ENEM

5) Campo elétrico interno: $\vec{E} = \vec{0}$
Potencial elétrico constante: $V \neq 0$

6) $\boxed{V_C = \frac{K_0 \cdot Q_A}{d_A} + \frac{K_0 Q_B}{d_B}}$

$V_C = 9.10^9 \cdot \left(\frac{3.10^{-8}}{3.10^{-3}} + \frac{6.10^{-8}}{5.10^{-3}} \right)$

$V_D = 9.10^9 \cdot \left(\frac{3.10^{-8}}{5.10^{-3}} + \frac{6.10^{-8}}{3.10^{-3}} \right)$

$V_C = 1,98.10^5\ V \qquad V_D = 2,34.10^5\ V$

$U_{CD} = V_C - V_D$

$U_{CD} = (1,98 - 2,34).10^5\ V$

$\boxed{U_{CD} = -3,6.10^4\ V}$

7)

$V_P = \frac{KQ}{L} + \frac{KQ}{L}$

$\boxed{V_P = \frac{2KQ}{L}}$

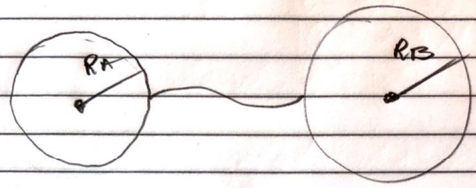
8) $W_R = \Delta E_C$

$q.U = E_{C(f)}$

$1,6.10^{-19}.2.10^2 = E_{C(f)}$

$\boxed{E_{C(f)} = 3,2.10^{-17}\ J}$

9)



$R_B = 2R_A$

No equilíbrio $\boxed{V_A = V_B}$

10) As cargas elétricas nos condutores em equilíbrio eletrostático distribuem-se pela superfície externa do condutor.

11)

$Q_{total} = Q_A + Q_B$

$Q_A = 4\mu C$

$Q_B = 2\mu C$

$Q_C = 2\mu C$

12)

$R + 2R = 16Q - 4Q$

$R + 2R = 12Q$

$R = \frac{12Q}{3}$

$\boxed{R = 4Q}$

$\boxed{2R = 8Q}$

QUESTÕES DISCURSIVAS

Questão 1 -

$$v = K\frac{Q}{d}$$

$$5{,}0 \cdot 10^4 = 9{,}0 \cdot 10^9 \cdot \frac{Q}{0{,}45}$$

$$Q = 2{,}5 \cdot 10^{-6}\ C$$

$$\boxed{Q = 2{,}5\ \mu C}$$

Questão 2 -

a) $C = \dfrac{Q}{v}$

$$C = \frac{3{,}0 \cdot 10^{-6}}{5{,}0 \cdot 10^3} \Rightarrow \boxed{C = 0{,}6 \cdot 10^{-6}\ F = 0{,}6\ nF}$$

b) $C = \dfrac{Q}{R}$

$$0{,}6 \cdot 10^{-9} = \frac{R}{9 \cdot 10^9} \Rightarrow \boxed{R = 5{,}4\ m}$$

Questão 3 -

a) $v = K\dfrac{Q}{r}$

$$v_1 = 9 \cdot 10^9 \cdot \frac{2 \cdot 10^{-9}}{0{,}05} \Rightarrow \boxed{v_1 = 360\ V}$$

b) $v_e = \dfrac{Q_1 + Q_2}{C_1 + C_2}$

$$v_e = \frac{Q_1}{\frac{r_1}{K} + \frac{r_2}{K}} = K\frac{Q_1}{(r_1 + r_2)}$$

$$v_e = 9 \cdot 10^9 \cdot \frac{2 \cdot 10^{-9}}{0{,}05 + 0{,}01} \Rightarrow \boxed{v_e = 120\ V}$$

Questão 4 -

$$v = K\frac{Q}{d}$$

$$v_A = 9 \cdot 10^9 \frac{2{,}0 \cdot 10^{-6}}{(10^{-1})^2} \Rightarrow v_A = 18 \cdot 10^9$$

$$v_B = 9 \cdot 10^9 \frac{2{,}0 \cdot 10^{-6}}{(3 \cdot 10^{-1})^2} \Rightarrow v_B = 2 \cdot 10^9$$

Assim:

$\tau_{AB} = 1{,}5 \cdot 10^{-6}\ (18 \cdot 10^5 - 2 \cdot 10^{-5})$

$\tau_{AB} = q\ (v_A - v_B)$

$T_{AB} = 2{,}4\ J$

Questão 5 -

$T_{AB} = q\ .\ (V_A - V_B)$

$q\ .\ (452 - V_B) = m\ .\ v_B^2/2$

$q\ .\ (791 - V_B) = m\ .\ v_B^2/2$

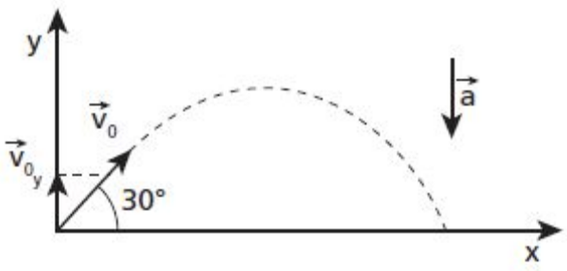
Comparando as duas expressões:

$q\ .\ (452 - V_B) = q\ .\ (791 - V_B)$

$v_B = 339\ V$

Questão extra - 10 pts

$$F = F_e$$
$$m\,a = |q|\,E$$
$$a = \frac{|q|\,E}{m} = \frac{1{,}6 \cdot 10^{-19} \cdot 100}{9{,}1 \cdot 10^{-31}}$$
$$a = 17{,}6 \cdot 10^{12}\ m/s^2$$



$$v_{0_y} = v_0 \operatorname{sen} 30°$$
$$v_{0_y} = \frac{v_0}{2}$$

Na vertical, temos um MUV:

$$v = v_0 + \gamma t$$
$$-\frac{v_0}{2} = \frac{v_0}{2} - a\,t$$
$$a\,t = v_0 \Rightarrow 17{,}6 \cdot 10^{12}\,t = 4 \cdot 10^5$$
$$t = 0{,}23 \cdot 10^{-7}\ s = 23 \cdot 10^{-9}\ s$$

$$\boxed{t = 23\ n\ s}$$