**Designing Experiments Key**

1. That the compound, Reduction, would decrease the number of cancer cells in mice.
2. The control group was group B that received sugar solution. The experimental group was group A that received Reduction.
3. Independent variable: the Reduction given; Dependent variable: the number of cancer cells
4. -Between both groups everything should be exactly the same except for the chemical given -Mice of the same age, size, sex, breed, and general health

-Mice all kept in the same room, same type of cage, and same number of mice in each cage -Cages all kept in the same conditions at the same temperatures

-Mice all fed the same food, and the same amount at the same time

-Mice all given the same volume of injection (just the type of injection is different), same place on their body, and at the same time of day

-The method of counting the number of cancer cells should be the same in both groups -The starting number of cancer cells should be almost the same

1. Students should look at the data table to answer questions. In looking at this partial data it would appear the Reduction did not work. None of the mice had a reduction in cancer cells, and there was no difference between the tested and untested groups.
2. The scientist’s hypothesis was not correct; none of the mice showed a reduction in cancer cells between the two groups.
3. More mice should have been used in both groups. A study is much more valid if numerous subjects are tested. Also, more than one test should be conducted—several repeats are required, whether the results were what he wanted or not. There may have been a problem or potential source of error with the mice in these groups. Maybe Group A didn’t get enough food or had a stronger version of the cancer and that is why the medicine didn’t work.

Repeat testing would hopefully catch any problems.

1. Yes, after he conducts the repeated experiments. Even if his hypothesis was incorrect, it adds to the scientific knowledge base. Maybe another scientist was planning to test the same drug and doesn’t need to; maybe testing needs to be done with a higher dose or a different version of the drug; maybe the drug would work better in another species of animal. Every result and conclusion has significance.
2. Question: Which type of dog food is the healthiest for a dog?

Hypothesis: If the premium brand is healthier for dogs, when compared to a store brand and table scraps, then dogs eating the premium brand will gain more weight and have higher energy levels

Independent Variable: Type of dog food

Dependent Variable: Weight gained and amount of activity Controlled Variables:

* + Dogs of the same breed, sex, age, and general health
  + An equal number of dogs in the 3 groups
  + Dogs fed the same amount of food, just not the same type of food
* Dogs fed by the same person, in same size dish, at the same times of day, and with the same amount of water available
* Dogs kept in the same environment (same yard) at the same temperature, shade, etc.
* The weight of the dogs should be gathered with the same scale (units), by the same person at the same time of day
* The determination of energy levels should be done with a numerical value, by the same person, at the same time(s) of day or continually throughout the day/night
* Materials:
* 60 dogs of the same breed and approximate age, weight, and sex
* 3 fenced separate areas for feeding
* Ample supplies of all 3 dog foods (and a measuring device for each food source)
* Dishes of equal size for all dogs
* A measuring cup for each food source
* A metric (Kg) scale for gathering dog weight
* A large yard or area for dogs to have unlimited activity; the yard should be similar in all areas with equal availability of shade, grass, etc.
* A video camera and source for watching video (monitor, TV, etc)
* A table and materials to record data
* Experimental Procedure:
  + 60 dogs will be broken into 3 groups of 20 dogs each
  + Group A will be fed the premium brand, Group B will be fed the store brand, and Group C will be fed table scraps
  + All groups will be fed 2 cups of food twice a day, and provided with unlimited water
  + All dogs will be weighed in kilograms every morning
  + All groups will be video-taped continuously for 4 weeks. The videos will be analyzed for time spent sleeping/napping, time spent lying down, standing, walking, running, barking. All activity will be documented
  + All dogs, foods, environments, and methods of data collection will be monitored and controlled
* Question: Which type light source is the best to use in finding trace evidence?
* Hypothesis: If the Forensic light source is superior for finding evidence, when compared to a regular white light, then more trace evidence will be found with the Forensic Light source Independent Variable: Type of light source
* Dependent Variable: Number of particulates of trace evidence Controlled Variables:
* Light operated by the same person, with the same methods/angles of light Same amount, size, and color of trace evidence (hair and fibers) distributed Same sources of trace evidence
* Same type and area dimensions of carpet searched Same search pattern used
* Same method for collecting evidence Same method for counting evidence
* Materials:
* 4 Forensic light sources
* 4 regular white light sources
* Batteries of the same brand for all light sources (if needed
* 8 rooms of the same size/same area of carpet (10' x 10' at least)
* Same carpet covering with the same color (beige) for all rooms
* 80 pieces of white cotton fibers
* 80 pieces of dark cotton fibers
* 80 blond hairs of about 2cm each
* 80 black hairs of about 2cm each
* Search grid for the room sizes
* 2 technicians to operate light sources and collect evidence
* 2 evidence distributors
* Coveralls (“bunny suits”) for technicians/distributers
* Paper for bindle collection
* Envelopes or bags for bindles
* Tweezers
* Trace Evidence Vacuum
* 4 Magnifying glasses

Experimental Procedure:

1. All light sources will be powered up or new batteries will be used
2. Evidence distributors will be assigned rooms with repeating patterns (each one will get 2 rooms for the white light source, and 2 rooms for the Forensic light source)
3. Evidence will be distributed with a particular and documented pattern in each assigned room
4. Evidence collectors will be assigned rooms with the same method as the distributors— so that each collector will have 2 rooms where they will use white light, and 2 rooms where they will use the Forensic Light
5. The evidence collector will work each room with the same methods of evidence location and collection, following the same grid plan
6. Evidence will be collected and marked by room and light source
7. A 2-hour interval will be allowed for each room
8. After the room has been searched, the trace vacuum will pick up any evidence left
9. Evidence will be counted and documented from each room (light source/technician)
10. Trace evidence will be catalogued according to color, size, etc.
11. Analyze the type of evidence (and color) and the number found for each light source