NAME _____ DATE _____ CLASS _____

Holt Physics

Problem 18B

POTENTIAL DIFFERENCE

PROBLEM

A giraffe is the tallest animal on Earth. With a height of 5.3 m, a giraffe can eat leaves high in acacia trees. Suppose an ion sits atop a giraffe's head. If the potential difference across the giraffe is 90.0 V, what is the charge on the ion?

SOLUTION

Given: $\Delta V = 90.0\ \text{V} \quad PE_{electric} = 1.18 \times 10^{-15}\ \text{J} \quad r = 5.3\ \text{m}$

Unknown: $q = ?$

Choose the equation(s) or situation: Use the equation for the potential difference near a point charge, given on page 672.

$$q = \frac{r\Delta V}{k_c} = \frac{(5.3\ \text{m})(90.0\ \text{V})}{8.99 \times 10^9\ \text{N}\cdot\text{m}^2/\text{C}^2} = \boxed{5.3\ 10^{-8}\ \text{C}}$$

ADDITIONAL PRACTICE

1. The Nile is 6695 km long, making it the longest river in the world. Suppose an ion placed at the Nile River's remotest stream in Burundi. If the potential difference across the Nile is 114.0 V, what is the charge on the ion?
2. The Akashi Kaikyo Bridge is the world's longest bridge. Built in 1998, this bridge spans the Japanese islands of Honshu and Awaji—a total of 1991 m across the islands. Suppose a support at one end of the bridge is charged. If the potential difference across the bridge is 18.6 kV, what is the charge on the ion?
3. How far from an electron is the electric potential 1.0 V?
4. How far from a charge of 94 nC is the electric potential 9.0 V?
5. Find the potential difference between a point infinitely far away and a point 3.95 cm from a carbon atom having a charge of 1.28×10^{-18} C.
6. Cars start by generating a 3.0×10^6 N/C electric field that causes a spark to cross a gap in a spark plug. The gap of a standard spark plug is 6.25×10^{-4} m. What minimum potential difference must you apply to the spark plug?
7. Gustave Alexandre Eiffel designed and built the 0.30 km-tall Eiffel Tower in 1889 for the World's Fair in Paris. Suppose the atmospheric electric field of the Earth is 95 N/C directed downward. What is the electrical potential difference between the ground and the tip of the Eiffel Tower?