(21)

$$+0.2\mu C = 2\times10^{-7}C$$

$$d = 10\,cm$$
$$d = 10^{-1}\,m$$

$$F_{elist.}$$

$$+0.3\mu C = 3\times10^{-7}C$$

$$F_{elect.}$$

$$mg$$

$$F_{elist.} = 0.1702 + 0.054$$
$$KX = 228\times10^{-3}$$
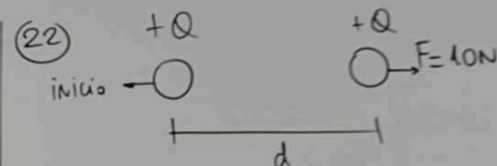$$4X = 224.2\times10^{-3}$$
$$X = 56.05\times10^{-3}\,m$$
$$\boxed{X = 5.605\,cm}$$

∴ long. natural $= 10\,cm - 5.605\,cm$

$$= 4.4\,cm$$

✓ $mg = (17.4\times10^{-3})\cdot9.8 = 0.1702\,N$

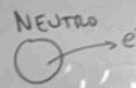✓ $F_{elect.} = k\dfrac{q_1 q_2}{d^2} = \dfrac{9\times10^9 \times 6\times10^{-14}}{10^{-2}} = 54\times10^{-3} = 0.054\,N$

(22)

$$+Q \qquad\qquad +Q$$
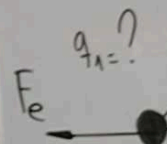
inicio ○ $\qquad\qquad$ ○ → $F = 10\,N$

$$\vert\underline{\qquad\qquad d \qquad\qquad}\vert$$

$$F = k\dfrac{Q^2}{d} = 10\,N$$

FINAL $\quad +2Q \qquad\qquad +2Q$

F' ← ○ $\qquad\qquad$ ○ → F'
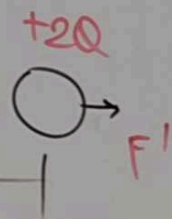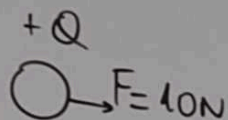
$$\vert\underline{\quad \tfrac{d}{3} \quad}\vert$$
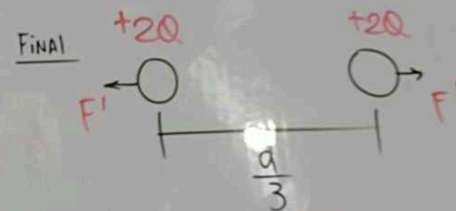
$$F' = \dfrac{k(4Q^2)}{\left(\dfrac{d^2}{9}\right)} = 36\left(\dfrac{kQ^2}{d^2}\right) = 36(10)$$

$$= 360\,N$$

(23)

NEUTRO ○ → e⁻

$$q_1 = ?$$

$$F_e$$

$+Q$

$\bigcirc \rightarrow F = 10N$

$\dfrac{2}{}$ |

$+2Q$

$\bigcirc \rightarrow$

F'

|

$\left(\dfrac{kQ^2}{d^2}\right) = 36(10)$

$= 360N$

NEUTRO

$\bigcirc \rightarrow e^-$

$+Q$ $\bigcirc \rightarrow e^-$

$^+Q + Q = {}^+2Q$ $\bigcirc$

(23)

$q_1 = ?$

T χ

F_e $\rightarrow$

$53°$

$d = 30cm$
$d = 3 \times 10^{-1} m$

$q_2 = -60\mu c$

$200N$

$40cm$

T

$200N$

$53°$

$F_e = 150N$
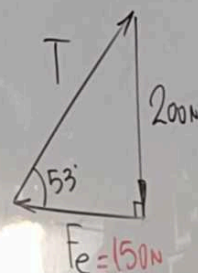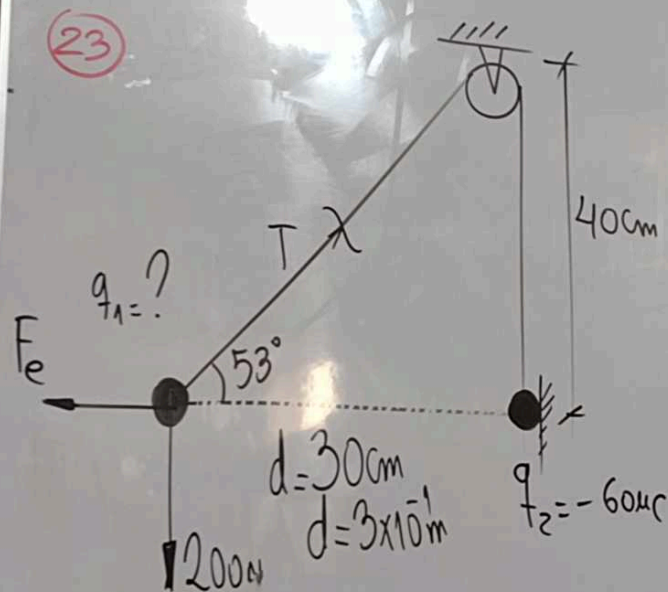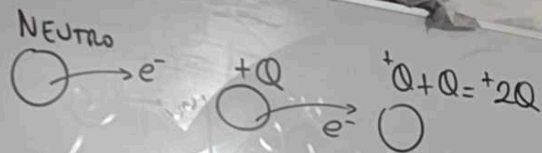
$\dfrac{K \cdot |q_1| \cdot |q_2|}{d^2} = 150$

