

PQ2 Coulomb's Law

Questions

Q1

What is the force of repulsion between two electrons held one metre apart in a vacuum? What is the gravitational force of attraction between them? By what factor is the electric repulsion greater than the gravitational attraction?

$$\text{mass of an electron} = 9.11 \times 10^{-31} \text{ kg}$$

$$\text{mass of a proton} = 1.67 \times 10^{-27} \text{ kg}$$

$$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$$

Q2

By what factor is the electric force between two protons greater than the gravitational force between them?

$$\text{mass of an electron} = 9.11 \times 10^{-31} \text{ kg}$$

$$\text{mass of a proton} = 1.67 \times 10^{-27} \text{ kg}$$

$$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$$

Q3

Given the difference in magnitudes of gravitational and electrical forces you've just discovered, why do you feel gravitational attraction from the earth, but no electrical forces?

Q4

- An object has a total electrical charge of +1.2 mC.
- Does the object have excess electrons, or a shortage of electrons?
- How many electrons?

Q5

- Two latex balloons are rubbed against hair and charged to **-2.0 μC** . The balloons are held a distance of **0.70 m** apart.
- a) What is the **FORCE** on each of the balloons?
- b) Is the force **ATTRACTIVE** or **REPULSIVE**?

Q6

Electrons and protons have equal but opposite charges.

The magnitude of this charge is known as the:

$$\text{Elementary Charge} = 1.60 \times 10^{-19} \text{ C}$$

A hydrogen atom contains one proton and one electron. If the electrostatic force of attraction is $8.2 \times 10^{-8} \text{ N}$, how far apart are they?

$$q_{p^+} = q_{e^-} = 1.60 \times 10^{-19} \text{ C}$$

Q7

- Two charges feel a repulsive force of 96 (N). What is the force if the separation, r , is quadrupled.

Q8

- Calculate the electrostatic force between two electrons placed 1.5 nm apart.

Q9

- The electrostatic repulsive force between two protons in a nucleus is 14 N.
- Find the separation between the protons.

Q10

A point charge of $+3.00 \times 10^{-6} \text{ C}$ is 12.0 cm distant from a second point charge of $-1.50 \times 10^{-6} \text{ C}$. Calculate the magnitude of the force on each charge.