Text Book Questions

Chapt 18

(4) D (5) C (6) A (7) C (8) C

(9) B (10) B (11) A

(18) C (19) A (20) C (21) A (22) C (23) A

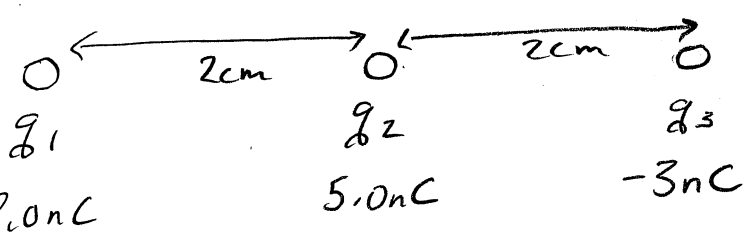
(27) C

$$F = \frac{kqQ}{r^2} \qquad q = Q$$

$$q = \sqrt{\frac{Fr^2}{k}} = \sqrt{\frac{(10\times10^{-9})(.3)^2}{9\times10^9}} = \pm 3.2\times10^{-10}\,C$$

charge could be positive or negative
magnitude corresponds to the positive value.

(28) D



$$F_{12} = \frac{kq_1q_2}{r^2} = \frac{9\times10^9(2\times10^{-9})(5\times10^{-9})}{(.02)^2} = 2.25\times10^{-4}\,N$$ to the right

$$F_{23} = \frac{kq_2q_3}{r^2} = \frac{9\times10^9(5\times10^{-9})(3\times10^{-9})}{(.02)^2} = 3.38\times10^{-4}\,N$$ to the right

$$F_{Net} = 2.25\times10^{-4} + 3.38\times10^{-4}$$

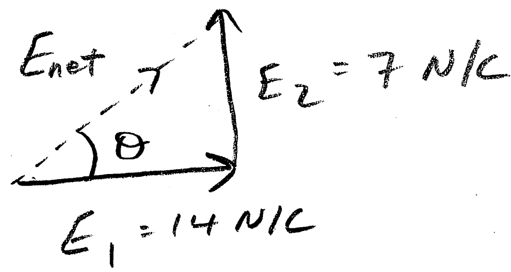
$$= 5.63\times10^{-4}\,N$$ to the right

(29) A

$F = qE$

$q = \frac{F}{E} = \frac{-3.0\times10^{-6}}{15} = -2.0\times10^{-7}\ C$

(30) A



$\theta = \tan^{-1}\left(\frac{E_2}{E_1}\right) = \tan^{-1}\left(\frac{7}{14}\right) = 27^\circ$

(31) A

$V = \frac{kQ}{r}$

$\Delta V = \frac{kQ}{r_f} - \frac{kQ}{r_i} = kQ\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$

$= 9\times10^{9}(10\times10^{-9})\left(\frac{1}{.4} - \frac{1}{.2}\right)$

$\Delta V = -225\ V$

(32) D

Work = energy

$= E_e = q E \Delta d$

$= (1.6\times10^{-19})(50)(.2)$

$= 1.6\times10^{-18}\ J$

(41) D $F \propto \frac{1}{r^2}$ $\frac{1}{(2r)^2} = \frac{1}{4}$

(42) A (43) D $4\times F \propto (q_1 q_2)^{\times 4}$

(44) C $E = \frac{kQ}{r^2} = \frac{9\times10^9(1.5\times10^{-9})}{(.12)^2} = 937.5 N/C$

(45) D

(46) C

q_2 is twice q_1 $\frac{q_1}{q_2} = \frac{+1}{-2}$

q_1 positive

q_2 negative

(47) B

(48) B $V = \frac{kQ}{r} = \frac{(9\times10^9)(-25\times10^{-9})}{1} = -225V$

(49) C $V \propto \frac{1}{r}$ $\frac{1}{2r}$ $V \propto \frac{1}{2}$

(50) A potential difference is more descriptive

(62) B

(63) D $F \propto \frac{q}{r^2}$ $\frac{\frac{q}{2}}{\left(\frac{r}{2}\right)^2} = \frac{q}{r^2}\left(\frac{4}{2}\right)^2$

new force is doubled.

(64) A electrostatic force is much stronger than the gravitational force.

(65) C

$$F = \frac{k q_1 q_2}{r^2}$$

$$= \frac{(9\times10^{9})(56\times1.6\times10^{-19})(1.6\times10^{-19})}{(10\times10^{-12})^2}$$

$$= 1.29\times10^{-4}\ N$$

(66) B

$$E = \frac{kQ}{r^2}$$

$$Q = \frac{r^2E}{k} = \frac{(10\times10^{3})^2(1000)}{9\times10^{9}}$$

$$= 11.1\ C$$

(67) A

$$F = qE$$

$$E = \frac{F}{q} = \frac{10}{10\times10^{-9}} = 1.0\times10^{9}\ N/C$$

Electric field points in opposite direction of the force.

