4. List the constants in this experiment.

5. How many trials were ran for this experiment?

6. Write a hypothesis for this experiment in the If/Then style.

Carefully read the paragraph below. Answer the following questions in complete sentences.

During gym class Sally noticed that her friend Melissa always ran faster than her. Sally knew that they exercised equally, so she wondered what could cause Melissa to run so fast. Sally began to compare herself and Melissa to see what could cause the difference in speeds. She noticed that Melissa was taller and wondered if height affected speed. Sally predicted that taller people were able to run faster, but wanted to check her prediction. She asked her gym teacher if she could test her idea because the class was all girls and she thought this would help her get accurate results. Sally measured all of her classmates' height in centimeters and recorded it in her chart. Each classmate then ran one mile while Sally timed them with a stopwatch and recorded the data in seconds. She then began to review her data and look for the answer to her question.

1. What question is Sally trying to answer?

2. What made her want to answer this question?

3. What is being measured or observed in this experiment?

4. Are the observations recorded in words or numbers?

5. What factor does Sally think might cause the measurement to change?

6. What parts of the experiment were kept the same throughout?

7. Is there a standard of comparison in this experiment (something she compared everyone to)?

8. How many times was the experiment completed?

Experimental Design Worksheet
Scientific Method

Name _____

Definitions: Define the following words and concepts related to the scientific method.

1. Hypothesis: _____
2. Independent Variable: _____
3. Dependent Variable: _____
4. Control Group: _____
5. Experimental Groups: _____
6. Constants: _____
7. Trials: _____
8. Variables (use a dictionary if necessary): _____

Practice: Write a hypothesis for each of the statements and identify the variables, control group, and experimental group.

1. Cigarette smoking increases the risk of lung cancer.

- Hypothesis: If _____, then _____
- Independent Variable: _____ Dependent Variable: _____
- Control Group: _____ Experimental Group: _____

2. Eating breakfast increases performance in school.

- Hypothesis: If _____, then _____
- Independent Variable: _____ Dependent Variable: _____
- Control Group: _____ Experimental Group: _____

3. Hummingbirds are attracted to the color red.

- Hypothesis: If _____, then _____
- Independent Variable: _____ Dependent Variable: _____
- Control Group: _____ Experimental Group: _____

4. Bats locate food using sound waves.

Hypothesis: If _____, then _____

Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

5. iBook batteries last for 5 hours.

Hypothesis: If _____, then _____

Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

Situations: Read the situation below and design an experiment.

John Smith has been hired by the city of Virginia Beach to investigate the recent shark attacks off the resort's coast. He has a budget of \$40,000, a 25 foot boat, and three graduate student assistants to help him. A helicopter has also been donated by a local television station, should he need one.

* * *

1. List 2 hypotheses John and his crew may have come up with for the recent shark attacks.

a. If _____, then _____

b. If _____, then _____

2. What materials will John need to perform this experiment (How will they spend the \$40,000?).

3. Where should they perform the experiment (Hint: Where do sharks like to live)? _____

4. Pick one of the two hypotheses and determine the following:

a. Control Group: _____

b. Experimental Group: _____

c. Dependent Variable: _____

d. Independent Variable: _____

5. What type of data do you think John will collect (What will be the results of the experiment?)?

6. What conclusions will John be able to make from the results of the experiment?

In the statements below, write the hypothesis, variable, control groups and experimental groups.

1. Plants grow best in white light.

Hypothesis: If _____, then _____

Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

2. The deer population decreases in the winter due to the lack of food.

Hypothesis: If _____, then _____

Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

3. Students who study perform better in school.

Hypothesis: If _____, then _____

Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

Read the following situation and answer the following questions.

Suzie Q wants to know the effect of different colors of light on the growth of plants. She believes that plants can survive best in white light. She buys 5 ferns of the same species, which are all approximately the same age and height. She places one in white light, one in blue light, one in green light, one in red light and one in the closet. All of the ferns are planted in Miracle-Grow and given 20 mL of water once a day for 2 weeks. After the two weeks, Suzie observes the plants and makes measurements.

