5) $\tau \overset{N}{=} A$

a) $A = \frac{b \cdot h}{2} = \frac{2F_1 \cdot x_1}{2} = F_1 \cdot x_1$

b) $A = \frac{(b+B)h}{2} = \frac{(0{,}5x_1 + x_1)\,2F_1}{2} = 1{,}5\,x_1 F_1$

d) $A = \frac{(b+B)h}{2} = \frac{(0{,}5x_1 + x_1)\,F_1}{2} = \frac{3}{4} x_1 F_1$

$b > a > d$

7) $\tau = F\,d \cdot \cos\theta$

P/ $\theta = 90°$ → $\tau = 0$

P/ $\theta = 60°$ → $\tau = mg \cdot \frac{1}{2}$

P/ $\theta = 30°$ → $\tau = mg \cdot \frac{\sqrt{3}}{2}$

$\tau \rightarrow c > b > a$

9) a) $\tau_{el} = -\frac{1}{2} k \cdot d^2 \rightarrow -\frac{1}{2} k_a \cdot d^2$ ou $-\frac{1}{2} k_b \cdot d^2$ } se $k_a > k_b$, então $\tau_a > \tau_b$

b) $\tau = -\frac{1}{2} k \cdot d^2 = -\frac{1}{2} k \cdot d \cdot d$

$\boxed{F = -k \cdot d}$

$\tau = -\frac{F \cdot d}{2}$ → Logo, $\tau_a = \tau_b$

EXERCÍCIOS

1) $\tau = \Delta E_c$

$F \cdot d \cdot \cos\theta = \frac{m}{2} V_f^2 - \frac{m}{2} V_i^2 \rightarrow m \cdot a \cdot d \cdot \cos\theta = \frac{m}{2}(V_f^2 - V_i^2)$

$V_i^2 + 2 \cdot a \cdot d \cdot \cos\theta = V_f^2 \rightarrow V_f^2 = (2{,}4 \cdot 10^7)^2 + 2 \cdot 3{,}6 \cdot 10^5 \cdot 3{,}5 \cdot 10^{-2}$

$\boxed{V_f = 2{,}8 \cdot 10^7\ m/s}$

3) a) $E_c = E_{dis}$

$E_c = m \cdot V^2 \cdot \frac{1}{2} \rightarrow E_c = 4 \cdot 10^6 \cdot (15 \cdot 10^3)^2 \cdot \frac{1}{2}$

$E_c = 4{,}5 \cdot 10^{14} J$

b) $E_c = E_{ex} \cdot n$

$n = \frac{4{,}5 \cdot 10^{14}}{4{,}2 \cdot 10^{15}} \rightarrow n = 1{,}07 \cdot 10^{-1} = 0{,}1$ megaton

c) $E_{bomba} \cdot n = E_{meteorito}$

$n = \frac{E_{met}}{E_{bomb}} = \frac{0{,}1 \cdot 10^6}{13 \cdot 10^3} \cong$ **8 bombas**

5) $E_{cpai} = \frac{E_{cfilho}}{2} \rightarrow \frac{m_p \cdot V_p^2}{2} = \frac{1}{2} \cdot \frac{m_f \cdot V_f^2}{2}$

$m_f = \frac{m_p}{2}$

$E_{cpai} = E_{cfilho}$

$\frac{1}{2} m_p (V_p + 1)^2 = \frac{1}{2} m_f \cdot V_f^2$

Substituindo m_p:

$\frac{1}{2} \cdot 2 m_f (V_p + 1)^2 = \frac{1}{2} \cdot m_f \cdot V_f^2$

a) $V_p = ?$

$(V_p + 1)^2 = \frac{1}{2} V_f^2 \rightarrow$ **$V_p = V_f \sqrt{\frac{1}{2}} - 1$**

b) $V_f = ?$

$(V_p + 1)^2 = \frac{1}{2} V_f^2 \rightarrow V_f = \sqrt{2 (V_p + 1)^2}$

$V_f = (V_p + 1) \sqrt{2}$