(68) A, B (Both say the same thing)
Field increases between the charges.

(69) B

$$V = \frac{E_e}{q} = \frac{13 \times 10^{-3}}{-8.8 \times 10^{-9}} = -1.48 \times 10^{6}\ V$$

(70) D

(71) C

$$E_e = qE\Delta d$$

$$q = \frac{E_e}{E\Delta d} = \frac{10 \times 10^{-3}}{(-20)(-.25 - .25)}$$

$$q = .001\ C$$

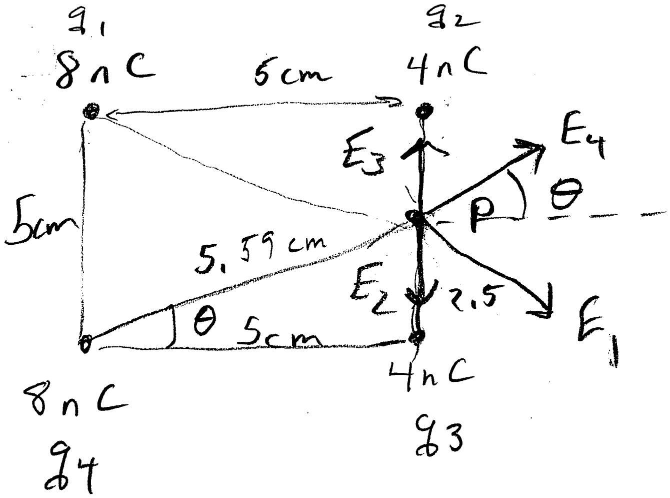
(72) B   (81) C

(82) C   Charge on each sphere will be 1.5nC

$$F = k\frac{q_1 q_2}{r^2} = \frac{(9 \times 10^{9})(1.5 \times 10^{-9})(1.5 \times 10^{-9})}{(.2)^2}$$

$$= 5.06 \times 10^{-7}\ N$$

(83) C



at P

$$E_1 = E_4 = \frac{kQ}{r^2} = \frac{(9\times10^9)(8\times10^{-9})}{(.0559)^2}$$

$$= 23041 \text{ N/C}$$

vertical components of E_1 and E_4 are in opposite directions and thus cancel.

Horizontal components add together

$E_1 \cos\theta + E_4 \cos\theta$ $\quad\quad$ $\theta = \tan^{-1}\left(\frac{2.5}{5}\right)$

$\theta = 26.565°$

$2(23041)\cos\theta$

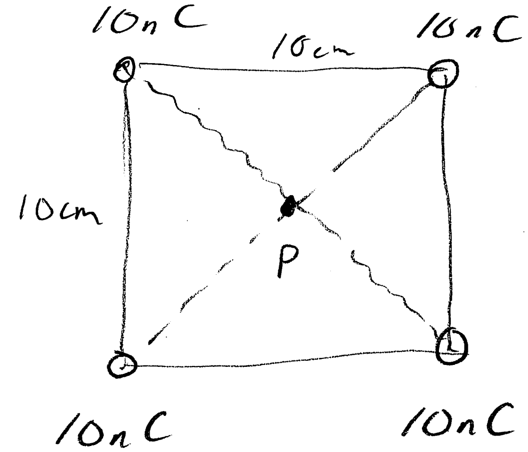
$2(23041)\cos(26.565) = 41216$ N/C.

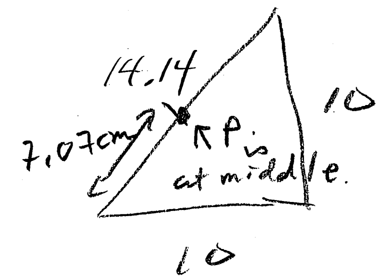
$E_2 = E_3$ but the fields are in opposite directions so they cancel.

Therefore, the net field is

4.1×10^4 NC (to the right)

(85) D





$$V = \frac{E_e}{q}$$

$E_e = qV$ V is total potential.

potentential from each charge in the square is the same

$$V = \frac{kQ}{r}$$

$$\therefore V_{net} = \frac{4kQ}{r}$$

$$E_e = q\frac{4kQ}{r} = \frac{(1\times10^{-9})4(9\times10^{9})(10\times10^{-9})}{.0707}$$

$$= 5.09\times10^{-6}\ J$$

(86) A