Scientific Method - Controls and Variables **Worksheet #4**

Please write your answers on a separate sheet of paper.

Write a definition for each:

Control -
Variable -
Independent (manipulated) Variable -
Dependent (responding) Variable -

SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

Krusty Krabs Breath Mints

Mr. Krabs created a secret ingredient for a breath mint that he thinks will "cure" the bad breath people get from eating crabby patties at the Krusty Krab. He asked 100 customers with a history of bad breath to try his new breath mint. He had fifty customers (Group A) eat a breath mint after they finished eating a crabby patty. The other fifty (Group B) also received a breath mint after they finished the sandwich, however, it was just a regular breath mint and did not have the secret ingredient. Both groups were told that they were getting the breath mint that would cure their bad breath. Two hours after eating the crabby patties, thirty customers in Group A and ten customers in Group B reported having better breath than they normally had after eating crabby patties.

1. Which people are in the control group?
2. What is the independent variable?
3. What is the dedpendent variable?
4. What should Mr. Krabs' conclusion be?
5. Why do you think 10 people in group B reported fresher breath?

SpongeBob Clean Pants

SpongeBob noticed that his favorite pants were not as clean as they used to be. His friend Sandy told him that he should try using Clean-O detergent, a new laundry soap she found at Sail-Mart. SpongeBob made sure to wash one pair of pants in plain water and another pair in water with the Clean-O detergent. After washing both pairs of pants a total of three times, the pants washed in the Clean-O detergent did not appear to be any cleaner than the pants washed in plain water.

6. What was the problem SpongeBob wanted to investigate?
7. What is the independent variable?
8. What is the dependent variable?
9. What should Sponge Bob's conclusion be?

Squidward's Symphony

Squidward loves playing his clarinet and believes it attracts more jellyfish than any other instrument he has played. In order to test his hypothesis, Squidward played a song on his clarinet for a total of 5 minutes and counted the number of jellyfish he saw in his front yard. He played the song a total of 3 times on his clarinet and repeated the experiment using a flute and a guitar. He also recorded the number of jellyfish he observed when he was not playing an instrument. The results are shown in the chart.

Number of Jellyfish/Instrument

Trial	No Music	Clarinet	Flute	Guitar
1	5	15	5	12
2	3	10	8	18
3	2	12	9	7

10. What is the independent variable?

11. What is the dependent variable?

12. What should Squidward's conclusion be?

13. Are the results reliable? Why or why not?

Super Bubbles

Patrick and SpongeBob love to blow bubbles! Patrick found some Super Bubble Soap at Sail-Mart. The ads claim that Super Bubble Soap will produce bubbles that are twice as big as bubbles made with regular bubble soap. Patrick and SpongeBob made up two samples of bubble solution. One sample was made with 5 oz. of Super Bubble Soap and 5 oz. of water, the other was made with the same amount of water and 5 oz. of regular bubble soap. Patrick and SpongeBob used their favorite bubble wands to blow 10 different bubbles and did their best to measure the diameter of each one. The results are shown in the chart

Bubbles

(Diameter in centimeters)

Bubble	Super Bubble	Regular Soap
1	15	10
2	10	5
3	12	16
4	18	14
5	22	11
6	13	12
7	16	11
8	18	15
9	15	15
10	12	6

14. What did the Super Bubble ads claim?

15. What is the independent variable?

16. What is the dependent variable?

17. Look at the results in the chart.
What should their conclusion be?

18. Are the results reliable? Why or why not?

Scientific Method Vocabulary Review

Name _____ **Date** _____

Write the terms from the following list it on the line provided by the correct definition.

conclusion	**control**	**data**	**experiment**	**graph**
hypothesis	**microscope**	**research**	**scientific method**	**variable**

_____ 1. anything that can change in an experiment

_____ 2. a possible explanation for an event; an educated guess

_____ 3. the information gathered during an experiment

_____ 4. a series of logical steps followed to solve problems

_____ 5. the gathering of information on a topic prior to experimentin

_____ 6. used to test your hypothesis

_____ 7. unaffected part of an experiment used for comparison

_____ 8. the final step of the scientific method

_____ 9. tool used to see extremely small objects, such as cells

_____ 10. a mathematical, pictorial representation of data

2. Write the 7 steps of the scientific method in order.

Independent Practice: ***Put the statements in order of the Scientific Method, beginning with "Identify the Problem" as "1" and "research the problem" as "2".***

