EngineeringRise

Mechanics and heat experiments: Young modulus, surface tension, viscosity, sound speed, specific heat

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Young modulus	Y = F L/(A dl) = 4 F L/(pi d^2 dl) Valid when: wire within the elastic limit (Hooke law), F and dl as load and extension, A the cross-section	N/m^2
Y from the load-extension graph	Y = g L/(A x slope), slope in m per kg Valid when: elastic limit, straight graph of extension against load; slope is extension per unit mass	N/m^2
Capillary rise	T = h r rho g/(2 cos theta); h proportional to 1/r Valid when: narrow tube, liquid wetting or not, meniscus a spherical cap; h is the height of the meniscus bottom	N/m
Stokes drag	F = 6 pi eta r v Valid when: small sphere, slow steady motion in a viscous fluid, Reynolds number below 1	N
Terminal speed and viscosity	eta = 2 r^2 (rho - sigma) g/(9 v) Valid when: small sphere at terminal speed, laminar flow (Stokes law), wide container	Pa s
Resonance tube	v = 2 f (l2 - l1); e = (l2 - 3 l1)/2 Valid when: closed air column, l1 and l2 first two resonances, same end correction e; l in metres for v in m/s	m/s (cm)
Closed air column resonances	l + e = (2n + 1) lambda/4 Valid when: closed air column; n = 0 for the first resonance, e the end correction	m
Method of mixtures	m_s s (T_h - T_f) = (m_w c_w + C)(T_f - T_c) Valid when: no heat loss to the surroundings, no change of phase; C heat capacity of the calorimeter	J

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/experimental-skills/mechanics-and-heat-experiments-young-modulus-su

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