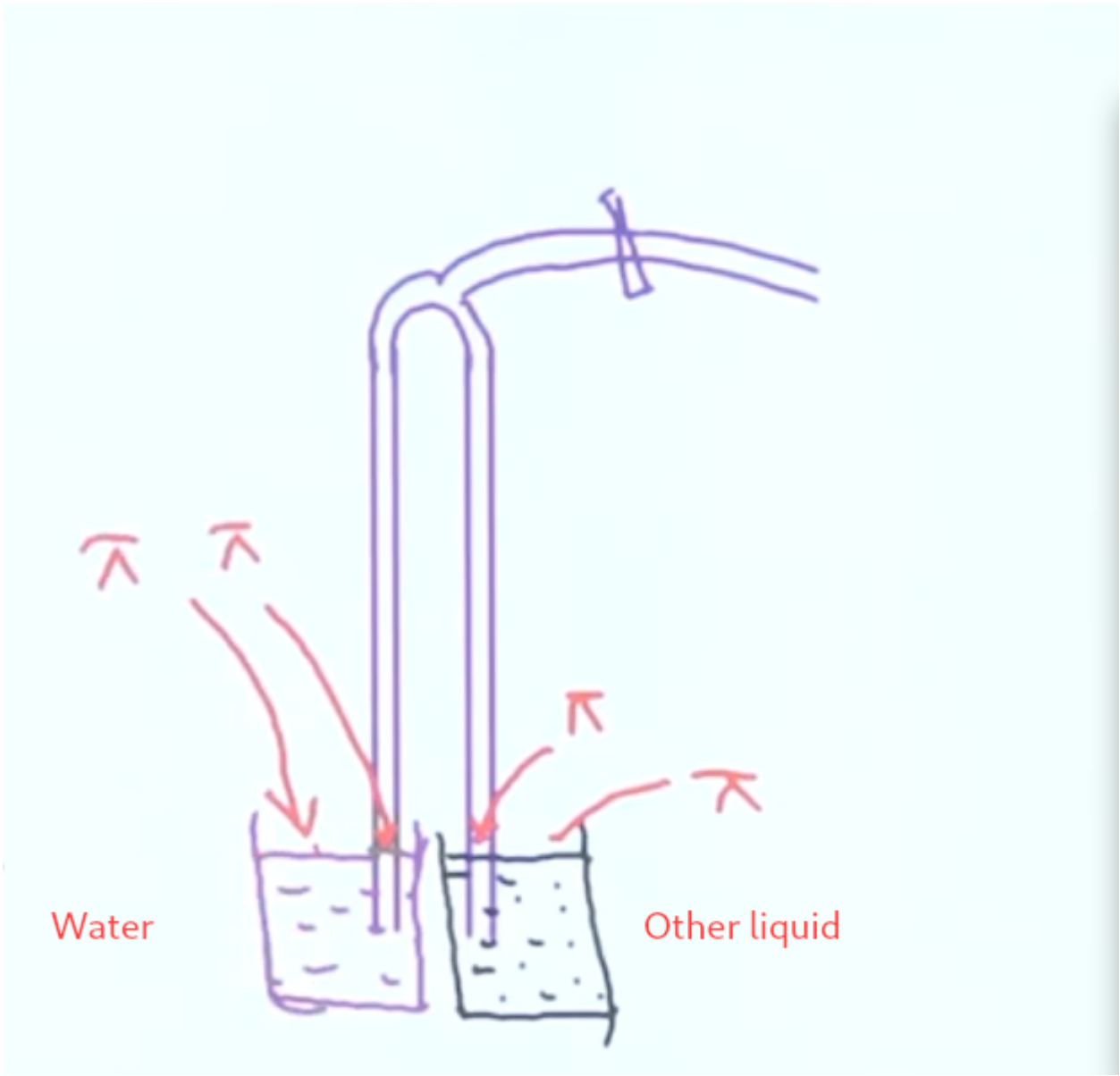
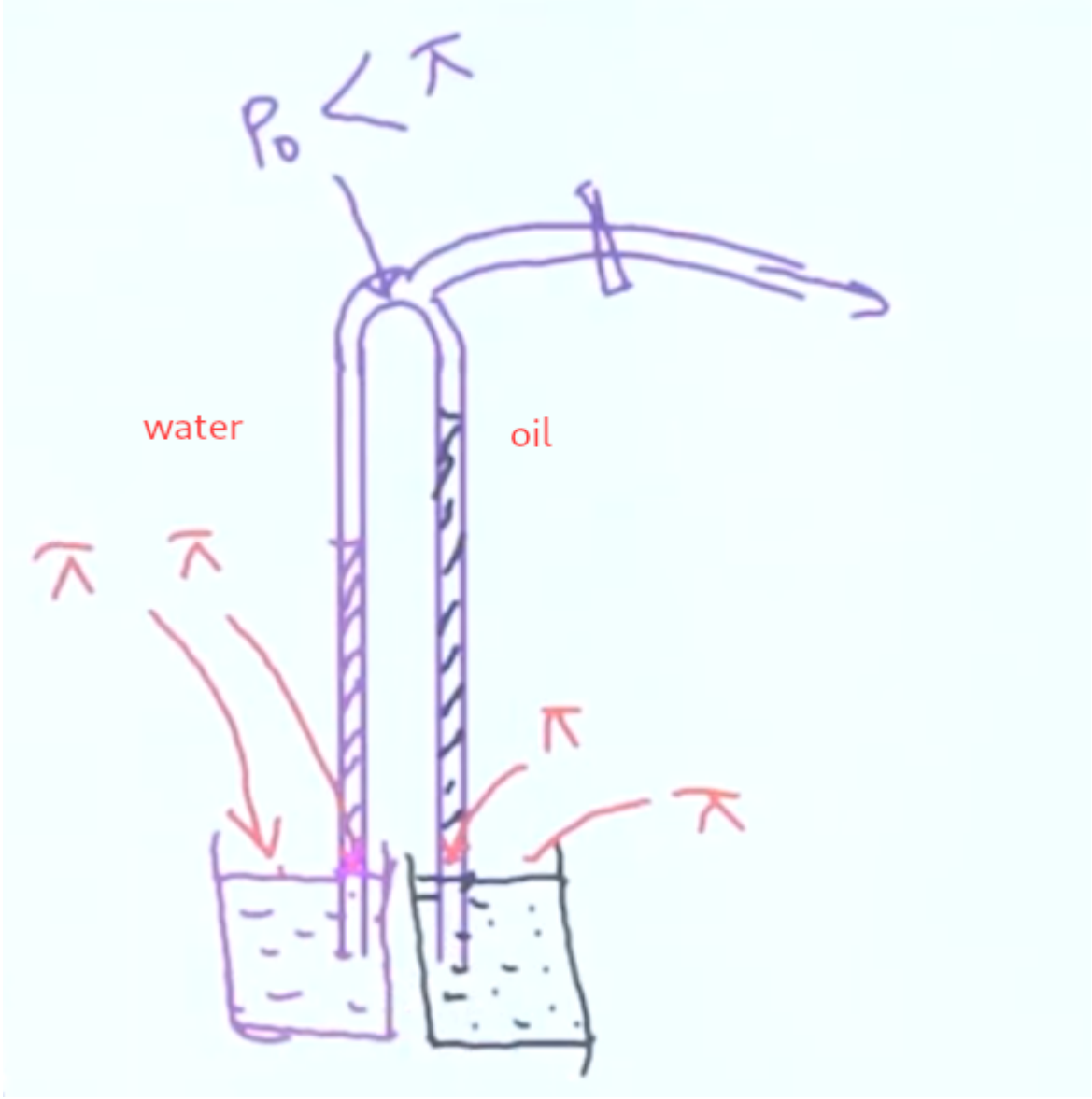
- What is the special advantage of using this method when compared to U-tube method?

