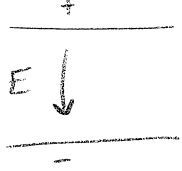
Electric fields #1

① $E = \frac{F}{q} = \frac{.2}{1.0\times10^{-5}} = 2.0\times10^{4}\ N/C$

② $E = \frac{F}{q} \qquad q = \frac{F}{E} = \frac{1.4\times10^{-8}}{2.0\times10^{-4}} = 7\times10^{-5}\ C$

③ $E = \frac{F}{q} \qquad q = \frac{F}{E} = \frac{.2}{4.5\times10^{5}} = 4.4\times10^{-7}\ C$

④ (a)

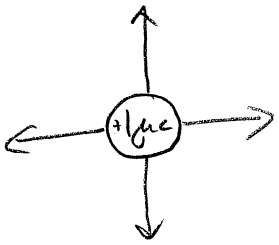


charge	force
+	down
−	up

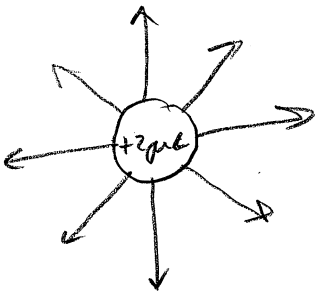
(b) $E = \frac{F}{q} \qquad F = qE = (1.6\times10^{-19})(150) = 2.4\times10^{-17}\ N$ down

(c) $F = mg = (1.67\times10^{-27})(9.8) = 1.64\times10^{-26}\ N$ down

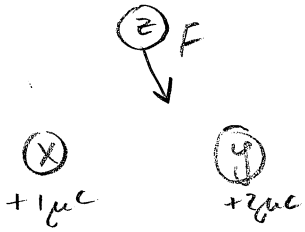
⑤ (a)



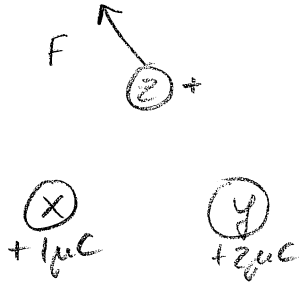
(b)



⑥ (a)



(b)



⑦ $E = \frac{F}{q} \qquad F = qE = (8.0\times10^{-5})(50) = 0.004\ N$

(8) (a) $E = \frac{F}{q}$ $\quad F = qE = (1.6 \times 10^{-19})(1 \times 10^{5}) = 1.6 \times 10^{-14}\ N$

(b) $F = ma$ $\quad a = \frac{F}{m} = \frac{1.6 \times 10^{-14}\ N}{9.11 \times 10^{-31}\ kg} = 1.76 \times 10^{16}\ m/s^2$

(9) (a) 

(b) $F_E = F_g$

(10) (a) $F_E = qE$ $\quad F_g = F_E$

$q = \frac{F_E}{E} = \frac{1.9 \times 10^{-15}}{6.0 \times 10^{3}} = \underline{3.17 \times 10^{-19}\ C}$

(b) $\frac{3.17 \times 10^{-19}}{1.6 \times 10^{-19}} = 1.98 \simeq \underline{2}$

(11) (a) $q = \frac{F_E}{E} = \frac{6.4 \times 10^{-13}}{4 \times 10^{6}} = \underline{1.6 \times 10^{-19}}$

(b) $\frac{1.6 \times 10^{-19}}{1.6 \times 10^{-19}} = \underline{1}$

(12) $q = 4\,(1.6 \times 10^{-19}) = 6.4 \times 10^{-19}\ C$

$F_E = 6.4 \times 10^{-13}\ N$

$E = \frac{F_E}{q} = \frac{6.4 \times 10^{-13}}{6.4 \times 10^{-19}} = \underline{1 \times 10^{6}\ N/C}$

(13) $E = \frac{F}{q} = \frac{0.060\,N}{2.0\times10^{-8}\,C} = 3.0\times10^{6}\ N/C$ left

E ← ⊖ → F

(14) $E = \frac{F}{q} = \frac{2.5\times10^{-4}\,N}{5.0\times10^{-4}\,C} = 0.50\ N/C$

(15) E ⟶

⟵ ⊕

$E = \frac{F}{q}$

$500\ N/C = \frac{F}{1.6\times10^{-19}\,C}$

$F = 8\times10^{-17}\ N$ (force exerted on proton)

proton moving in $-x$ direction, therefore this force causes a negative acceleration

$F = ma$

$8\times10^{-17}\,N = (1.6\times10^{-27}\,kg)\,a$

$a = -5\times10^{10}\ m/s^2$

$v_i = 4\times10^{5}\ m/s$

$a = -5\times10^{10}\ m/s^2$

$d = .4\ m$

$v_f = ?$

$v_f^2 = v_i^2 + 2ad$

$= (4\times10^{5}\ m/s)^2 + 2(-5\times10^{10}\ m/s^2)(.4\ m)$

$v_f = 3.5\times10^{5}\ m/s$