FISICA 1 - 18/09/2014

UNIPA LOMBA SOFT CORPORATION

15/09/2015

A1 + A2 + A3

Essendo l'urto di tipo elastico, si conserva l'energia cinetica. Quindi nessuna variazione nè di velocità nè di E. cinetica nè di quantità di moto.

A4 $p = m \cdot v = 1 \cdot 3 = \boxed{3\ kg\ \frac{m}{s}}$

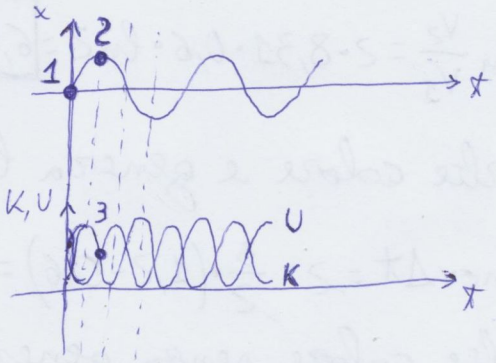
A5 $p = F \cdot \Delta t$

$F = \frac{p}{\Delta t} = \frac{3}{0{,}03} = \boxed{100\ N}$

B1 $\omega = \sqrt{\frac{K}{m}} = \sqrt{\frac{4}{1}} = \boxed{2\ rad/s}$

$T = \frac{2\pi}{\omega} = \frac{2\pi}{2} = \boxed{\pi\ s}$

$f = \frac{1}{T} = \boxed{\frac{1}{\pi}\ Hz}$



1: a riposo
2: massima elongazione
3: punto di equilibrio

B2 + B3 + B4 + B5 + B6

Caso 1:

$x(t) = 2\sin(2t)$

$v(t) = 4\cos(2t)$

$a(t) = -8\sin(2t)$

$U = \frac{1}{2}Kx^2 = 2(2\sin(2t))^2 = 8\sin^2(2t)$

$K = \frac{1}{2}mv^2 = \frac{1}{2}(4\cos(2t))^2 = 8\cos^2(2t)$

Caso 2:

$x(t) = 2\cos(2t)$

$v(t) = -4\sin(2t)$

$a(t) = -8\cos(2t)$

$U = \frac{1}{2}Kx^2 = 2(2\cos(2t))^2 = 8\cos^2(2t)$

$K = \frac{1}{2}mv^2 = \frac{1}{2}(-4\sin(2t))^2 = 8\sin^2(2t)$

Caso 3:

$\frac{1}{2}mv^2 = \frac{1}{2}Kx^2$

$\frac{K}{m} = \frac{v^2}{x^2} \Rightarrow \frac{v}{x} = \sqrt{\frac{K}{m}}$

$\frac{4\cos(2t+\varphi)}{2\sin(2t+\varphi)} = \sqrt{\frac{4}{1}}$

$2\cot an(2t+\varphi) = 2$

$\cot an(2t+\varphi) = 0$

$2t+\varphi = \text{arccotan}(0)$

$2t+\varphi = \frac{\pi}{2}$

$\varphi = \frac{\pi}{2}$

Si applicano le formule del caso 1 con l'aggiunta della fase $\frac{\pi}{2}$

C1

$P_1 = 5\,N/m^2$

$V_1 = 2\,m^3$

$T_1 = \frac{P_1 V_1}{mR} = \frac{5 \cdot 2}{2 \cdot 8{,}31} = 0{,}6\,K$

$P_2 = \frac{mRT_2}{V_2} = \frac{2 \cdot 8{,}31 \cdot 0{,}6}{4} = 2{,}49\,N/m^2$

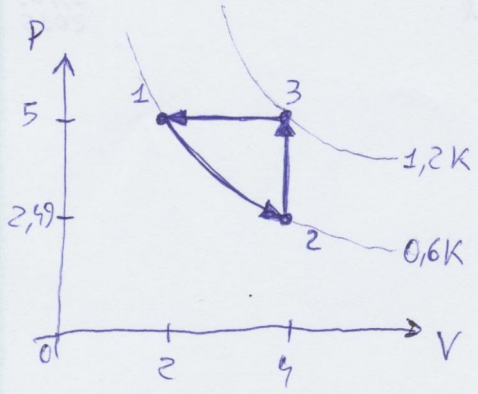
$V_2 = 4\,m^3$

$T_2 = 0{,}6\,K$

$P_3 = 5\,N/m^2$

$V_3 = 4\,m^3$

$T_3 = \frac{P_3 V_3}{mR} = \frac{5 \cdot 4^2}{2 \cdot 8{,}31} = 1{,}2\,K$



C2 + C3 + C4

$L_{12} = Q_{12} = nRT \ln \frac{V_2}{V_1} = 2 \cdot 8{,}31 \cdot 0{,}6 \cdot \ln 2 = \boxed{6{,}91\,J}$

(Isoterma. Assorbe calore e genera lavoro)

$L_{23} = \boxed{0}$ $\quad Q = nc_v \Delta T = 2 \cdot \frac{3}{2} \cdot (1{,}2 - 0{,}6) = 3 \cdot 0{,}6 = \boxed{14{,}96\,J}$ ($\cdot 8{,}31$)

(Isocora. Assorbe calore senza generare lavoro)

$L_{31} = P \cdot \Delta V = 5 \cdot (-2) = \boxed{-10\,J}$ $\quad Q = nc_p \Delta T = 2 \cdot \frac{5}{2} \cdot (0{,}6 - 1{,}2) = 5 \cdot 0{,}6 = \boxed{-24{,}93\,J}$ ($\cdot 8{,}31$)

(Isobara. Rilascia calore e subisce lavoro)

$L_T = 6{,}91 + 0 - 10 = -3{,}09\,J$ [Subisce lavoro]

$Q_T = 6{,}91 + 14{,}96 - 24{,}93 = -3{,}06\,J$ [Rilascia calore]