16 A student is investigating a 'Cartesian diver'.

The diver is made from a plastic pipette. When placed in a plastic bottle full of water the diver rises to the top and touches the lid.

(a) Show that the downward force of the lid on the diver is about $0.02\,\text{N}$.

volume of diver $= 8.0 \times 10^{-6}\,\text{m}^3$

mass of diver $= 0.0059\,\text{kg}$

density of water $= 1.0 \times 10^3\,\text{kg}\,\text{m}^{-3}$

(3)

(b) When the pressure is increased by squeezing the bottle, water is forced into the diver increasing its weight. The diver sinks, then remains at rest in the position shown.

The volume of air in the empty pipette in part (a) was $8.0 \times 10^{-6}\,\text{m}^3$.

Show that the volume now occupied by the air is about $6 \times 10^{-6}\,\text{m}^3$.

(3)

(c) The pressure of the air in the empty pipette in part (a) was $1.01 \times 10^5\,\text{Pa}$.

Calculate the pressure of the air in part (b).

(2)

Pressure = ...

(Total for Question 16 = 8 marks)