We can use this method to find the relative density of 2 liquids which are miscible (In the U-tube method we can only measure relative densities of liquids which doesn't mix with with each other - i.e water and oil)

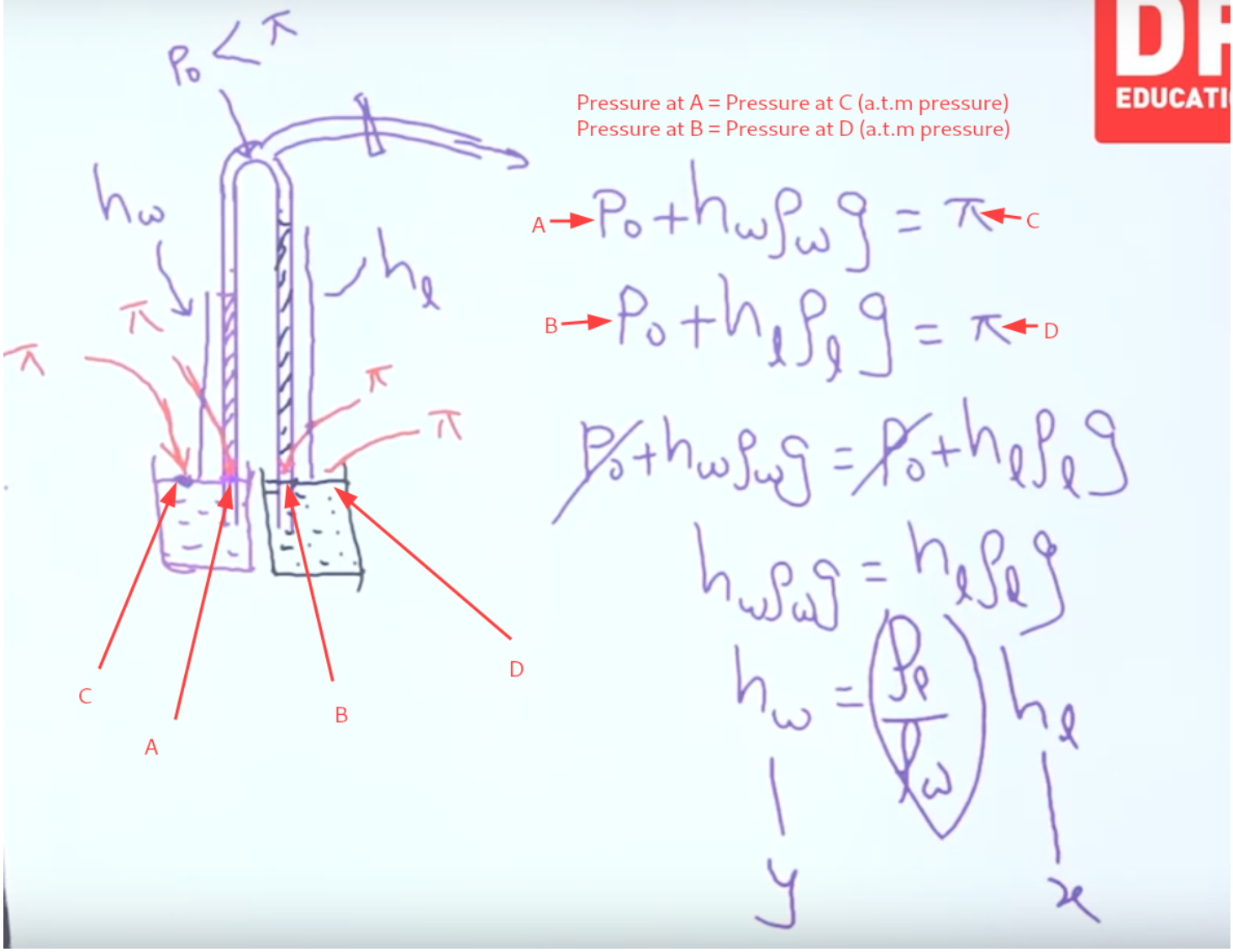
> Initial setup



- We open the clip on the top of the hare apparatus and suck air out, either using our mouth or a syringe. This is going to create a low pressure region inside the tube.
- So, the liquids inside the tube will travel upwards.

