Name _____ *1 The Scientific Study of Life* *Test Date* _____

Study Guide

1. Review the processes of science by reading the following story. Match each of the statements in italic type with a process or characteristic of science. Write your answers in the parentheses. Choose from **question, variable, hypothesis, test, repetition, experimental test, controlled experiment, observation, prediction, control test, deductive reasoning, background information, conclusion, sharing information.**

While investigating the insect life of the rain forest canopy, a zoologist captured several specimens of a previously unknown species of butterfly. The butterfly was mostly black but had conspicuous red and yellow stripes on its wings. It rested on bare tree limbs in plain view; the zoologist was surprised she had not seen it before. The butterfly was very similar in structure to that of a much less conspicuous all-black species found in the same general area, so the zoologist figured that the two species were closely related.

The zoologist noticed that *predatory birds avoided the brightly colored butterflies* (1_____), and she wanted to find out why this occurred. She had read that among other species-such as monarch butterflies-*bright colors and patterns often warn predators* (2_____) to stay away from unpalatable prey. *Did the red and yellow stripes on the butterflies' wings really deter predators? And did the butterflies really taste bad*? (3_____) She *guessed that the butterflies did taste bad and that their stripes served as a warning* (4_____), and she decided to *try out this guess* (5_____) in the laboratory.

She captured several insect-eating birds native to the area and put them in cages at a nearby tropical field station. Then she netted a number of the brightly striped butterflies and their black cousins. For her first experiment, she allowed birds to choose between a black butterfly and a striped one. They invariably chose the black butterflies and avoided the striped ones. This confirmed her field observations.

Next she used black paint to cover the bright stripes of a number of the striped butterflies. These *altered butterflies* (6_____) were offered to predators, along with some *"normal" striped butterflies as a comparison* (7_____). Actually, the normal striped butterflies were also painted, but with a clear paint, so that *only one factor-wing pattern-would differ between the two groups* (8_____). It is important, if possible, to set up *an experiment like this, so that it is two parallel tests with only one factor differing between the two* (9_____). The researcher speculated that *the birds would be more likely to eat the bad-tasting butterflies if their stripes were covered up* (10_____). She used this kind of reasoning: *If the wing pattern really did warn predators, then they would be fooled* (11_____) by the painted wings and try to eat the black-painted butterflies.

Just as the zoologist suspected, the birds chose the black-painted butterflies in every trial. This showed that *the wing pattern did indeed function as a warning* (12_____). Also, most of the birds quickly spat out the black-painted butterflies, and those who swallowed the butterflies became ill. The zoologist performed another experiment in which she painted the wings of the edible black-winged butterflies. The birds ate them with gusto, demonstrating that the paint itself was not distasteful and produced no ill effects.

The zoologist *performed the experiment several times* (13_____) verifying her technique and conclusions. Then she *wrote a short paper for The Journal of Tropical Entomology describing this new example of warning coloration* (14_____). Of course she knew that her experiments supported her hypothesis but did not absolutely prove it. Other scientists could read about the experiments, repeat them, challenge her results, or expand on her conclusions-all part of the process of science.

2. Jason tried a new fertilizer called MegaGro on his garden. He said, "I used it on all my tomato plants this year, and they grew much better than they did last year! MegaGro is fantastic!" Was Jason's test of MegaGro scientifically valid. Why or why not?

3. A camera sends back pictures of purple gelatinous blobs in near-boiling water near volcanic vents on the ocean floor. What properties should scientists look for to determine whether the blobs represent life?

4. Practice using the process of science to carry out a simulated study of acid precipitation (CD 1A).