continued from page –

Background

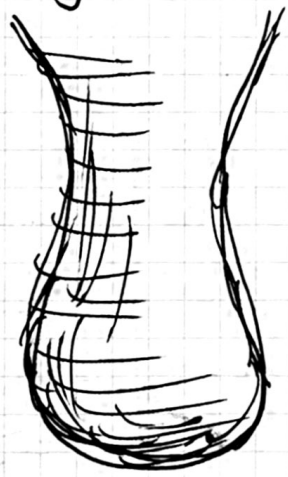
Surface Tension: Tendency of liquid's surfaces at rest to shrink to the minimum surface area. We define this as

$$\gamma = \frac{F}{L} \quad \begin{matrix} \leftarrow \text{Force} \\ \leftarrow \text{Length} \end{matrix} \qquad (1)$$

Viscosity: Resistance of a fluid to deformation at a given rate.

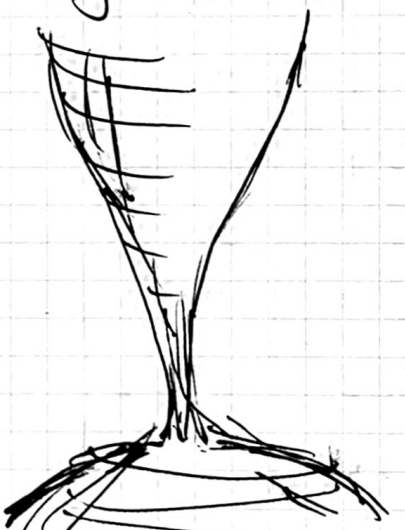
We can then say that:

Regime 1



Surface Tension

Regime 2



Viscosity

$$\left(\frac{\gamma}{\rho}\right)^{1/3} t^{2/3} = \gamma_{min} = \left(\frac{\gamma}{\eta}\right) t$$

Notice that both of these are of the form

$$\gamma_{min} = C_0 t^{\alpha} \quad \leftarrow \text{Important!}$$

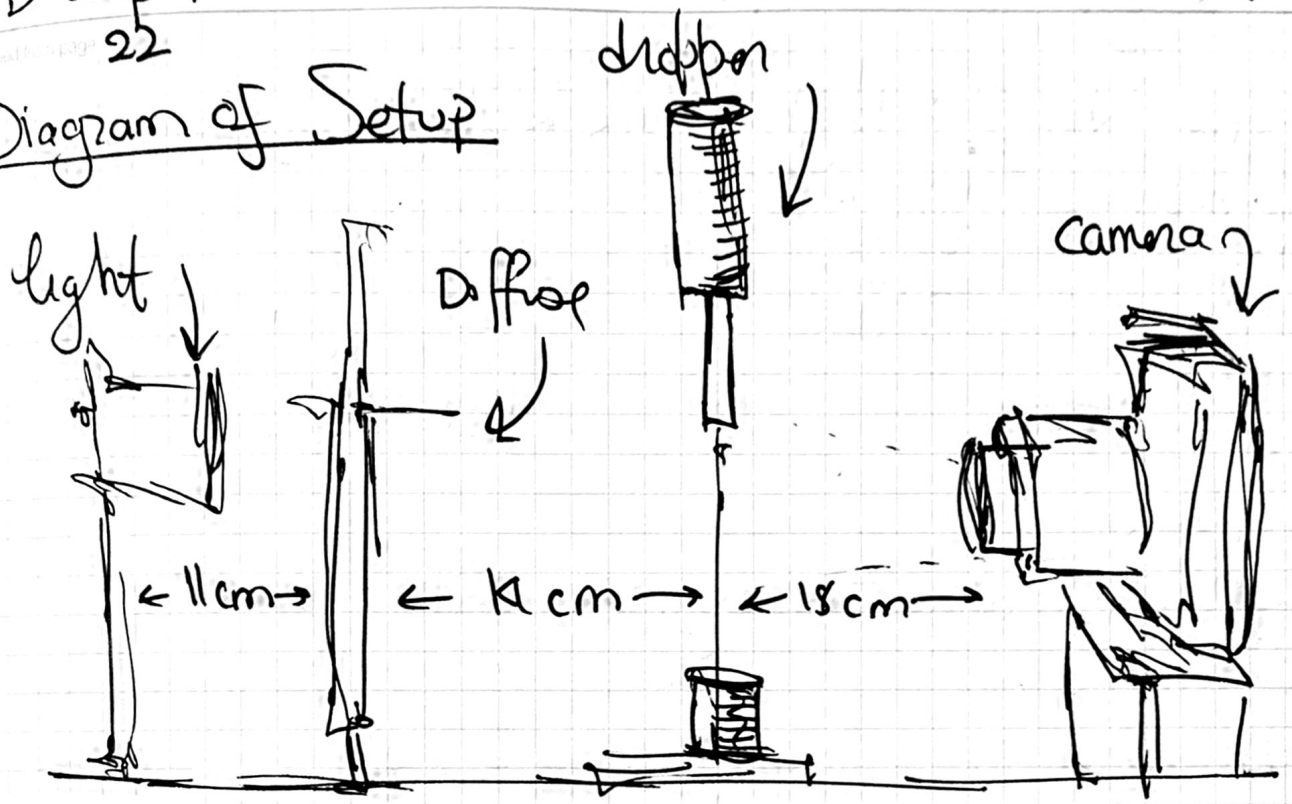
where C_0 & α are constants that we can get through testing.

