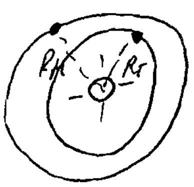
1-



$\frac{R_M}{R_T} = 1{,}53$

a) $T^2 = K r^3$

$$\frac{T_M^2}{T_T^2} = \left(\frac{R_M}{R_T}\right)^3 \Rightarrow T_M = \sqrt{\left(\frac{R_M}{R_T}\right)^3}\, T_T$$

$$T_M = 1{,}89\, T_T = \underline{690{,}76\ d}$$

b) $F_c = F_g$

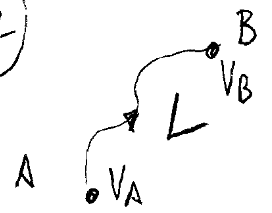
$$\boxed{V = \sqrt{\frac{GM}{r}}}$$

$$T = \frac{2\pi r}{V} = \frac{2\pi r}{\sqrt{GM/r}} \Rightarrow T^2 = \frac{4\pi^2}{GM} r^3$$

$$\boxed{M_{SOL} = \frac{4\pi^2}{G}\frac{r^3}{T^2}}$$

Necesitamos medir el radio medio y el periodo de un planeta (p.ej. MARTE).

2-



$V_B - V_A = 3\cdot 10^3\,V$

$q = 6\,mC = 6\cdot 10^{-3}\,C$

$$W_{AB} = -\Delta E_{p_{AB}} = E_{p_A} - E_{p_B}$$

$$W_{AB} = q\,(V_A - V_B) = 6\cdot 10^{-3}C\cdot(-3\cdot 10^3)V = \boxed{-18\,J}$$

CARGA ⊕ no se mueve espontáneamente hacia potenciales crecientes

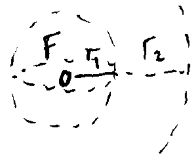
si $q = -6\,mC$

$\boxed{W_{AB} = 18\,J}$ iría ella sola.

3-

$\beta = 50\,dB$

$r_1 = 5\,m$



a) $$\boxed{\beta = 10\log\frac{I}{I_0}}$$

$$I = \frac{P}{S} = \frac{P}{4\pi r^2}$$

pero P se mantiene cte:

$$\frac{I_2}{I_1} = \frac{\cancel{P}/\cancel{4\pi} r_2^2}{\cancel{P}/\cancel{4\pi} r_1^2} = \boxed{\frac{r_1^2}{r_2^2}}$$

$$\boxed{I_2 = \frac{r_1^2}{r_2^2} I_1 =}$$

$$I_2 = \frac{5^2}{(5\cdot 100)^2} I_1 = \boxed{10^{-4} I_1}$$

$$\beta_2 = 10\log\frac{I_2}{I_0} = 10\log\frac{10^{-4} I_1}{I_0} = 10\left(\log 10^{-4} + \log\frac{I_1}{I_0}\right)$$

$$\beta_2 = \beta_1 + 10\log 10^{-4} = \beta_1 - 40\,dB = \boxed{10\,dB}$$

b) Dejará de ser audible cuando $I = I_0$

$$50 = 10\log\frac{I_1}{I_0}$$

$$\log\frac{I_1}{I_0} = 5$$

$$\boxed{I_1 = 10^5 I_0 = 10^{-7}\,Wm^{-2}}$$

$$\frac{I_3}{I_1} = \frac{r_1^2}{r_3^2} \Rightarrow r_3^2 = \frac{I_1}{I_0} r_1^2$$

$$r_3 = \sqrt{\frac{I_1}{I_0}}\, r_1$$

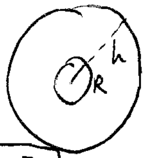
$$r_3 = \sqrt{\frac{10^5 \cancel{I_0}}{\cancel{I_0}}} \cdot 5 = \boxed{1581,13\ m}$$

4-

$m = 500\ kg$

$T = 48h = \boxed{1,728 \cdot 10^5 s}$

G, R_T, M_T



a) $$\left.\begin{array}{l} T = \dfrac{2\pi r}{v} \\ v = \sqrt{\dfrac{GM}{r}} \end{array}\right\} T^2 = \frac{4\pi^2}{GM} r^3$$

