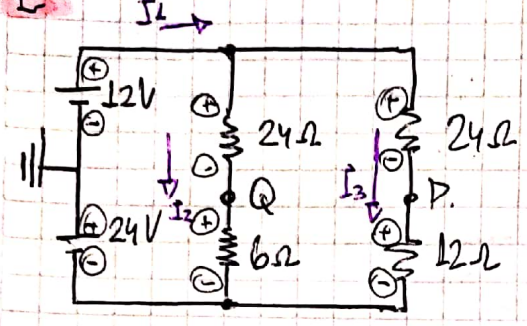
Segundo Parcial

1.



¿$V(P) - V(Q)$?

- $V(Q) = -24V + 6\Omega . I_2$
- $V(P) = -24V + 12\Omega . I_3$

$V(P) - V(Q) = 12\Omega . I_3 - 6\Omega I_2$

Malla izq.: $-24V + 6\Omega . I_2 + 24\Omega . I_2 - 12V = 0$

$-36V + 30\Omega I_2 = 0$

$30\Omega I_2 = 36V$

$I_2 = 1,2A$

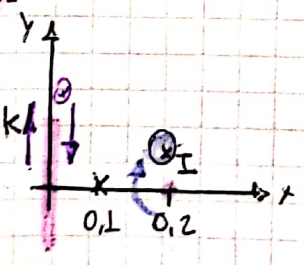
Malla der.: $-24V + 12\Omega . I_3 + 24\Omega . I_3 - 12V = 0$

$36\Omega I_3 = 36V$

$I_3 = 1A$

$V_P - V_Q = (12 - 6.1,2)V = 4,8V$

2.



$\bar{k} = -1\check{z}\ \frac{A}{m}$ $\quad \bar{B}(0,1) = \bar{0}$

$\bar{B}_{TOTAL} = \bar{0} = \frac{\mu_0 |\bar{k}|}{2}(-\check{y}) + \frac{\mu_0 I}{2\pi . d}\check{y}$

↳ plano ↳ alambre

$= \frac{\mu_0}{2}\left(-k + \frac{I}{\pi . 0,1}\right) = \frac{4\pi . 10^{-7}}{2}\left(1 + \frac{I}{\pi . 0,1}\right)$

$\rightarrow \pi . 0,1 = I$

$0,314 = I$ → entrante.

3.

$N = 20$. $R = 0,4m$.

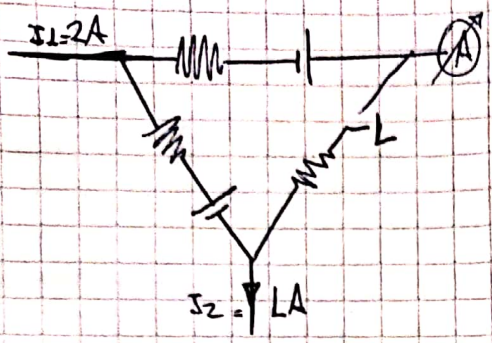
$I_{espira} = 0,32A$ $\quad B = 0,75T$.

¿$\bar{\tau}$?

$\bar{\tau} = \bar{m} \times \bar{B}$ con $\bar{m} = N.I.\bar{S} = N.I.S(-\check{z})$, $\bar{B} = B(-\check{y})$

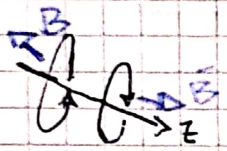
$\rightarrow \bar{\tau} = NISB(-\check{x}) = 20.0,32.0,4^2\pi . 0,75 = 2,41(-\check{x})$

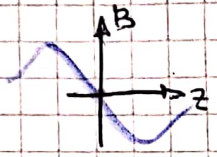
4.



• Sale el resto: 1A (tanto con L cerrada como abierta)

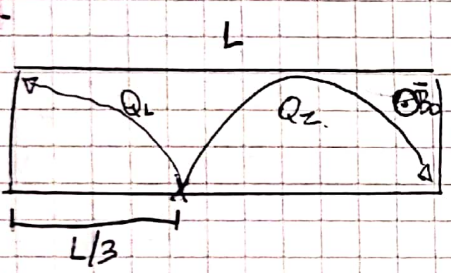
5.





$$\bar{B}(z) = \frac{\mu_0 \cdot I R^2}{2(R^2+z^2)^{3/2}}$$

6.



