

Physics 122  
Charge and Coulomb's Law (Two Charges)

1. How many electrons are needed to make up 25 C of charge?  
( $1.6 \times 10^{20}$  electrons)
2. How many coulombs of charge do  $1.88 \times 10^{19}$  electrons have?  
(3.01 C)
3. How many electrons must be removed from a small pith ball to give it a charge of  $1.0 \times 10^{-12}$  C? ( $6.3 \times 10^6$ )
4. How many excess electrons are on a ball with a charge of  $2.04 \times 10^{-17}$  C?  
(128)
5. Two charges,  $q_1$  and  $q_2$ , are separated by a distance,  $d$ , and exert a force,  $F$ , on each other. What new force will exist if:
  - a)  $q_2$  is doubled?
  - b)  $d$  is tripled?
  - c)  $q_1$  is halved and  $q_2$  is tripled?
  - d)  $q_2$  is doubled and  $d$  is tripled?
  - e)  $q_1$  is halved,  $q_2$  is one-fourth its original value and  $d$  is one-fourth its original value?
6. A positive charge of  $1.8 \times 10^{-6}$  C and a negative charge of  $1.0 \times 10^{-6}$  C are 0.040 m apart. What is the magnitude of the force between the two charges?  
(10 N).
7. A negative charge of  $4.0 \times 10^{-6}$  C exerts a force of repulsion of 7.2 N on a second charge. The charges are separated by 0.050 m. What is the sign and magnitude of the second charge? ( $-5.0 \times 10^{-7}$  C)
8. How far apart are two charges of  $1.0 \mu\text{C}$  and  $-1.0 \mu\text{C}$  if they exert a force of attraction of 440 N on each other? ( $4.5 \times 10^{-3}$  m)
9. What is the magnitude of the electrostatic force exerted by the proton in a hydrogen atom on the electron that orbits the nucleus when the electron is  $5.3 \times 10^{-11}$  m from the proton? ( $8.2 \times 10^{-8}$  N)
10. How far apart are two electrons if they exert a force of repulsion of  $1.80 \times 10^{-10}$  N on each other? ( $1.13 \times 10^{-9}$  m)
11. At what separation distance do two point charges of  $2.0 \mu\text{C}$  and  $-3.0 \mu\text{C}$  exert a force of attraction on each other of 565 N? ( $9.8 \times 10^{-3}$  m)
12. A distance of 0.64 m separates two neutral spheres. If  $2.0 \times 10^{13}$  electrons are removed from one sphere and placed on the other, what is the magnitude of the force that exists between the spheres? (0.23 N)
13. Two spheres, one with three times the charge of the other, are located 24 cm apart and exert a repulsive force of 72 N on each other. What is the magnitude of the charge of the sphere with more charge? ( $3.7 \times 10^{-5}$  C)