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.)