IMPORTANT JEE-NEET FORMULAS

Fluid Mechanics

Topics	Formulas
Pressure	$$P = \frac{F}{A}$$ For hydraulic press: $$F = \frac{A}{a} f$$ Here, P is the pressure, F is the force applied on bigger piston with area A and f is the force on the smaller piston with area a.
Angle made by liquid surface due to acceleration	$$\tan\theta = \frac{a_0}{g}$$ Here, θ is the angle made by the liquid surface with the horizontal, a_0 is the acceleration of the container and g is the gravitational acceleration.
Continuity equation	According to the equation of continuity, the product of velocity and the area of cross section at any section in a tube is constant. $$a_1 v_1 = a_2 v_2$$ Here, a_1 v_1 are the area of cross section and velocity of fluid at section 1 and a_2 v_2 are the area of cross section and velocity of the fluid at section 2.
Bernoulli's equation	According to Bernoulli's equation the total energy of liquid flowing through a tube is constant throughout the tube. $$\frac{P}{\rho g} + \frac{v^2}{2g} + Z = constant$$ Here, P is the pressure, ρ is the density of the fluid, g is the gravitational acceleration, v is the velocity of the fluid and Z is the potential head.

Speed of efflux	$$v = \sqrt{\frac{2gh}{1 - \frac{A_2^2}{A_1^2}}}$$ Here, v is the velocity, g is the gravitational acceleration, h is the height, A_2 is the area of hole and A_1 is the area of the vessel.
Stress	$$\sigma = \frac{F}{A}$$ Here, σ is the stress, F is the force and A is the area.
Strain	$$\varepsilon = \frac{\Delta L}{L}$$ Here, ε is the strain, ΔL is the change in length, and L is the initial length.
Young's modulus	$$E = \frac{\sigma}{\varepsilon}$$ Or $$E = \frac{FL}{A\Delta L}$$ Here, E is the young's modulus, F is the force, L is the initial length, A is the area of cross section and ΔL is the change in length.
Stoke's law	$$F = 6\pi\eta r v$$ Here, F is the drag experienced by the sphere, r is the radius of the sphere, η is the viscosity of the fluid and v is the velocity of the sphere.
Terminal velocity	$$v = \frac{2}{9}\left(\frac{r^2(\rho - \sigma)g}{\eta}\right)$$ Here, r is the radius of the sphere, ρ is the density of the sphere, σ is the density of the fluid, g is the gravitational acceleration and η is the viscosity of the fluid.