$\dfrac{9 \times 10^9 |q_1| \cdot 60 \times 10^{-6}}{9 \times 10^{-2}} = 150$

$|q_1| = 25 \times 10^{-5} C$

$|q_1| = 25 \times 10^{-6} C$

$|q_1| = 25\mu c$

$q_1 = -25\mu c$ $\searrow$

$C5: \langle -8, -1] \cup [8, 7\#)$

(24)

////

$q = +10\mu C$
$= 10^{-5} C$

$d = 50cm$
$d = 5 \times 10^{-1} m$

$F_{elást.} = 10N$

$q = +10\mu C = 10^{-5} C$

6,4N $\quad F_{eléct.} = 3,6N$

2) $Kx = 10$
$100x = 10$
$x = 0,1m$
$\boxed{x = 10cm}$
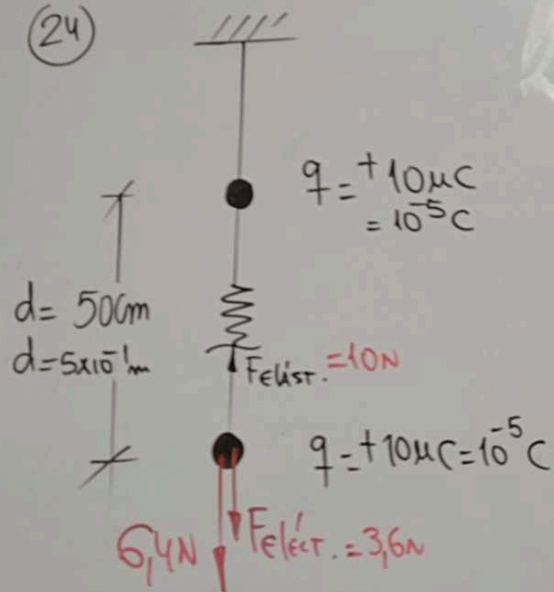
1)
$$F'_{eléct.} = \frac{k|q_1| \cdot |q_2|}{d^2} = \frac{9 \times 10^9 \times 10^{-10}}{25 \times 10^{-2}} = \frac{90}{25} = 3,6N$$
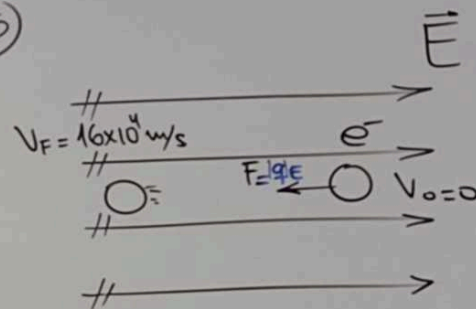
(25)

