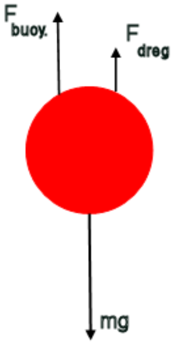
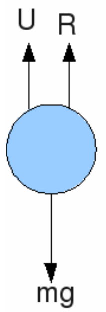




$$F + U = W$$

$$6\pi\eta r v + \rho_f \frac{4}{3}\pi r^3 g = \rho_b \frac{4}{3}\pi r^3 g$$

$$\eta = \frac{2r^2(\rho-\sigma)g}{9v} \quad \eta = \frac{2r^2\rho g}{9v} \qquad v = \frac{2r^2(\rho-\sigma)g}{9\eta}$$

Q.An iron ball of radius 2×10^{-4} m is falling through tarpin oil at terminal velocity of 4×10^{-2} ms^{-1}. The densities of iron and tarpin oil are respectively 7.8×10^3 kg m^{-3} and 0.87×10^3 kg m^{-3}. Calculate the co-efficient of viscosity of tarpin oil. [$1.5\text{x}10^{-2}$ Nsm^{-2}]

Q.A drop of water is falling through air. The terminal velocity of the drop is 1.2×10^{-2} ms^{-2} and co-efficient of viscosity of air = 1.8×10^{-5} Nsm^{-2}. What is the diameter of the drop ?[Density of air =1.21 kgm^{-3}] [$1.99\text{x}10^{-5}$m]

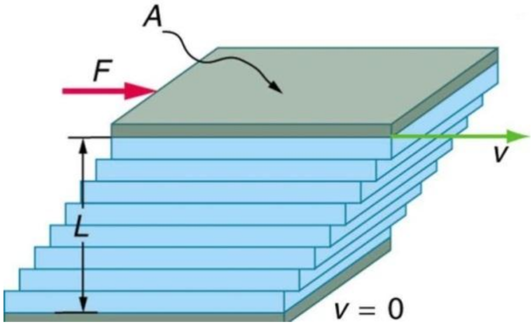
Q.Determine the radius of a drop of water falling through air with terminal velocity 1.2 cms^{-1}. The co-efficient of viscosity of air = $1.8 \times 10^{-5} Nsm^{-2}$ and density of air = 1.21 kgm^{-3}.

Q.Calculate the terminal velocity of a rain drop of diameter 0.03 mm. The co-efficient of viscosity of air is $1.8 \times 10^{-5} Nsm^{-2}$ and its density is 1.2 kg m^{-3}. [Ans. 2.7 cms^{-1}]

Q.A spherical ball of radius 4×10^{-4} m is falling through glycerin at terminal velocity of 6.5×1^{-3} ms^{-1}. The densities of material of the spherical ball and glycerin are respectively 11.37×10^{3} kgm^{-3} and $1.26 \times 10^{3} kgm^{-3}$. Calculate the co-efficient of viscosity of glycerine .[Ans. 0.54 Nsm^{-2}]

Q.Calculate the terminal velocity of a rain drop of radius 0.01 mm. The co-efficient of viscosity of air is 1.8×10^{-5} N-sm^{-2} and its density is 1.2 kgm^{-3}. Density of water = 1×10^{3} kgm^{-3}.

Q. An air bubble of diameter 2 mm steadily through a solution of density 1700 kg m^{-3} at the rate of 0.40 cm/s. Calculate the co-efficient of viscosity of the solution. The density of air is negligible.

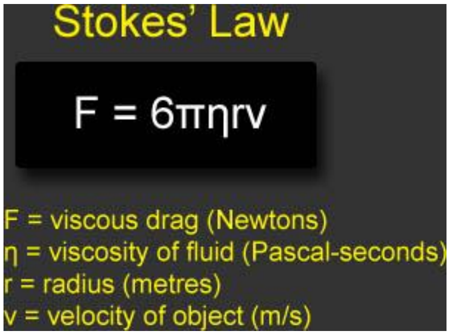


$$F = -\eta A \frac{dV}{dx}$$

Q. A metal plate of area 100 cm^2 is placed on a layer of castor oil of thickness 0.2 cm. Calculate the horizontal force required to move the plate with a speed 3cm s^{-1}.[Co-efficient of viscosity of oil = 1.55 N-sm^{-2}]