$r = R + h$

$$r = \sqrt[3]{\frac{GM}{4\pi^2} T^2} = \sqrt[3]{\frac{6,67 \cdot 10^{-11} \cdot 5,98 \cdot 10^{24}}{4\pi^2} \cdot (1,728 \cdot 10^5)^2}$$

$$r = \sqrt[3]{3,01 \cdot 10^{23}} = 6,70 \cdot 10^7\ m$$

$6,07 \cdot 10^7$

$$h = \cancel{R} - \cancel{R_T} = 6,70 \cdot 10^7 - 6,37 \cdot 10^6 = \boxed{6,07 \cdot 10^7\ m}$$

60700 km

$$g = \frac{GM}{r^2} = \boxed{0,0887\ m/s^2} = 8,87 \cdot 10^{-2}\ m/s^2$$

b) $$E_m = E_c + E_p = -\frac{1}{2}\frac{GMm}{r}$$

$T_2 = 72h = \frac{3}{2} T_1$

$2,592 \cdot 10^5 s$

$$\Delta E = E_{m_2} - E_{m_1} = \boxed{-\frac{1}{2} GMm \left(\frac{1}{r_2} - \frac{1}{r_1}\right) =}$$

$$r_2 = \sqrt[3]{\frac{GM}{4\pi^2} T_2^2} = \boxed{8,78 \cdot 10^7 m}$$

$$\cancel{\Delta E = -\frac{1}{2} GMm \left(\frac{2}{3}\frac{1}{r_1} - \frac{1}{r_1}\right) = +\frac{1}{2}\frac{GMm}{r_1} \cdot \frac{1}{3}}$$

$$r_2 = \sqrt[3]{\frac{3}{2}}\, r_1 = \text{[illegible]}$$

$$\Delta E = -\frac{1}{2}\, 6,67 \cdot 10^{-11} \cdot 5,97 \cdot 10^{24} \cdot 500 \cdot \left(\frac{1}{8,78 \cdot 10^7} - \frac{1}{6,07 \cdot 10^7}\right) =$$

$$= \boxed{5,06 \cdot 10^8\ J}$$

5-) $y(x,t) = 0{,}02 \text{ sen } (10\pi x + 30\pi t + \pi/2) \text{ m}$

a) $y(x,t) = A \text{ sen } (Kx + \omega t + \varphi_0)$ PROPAGACIÓN $\underline{-OX}$

$$\left\{ \begin{array}{l} K = 10\pi \text{ m}^{-1} \\ \omega = 30\pi \text{ rad/s} \\ \varphi_0 = \pi/2 \text{ rad} \end{array} \right.$$

$\boxed{K = \frac{2\pi}{\lambda}} \Rightarrow \boxed{\lambda = \frac{2\pi}{10\pi} = \frac{1}{5} \text{ m} = 0{,}2 \text{ m}}$

$\omega = 2\pi f \rightarrow f = \frac{\omega}{2\pi} = \frac{30\pi}{2\pi} = \boxed{15 \text{ Hz}}$

$\boxed{v = \lambda f}$ $v = 0{,}2 \cdot 15 = \boxed{3 \text{ m/s}}$ en el sentido $-OX$

b) $V(x,t) = \frac{dy}{dt} = A\omega \cos (Kx + \omega t + \varphi_0)$ cuando $\cos(\ ) = \underline{1}$

$V_{máx} = A\omega = 0{,}02 \cdot 30\pi = 0{,}6\pi \text{ m/s} = \boxed{1{,}88 \text{ m/s}}$

c) $y(\overset{x,t}{5,3}) = \overset{0{,}02 \cdot \text{sen}}{(10\pi \cdot 5 + 30\pi \cdot 3 + \pi/2)} = 0{,}02 \text{ sen } (\underbrace{140\pi}_{70 \text{ rev}} + \pi/2) = 0{,}02 \text{ sen } \pi/2 = \underline{0{,}02 \text{ m}}$

d) DEM $\Delta\varphi = K\Delta x = 10\pi \text{ m}^{-1} \cdot 2{,}5 \text{ m} = \boxed{25\pi \text{ rad}}$ en op. fase.