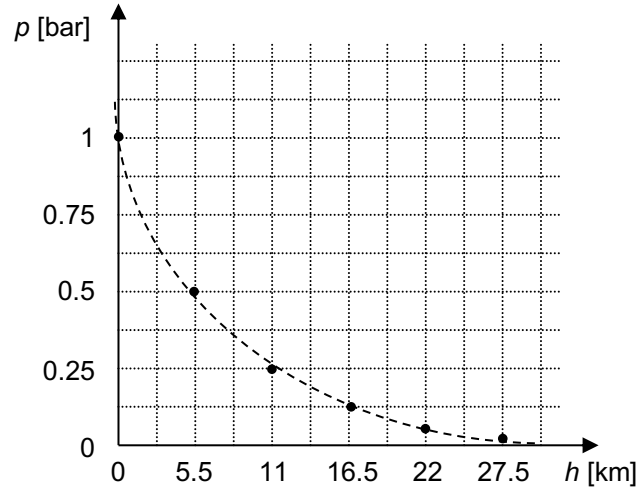
1. a) At sea level: 1013 mbar.
   At 5'500 m above sea level: 506.5 mbar
   At 11'000 m above sea level: 253.3 mbar
   At 16'500 m above sea level: 126.6 mbar
   At 22'000 m above sea level: 63.31 mbar
   (Atmospheric pressure is divided by two every 5.5 km)

   b) $\frac{63.31 \text{ mbar}}{2} = 31.66 \text{ mbar}$ (27'500 m above sea level)

   $\frac{31.66 \text{ mbar}}{2} = 15.83 \text{ mbar} \quad \Rightarrow$ <u>33'000 m above sea level</u>

   c)



   d) ca. 625 mbar

   e) ca. 8'250 m above sea level

2. Suction cups are pressed on the wall by atmospheric pressure. If the surface is not entirely smooth, air will sneak underneath the suction cup until the pressure is equal on both sides and it then falls off.

3. The pressure inside the package is smaller than on the outside. The atmospheric pressure squeezes the package together.

4. a) gauge pressure: $p_{gauge} = \frac{F}{A} = \frac{11200 \text{ N}}{0.1170 \text{ m}^2} = 95'726 \text{ Pa} =$ <u>957 mbar</u>

   b) $p_{gauge} = p_{atmospheric} - p_{inside}$

   $p_{inside} = p_{atmospheric} - p_{gauge} = 999 \text{ mbar} - 957 \text{ mbar} =$ <u>42 mbar</u>

5. a) Because the upper opening is closed no atmospheric pressure is exerted at the upper end. The atmospheric pressure exerted on the lower end is holding the water back. It does not flow out.

   b) The atmosphere is exerting the same amount of pressure on both sides of the hose. The water flows out of the hose until the level of the water surface is equal on both sides.

   c) Since there is no atmospheric pressure the water will flow out of the hose until the level of the water surface is equal on both sides.

6. $h = \frac{p}{\rho \cdot g} = \frac{33'500\text{Pa}}{13'600\,\frac{\text{kg}}{\text{m}^3} \cdot 9.81\frac{\text{N}}{\text{kg}}} = \underline{\underline{0.25\text{ m}}} = \underline{\underline{25\text{ cm}}}$

7. a) Pulling on the piston causes the pressure on the inside to be smaller than on the outside. The atmospheric pressure pushes the water into the syringe.

   b) No, because there is no atmospheric pressure pushing the water into the syringe.

8. a) Decreasing the pressure in the upper part of the straw will cause a difference in pressure between the outside and the inside of the straw. The atmospheric pressure on the outside is greater and it pushes the water up the straw.

   b) air pressure at sea level: 1.013 bar = 101.3 kPa

   c) $p = \rho \cdot g \cdot h = 998\ \frac{\text{kg}}{\text{m}^3} \cdot 9.81\ \frac{\text{m}}{\text{s}^2} \cdot 0.20\text{ m} = \underline{1'958\text{ Pa}}$

   d) $p_0 = \rho \cdot g \cdot h + p_1$

   $\Rightarrow \quad p_1 = p_0 - \rho \cdot g \cdot h = 101'300\text{ Pa} - 998\ \frac{\text{kg}}{\text{m}^3} \cdot 9.81\ \frac{\text{m}}{\text{s}^2} \cdot 0.20\text{ m} = \underline{99'342\text{ Pa}}$

   e) $p_{\text{gauge}} = p_{\text{atmospheric}} - p_{\text{inside}} = 101'300\text{ Pa} - 99'342\text{ Pa} = \underline{1'958\text{ Pa}}$

   f) No, because there is no atmospheric pressure pushing the water up the straw.