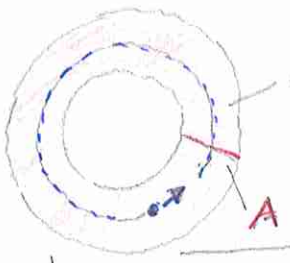
93

$$\Delta t = \frac{2\pi R}{v} \qquad \frac{2\pi \times 53\ 10^{-12}}{2,2\ 10^{6}}$$

$$\boxed{I = \frac{-e}{\Delta t} = \frac{-1,6\ 10^{-19}}{10^{-3}\ [A]}}$$



$$n = \frac{1}{2\pi R A}$$

$$\boxed{I = nve/A = \frac{-ev}{2\pi R}}$$

94

RESISTANCE AXIALE →

$$\boxed{R_l = \frac{\rho L}{\pi(b^2 - a^2)}}$$

$$dR = \frac{\rho\, dx}{S} \qquad R = \int_0^L \rho \frac{dx}{S} = \frac{\rho L}{S}$$

ON CONSIDERE UNE SERIE DE COUCHES DE CONDUCTEURS .... DE RESISTANCE dR :-)

MAIS ICI LA SURFACE VARIE !!

$$dR = \frac{\rho\, dr}{2\pi L r} \qquad R = \int_a^b \frac{\rho}{2\pi L r} dr = \frac{\rho}{2\pi L} \ln\left(\frac{b}{a}\right)$$

RESISTANCE RADIALE →

$$\boxed{R_r = \frac{\rho}{2\pi L} \ln\left(\frac{b}{a}\right)}$$

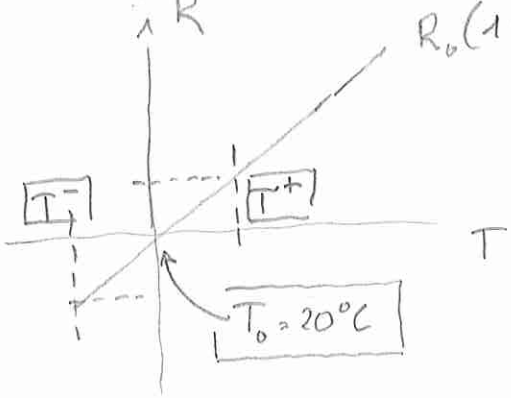
$$\frac{\rho L}{\pi(b^2 - a^2)} = \frac{\rho}{2\pi L} \ln\left(\frac{b}{a}\right)$$

$$L^2 = \frac{(b^2 - a^2)}{2} \ln\left(\frac{b}{a}\right)$$

$$\boxed{L = \sqrt{\frac{(b^2 - a^2)}{2} \ln\left(\frac{b}{a}\right)}}$$

7,4 cm

95



$$R_0(1 + \alpha(T - T_0))$$

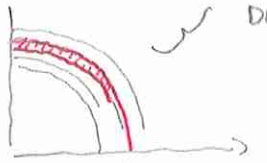
$3,93\ 10^{-3}\ [1/K]$

$$\frac{\Delta R}{R_0} = 0,1 \qquad \Delta T = \frac{0,1}{\alpha} = 25,44°C$$

$$\boxed{\begin{aligned} T^+ &= 45,44°C \\ T^- &= -5,44°C \end{aligned}}$$

96

ON INTEGRE UNE SERIE DE COUCHES RESISTIVES D'EPAISSEUR dr :-)



$$dR = \frac{\rho\, dr}{4\pi r^2}$$

$$\int_a^b dR = \int_a^b \frac{\rho\, dr}{4\pi r^2} = \frac{\rho}{4\pi}\int_a^b \frac{dr}{r^2} = \frac{\rho(b-a)}{4\pi ab}$$

$$\left[-\frac{1}{r}\right]_a^b = -\frac{1}{b} + \frac{1}{a}$$

97

$[Ah]$ = CHARGE !

$\frac{C}{s}$:-)

80×3600

$288\ 10^{+3}$ [C]

$P = VI$

24 Volt — 12 Volt

$I = 2$ A

CHARGES CONTENUES DANS LA BATTERIE 80 [Ah]

$t = 40$ [heures]

$P = 24$ [Volt]

$U = \underbrace{288\ 10^{+3}}_{Q} \times \underbrace{12}_{V}$

$3456\ 10^3$ [J]

$t = \frac{U}{P} = 40$ [heures]

98

PUISSANCE REQUISE $\left[\widetilde{1,5} \times \underbrace{4190}_{\text{CHALEUR SPECIFIQUE DE L'EAU [J/kg K]}} \times 70 \times \frac{1}{240}\right] = 1833$ [Watt]

