In our universe, like charges repel and opposites attract. Imagine another universe where opposite charges repel each other, while charges of the same charge attract. What would that be like? Consider both very large and very small phenomena. Try to connect that hypothetical condition to whatever conclusions you draw rather than just fantasizing something vague.

Chemistry goes out the window

This would change the chemical makeup of basically everything. Think about a molecule of water for a small example. There are 2 positively charged Hydrogen molecules and 1 positively charged Oxygen molecule. If opposites did not attract and similar molecules did not repel, the water molecule would not be created in the first place because the Hydrogen molecules would not work to create the outer electron shell of the Oxygen molecule. Furthermore, each water molecule would not be able to be attracted to another water molecule because polarization of each water molecule would not be able to occur. Water composes many things on Earth and is the basis of many chemical reactions because of the polar properties it has. This can be used to explain large and small phenomena.

The fundamental principles that we have established would all be flipped on their head as the relationship between electron and proton would change as opposite charges attracts but in these said universe they would repel each other also the chemical bonding between electrons will change as there are more variability for like charges to attract. In a large scale phenom because of the dominance of gravity as the main force, the changes that are reflected within the solar system will not have an influence on the landscape of livelihood. The complexity of life would be amplified as the hurdle of justifying the attraction between like charges and the repel between opposite charges this would interrupt the building blocks of life.

Atoms of the same sign would accumulate indefinitely

On the small(set) end of things, if like charges were attracted to one another, atoms with like charges would continue to bind together strongly forever. The charge of a molecule would continue to stack up to infinity. On the larger end of things, batteries would work very differently, and there would be only one type of end to the battery (meaning the positive or negative ends)

Given the universal constants

- Newton's constant: G = 6.7 * 10^-11 N m^2 / kg^2
- Coulomb's constant: k_e = 9 * 10^9 N m^2/C^2
- the electron and proton masses: me = 9 * 10^-31 kg, mp = 1836 * me = 1.7 * 10^-27 kg
- and the elementary unit of charge: e = 1.6 * 10^-19 C

Estimate the ratio of the electric force between a proton and an electron relative to the gravitational force between them (Fe / Fg). Assume they are separated by one meter from each other. And don't use your calculator! Concentrate on getting the order of magnitude right (and show your work!)

Uh, where are the units?

Fg = G (m1m2/r^2)rhat
Fg = (-) 7E-11 (10E-31 * 2E-27 / 1^2)
Fg = (-) 7E-11 * 20E-38
Fg = -140E-49

Fe = ke (q1q2/r^2)rhat
Fe = (-) 10E-9 (2E-19 * -2E-19 / 1^2)
Fe = (-) 10E-9 (-4E-38)
Fe = (-) (-) 40E-47
Fe = +40E-47
Fe/Fg = 40E-47/-140E-49

~50E-47/150E-49
= 1/3E2

Nicely done with units included!

Fe/Fg
Fe = [1/4(pi)(epsilon)k][qeqp/r^2]
Fe = ke[qeqp/r^2]
F = 9 x 10^9 Nm^2/C^2 [(1.6 x 10^19 C)^2/(1m)^2] ~ Estimate 1.6 to 2
Fe = 36 x 10^-29 N
Fg = -GMeMp/r^2
Fg = -6.7 x 10-11 Nm^2/C^2(9 x 10^-31 kg)(1.7 x 10^-27 kg) ~ Estimate 6.7 to 7 and 1.7 to 2
Fg = -126 x 10^-69 N
Fg = 1.3 x 10^-67 N
Fe/Fg = - 3.6 x 10^-28 N/1.3 x 10^-67 N
Fe/Fg = 2.5 x 10^39

Which of the following equations is always applicable?

1.

$$\vec{\mathbf{F}}_e = k_e \frac{q_1 q_2}{r^2}\ \hat{\mathbf{r}}$$

2.

$$\vec{\mathbf{F}}_e = q\vec{\mathbf{E}}$$

3. Both 1 & 2 are always applicable
4. Neither 1 nor 2 are always applicable