5. Saturation pressure of water (8 points) — *Eero Uustalu.* Tools: transparent plastic tube (open at both ends, Luer lock to connect with a syringe at one end, length $\sim 1.5\,\mathrm{m}$, inner diameter $\sim 1.5\,\mathrm{mm}$); plastic syringe with a water-tight Luer fitting to the tube; small open container with a few millilitres of dodecane (labelled "D"); metal pin with outer diameter $\sim 2\,\mathrm{mm}$ to close the tube tightly (if it gets stuck, ask the invigilator to help remove it); measuring tape; container with water (labelled "W"); a large container for waste liquids; a small wooden stick; a few strips of masking tape; paper towel.

Water and dodecane do not dissolve in each other. The density of dodecane is less than the density of water.

Avoid skin and eye contact with dodecane, and do not ingest it; wash your hands after handling.

During the experiment, the tube can only be filled with dodecane: **the inner surface of the tube must never touch water!**

If necessary, you can have one replacement tube, one replacement syringe, and reasonable additional amounts of dodecane and water.

Determine the saturated vapour pressure p_{sat} of water at room temperature; room temperature and air pressure are recorded by the invigilator at the start of the session: $T_{\mathrm{room}} =$ _____ °C; $p_{\mathrm{air}} =$ _____ kPa.

Note that at typical room temperatures, the saturated vapour pressure of dodecane is much lower than that of water.

i) *(2 points)* Describe your measurement procedure and explain the physical principle it is based on.

ii) *(4 points)* Perform the measurements. Tabulate all quantities you measure and document the sequence of operations.

iii) *(2 points)* Determine p_{sat} at room temperature. What is the dominant source of systematic error?