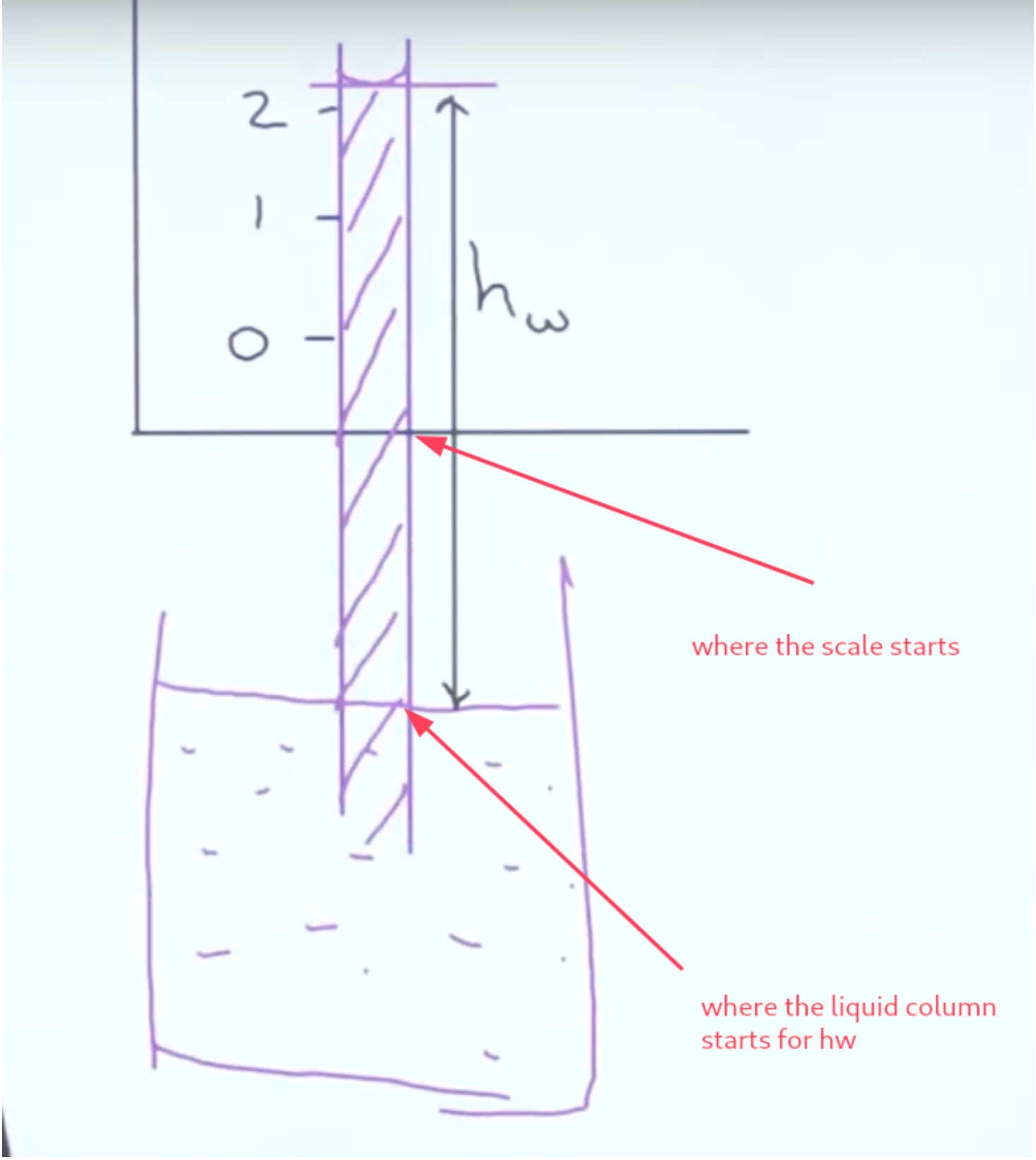


> Final setup

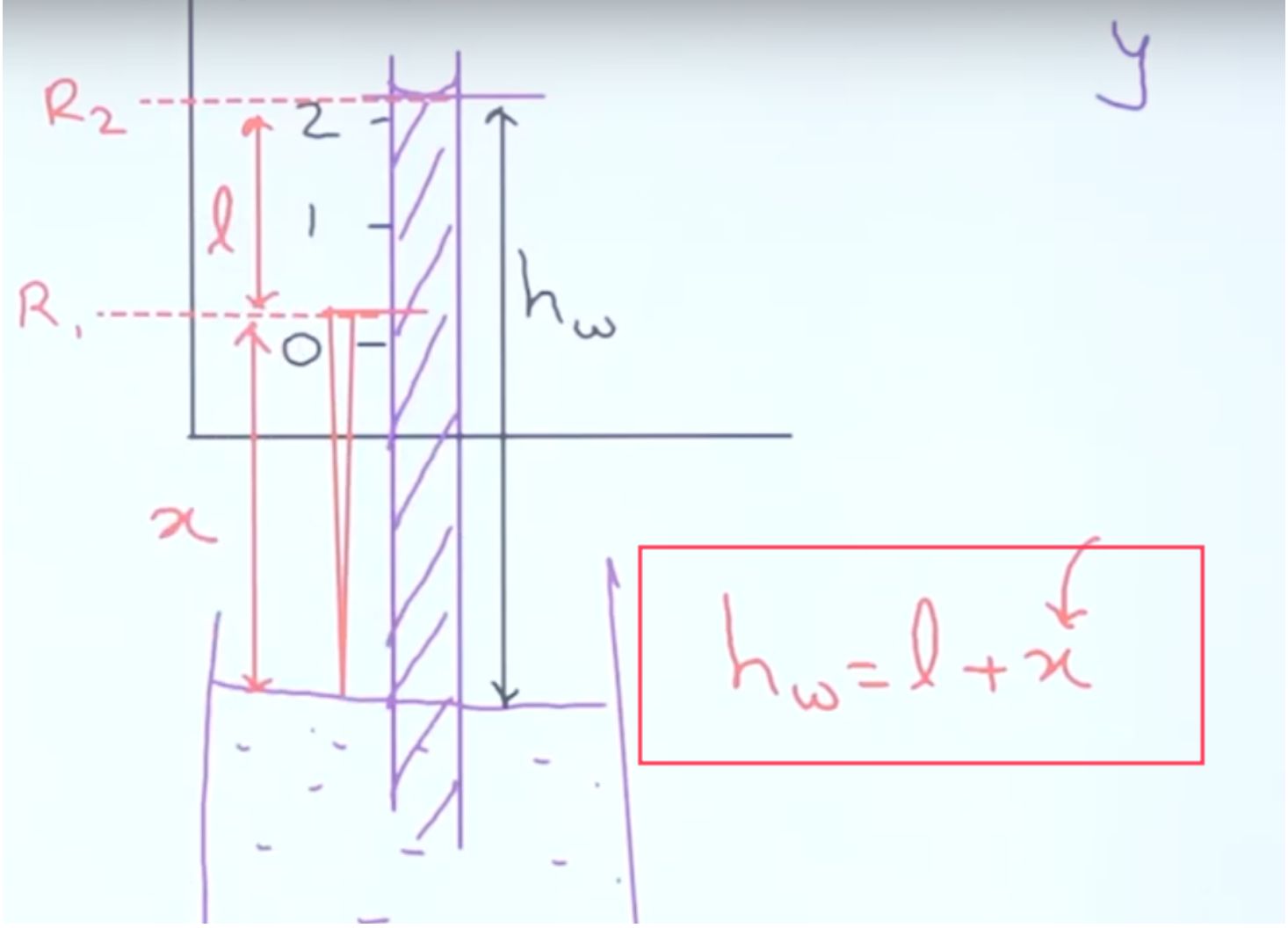


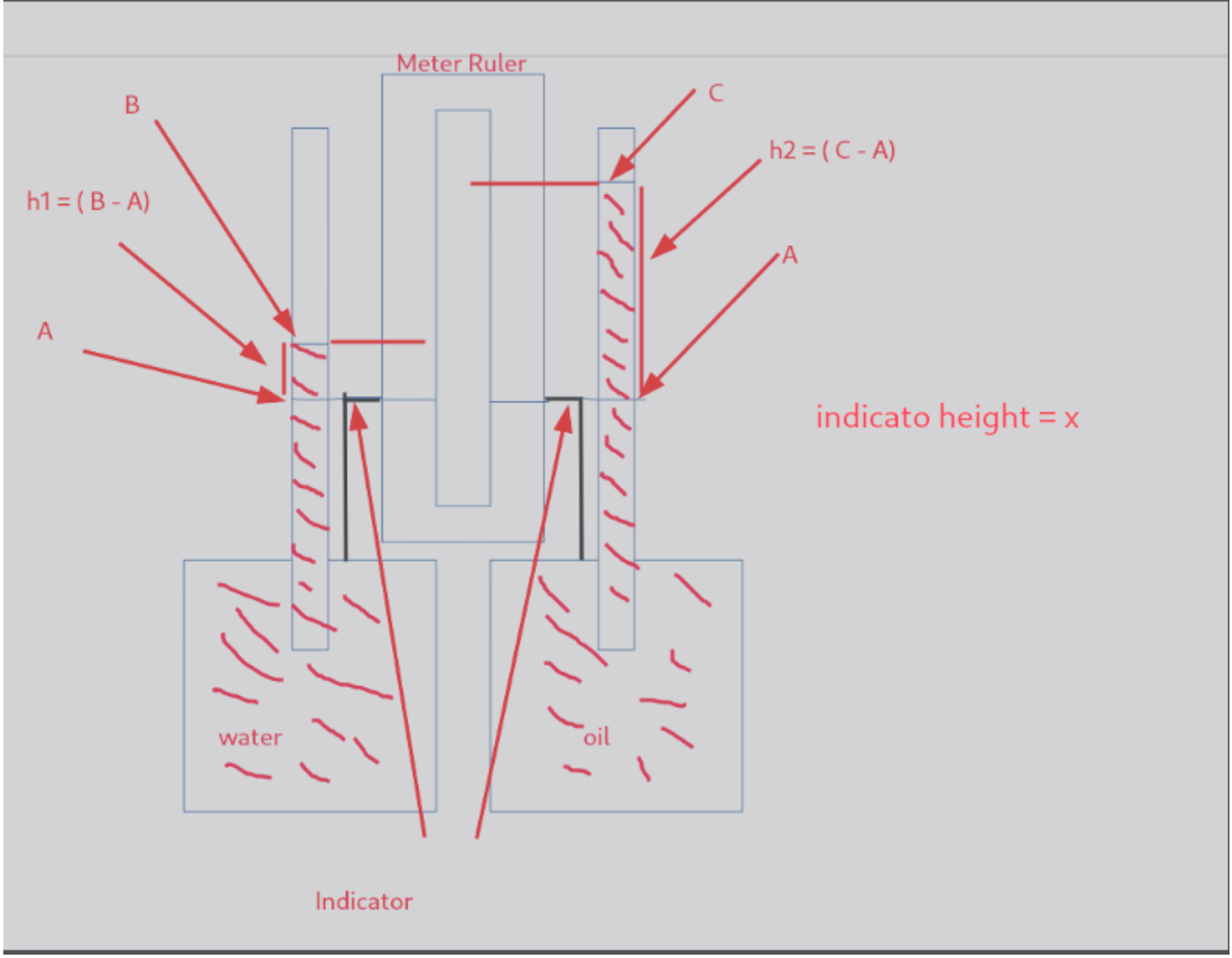
- Accordingly, the graph is `y = mx` type

> When measuring the `hw` and `hl` it's hard to get the reading correctly as the meter ruler's reading starts at a higher point from the start of the liquid column



- So we use an indicator like below


y
R_2
2
l
1
h_ω
R_1
0
x
$h_\omega = l + x$



`hw = h1 + x`
`hl = h2 + x`

> Without the indicator

$$hw = \frac{\rho_l}{\rho_w} hl$$

> With the indicator

$$h1 + x = \frac{\rho_l}{\rho_w}(h2 + x)$$
$$h1 = \frac{\rho_l}{\rho_w} h2 + \frac{\rho_l}{\rho_w} x - x$$
$$h1 = \frac{\rho_l}{\rho_w} h2 + (\frac{\rho_l}{\rho_w} - 1)x$$

- And this is in the format of $y = mx + c$

> Therefore, the gradient `m` will give the relative density of liquid `l` (in this case, oil)

Important points

Liquid with less density goes up higher when air is sucked

- How can we know which liquid column goes up higher when air is pumped

Liquid with the lower denisty will go higher as the mass is less (when the volume is constant) of that liquid compared to the other liquid

- What is the use of the clip we have on the tube?

After the air is sucked, the clip is used to close the tube and make sure the low pressure area remains without changing. (to keep the heights of the liquid columns constant)

- How can we measure the length of the indicator?

We can either use a meter ruler or we can set the indicator such that the tip of the indicator is at 0 and measure using the meter ruler in the hare's apperatus itself.

- When sucking the air, which column should you pay more attention to? and why?

The liquid column with less density liquid.
As that liquid column will come higher faster than the other column, you need to make sure that column doesn't come over the highest level and mix with the other liquid

- What is the procedure you have to follow every time you take a new reading by adjusting the height of the liquid columns?

You need to make sure the tip of the index touches the liquid surface and take the reading of the indicator accordingly

- Why should we use a hare's apparatus with tubes of very small diameter for this experiment?

To avoid the impact of surface tension we have to use a tube with a diameter at least 5 mm - 10 mm

- Why is it better to get the maximum heights of the liquid columns when drawing the graph?

To minimize the fractional error