$Q_1 < 0$ $\quad Q_2 > 0$ $\quad |Q_1| = |Q_2|$ $\quad R = \frac{mV}{qB_0}$

7- Cable sección circular $d = 1{,}5mm = 0{,}0015m$ $\quad I = 4{,}55A$ $\quad \rho = 200\,n\Omega m$ $\quad \bar{E}$ ⊙ int.

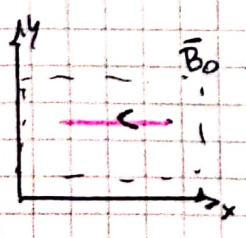
radio $= 7{,}5 \cdot 10^{-4} m$

$200 \cdot 10^{-9}\,\Omega m$

$\bar{E} = \rho \cdot \bar{J}$ $\quad \oint_A \bar{J}\, d\bar{s} = I \rightarrow J \cdot A = I$.

$$\Rightarrow E = \rho \cdot \frac{I}{A} = 200 \cdot 10^{-9} \cdot \frac{4{,}55}{\pi (7{,}5 \cdot 10^{-4})^2} = \boxed{0{,}51}$$

8.



$L = 1m$ $\quad I = 2A$ $\quad \bar{d} = 1(-\hat{y})$ $\quad \bar{B}?$ ⊙

$m = 200g = 0{,}2kg$

$$|\bar{F}_M| - |\bar{P}| = m \cdot a \rightarrow I \cdot L \cdot B - m \cdot g = m \cdot a$$

$$2A \cdot 1m \cdot B - 0{,}2 \cdot 10 = 0{,}2 \cdot (-1)$$

$$2B - 2 = -0{,}2$$

$$B = 0{,}9T\left(\frac{y}{z}\right)$$

9. $V_1 = 1V$.
$r_1 = 0{,}001m$ $\quad \sigma = \frac{6 \cdot 10^{-8}}{\Omega m}$

$r_2 = 2mm = 0{,}002m$
$V_2 = 10V$.

• El pot. decrece en sentido que circula la I
$\Rightarrow$ (+I) $V_2 > V_1$.

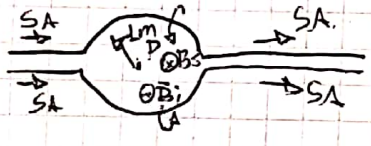
$V_{12} - V_2 = -9V = -IR_1 - IR_2 \rightarrow I = \frac{9V}{(R_1 + R_2)}$

$R = \rho \cdot \frac{l}{A} = \frac{1}{\sigma} \cdot \frac{l}{A} \rightarrow R_1 = \frac{1}{6 \cdot 10^{-8}} \cdot \frac{2m}{\pi \cdot (0{,}001)^2}$, $R_2 = \frac{1}{6 \cdot 10^{-8}} \cdot \frac{1m}{\pi \cdot (0{,}002m)^2}$

$= 1{,}06 \cdot 10^{13}$. $\quad = 1{,}33 \cdot 10^{12}$

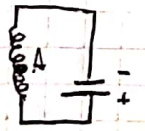
$I = 7{,}54 \cdot 10^{-13} = \boxed{0{,}75 pA.}$

10. $R = 1m$



Se anulan $\Rightarrow \vec{B} = 0$.

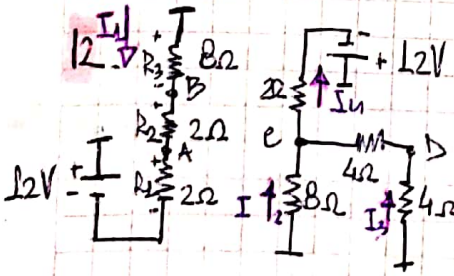
11. Solenoide $N = 1000$ cilindro hueco diam. $1cm$ $\quad r = 0{,}005m$ $\quad L = 2m$ $\quad B = 1{,}57mT$ en A. $1{,}57 \cdot 10^{-3} T$.
$R = 4\Omega$ $\quad \mathcal{E}$, P



$B = \frac{\mu_0 I N}{L}$ $\quad IR = \Delta V$. $\quad I = \frac{\Delta V}{R}$.

$\Rightarrow B = \mu_0 \cdot \frac{\Delta V}{R} \cdot N \cdot \frac{1}{L} = 4\pi \cdot 10^{-7} \cdot \mathcal{E} \cdot \frac{1}{4\Omega} \cdot \frac{1000}{2m} \cdot 1 \Rightarrow \boxed{10V = \mathcal{E}}$

12. I_1



$0 = -8\Omega \cdot I_1 - 2\Omega \cdot I_1 - 2\Omega \cdot I_1 + 12V \rightarrow I_1 = 1A$.

