

Answer on Question#39743, Physics, Other

When the air is pumped out of a lidded can, air remains only on the upper side of the lid. A spring balance is then used to determine the amount of lifting force required to raise the lid. Suppose we observe that for a can with a diameter of 12.0 cm and a lid weight of 2.0 N, the lid does not come off until the spring balance reading exceeds 1144 N. Find the air pressure on the upper lid of the can.

Solution

The lid comes off until when the air pressure on the upper lid of the can is equal to the pressure of lifting force:

$$P_{air} = P_{lift}.$$

The pressure of lifting force is

$$P_{lift} = \frac{F_{lift}}{A} = \frac{F_{spring} - W}{A} = \frac{F_{spring} - W}{\frac{\pi d^2}{4}}.$$

W - weight of a lid, A - area of a lid, d - diameter of a lid, F_{spring} - the force of spring.

We have:

$$P_{air} = \frac{F_{spring} - W}{\frac{\pi d^2}{4}} = \frac{1144 - 2}{\frac{3.14 \cdot (12 \cdot 10^{-2})^2}{4}} = 1.01 \cdot 10^5 Pa.$$

Answer: $1.01 \cdot 10^5 Pa$.