Answer on Question #58066-Physics-Other

An airship contains about 4 x103 m3 of helium (He), whose density is 0.179 kg/m3. Find the maximum mass that the airship can carry in equilibrium at an altitude where the density of air is 1.20 kg/m3.

Solution

Free-body diagram
of the airship

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

The maximum mass that the airship can carry in equilibrium is

$$m = \frac{F_B - W_{He}}{g} = \frac{\rho_{air} V_{ship} g - \rho_{He} V_{ship} g}{g} = (\rho_{air} - \rho_{He}) V_{ship} = (1.20 - 0.179) \cdot 4 \cdot 10^3$$
$$= 4.08 \cdot 10^3 kg.$$

Answer: $4.08 \cdot 10^3 kg$.

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