$V_{(A)} = -12V + 2\Omega \cdot 1A = -10V$ $\quad V_{(B)} = -10V + 2\Omega \cdot 1A = -8V$.

• Como resistencias iguales $\Rightarrow I_2 = I_3 = \frac{I_4}{2}$.

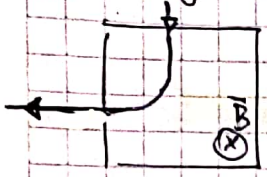
$-8\Omega \cdot \frac{I_4}{2} - 2\Omega \cdot I_4 + 12V = 0 \rightarrow I_4 = 2A \Rightarrow I_2 = I_3 = 1A$.

$V_{(D)} = -4\Omega \cdot 1A = -4V$

$V_{(B)} - V_{(D)} = -8V + 4V = -4V$

13- carga < 0 $m = 9,11 \cdot 10^{-31}\,kg$ $q = -1,6 \cdot 10^{-19}\,C$ $\Delta V = 2000V$ $R = 18cm = 0,18m$

$v_i = 0$ Δ trabajo por unidad de carga.

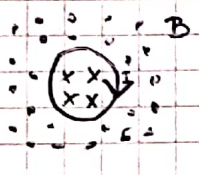


$\Delta V \cdot q = W = \Delta E_{cin} = \frac{1}{2} m v_F^2 - \frac{1}{2} m v_i^2 = \frac{1}{2} m v_F^2$

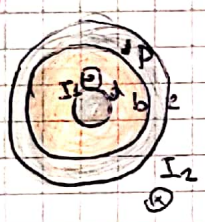
$2000V \cdot (1,6 \cdot 10^{-19}) = \frac{1}{2} 9,11 \cdot 10^{-31} \cdot v_F^2$

$F_n = q \cdot v \cdot B_0 = \frac{m v^2}{R} \rightarrow q \cdot B_0 = \frac{m v}{R} \rightarrow B_0 = \frac{m v}{R q} = \left(\sqrt{\frac{\Delta V \cdot q \cdot 2}{m}} \cdot m\right) \cdot \frac{1}{R q} = 8,38 \cdot 10^{-4} = \boxed{0,838 \cdot 10^{-3}}$

14-



15-



$d = 4cm$ $b = 6cm$ $c = 7cm$ $I_1 = 1A$ $I_2 = 2A$

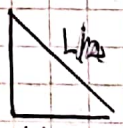
$\vec{B}(P) = (0,5cm, 0) = ?$

$d < r < b$

$B \cdot 2\pi \cdot r = \mu_0 \cdot I_c = \mu_0 \cdot I_1 \Rightarrow \vec{B} = \frac{\mu_0 \cdot I_1}{2\pi r} \vec{\varphi}$

$\vec{B}(0,05m) = \frac{4\pi \cdot 10^{-7} \cdot 1A}{2\pi \cdot 0,05} = \boxed{4 \cdot 10^{-6}}$

16- $N = 200$ $L = 1m$ $I = 10A$ $B = 1T$



$h^2 + \left(\frac{L}{2}\right)^2 = \left(\frac{L}{\sqrt{2}}\right)^2$

$h^2 = L^2 - \frac{L^2}{4}$

$h^2 = \frac{3}{4} L^2$

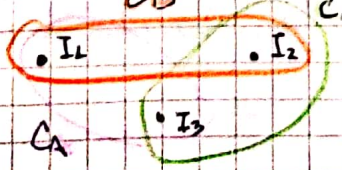
$h = \sqrt{\frac{3}{4}} \cdot L$

$\Delta \rightarrow$ equilátero

$|\vec{F}| = N \cdot I \cdot S \cdot B = 200 \cdot 10A \cdot \left(\frac{\sqrt{3}}{2} L \cdot L\right) \frac{1}{2} T = \boxed{8660,03\,N/m}$

Como es cerrado y B uniforme $\rightarrow \boxed{F_n = 0N}$

17- antihorario



$\oint \vec{B} d\vec{l}$ vale · $CA = -2,51\mu Tm$ · $CB = 2,51\mu Tm$ · $CC = -2,51\mu Tm$.

