

The Scientific Method

A. Read the passage and answer the questions that follow.

On July 20, 1976, the *Viking I* lander touched down on the dusty red surface of Mars. A few months later, the *Viking II* lander arrived on another Martian plain. The primary mission of these two robot spacecraft was to determine if there was life on Mars.

Conditions on Mars were thought to be far too harsh for large life forms. There is no liquid water on Mars and the atmosphere is very thin. During the course of a day, the temperature on Mars may range from 10°C to -80°C. The large changes in temperature produce strong winds and planetwide dust storms. Because of these conditions, scientists decided to look for microorganisms rather than large life forms.

The Viking spacecraft performed several experiments. In one experiment, samples of soil were taken from different locations. The soil samples were put into a nutrient broth that supported the growth of microorganisms on Earth. The amount of carbon dioxide in the broths was tested over a period of time.

Scientists were excited to discover that Martian soil produced carbon dioxide in the nutrient broth. However, the amount of carbon dioxide produced in the Martian soil was much smaller than the amount that would be produced by living things on Earth. Thus, the results of the Viking spacecraft experiments are not conclusive. Scientists are still not sure if life exists on Mars.

1. What assumptions did scientists make in this experiment? _____

2. Why did scientists obtain soil samples from different places and from different parts of the Martian soil? _____

3. Which characteristic of life was being tested for in the experiment? _____

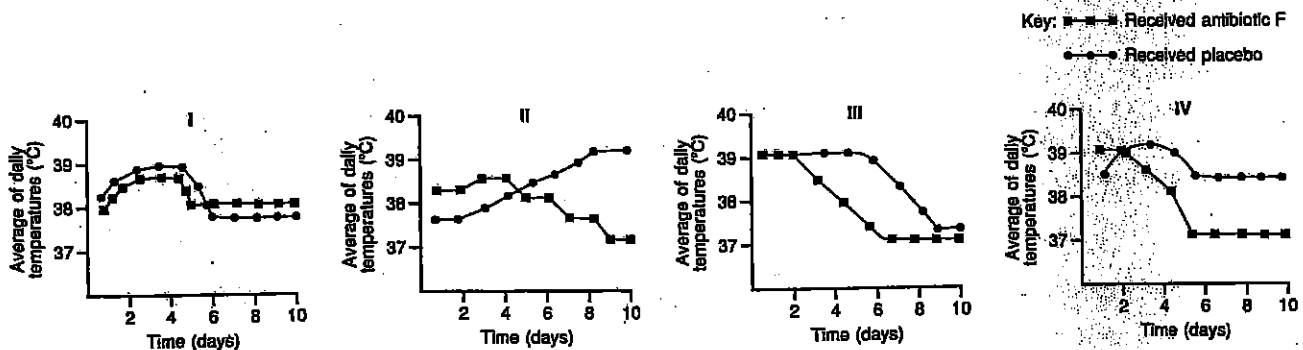
4. Why can't scientists be sure if life exists on Mars? _____

B. Now that you have seen some of the assumptions and limitations associated with experimentation, try your hand at analyzing experimental data. Remember that you must be objective, regardless of what you are trying to prove.

A scientist wished to determine if a new type of antibiotic, called antibiotic F, was effective against a particular type of microorganism that caused pneumonia. To test the hypothesis, the scientist found 100 volunteers in a large hospital, all suffering from the same type of pneumonia. The scientist gave 50 of the volunteers the new antibiotic for 10 days. The other 50 volunteers were given a sugar pill for 10 days. The sugar pill is called a placebo.

The scientist measured the effectiveness of the antibiotic by measuring each volunteer's temperature. Higher than normal body temperature indicated the presence of the disease-causing microorganisms. When a volunteer's temperature remained normal (37°C) for three days, he or she was considered free of the disease-causing microorganism.

- 1. What was the scientist's hypothesis? _____
- 2. Identify the control group. _____
- 3. Identify the experimental group. _____



- 4. Which graph indicates that the antibiotic was not effective against the disease-causing microorganism? Explain your answer. _____
- 5. Which graph supports the scientist's original hypothesis? Explain your answer. _____
- 6. Can you think of any other observations or comparisons the scientist might have made in this experiment? _____
- 7. Why do you think the scientist gave 50 of the volunteers a placebo? _____