

Two metal balls of radius R and $2R$ falling through a fluid have same velocity at some point. The viscous drag acting on them at that instant are in the ratio?

Drag force can be calculated from:

$$F_d = \frac{1}{2} \rho v^2 C_D A$$

where ρ is the density of the fluid, v is the speed of the object relative to the fluid, A is the cross-sectional area, and C_D – some coefficient the same for both balls.

Assuming A is proportional to r^2 ($A \propto r^2$) we can write:

$$F_d \propto r^2$$

Therefore, the viscous drag acting on balls is in the ratio:

$$\frac{F_d(R)}{F_d(2R)} = \frac{R^2}{(2R)^2} = \frac{1}{4}$$

Answer: $\frac{1}{4}$