1.
Molar mass of water is about 18 g/mol, hence there are 0.167 moles of water molecules. Besides, there are 4.41x10^{-4} moles of air.
By ideal gas law, the final pressure is 8.31x373x (m_a + m_w)/1 = 519Pa. Here m_a and m_w are the number of mole of air and water respectively.

2.
The ratio of mass of the two cup of liquid is 110/(300+0.001x100)=1/3
Then T_f=100/4=25°C. The final volume is then
300+110+300x0.001x25-110x0.001x75=409.25 cm^3

3.
Consider an air column just above the funnel, the force difference due to pressure =$(P_{gas} - P)$A=(nRT/LA-P)=ΔnMv/Δt , Δn=number of mole of gas in the column, use vrms to esimate v, then the rate of gas disposal Δn/Δt=$\frac{A}{\sqrt{3RTM}}\left(\frac{nRT}{LA} - P\right)$

4.
Since all three cubes are of the same material and volume, their heat capacities are the same. When they are in contact, the final temperature is simply the average. First, say, let A and B reach thermal equilibrium, the final temperature is 100 °C. Then let A and C in contact to reach temperature of 50 °C. After that, let B and C in contact, temperature becomes 75 °C. Now A is of temperature lower than both B and C.

5.

Initial conditions:

$$P_i = P_0$$

$$V_i = \frac{1}{2} lS$$

Where $l = 1m$, S is the cross section of the tube.

The tube being lifted out of the water into the atmosphere, we must have

$$P_f S + \rho g h S = P_0 S$$

Also, the ideal gas law gives us

$$P_i V_i = P_f V_f$$

Which yields

$$\frac{1}{2} l P_0 = h P_f$$

Combined, we can solve

$$h \approx 0.25m$$