Hypothesis: If _____, then _____

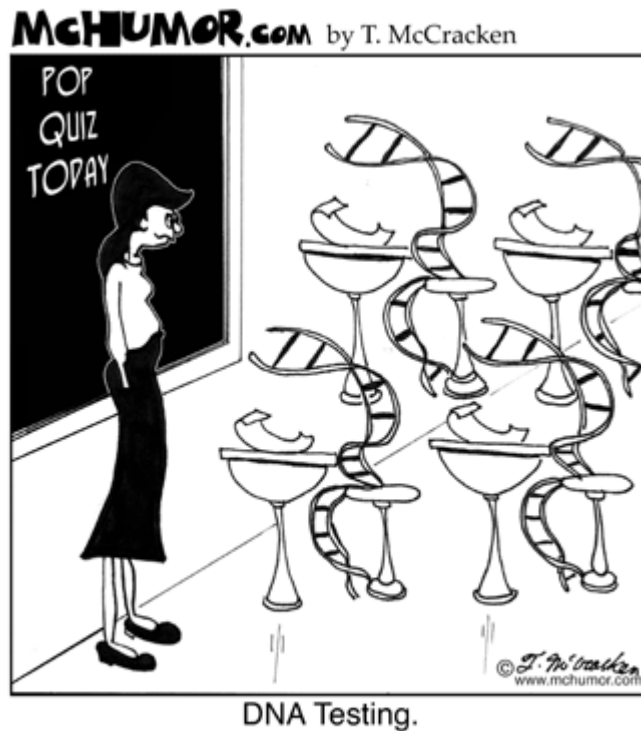
Independent Variable: _____ Dependent Variable: _____

Control Group: _____ Experimental Group: _____

Constants: _____

What types of measurements can Suzie make on the plants to determine how they did in different types of light? _____

Science is not taught in isolation. Science is part of everyday life whether we realize it or not. Science is connected in song lyrics, television commercials, and bill boards. You are to find 10 comics from any media source. Explain the comic; describe the science behind the comic, and most importantly how the situation in the comic is funny.



What is the science behind the cartoon? Why is it funny? Why are the strands sitting at a desk?

- Find 10 cartoons related to Biology. Explain the science behind each cartoon. Explanations must be detailed. Minimum of 1 paragraph (5-7 sentences).
- Each cartoon must be large (1/2 page) and the explanation must be at the bottom of each one. Use proper grammar.
- Use comic strips, newspapers, or the internet to find cartoons.

Experimental Design Organizer

Honors Biology

You should only turn in one worksheet per group.

Research Group Members:	
1.	2.

1. Project Title:

The Effects of...(independent variable) on the (dependent variable).

2. What is the **Question** that you want to ask?

3. Formulate a specific, testable **Hypothesis**. (If..., then... statement!) Your question may be general, but your hypothesis must be specific enough to predict a specific result. Keep it simple and focused. *Example: "Why are plants green?" is a question. Hypothesis: "If Plants are green because the chlorophyll pigment they contain absorbs light in the red and yellow wavelengths, then plants will grow tallest in the presence of these wavelengths" (this is a specific, testable hypothesis).*

4. Give a biological **Justification** for your hypothesis. That is, what is your hypothesis based on? What facts or previous knowledge lead you to believe your hypothesis is correct? (Remember that a hypothesis is not a random guess, but is based on previous knowledge!) Be specific! *Example: "We know that plants contain chlorophyll and that visible color results from a molecule's ability to absorb some wavelengths of light and reflect the remaining wavelengths."*

5. Summarize how you will carry out an **Experiment** to test your hypothesis. You do not have to give a step-by-step procedure at this time, but include enough detail to show that you have thought through the experiment carefully. What conditions will you change in your experiment? What materials will you need? Where will you carry out your experiment?

6. What **Predictions** does your hypothesis make about the outcome of your experiment? That is, if your hypothesis were correct, what results would you expect? What kind of results would not support your hypothesis? You must explain the type of data you will collect!

7. If you are working with a partner, explain how you will find the time to collaborate on this project. You will need to convince me that you will work TOGETHER and find common meeting times. You will share a grade, and need to depend on each other! Chose your partners wisely... ☺

8. Carry out your experiment, provide proof (pictures, video and results) and record your conclusion. Presentation of experiment needs to be in the form of a power-point or like media. Presentation needs to include Title, materials, hypothesis, procedures, data (in tables and graphed) results, conclusions and acceptance or rejection of hypothesis. The finished report must be emailed to Melissa.green@bufordcityschools.org by August 1, 2011. A late grade will assessed after August 1.

For instructor's use only:

- Project asks an interesting question
- Hypothesis is specific, testable and based on a solid scientific rationale
- Experiment is well-designed
- Experimenters propose to collect sufficient data
- Experimenters understand the predictions of their hypotheses

Experimental design: is acceptable as written needs work