An airship contains 6*10^3 m^3 of helium. Helium has a density of 0.180 kg m^-3. Given that the air has a density of 1.20 kg m^-3 at the height at which the airship is floating in equilibrium, what load is the airship carrying?

Solution

W_L - the weight of the load that the airship can carry in equilibrium at an altitude where the density of air is 1.20 kg/m^3.

$$W_{He} + W_L = F_B \rightarrow W_L = F_B - W_{He}$$

So

$$W_L = \rho_{air} V_{ship} g - \rho_{He} V_{ship} g = (\rho_{air} - \rho_{He}) V_{ship} g$$

$$W_L = (1.2 - 0.18) * 6 * 10^3 * 9.8 = 5.997 * 10^4 N \approx 6 * 10^4 N$$

Answer: $6 * 10^4 N$.