Q. A sheet of area 0.01 m^2 is placed on a layer of glycerin of 2 mm thickness. If a force of 0.4 N is required to move the sheet with velocity of 0.05 ms^{-1}. Calculate the co-efficient of viscosity.[1.6 N-sm^{-2}]

Q.A plate of area 10 $\times$ 10^{-3} m^2 is placed on a layer of castor oil(η = 1.55 N-sm^{-2}) of thickness 2 $\times$ 10^{-3}m. Calculate the horizontal force required to move the plate with a speed pf 0.05 ms^{-1}.[Ans. 0.3875 N]



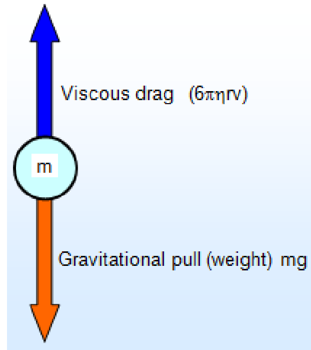


Figure 1

$$F = 6\pi\eta r v$$

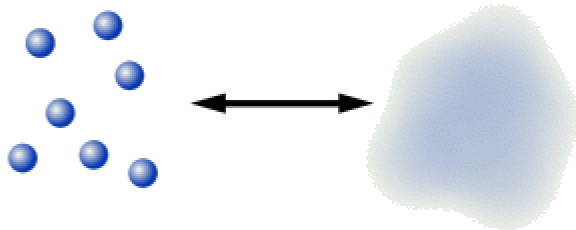
Q.A metal sphere of radius 200 mm is falling through a liquid with terminal velocity of 2.1 $\times$ 10^{-2} ms^{-1}. The co-efficient of viscosity of the liquid 0.003 N-sm^{-2}. Calculate the viscous force of the liquid.

Q. A plate of area 10 $\times$ 10^{-3} m^{2} is placed on a layer of castor oil (η = 1.55 N-sm^{-2}) of thickness 2 $\times$ 10^{-3} m. Calculate the horizontal force required to move the plate with a speed of 0.05 ms^{-1}. [Ans. 0.3875 N]

Q.A sheet of area $2cm^2$ is placed on a layer of glycerin of 3 mm thickness. If a force of 0.5 N is required to move the sheet with velocity of 4 cms^{-1}, calculate the co-efficient of viscosity . [Ans. 1.875N-sm^{-2}

Q.A metal sphere of radius 25 cm is falling through a liquid with terminal velocity of 2.5 cms^{-1}. The co-efficient of viscosity of the liquid is 0.005 N-sm^{-2}. Calculate the viscous force of the liquid . [Ans. 05.88 $\times$ 10^{-4} N]

Q. Eight rain drops of radius 1mm each falling downwards with a terminal velocity of 6cms^{-1} coalesces to form a bigger drop. Find the terminal velocity of the bigger drop. [24cms^{-1}]



W=ΔA T

ΔA=2 x 4π $(r_2^2 - r_1^2)$

Q. A large drop is formed by 25 small drops of water, each of diameter 0.17×10^{-2} m. Find the energy released. [Surface tension of water = 72×10^{-3} Nm^{-1}]

Q. A water drop of radius 0.5 cm is broken into one million (10^6) equal droplets. Calculate the gain in surface energy and the applied energy. [Surface tension of water 72×10^{-3} Nm^{-1}]

Q. A water drop of radius 10^{-2} m is broken into 1000 equal droplets. Calculate the gain in surface energy. [Surface tension of water =0.075 Nm^{-1}] [Ans. 8.5 $\times$ 10^{-4} J]

Q. A large drop is formed by 10^{3} small drops of water each of radius 1 mm. Find the energy released. [Surface tension of water = 72 $\times$ 10^{-3} Nm^{-1}] [Ans. 11.304 $\times$ 10^{-5} J]

Q. A water drop of radius 10^{-4} m is broken into 125 equal droplets. Calculate the increase in surface energy. [Surface tension of water = 7.2 $\times$ 10^{-2} Nm^{-1}] [Ans. 3.62 $\times$ 10^{-8} J]

Q. A soap bubble of radius 2 cm. is slowly increased and it reaches to a bubble of radius 3cm. [Surface tension of soap solution 4×10^{-2} Nm^{-1}]

Q. Two mercury drops each of radius r merge to form a bigger drop. Calculate the surface energy released. [Ans. $1.65\pi r^2 T$]