## Suggested problems: Chapter 22- HRW-Principles of Physics- ISV 10<sup>th</sup> Edition.

**1.**Two charged particles are fixed to an x-axis: Particle 1 of charge  $q_1 = 2.1 \times 10^{-8}$  C is at position x=20 cm and particle 2 of charge  $q_2 = -4.00 \, q_1$  is at position x = 70 cm. (a) At what coordinate on the x-axis (other than at infinity) is the net electric field produced by the two particles equal to zero? (b) What are the zero-field coordinate if the particles are interchanged?

**Answer:** (a) -30 cm; (b) + 1.20 m

**22.**In Fig. 22-34 the electric field lines on the left have twice the separation of those on the right. (a) If the magnitude of the field at A is 60 N/C, what is the magnitude of the force on a proton at A? (b) What is the magnitude of the field at B?

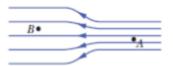
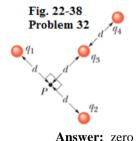


Fig. 22-34 Problem 22

**Answer:** (a)  $9.6 \times 10^{-18}$  N; (b) 30 N/C

32.In Fig. 22-38, the four particles are fixed in place and have charges  $q_1 = q_2 = +5e$ ,  $q_3 = +3e$ , and  $q_4 = -12e$ . Distance  $d = 8.0 \mu m$ . What is the magnitude of the net electric field at point P due to the particles?



**35.**An electric dipole consisting of charges of magnitudes 1.50 nC seperated by 6.20  $\mu$ m is in an electric field of strength 300 N/C. What are (a) the magnitude of the electric dipole moment and (b) the difference between the potential energies for dipole orientation parallel and perpandicular to E?

**Answer:**(a) 9.30 x 10<sup>-15</sup> C.m (b) 2.79 x 10<sup>-12</sup> J

**38.**An electron enters a region of uniform electric field with aninitial velocity of 30 km/s in the same direction as the electric field, which has magnitude E = 50 N/C. (a) What is the speed of theelectron 1.5 ns after entering this region? (b) How far does theelectron travel during the 1.5 ns interval?

**Answer:**(a)  $1.7 \times 10^4 \text{ m/s}$  (b)  $3.5 \times 10^{-5} \text{ m}$ 

**40.** An electric dipole consists of charges + 2e and - 2e separated by 0.85 nm. It is in an electric field of strength  $3.4 \times 10^6$  N/C.Calculate the magnitude of the torque on the dipole when the dipole moment is (a) parallel to, (b) perpendicular to, and (c) antiparallel to the electric field.

**Answer:** (a) zero; (b)  $9.2 \times 10^{-22}$  N; (c) zero