

31. (a) Eq. 22-11 (in absolute value) gives

$$n = \frac{|q|}{e} = \frac{2.00 \times 10^{-6} \text{ C}}{1.60 \times 10^{-19} \text{ C}} = 1.25 \times 10^{13} \text{ electrons} .$$

- (b) Since you have the excess electrons (and electrons are lighter and more mobile than protons) then the electrons “leap” from you to the faucet instead of protons moving from the faucet to you (in the process of neutralizing your body).
- (c) Unlike charges attract, and the faucet (which is grounded and is able to gain or lose any number of electrons due to its contact with Earth’s large reservoir of mobile charges) becomes positively charged, especially in the region closest to your (negatively charged) hand, just before the spark.
- (d) The cat is positively charged (before the spark), and by the reasoning given in part (b) the flow of charge (electrons) is from the faucet to the cat.
- (e) If we think of the nose as a conducting sphere, then the side of the sphere closest to the fur is of one sign (of charge) and the side furthest from the fur is of the opposite sign (which, additionally, is oppositely charged from your bare hand which had stroked the cat’s fur). The charges in your hand and those of the furthest side of the “sphere” therefore attract each other, and when close enough, manage to neutralize (due to the “jump” made by the electrons) in a painful spark.