

Ex #10

An empty rubber balloon has a mass of 0.015kg. The balloon is filled with helium at a density of 0.181kg/m³, and at this density the balloon is spherical with a radius of 0.3m. When the balloon is released, how fast does it accelerate upwards in the air?

$$\sum F = ma$$

$$B = \rho_f V_f g = (1.29)(.113)(9.8) = 1.43 \text{ N}$$

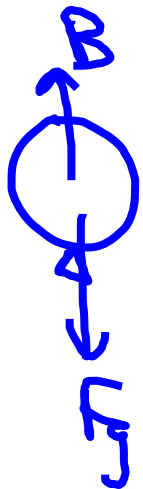
$$B - F_g = ma$$

$$1.43 - .343 = .035a$$

$$1.087 = .035a$$

$$a = 31.06 \text{ m/s}^2$$

$$\begin{aligned} F_g &= m_o g = (m_{\text{shell}} + m_{\text{He}}) g \\ &= [(.015) + (.181)(.113)] g \\ &= (.015 + .02) g \\ &= (.035)(9.8) g \\ &= .343 \text{ N} \end{aligned}$$



$$\begin{aligned} V &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \pi (.3^3) \\ &= .113 \text{ m}^3 \end{aligned}$$