

## Standard 1: SC.912.N.1.1: First Assessment

### Section 1 - Multiple Choice

1) Michael wants to test the effect that different concentrations of stomach acid will have on the dissolution of a particular kind of oral medication. As he sets up and completes his experiment, which of the following experimental designs would be most likely to help him answer his question?

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| (a) Allow several pills to soak in different amounts of acid of a single concentration and then measure the amount of dissolution on each. | (c) After allowing a pill to be exposed to one acid concentration, place it in different acid concentrations, and then measure the surface area that is dissolved                    |
| (b) After allowing several pills to be exposed to different acid concentrations, measure the surface area of each that is dissolved.       | (d) Prepare solutions of different acid concentrations, measure 50 milliliters of each into different beakers, and place different types of pills of the same mass into the beakers. |

2) A Magnetic Resonance Imaging (MRI) scanner is a machine used in medicine to display accurate 2-D and 3-D images of organs inside the human body. It applies strong magnetic fields on the body which are produced by electromagnets composed of wire coils. The amount of electric current in the wire affects the electromagnet's strength.

Logan has created two electromagnets by tightly wrapping wire around two different nails, each made of a different metal (Metal A and Metal B), and connecting the wires to D batteries. He hypothesizes that Metal A is a better conductor than Metal B. He tests his hypothesis by seeing how many paper clips each electromagnet can pick up. His results are shown below.

Which is the best explanation for Logan's results?

Trial Number	Number of paper clips picked up (Metal A)	Number of paper clips picked up (Metal B)
1	4	22
2	6	18
3	8	25
4	5	21
5	3	20

- (a) Metal A is not a conductor.
- (b) Metal B is a better conductor than Metal A.
- (c) His data are probably incorrect since they do not support his hypothesis.
- (d) His equipment was set up incorrectly since he got different results each time.

3) Several groups of researchers were conducting experiments to study how exercise affects cholesterol levels. One group had college students run two miles a day for six weeks. Another group had senior citizens participate in gentle water aerobics twice a week for a year. Cholesterol levels dropped slightly among the college students but dropped significantly among the senior citizens. Based on these results, what should the researchers plan to do next to validate the findings?

- (a) Determine that exercise is more useful in lowering cholesterol levels in older people than in young adults.
- (b) Conclude that moderate exercise is more beneficial at lowering cholesterol levels than more intensive exercise.
- (c) Design more studies testing the effect of duration and intensity of exercise on cholesterol levels in different age groups.
- (d) Repeat the experiment on college students using different groups of students until the results show a drop in cholesterol levels.

4) Sometimes scientists must make assumptions about their subject of study because some aspect of it cannot be tested directly. In cases like this, scientists assume that the natural world operates in a consistent fashion.

Which of the following would be the best example of a case in which scientists would have to make an assumption based on present experience?

- (a) assuming that modern DNA is composed of the same nucleotide bases that made up DNA 1,000 years ago
- (b) assuming that rainfall patterns in the northern United States are similar to rainfall patterns there 50 years ago
- (c) assuming that trees in Brazil use the chlorophyll in their leaves for photosynthesis in the same way trees in Florida do
- (d) assuming that the feathers on a dinosaur skeleton were used for flight and insulation as they are in modern birds

5) A scientist wanted to find out if the height of a shrub would make it more prone to frost damage. He found a hillside covered with shrubs and trimmed all the shrubs located at the bottom to one meter tall. He left the shrubs growing at the top of the hill untrimmed. They ranged from one to three meters tall.

After a heavy frost, he found that 90% of the shorter shrubs had frost damage while only 10% of the tall shrubs did. He concluded that short shrubs were more likely to suffer frost damage than tall shrubs.

When he submits his research report for review by other scientists, which of the following are they likely to criticize about his experiment?

- (a) His hypothesis that shrub height might influence frost damage is not a question worth testing.
- (b) His conclusion is inaccurate because the location of the shrubs on the hillside might also have contributed to where frost damage occurred.
- (c) His methods of recording frost damage must have been biased toward tall shrubs since there was such a large difference in frost damage.
- (d) His results are not valid because he had some shrubs in the tall group that were close to the same height as some shrubs in the short group.

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## Answer Key

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- 1) **b**
- 2) **b**
- 3) **c**
- 4) **d**
- 5) **b**