$\vec{E}$

$V_F = 16 \times 10^4 \, m/s$

$\overline{e}$

$F = |q|E$

$V_0 = 0$

1) $F = ma$
$|q| \cdot E = ma$
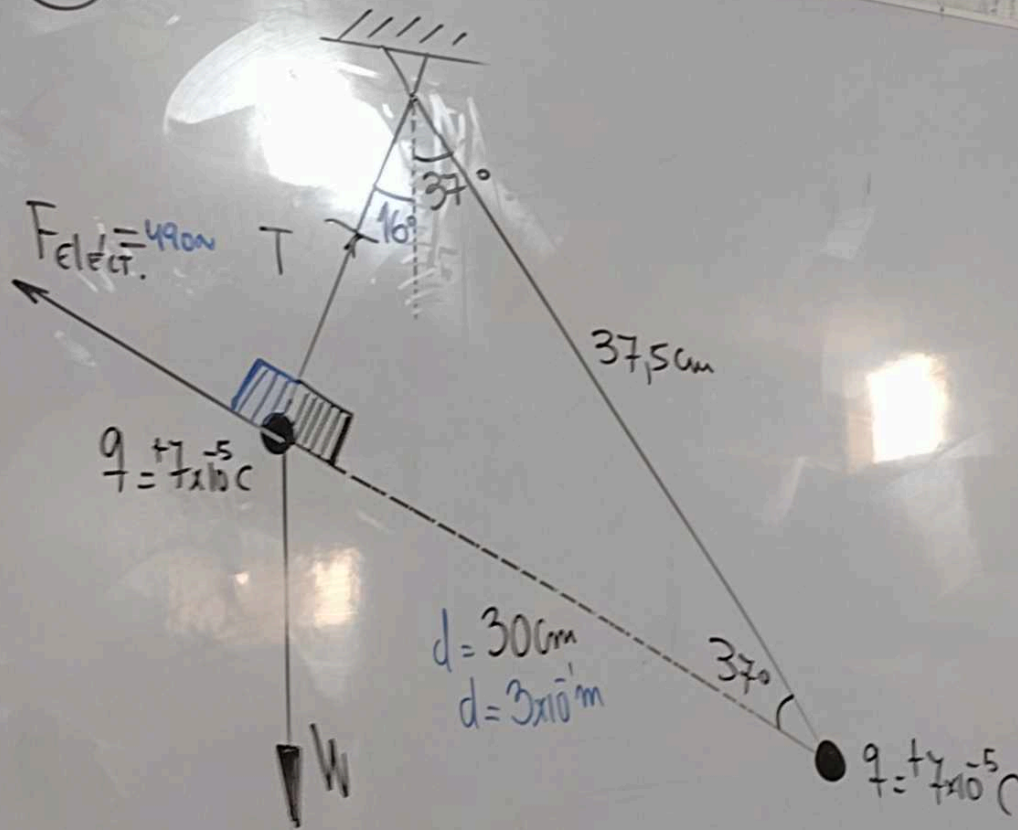$$\frac{1,6 \times 10^{-19} \times 9,11 \times 10^4}{9,11 \times 10^{-31}} = a$$

$a = 1,6 \times 10^{16} = 16 \times 10^{15}$

2) $V_F = V_0 + at$
$16 \times 10^4 = 0 + 16 \times 10^{15} t$
$t = 10^{-11} s$

(26)

$$F_{Elect.} = 490N$$

T

37°

16°

37,5cm

$$q = +7 \times 10^{-5} C$$

W

d = 300cm
d = 3×10^1 m

37°

$$q = +7 \times 10^{-5} C$$
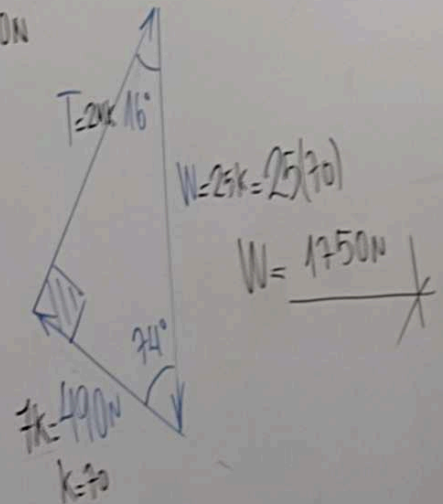
$$F_{Elecr.} = \frac{k|q_1|.|q_2|}{d^2}$$

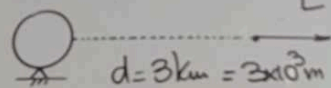$$= \frac{9 \times 10^9 \times 49 \times 10^{-10}}{9 \times 10^{-2}}$$

$$= 49 \times 10^1$$

$$= 490N$$

T=2k/16°

W=25k=25(70)

W = 1750N

7k=490N
k=70

74°

CS: (-∞,-1) U (∞,∞)

(27)

