Name _____ Date _____ Period _____

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Comparing Gravity and Electric Forces

Physics

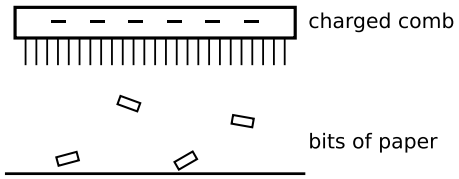
Part A: Alike and Different

Use the ideas from the lesson notes. Explain your reasoning in complete sentences.

1. Complete the table to compare the two forces.

	Gravity	Electric force
What it acts on		
Attract, repel, or both?		
Strong or weak?		
Rules at what scale?		
How it changes with distance		

2. Ava runs a plastic comb through her hair and holds it above some tiny bits of paper. The paper jumps up and sticks to the comb. What does this show about the strength of the electric force compared to gravity? Explain.



3. If the electric force is so much stronger, why does gravity, not the electric force, keep the Moon in orbit around Earth?

4. A book rests on a table. The table pushes up on the book with a normal force. Explain why the normal force is really an electric force. Name one other contact force that is also electric.

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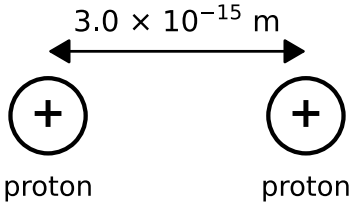
Part B: How Much Stronger?

Use $F_e = kq_1q_2/d^2$ with $k = 9.0 \times 10^9$ N·m^2/C^2, and $F_g = Gm_1m_2/d^2$ with $G = 6.67 \times 10^{-11}$ N·m^2/kg^2. A proton has charge 1.6×10^{-19} C and mass 1.67×10^{-27} kg.

5. Inside a helium nucleus, two protons are 3.0×10^{-15} m apart.



a. Find the electric force between the protons. Is it attractive or repulsive?

b. Find the gravitational force between the protons.

c. How many times stronger is the electric force than gravity?

d. If the protons were twice as far apart, would your answer to part c change? Explain.

6. Two 0.10 kg balloons, each with a charge of $+1.0 \times 10^{-7}$ C, hang 0.50 m apart.

a. Find the electric force and the gravitational force between the two balloons.

b. Which force matters more for how the balloons move toward or away from each other? Support your answer with a ratio.

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