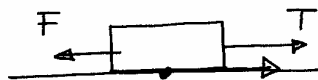
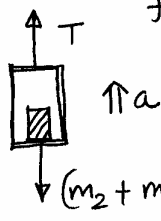


P1. (a) $F - T - \mu m_1 g = m_1 a$ (0,5)



$$f = \mu N$$

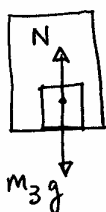


$$T - (m_2 + m_3)g = (m_2 + m_3)a$$
 (0,5)

$$\Rightarrow a = 1,5 \text{ m/s}^2$$
 (0,5)

$$T = 1,265 \text{ N}$$
 (0,5)

(b) (0,5)



$$\uparrow a$$

$$N - m_3 g = m_3 a \rightarrow N = 115 \text{ N}$$
 (0,5)

Q1. $x = 2\pi \cos(10\pi t)$, $a = -20\pi^2 \sin(10\pi t)$

• $E_{c \max} = \frac{1}{2} m v_{\max}^2 = 9,87 \text{ J}$ (0,25) $\rightarrow$ En el punt mitjà de l'oscil·lació. (0,25)

• $F_{\max} = m \cdot a_{\max} = 98,7 \text{ N}$ (0,25) $\rightarrow$ En els extrems de l'oscil·lació. (0,25)

Q2. $E = k|q|/r^2$, $V = kq/r$ (0,5) $\rightarrow |q| = \frac{1}{k} \frac{V^2}{E} = 1 \times 10^{-10} \text{ C}$ (0,25)

$\rightarrow q$ negativa (com V) (0,25)

OPCIÓ A / SÈRIE 3

P2. (a) $T = 1 \text{ dia} = 86.400 \text{ s}$ (0,25)

$$G M_T m / r^2 = m \omega^2 r \rightarrow r^3 = G M_T (T/2\pi)^2$$
 (0,5)

$$\rightarrow r = 4,23 \times 10^7 \text{ m} \rightarrow h = r - R_T = 3,59 \times 10^7 \text{ m}$$
 (0,25)

(b) $U = -G \frac{M_T m}{r} = -2,84 \times 10^9 \text{ J}$ (0,5)

$$E = U + E_c = -\frac{1}{2} G \frac{M_T m}{r} = \frac{1}{2} U \rightarrow E = \boxed{-1,42 \times 10^9 \text{ J}} \quad (0,5)$$

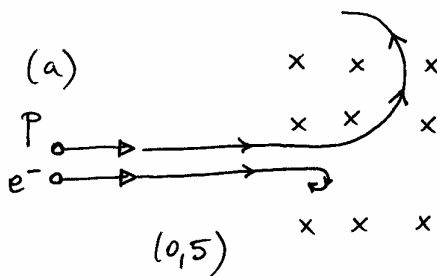
$$(c) \quad E = E_c^* + U(R_T) \rightarrow E_c^* = E + G \frac{M_T m}{R_T} = \boxed{1,74 \times 10^{10} \text{ J}} \quad (0,5)$$

Q3. $\vec{T} \perp d\vec{r} \Rightarrow W_T = 0 \quad (0,5); \quad W_{mg} = -\Delta U = \boxed{mg \cdot 2L} \quad (0,5)$

Q4. ν no canvia $(0,25) \rightarrow E = h\nu$ no canvia $(0,25)$
 λ es modifica $(0,25) \rightarrow \lambda = v/\nu$ també es modifica $(0,25)$.

OPció B / SÈRIE 3

P2.



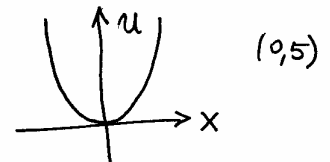
$$q v B = m v^2 / r \rightarrow \boxed{m/r = \frac{qB}{v}} \quad (0,25)$$

$$m_p \gg m_e \rightarrow r_p \gg r_e \quad (0,25)$$

(b) $|q_p| = |q_e| \rightarrow r_p / r_e = m_p / m_e = \boxed{1758} \quad (1,0)$

(c) $\frac{m}{r} = \frac{qB}{v}$ amb $v = \omega r = \left(\frac{2\pi}{T}\right)r \rightarrow \frac{T_p}{T_e} = \frac{m_p}{m_e} = \boxed{1758} \quad (0,5)$

Q3. $U = \frac{1}{2} k x^2 \rightarrow$ paràbola amb les branques cap amunt $\rightarrow$



Q4. Circuit complet: $6 = i R + \frac{i}{2} \cdot 20 \quad (0,25)$
 branca 1 bombeta: $3 = \frac{i}{2} \cdot 20 \quad (0,25)$ } $i = 0,3 \text{ A}$
 $\boxed{R = 10 \Omega} \quad (0,5)$