$Q = {}^+5C$

$d = 3km = 3 \times 10^3 m$

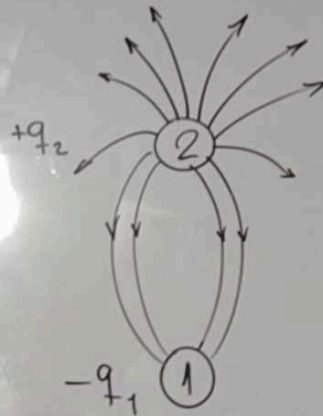$\swarrow E = \dfrac{k|Q|}{d^2}$

$E = \dfrac{9 \times 10^9 \times 5}{9 \times 10^6} \text{ N/C}$

$E = 5000 \text{ N/C}$ $\cancel{}$
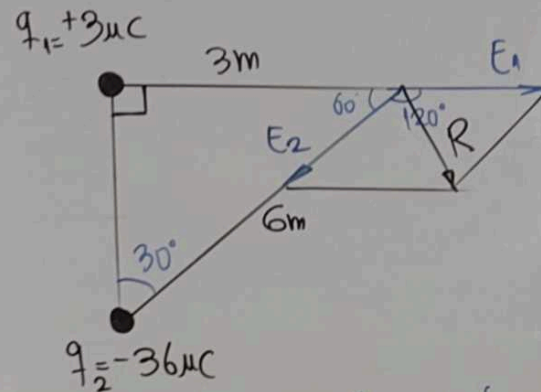
(28)

$+q_2$ 〔2〕

$-q_1$ 〔1〕

$\dfrac{|q_1|}{\# \text{línea entrante}} = \dfrac{|q_2|}{\# \text{líneas salientes}}$

$\dfrac{-q_1}{4} = \dfrac{+q_2}{12} \rightarrow \boxed{\dfrac{q_1}{q_2} = -\dfrac{1}{3}}$

(29)

$q_1 = {}^+3\mu C$

$3m$

E_1

60

$120°$ R

E_2

$6m$

$30°$

$q_2 = -36\mu C$

$E_1 = \dfrac{k|Q_1|}{d^2} = \dfrac{9 \times 10^9 \times 3 \times 10^{-6}}{3^2} = 3 \times 10^3 \dfrac{N}{C}$

$E_2 = \dfrac{k|Q_2|}{d^2} = \dfrac{9 \times 10^9 \times 36 \times 10^{-6}}{6^2} = 9 k \dfrac{N}{C}$

$= 3 \text{K} \dfrac{N}{C}$

E_1

$60°$ $120°$ R
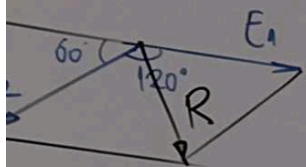
$$R = \sqrt{A^2 + B^2 + 2AB\cos\alpha}$$

$$R = \sqrt{3^2 + 9^2 + 2(3)(9)\left(-\frac{1}{2}\right)}$$

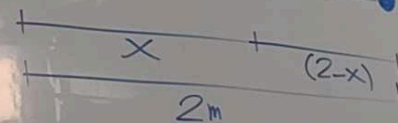$$R = \sqrt{9 + 81 - 27}$$

$$R = \sqrt{63} = 7,9 \approx 8\,KN/c$$

(30)

$q_1 = 2\times10^{-8}C$ P $q_2 = -4\times10^{-8}C$

X $(2-x)$

$2m$

$E_N \,"P":$ $E_1 = 2E_2$

$$\frac{K\cdot(2\cdot10^{-8})}{X^2} = 2\cdot\frac{K\cdot(4\cdot10^{-8})}{(2-X)^2}$$
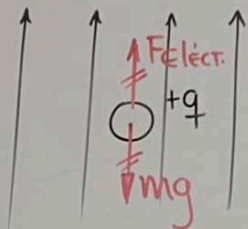
$(2-x)^2 = 4x^2$

$2 - X = 2X$

$X = \frac{2}{3}$

$X = 0,6\,m$

$Y = 0,6\,m$

$\frac{9}{3^2} \times 3\times10^{-6} = 3\times10^3\,\frac{N}{C} = 3\,K\frac{N}{C}$

$10^9 \times 36\times10^{-6} = 9K\frac{N}{C}$

$K=5$

$\frac{S}{2}$ $\frac{S}{2}$

$C_5: \langle -8, -7] \cup [8,$

(31)

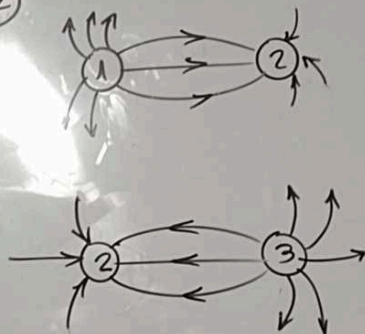
$F_{\text{elect.}}$ $+q$ mg

$F_{\text{elect.}} = mg$

$qE = mg$

$10 \times 10^{-6} \, E = (18 \times 10^{-3})(10)$

$E = 18 \times 10^3 \, N/C$

$E = 18 \, kN/C$

(32)

