moto rettilineo uniforme

$v = cost$

$s = s_0 + v_0 t$

moto uniform. accelerato

$a = cost$

$v = v_0 + at$

$s = s_0 + v_0 t + \frac{1}{2}at^2$

in casi anche $s = \frac{v^2}{2a}$

moto di un grave

$\begin{cases} a_x = 0 \\ a_y = -g \end{cases}$ $\begin{cases} v_x = v_{0x} \\ v_y = -g \end{cases}$

$\begin{cases} x = v_{0x} t \\ y = -\frac{g}{2}t^2 + h \end{cases}$

$d = v_{0x}\sqrt{\frac{2h}{g}}$ | $t = \sqrt{\frac{2h}{g}}$

$F = ma$

$p = mv \rightarrow$ quantità di moto (l'impulso ha la stessa formula)

$F = dp/dt$ con $Fdp \rightarrow$ impulso elementare

$\Delta p = \int_{t_1}^{t_2} F dt$ con $\int .. \rightarrow$ impulso della forza

$A = f_s R$ (se corpo fermo $F = A$)

$w_0 = \sqrt{K/m} \rightarrow$ pulsazione oscill. libera

moto armonico

$x = A \operatorname{sen} wt$ (→ angolo di fase)

$v(t) = \dot{x}(t) = Aw\cos wt$

$a(t) = \ddot{x}(t) = -Aw^2 \operatorname{sen} wt = -w^2 x$

molla $\rightarrow w = \sqrt{K/m}$ $K = mg/\Delta e$

moto circolare uniforme

$w = \frac{v}{R}$ (se periodico $= 2\pi/T$)

$a_n = \frac{v^2}{R}$ o $w^2 R$

massa ruota $= \rho(\pi R^2 d)$

giro $= \theta_1 + \theta_2 = 2\pi$

$\theta = wt$

$T = 2\pi/w = 2\pi\sqrt{\ell/g} \rightarrow$ x pendolo

$F = -G\frac{m_1 m_2}{r^2}$

$M = db/dt$ con $Mdb \rightarrow$ impulso elementare angolare

$L = F\Delta s = F\Delta s\cos\theta \rightarrow \int F ds$ o $\int_{t_0}^{t} M w(t) dt$

$W = dL/dt \rightarrow$ potenza

$T = \frac{1}{2}mv^2$ o $\frac{1}{2}(mr^2)w^2$

campi uniformi

$L = mgh$

$L = -\Delta U$

$U = -mgy$

$U = \pm K/R$

$U = \frac{1}{2}Kx^2 \rightarrow$ forze elastiche

energia

$E = T + U$

$E = \frac{1}{2}KA^2 \rightarrow$ oscillatore armonico

momento d'inerzia

$I = \int \rho r^2 dV$

↳ $T = \frac{1}{2}Iw^2$

$T_{RC} = T - T_{rot}$

anello: $I_x = mR^2$

$y = mR^2/2$

$z = 3/2\, mR^2$

cilindro: $= m/2\,(R_1^2 + R_2^2)$

sbarra sottile: centro $= m\ell^2/12$

estremo $= m\ell^2/3$

parallelepipedo: $= m(a^2+b^2)/12$

sfera piena: $= 2mR^2/5$

cava: $= 2mR^2/3$

centro di massa

$r = \frac{\sum m r}{m}$ o $\frac{1}{m}\int \rho r dV$

$F = m\frac{d^2 r}{dt}$

$\rho = M/V \rightarrow M = \int_V \rho dV$

Fluidi

spinta A: $P = \rho V g$

$p = p + \rho g h$

galleggiamento $\rightarrow F = A$

$A = \rho g V$

$P = F/S$

termologia

$\rho = \rho_0(1 + \alpha\Delta t) \rightarrow$ con $Ve =$

$T_p = T_0 + \beta^{p - p_0/p_0}$

$T = 273.15$

$Q = cm(t_2 - t_1) \rightarrow H_2O\ c = 1$

↳ calore spec.

N.B → cm: capacità termica

$\Delta L = p\Delta V \rightarrow L = \int_V p dV$

$\Delta U = Q - L$

$H = U + pV \rightarrow$ entalpia

$L = \int .. = RT\ln\frac{V_2}{V_1} = RT\ln\frac{p_1}{p_2}$

$U = mc_v\Delta t$

$c_p - c_v = R$

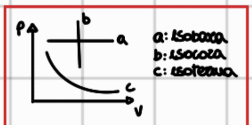
se rev. $\rightarrow \frac{Q_1}{T_1} - \frac{Q_2}{T_2} = 0$

$C_K = C_v + R/1-K$

$Q = \frac{KA\Delta T}{\ell} t$ con K conducib. termica

$\gamma = \frac{c_p}{c_v}$ con $c_p = 5/2$

$c_v = 3/2$



isobara

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

isocora

$\frac{p_1}{T_1} = \frac{p_2}{T_2}$

$\Delta U = Q$

adiabatica

$Q = 0$

$TV^{\gamma-1} = cost$

$pV^{\gamma} = cost$

$p^{(1-\gamma/\gamma)} T = cost$

entropia

$\Delta S = \int Q/dt$

$\Delta S_{univ} = \Delta S_{amb} + \Delta S_{sist}$

$\Delta S_{univ} = 0$ se reversibile

isot $\rightarrow Q = L$

isoterma $Q = L$

$M_a = I_a \dot{w}_a$

$I_a = I_c + md^2$

$L = \int M d\theta = \int M w(t) dt$

$T = \frac{1}{2}I_a w^2$, $T = \frac{1}{2}m_{tot}v_c^2 + \frac{1}{2}Iw^2$

$L = \Delta T$ quando un corpo si sposta

moto puro rotolamento:

$v_c = wr$

$a_c = \dot{w}r$

unità di misura

$F \rightarrow N$

$L \rightarrow J$

$P = \frac{dL}{dt} \rightarrow W$

$T_{c.m.} \rightarrow J$

$Q \rightarrow J$

misure

1 cal = 4,1868 J

R = 8,314

1 atm = 101325 Pa

= 1,01325 bar

= 760 torr

= 760 mm Hg

1 m/s = 3,6 K/h

2° p. termod.

in ciclo ⇒ 2 isot + 2 adiab ⇒ $\Delta U = 0$

$L_{TOT} = \sum Q_{isot}$

$\eta = \frac{L}{Q_{ass}} = 1 - \frac{|Q_{ced}|}{|Q_{ass}|} < 1$

in 1 ciclo ho $\frac{\ln \frac{V_D}{V_C}}{\ln \frac{V_B}{V_A}} = -1$

entropia

$\Delta S = \int \frac{dQ}{T} \Rightarrow dQ = TdS$

$dU = TdS - pdV$

a $V = cost$: $dU = dQ = TdS$

$\Delta S = \int n c_v \frac{dT}{T}$

a $T = cost$: $dU = 0 \Rightarrow TdS = pdV$

$\Delta S = \int nR \frac{dV}{V}$

gas perfetto ΔS

$dU = dQ - pdV$

$\Delta S = \int n c_v \frac{dT}{T} + \int nR \frac{dV}{V}$

in generale

$\ln \frac{T_F}{T_I} = \ln \frac{P_F V_F}{P_I V_I} = \ln \frac{P_F}{P_I} + \ln \frac{V_F}{V_I}$

densità

$\rho = \frac{m}{V}$: volumica

$\sigma = \frac{m}{S}$ areica

$\lambda = \frac{m}{l}$: lineica