continued to page 23

Signature Date 22.10.21

Witnessed And Understood By Date

Diagram of Setup



EXPERIMENTAL SETUP

DATA COLLECTION

Setup No 1: Low Framerate

Resolution : 336 × 240 px
FPS : 1594.3 fps
EXP : 57.17 µs

PUT IN GOOGLE DRIVE FOLDER NAMED "DROP PINCH LAB - PHYS 2110"

Recorded files :

dpo-1
dpo-2
dpo-3
dpo-4
dpo-5

→ Too far out - no regime 2. → reduce aperture for increased resolution

← INCREASED VISCOSITY FOR NEXT TIME.

continued to page 24

continued from page 23

Setup No. 2 : High Frame Rate

Resolution : 192 × 96 px
FPS : 38.565 fps
EXP : 25.93 ms
GAIN : 0 dB

Min Period : 20.98

UPLOAD TO GOOGLE DRIVE

filenames

dpo-6
dpo-7 , dpo-7-regime1
dpo-8
dpo-9, dpo-9-regime-2
dpo-10
dpo-11 , dpo-11R

← Best for tested regimes.

↑ Ruler measurement

[END DAY 1] - - - - -

SAME SETUP INTO DAY 2, SO recorded:

filenames

UPLOAD TO GOOGLE DRIVE

dpo-12
dpo-13
dpo-14 ← converted to AVI using FFMpeg
dpo-15 , dpo-15R ← ruler measurement

→ After review, it is clear that the best framing and resolution, also focus, is dpo-14. We will use this.

continued to page 25

Signature

Date 23.10.21

Witnessed And Understood By

Date

continued from page 24

Image analysis

$\frac{T_f - T_i}{\#(dp)}$ = [$\frac{5.23 - 0.92}{20}$ ≈ $\Delta t = 0.2$ to pinch off
or 3 frames]

pixels2meters: 164090
d px2m : 294360

dpo_15 R.AVI

UPLOAD TO radii_min.xlsx

AVI BASED

BASED ON RESOLUTION OF CAMERA

	time (s)	dt (s)	radius (px)	dr (px)
1)	0.92	0.08	28.88	0.12
2)	1.15	0.08	27.75	0.12
3)	1.38	0.08	26.63	0.12
4)	1.62	0.08	25.00	0.12
5)	1.85	0.08	23.63	0.12
6)	2.08	0.08	22.13	0.12
7)	2.31	0.08	18.88	0.12
8)	2.54	0.08	17.88	0.12
9)	2.77	0.08	16.13	0.12
10)	3.00	0.08	14.16	0.12
11)	3.23	0.08	14.05	0.12
12)	3.46	0.08	11.72	0.12
13)	3.69	0.08	9.76	0.12
14)	3.92	0.08	7.55	0.12
15)	4.15	0.08	5.93	0.12
16)	4.38	0.08	3.93	0.12
17)	4.62	0.08	3.02	0.12
18)	4.69	0.08	1.87	0.12
19)	4.77	0.08	0.73	0.12
20)	5.23	0.08		0.12

continued on page

NOTE: dpx2m taken as width of marker on video.

Signature

Date 25.10.21

Witnessed And Understood By

Date