Example #1

_____ Mr. Snider put a set of tiles in a dark cabinet and another set in the sunlight.

_____ Mr. Snider read in an article that a lack of light can be the cause of some mold growth

_____ Mr. Snider took measurements of the mold for a month and tried to make sense of the numbers.

_____ Mr. Snider wondered why mold always grew in only one corner of his classroom.

_____ Mr. Snider students looked at the data and decided the mold was growing in dark places.

_____ Mr. Snider thought that the lack of light in the corner might be causing the mold to grow.

Example #2

_____ Mr. Holman buys four different foods and tries each one for a month.

_____ Mr. Holman decided that Chow© dog food was making the dog fat.

_____ Mr. Holman is concerned that his dog's food is making him fat.

_____ Mr. Holman read about how Chow© dog food can make dogs fat.

_____ Mr. Holman measures the dog's weight every day and graphs her results.

_____ Mr. Holman suggests that he should try different dog foods.

Scientific Method - **Controls and Variables** ANSWER KEY

Write a definition for each:

Control - A part of the experiment that is not being tested and is used for comparison.

Variable - Any part of an experiment that can vary.

Independent Variable - The part of the experiment that is manipulated or changed by the scientists or person performing the experiment.

Dependent Variable - The part of the experiment that is affected by the independent variable.

SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

Krusty Krab Breath Mints

1. Which people are in the control group? The people who received the mint without the secret ingredient (Group B) would be the control group.
2. What is the independent variable? Secret ingredient in the breath mint
3. What is the dependent variable? Amount of breath odor (or bad breath)
4. What should Mr. Krabs' conclusion be? The breath mint with the secret ingredient appears to reduce the amount of breath odor more than half the time, but it is not 100% effective.
5. Why do you think 10 people in group B reported fresher breath? This may be due to the placebo effect.

Sponge Bob Clean Pants

6. What was the problem? SpongeBob's pants were not clean.
7. What is the independent variable? Laundry soap
8. What is the dependent variable? Amount of dirt left on the pants (or how clean the pants were)
9. What should Sponge Bob's conclusion be? Clean-O laundry soap does not appear to be effective in cleaning
his pants.

Squidward's Symphony

10. What is the independent variable? Instrument
11. What is the dependent variable? Number of jellyfish
12. What should Squidward's conclusion be? The clarinet did seem to attract a large number of jellyfish, but
the average number for the three trials also matched the average for the guitar. The flute attracted the least
number of jellyfish, but the average for this category is still larger than the control. Music seems to attract
jellyfish in greater numbers than when no music is played. Squidward's hypothesis that the clarinet attracts
larger numbers of jellyfish than other instruments is not proven by this experiment alone.
13. Are the results reliable? Based on the limited amount of information provided, it is difficult to tell if
Squidward's results are reliable. The description did not tell how long each break was between trials. Did he
leave enough time for the jellyfish to "clear out" of the area? (NOTE: Accept other potential flaws that
students can support.)

Super Bubbles

14. What did the Super Bubble ads claim? The ads claimed that the Super Bubble solution would produce
bubbles that were twice as large as those made with regular bubble soap.
15. What is the independent variable? Type of bubble solution
16. What is the dependent variable? Size (diameter) of the bubble
17. a. Calculate the average diameter for each. Super Bubble = 15.1 cm Regular Soap = 11.5 cm
b. What should their conclusion be? The Super Bubble solution did not seem to produce bubbles that
were twice as large as those made with the regular soap. Although the average for the Super Bubble
solution was larger than that for the regular soap, it was not "twice as large" as the ads claimed. In fact,
only two of the ten trials had results that would fit the ads claims.
18. Are the results reliable? Why or why not? The description does not say who blew the bubbles for each
solution. There may be differences in bubble sizes due to the person blowing the bubble rather than the bubble
solution. They might have considered having each person blow 5 bubbles with each solution. (NOTE: Accept
other potential flaws that students can support.)