1.3.2 Classical mechanics

Name	*Symbol*	*Definition*	*SI unit*	*Notes*
mass	m		kg	
reduced mass	μ	$\mu = m_1m_2/(m_1+m_2)$	kg	
density, mass density	ρ	$\rho = m/V$	kg m^{-3}	
relative density	d	$d = \rho/\rho^\theta$	1	(1)
surface density	ρ_A, ρ_S	$\rho_A = m/A$	kg m^{-2}	
specific volume	v	$v = V/m = 1/\rho$	m^3 kg^{-1}	
momentum	$\boldsymbol{p}$	$\boldsymbol{p} = m\boldsymbol{v}$	kg m s^{-1}	
angular momentum, action	$\boldsymbol{L}$	$\boldsymbol{L} = \boldsymbol{r}\times\boldsymbol{p}$	J s	(2)
moment of inertia	I, J	$I = \Sigma m_i r_i^2$	kg m^2	(3)
force	$\boldsymbol{F}$	$\boldsymbol{F} = \mathrm{d}\boldsymbol{p}/\mathrm{d}t = m\boldsymbol{a}$	N	
torque, moment of force	$\boldsymbol{T}$, $(\boldsymbol{M})$	$\boldsymbol{T} = \boldsymbol{r}\times\boldsymbol{F}$	N m	
energy	E		J	
potential energy	E_p, V, Φ	$E_\mathrm{p} = -\int\boldsymbol{F}\cdot\mathrm{d}\boldsymbol{s}$	J	
kinetic energy	E_k, T, K	$E_\mathrm{k} = \frac{1}{2}mv^2$	J	
work	W, w	$W = \int\boldsymbol{F}\cdot\mathrm{d}\boldsymbol{s}$	J	
pressure	p, P	$p = F/A$	Pa, N m^{-2}	
surface tension	γ, σ	$\gamma = \mathrm{d}W/\mathrm{d}A$	N m^{-1}, J m^{-2}	
weight	G, (W, P)	$G = mg$	N	
gravitational constant	G	$F = Gm_1m_2/r^2$	N m^2 kg^{-2}	
normal stress	σ	$\sigma = F/A$	Pa	

(1) Usually $\rho^\theta = \rho(H_2O, 4°C)$.

(2) Other symbols are customary in atomic and molecular spectroscopy; see the section 3.5.

(3) In general I is a tensor quantity: $I_{\alpha\alpha} = \Sigma m_i(\beta + \gamma)$, and $I_{\alpha\beta} = -\Sigma m_i\alpha_i\beta_i$ if $\alpha\neq\beta$, where α, β, γ is a permutation of x, y, z. For a continuous distribution of mass the sums are replaced by integrals.

Name	*Symbol*	*Definition*	*SI unit*	*Notes*
shear stress	τ	$\tau = F/A$	Pa	
linear strain, relative elongation	ε, e	$\varepsilon = \Delta l/l$	1	
modulus of elasticity, Young's modulus	E	$E = \sigma/\varepsilon$	Pa	
shear strain	γ	$\gamma = \Delta x/d$	1	
shear modulus	G	$G = \tau/\gamma$	Pa	
volume strain, bulk strain	θ	$\theta = \Delta V/V_0$	1	
bulk modulus, compression modulus	K	$K = -V_0(\mathrm{d}p/\mathrm{d}V)$	Pa	
viscosity, dynamic viscosity	η, μ	$\tau_{x,z} = \eta(\mathrm{d}v_x/\mathrm{d}z)$	Pa s	
fluidity	φ	$\varphi = 1/\eta$	m kg^{-1} s	
kinematic viscosity	ν	$\nu = \eta/\rho$	$m^2\ s^{-1}$	
friction factor	$\mu, (f)$	$F_{\mathrm{frict}} = \mu F_{\mathrm{norm}}$	1	
power	P	$P = \mathrm{d}W/\mathrm{d}t$	W	
sound energy flux	P, P_{a}	$P = \mathrm{d}E/\mathrm{d}t$	W	
acoustic factors,				
reflection	ρ	$\rho = P_{\mathrm{r}}/P_0$	1	(4)
absorption	$\alpha_{\mathrm{a}}, (\alpha)$	$\alpha_{\mathrm{a}} = 1 - \rho$	1	(5)
transmission	τ	$\tau = P_{\mathrm{tr}}/P_0$	1	(4)
dissipation	δ	$\delta = \alpha_{\mathrm{a}} - \tau$	1	

(4) P_0 is the incident sound energy flux, P_{r} the reflected flux and P_{tr} the transmitted flux.

(5) This definition is special to acoustics and is different from the usage in radiation, where the absorption factor corresponds to the acoustic dissipation factor.