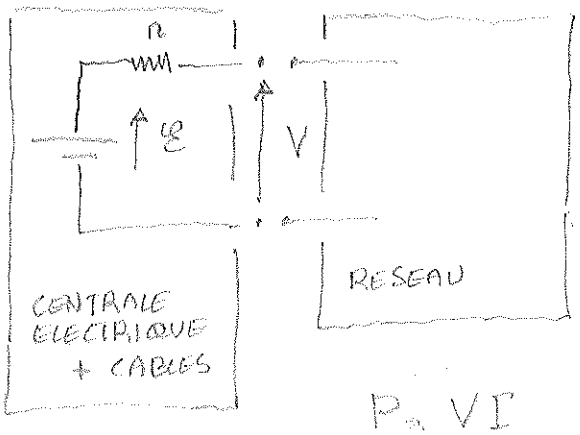
MASSE EAU

$P = VI$

1833 — 220

$I = 8,33$ A

99



$\uparrow V \Rightarrow \downarrow I \Rightarrow \downarrow r I^2$

INTERET DE TRANSPORTER L'ELECTRICITE A TRES HAUTE TENSION :-)

$P = VI$

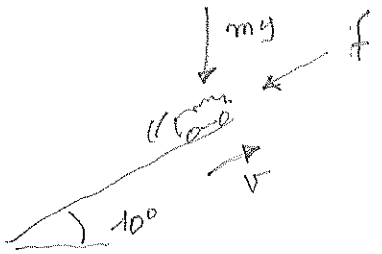
10^5 — 10^4

$I = 10\ A$

$r I^2 = 500$ Watt

PERTE DE PUISSANCE DANS LES CABLES

100



$f = 180\ N$

$mg = 600 \times 9{,}81\ N$

$v = 60\ Km/h = 16{,}67\ m/s$

- PUISSANCE DISSIPEE PAR FROTTEMENT

$P_f = \vec{f} \cdot \vec{v} = \underbrace{180 \times 16{,}67}_{3\,10^3\ Watt}$

- PUISSANCE POUR VAINCRE LA GRAVITE

$P_{mg} = m\vec{g} \cdot \vec{v}$

$= mgv \underbrace{\sin(10°)}_{\approx 0 \text{ SUR TERRAIN PLAT}} = 17\,10^3$ Watt

PUISSANCE REQUISE : $20\,10^3$ Watt

ENERGIE DISPONIBLE PAR LES BATTERIES

$20 \times \underbrace{12}_{12\ Volt} \times \underbrace{100}_{100\ Ah}$

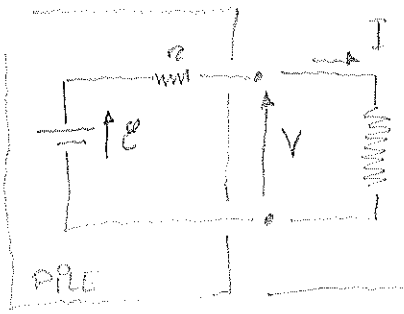
$E = 24\,10^{+3}$ Wh

90% EFFICACITE MOTEUR

$21{,}6\,10^{+3}$ Wh

ON PEUT ROULER 1h ENVIRON :-)

101



CIRCUIT EXTERIEUR

$V = RI$

$VI = RI^2$ (P)

PILE

$V = \mathcal{E} - rI$

$VI = \mathcal{E}I - rI^2$ (P)

$P = 50$ Watt
$\mathcal{E} = 16$ Volt
$R = 4\,\Omega$ → $I = 3{,}53$ A, $V = 14{,}14$ Volt

$rI = 1{,}86$ Volt
$r = 0{,}525\,\Omega$
$rI^2 = 6{,}57$ Watt

• AUTRE RESISTANCE EXTERNE

$\mathcal{E} = (R+r)I$

$P = RI^2$

$P = R\,\dfrac{\mathcal{E}^2}{(R+r)^2}$

$PR^2 + (2Pr - \mathcal{E}^2)R + Pr^2 = 0$

POLYNOME DU SECOND DEGRÉ EN R

$100R^2 - 151{,}6R + 27{,}6 = 0$

$R' = 0{,}22\,\Omega$
$R'' = 1{,}28\,\Omega$

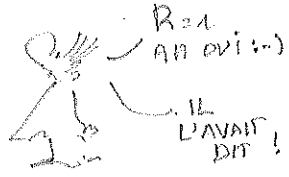
• PUISSANCE MAXIMALE ?

$P(R) = \dfrac{R\mathcal{E}^2}{(R+r)^2}$

$P'(r) = \dfrac{-2R\mathcal{E}^2}{(R+r)^3} + \dfrac{\mathcal{E}^2}{(R+r)^2}$ (= 0)

$-2R\mathcal{E}^2 + \mathcal{E}^2R + \mathcal{E}^2r = 0$

$R = r$



$P_{max} = \dfrac{\mathcal{E}^2}{4r}$