Phys 110, Spring 2020, Review Problems (from Giancoli)

Coulomb's Law

[$1\,mC = 10^{-3}\,C, 1\,\mu C = 10^{-6}\,C, 1\,nC = 10^{-9}\,C.$]

1. (I) Calculate the magnitude of the force between two $3.60\,\mu C$ point charges 9.3 cm apart.

2. (I) How many electrons make up a charge of $-300\,\mu C$?

4. (I) What is the repulsive electrical force between two protons $5.0\times10^{-15}\,m$ apart from each other in an atomic nucleus?

6. (II) Two charged dust particles exert a force of $3.2\times10^{-2}\,N$ on each other. What will be the force if they are moved so they are only one-eighth as far apart?

7. (II) Two charged spheres are 8.45 cm apart. They are moved, and the force on each of them is found to have been tripled. How far apart are they now?

10. (II) Compare the electric force holding the electron in orbit ($r = 0.53\times10^{-10}\,m$) around the proton nucleus of the hydrogen atom, with the gravitational force between the same electron and proton. What is the ratio of these two forces?

11. (II) Two positive point charges are a fixed distance apart. The sum of their charges is Q_T. What charge must each have in order to (*a*) maximize the electric force between them, and (*b*) minimize it?

13. (II) Three positive particles of equal charge, $+11.0\,\mu C$, are located at the corners of an equilateral triangle of side 15.0 cm. Calculate the magnitude and direction of the net force on each particle.

14. (II) A charge of 6.00 mC is placed at each corner of a square 0.100 m on a side. Determine the magnitude and direction of the force on each charge.

15. (II) Repeat Problem 14 for the case when two of the positive charges, on opposite corners, are replaced by negative charges of the same magnitude.