$\dfrac{q_1}{8} = \dfrac{q_2}{6}$

$\boxed{q_1 = \dfrac{4}{3} q_2}$
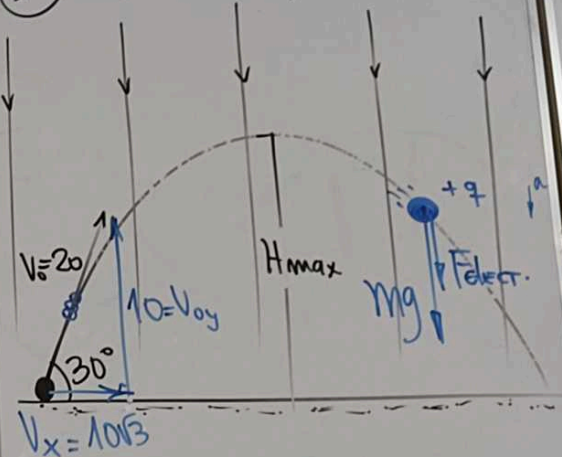
$\dfrac{q_3}{8} = \dfrac{q_2}{6}$

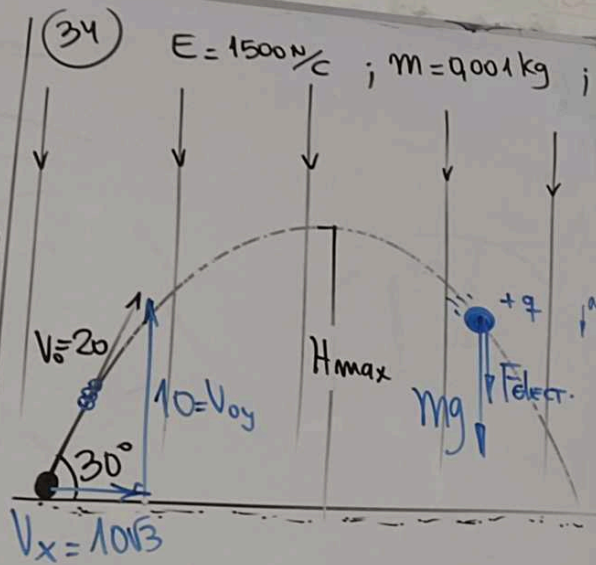$\boxed{q_3 = \dfrac{4}{3} q_2}$

$\dfrac{q_1}{q_3} = 1$

(34) $E = 1500 \, N/C$; $m = 0.001 \, kg$; $q = {}^+1$

$V_0 = 20$ $10 = V_{oy}$ H_{max} $30°$ mg $F_{\text{elect.}}$ $+q$

$V_x = 10\sqrt{3}$

$\frac{q_2}{6}$

$\boxed{\frac{4}{3}q_2}$

(34) $E = 1500\,N/c$; $m = 0.001\,kg$; $q = {}^+10^{-5}C$

$V_0 = 20$

$10 = V_{oy}$

H_{max}

$30°$

$V_x = 10\sqrt{3}$
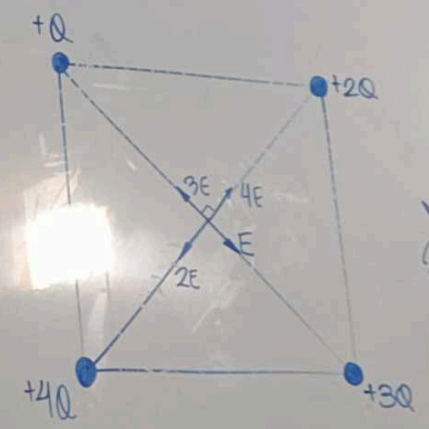
$+q$

$mg \downarrow F_{elect.}$

1) $F_{Rel} = ma$

$mg + F_{} = ma$

$mg + qE = ma$

$g + \dfrac{qE}{m} = a$

$10 + \dfrac{10^{-5} \times 1500}{10^{-3}} = a$

$a = 25\ \dfrac{m}{s^2}$

2) $H_{max} = \dfrac{V_{oy}^2}{2a} = \dfrac{10^2}{2(25)} = 2m$

(35)

$+Q$ $\quad +2Q$

$3E \quad 4E$

E

$2E$

$+4Q$ $\quad +3Q$

$E = 25\sqrt{2}\,N/c$

$R = 2E\sqrt{2} = 2(25\sqrt{2})\sqrt{2}$

$= 100\,N/c\,(\hat{j})$

$2E \quad 2E$

y

j

$i \quad x$

$C_5 = \langle -8, -1] \cup [8,$