$\oint \vec{B} d\vec{l} = \mu_0 \cdot I_{cerc} \Rightarrow \mu_0 \cdot (I_1 + I_3) = -2,51\mu Tm$

$\mu_0 \cdot (I_1 + I_2) = 2,51\mu Tm$

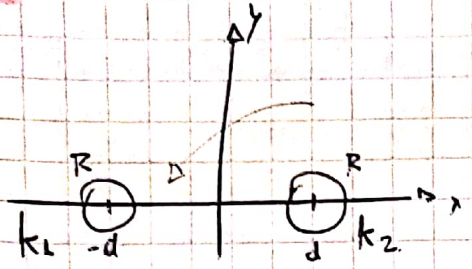
$\mu_0 \cdot (I_2 + I_3) = -2,51\mu Tm$

$$\left[\begin{array}{ccc|c} 1 & 0 & 1 & -2,51/\mu_0 \\ 1 & 1 & 0 & 2,51/\mu_0 \\ 0 & 1 & 1 & -2,51/\mu_0 \end{array}\right] \rightarrow \left[\begin{array}{ccc|c} 1 & 0 & 1 & -2,51/\mu_0 \\ 0 & 1 & -1 & 5,02/\mu_0 \\ 0 & 1 & 1 & -2,51/\mu_0 \end{array}\right] \rightarrow \left[\begin{array}{ccc|c} 1 & 0 & 1 & -2,51/\mu_0 \\ 0 & 1 & -1 & 5,02/\mu_0 \\ 0 & 0 & 2 & -7,53/\mu_0 \end{array}\right]$$

$\Rightarrow 2I_3 = -7,53/\mu_0$ $\boxed{I_3 = -3A}$ | $I_2 + 3A = \frac{5,02}{\mu_0}$ $\boxed{I_2 = 1A}$ | $I_1 - 3A = \frac{-2,51}{\mu_0}$ $\boxed{I_1 = 1A}$

18. $R = 0{,}05\,m$. $k_1 = -4\,\frac{A}{m}\,\check{\imath}$. $d = 0{,}2\,m$. $\vec{B}$ (0,38 cm) = ?

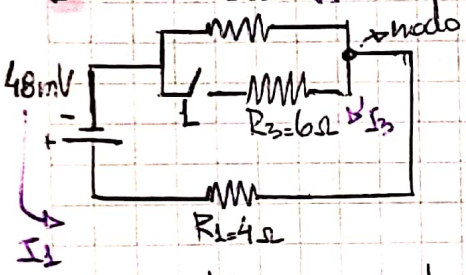
$k_2 = 2\,\frac{A}{m}\,\check{k}$



→ Sólo aporta k_2.

$$B(P) = B(-\check{\jmath}) = \frac{\mu_0 . k . R}{r}(-\check{\jmath}) = \frac{4\pi 10^{-7} . 2 . 0{,}05}{0{,}38\,m}(-\check{\jmath}) = -3{,}31 . 10^{-7}\,\check{\jmath} = \boxed{-0{,}33 . 10^{-6}\,\check{\jmath}}$$

19.



• Se abre L

$$48 . 10^{-3}\,V - 4\Omega . I_1 - 12\Omega . I_2 = 0 \;\wedge\; 48 . 10^{-3}\,V - 4\Omega . I_1 - 6\Omega . I_3 = 0 \;\wedge\; I_1 = I_2 + I_3$$

• En paralelo ΔV es igual ⇒ $I_3 . R_3 = I_2 . R_2$ ⇒ $I_1 = 3 I_2$.

$I_3 . 6\Omega = I_2 . 12\Omega$.

$I_3 = 2 I_2$

$48 . 10^{-3} - 4\Omega . 3 I_2 - 12\Omega I_2 = 0$.

$48 . 10^{-3} - 12 I_2 - 12 I_2 = 0$.

$48 . 10^{-3} - 24 I_2 = 0$

$48 . 10^{-3} = 24 I_2$

$\boxed{2 . 10^{-3} = I_2}$ → $\boxed{I_1 = 6 . 10^{-3}}$ → $\boxed{I_3 = 4 . 10^{-3}}$

• Se abre la llave → $48 . 10^{-3} - 4\Omega . I - 12\Omega . I = 0$. → $I = 3 . 10^{-3}\,A$. $\boxed{R_1 \downarrow \; R_2 \uparrow}$

20 - $q > 0$, $\vec{v} = 10\,\frac{m}{s}\,\check{\imath}$ $\vec{E} = 10\,\frac{N}{C}\,\check{\imath}$ → MRUV.

$\vec{F} = m . \vec{a} = q . \vec{E}$