Name _____ Date _____

Pterosaurs: Observations And Hypotheses Answer Key

Read the National Geographic news article online from April, 2009, "Giant Pterosaurs Couldn't Fly, Study Suggests." Use the definitions below and information from the article to determine observations and hypotheses about giant pterosaurs. For questions 1 and 2, answer questions below each of the quotes from the article.

observation *noun* data collected by using senses, such as sight, or an instrument, such as a ruler or thermometer.

hypothesis *noun* a possible explanation for a set of data. A requirement of a hypothesis is that it is testable using the scientific method.

scientific method *noun* a method of research in which a question is asked, data are gathered, a hypothesis is made, and the hypothesis is tested.

1. *Animals heavier than 90 pounds (41 kilograms) with wingspans greater than 16.7 feet (5.1 meters) would not be able to flap fast enough to stay aloft…in an environment similar to the present.*

a. What parts of this statement are based on observations? Weight of 90 pounds and wingspan of 16.7 feet

b. What is the proposed explanation, or hypothesis? With body parts much larger than present-day birds, some pterosaurs would have been too large to fly.

2. *Giant pterosaurs, colossal winged reptiles that lived alongside the dinosaurs, have long been considered the heaviest animals ever to [fly].*

a. What parts of this statement are based on observations? Fossil finds of colossal winged reptiles that lived at the time of dinosaurs

b. What is the proposed explanation, or hypothesis? Some pterosaurs, even though much larger than present-day birds, were able to fly.

3. Is it possible that the statements above both include hypotheses, even though they provide two completely different explanations based on the same pterosaur fossil? Explain.
Yes. Both are hypotheses because they suggest whether large animals such as pterosaurs were able to fly. Scientists can compare the bones of the pterosaurs to the bones of living flying animals to learn more about their skeleton and muscles. They can also do experiments to test if pterosaur-like structures would need power greater than what pterosaur muscles could have provided.

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4. Describe the observations Researcher Sato made before arriving at his hypothesis.
   Sato studied weights and body sizes of modern birds, the wandering albatross and four smaller bird species. He outfitted 26 birds with tiny accelerometers, which collected data on their flapping speeds from takeoff to landing.

5. Which of these responses to Sato's hypothesis are observations, and which are hypotheses? Label each.

hypothesis	a. …Sato's findings don't really apply to pterosaurs or even to all birds.
observation	b. Argentavis, a giant bird, had a wingspan of 20 feet (6 meters).
hypothesis	c. Argentavis… seems to have been able to fly.
observation	d. …giant pterosaur fossils all seem to have extraordinarily thin bone walls.
hypothesis	e. …giant pterosaurs might have been lighter than their size would suggest.

6. Explain your decision about whether statement (e.) above is an observation or hypothesis. How did you make that decision?
   Answers will vary; statement (e) is a hypothesis because it is a proposed explanation for why pterosaurs could fly even though similarly-proportioned birds probably could not have flown. This explanation could be tested by investigating evidence in their fossils for how pterosaurs could have been lighter than birds.

7. How do you think the following hypothesis by Sato might be tested?
   But if pterosaurs really were capable of sustained flight, 'we must think about the possibility of drastic change in other environmental factors, such as much lighter gravity or much denser air over geological time.'
   Scientists might observe physical characteristics of other animals living at the same time as these animals to look for patterns of how they might have adapted to different environmental conditions. They might be able to simulate different levels of gravity or denser air, and could test how present-day animals respond to those conditions. They might be able to use computer simulations and modeling.

8. The American Association for the Advancement of Science states that "hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations." How might this apply to our understanding of pterosaurs?
   Possible response: When scientists challenge each other's hypotheses, this can force the scientists to make more observations and collect more data, helping them to reject some hypotheses and further strengthening others.