

Experimental Design Worksheet
Scientific Method

Name _____
Block _____ Date _____

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

1. Hypothesis: **_Proposed explanations to a problem based on observation or research_____**
2. Independent Variable: **_The variable the scientist controls/manipulates; known as the experimental variable or manipulated variable._**
3. Dependent Variable: **The response to the change in the independent variable; the measurements collected in the experiment_**
4. Control Group: **the group that does not change variables; does not receive the independent variable; it is the standard of comparison for the experimental group_____**
5. Experimental Groups: **the group exposed to the independent variable; the test group_____**
6. Constants: **variables that are not changed in the control group and experimental group; they remain the same in both groups.____**
7. Trials: **each time an experiment is run _____**
8. Variables (use a dictionary if necessary): **traits that can be changed in the experiment_**

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 **if you smoke cigarettes_**, then **_your chances of getting cancer increases_**

Independent Variable: **smoking cigarettes_____** Dependent Variable: **whether you get cancer**

Control Group: **people who do not smoke** Experimental Group: **smokers_____**

2. Eating breakfast increases performance in school.

Hypothesis: If **if you eat breakfast_____**, then **you will get better grades__**

Independent Variable: **breakfast_____** Dependent Variable: **grades_____**

Control Group: **students who do not eat breakfast_** Experimental Group: **students who eat breakfast**

3. Hummingbirds are attracted to the color red.

Hypothesis: If **if a bird feeder is red** _____, then **it will attract hummingbirds** ____

Independent Variable: **color of feeder** Dependent Variable: **hummingbirds present**

Control Group: **feeder that is not red** _____ Experimental Group: **feeder that is red** _____

4. Bats locate food using sound waves.

Hypothesis: **If bats hear a sound** _____, then **they will be attracted to it** _____

Independent Variable: **sound waves** _____ Dependent Variable: **number of bats** _____

Control Group: **no sound** _____ Experimental Group: **:sound** _____

5. iBook batteries last for 5 hours.

Hypothesis: If **you use iBook batteries** _____, then **your iBook will run for 5 years** ____

Independent Variable: **battery type** _____ Dependent Variable: **time plays** _____

Control Group: **different type of battery** _____ Experimental Group: **iBook battery** _____

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 **swimmers wear bright colored swimming suits** _____, then **sharks will attack** _____

b. If _____, then _____

2. What materials will John need to perform this experiment (How will they spend the \$40,000?). **manikins, bright swim suits and dark swim suits, floating devices;**

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

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

a. Control Group: **dark swim suits** _____

b. Experimental Group: **colorful swim suits** _____

c. Dependent Variable: **number of shark attacks** _____

d. Independent Variable: **color of swim suit** _____

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

number of shark attacks _____

6. What conclusions will John be able to make from the results of the experiment? **Whether wearing bright, colorful swim suits increases the number of shark attacks** _____

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

1. Plants grow best in white light.

Hypothesis: **If plants are grown in white light** _____, then **they will grow taller** _____

Independent Variable: **type of light** _____ Dependent Variable: **height of plant** _____

Control Group: **plants in different colors of light** _____ Experimental Group: **plants in white light** _____

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

Hypothesis: **If there is a lack of food** _____, then **the deer population will decrease** _____

Independent Variable: **amount of food** _____ Dependent Variable: **number of deer** _____

Control Group: **plenty of food** _____ Experimental Group: **lack of food** _____

3. Students who study perform better in school.

Hypothesis: **If a student studies** _____, then **he/she will get good grades** _____

Independent Variable: **studying** _____ Dependent Variable: **grades** _____

Control Group: **not studying** _____ Experimental Group: **studying** _____

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 plants are grown in white light** _____, then **they will grow taller** _____

Independent Variable: **type of light** _____ Dependent Variable: **height of plant** _____

Control Group: **plant in closet** _____ Experimental Group: **plants in different colors of light** _____

Constants: **same species of plant, same age and height, plant food, amount of water, time period** _____

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