

Name : \_\_\_\_\_ Per: \_\_\_\_\_ Date: \_\_\_\_\_

## Nature of Science, Experimental Design, Characteristics of Life and Atoms Study Guide

**Part 1 - Directions: For the following scenarios, determine the parts below.**

- A. Independent variable
- B. Dependent variable
- C. Constant (What variables remain constant)
- D. Control Group
- E. Experimental Group

The Byrnes High School AP Biology class conducted an experiment to determine the effects of Wal-Mart brand plant food on grass growth. Two plots of grass located in the same yard were used. Both plots received 10 hours of sunlight per day, one inch of water per week, and were maintained at 28 C for a period of 30 days. Once every seven days, plot A received 3 grams of Wal-Mart brand plant food dissolved in that day's water supply. Plot B did not receive any plant food throughout the experiment.

- A. Independent variable **If they received fertilizer.**
- B. Dependent variable **The growth of the grass.**
- C. Constant **Sunlight, water, and temperature.**
- D. Control Group **Plot B – Grass with no fertilizer.**
- E. Experimental Group **Plot A – Grass with fertilizer.**

To determine the effect sewage spillage in the Reedy River had on local fish populations, the Reedy River Environmental Coalition counted the number of dead fish found downstream of the spillage each day for ten days. They also counted the number of dead fish found upstream from the spillage each day for ten days. It is assumed that fish populations in both areas live in water of the same temperature and pH, and that they receive the same amount of pesticide runoff and industrial waste. It is also assumed that the sewage always ran downstream from the spillage since the current is so strong in that direction.

- A. Independent variable **Presence of sewage.**
- B. Dependent variable **How many dead fish.**
- C. Constant **Temperature, pH, runoff, and waste.**
- D. Control Group **The fish upstream.**
- E. Experimental Group **The fish downstream.**

Scientists observed that white mice that were fed seeds appeared to grow more than mice fed the regular diet of leafy green and yellow vegetables. The scientists hypothesized that the protein in the seed was responsible for the growth. They designed an experiment to test this hypothesis. They divided 200 mice of the same age, size, health, and sex into two groups of 100 mice each. The mice were kept under identical conditions for 90 days. One group was given the normal low protein diet. The other group was given new high protein diet. The mass of each mouse was recorded weekly for 90 days.

- A. Independent variable **The type of diet.**
- B. Dependent variable **Mass of the mice.**
- C. Constant **age, size, health, and sex of mice.**
- D. Control Group **Mice fed the low protein diet.**
- E. Experimental Group **Mice fed the high protein diet.**

**Part 2 – Directions:** Design an experiment for the testing of a new medication used to treat headaches called Priclos.

Describe what your control group is and will be doing: **Group should be patients who do not receive the medication. All other parts of the group should be the same as your experimental group. (Same people participating in both groups would be ideal to keep constants correct)**

Describe what your experimental group is and will be doing: **Group should be patients who do receive the medication. All other parts the same as control group.**

Independent Variable: **If they get the medication.**

Dependent Variable: **If the headaches go away.**

**Part 3 – Direction:** Answer the following questions.

1. How does a law differ from a theory? Give an example of each.

**Theory will explain why something is occurring – Example: Big Bang Theory**

**Law will describe what is happening, but give no reasoning why – Example: The Law of Thermodynamics.**

2. What types of questions can be answered by science? Given an example of one question that can be answer by science and one question that cannot.

**Questions where data can be collected.**

**Can – What is the effect of nuclear radiation on unborn fetuses?**

**Can't – Is there an afterlife?**

3. What are the eight characteristics of life?

Evolve, Obtain and use energy (Metabolism), Reproduction, Have cells, Maintain stable internal environment, Genetic Code, Growth, Respond to environment

4. What is homeostasis?

When the insides of an organism stay the same no matter what changes in the outside environment. Examples – Body temperature, Blood sugar level, salt level of the body, etc.

5. What is metabolism?

When an organisms obtains energy from a source and uses that energy. The process results in some production of waste due to the Law of conservation of matter (The atoms in the bonds that are broken for energy must go somewhere).

6. What characteristics of life do viruses possess? Which ones do they not possess?

Possess – Evolve, Genetic Code

Not Possess – Metabolism, reproduction, cells, homeostasis, growth, responds

7. How do viruses reproduce and get energy?

They inject their genetic code into a host cell, and the host cell gets the energy and reproduces for the virus.

8. How does spontaneous generation differ from biogenesis

Spontaneous generation – Life can come from nothing as long as the right conditions are met. You do not need other life to produce it.

Biogenesis – Life comes from other life.

9. What were the experiments Pasteur, Redi, and Spallanzani do to help disprove abiogenesis?

Redi – Meat in covered and uncovered jars. Found maggots only appeared in jars where flies had access to meat.

Spallanzani – two flasks, one sealed and other open. The open one spoiled, because it allowed microbes access to the broth.

Pasteur – Used swan-neck flask that allowed air in and out, but microbes were unable to get to broth. No growth occurred. Broke neck off and let microbes in – resulted in broth having microbe growth.