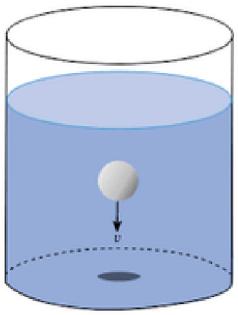
GROUP - F[A]



Stoke's law & TERMINAL VELOCITY

PRESENTED BY:
Gobind Puri, Shrey Jalota, Ujjwal Rai, Yash Rai, S.V.VASISTA

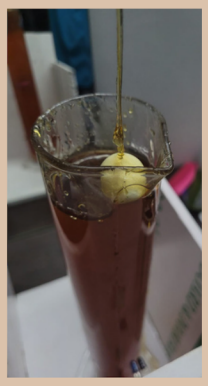
Background and Aim

Terminal Velocity{V(T)}=2gr^2(a-b)/9n
a=density of object inside fluid
b= density of fluid
r=radius of sphere
n= viscocity of fluid

We are measuring terminal velocity of the object in the fluid of known density and viscocity. using IR Sensor. we will then calculate density using the above formula. we will then compare it with actual density and will verify stoke's law

APPARATUS & SETUP

1. HONEY - AS FLUID MEDIUM- [DENSITY =1.54GM/CM3 ; DYNAMIC VISCOSITY= 10P]
2. 50CM TEST TUBE
3. ARDUINO UNO
4. 2 IR SENSORS, LCD DISPLAY, BREADBOARD
5. BALL MADE UP OF M-SEAL [DENSITY=2.67GM/CM3 ; RADIUS=0.93CM]



Theory:Stokes law applies specifically to the motion of a small, spherical particle moving through a fluid in laminar flow. The drag force acting on the particle is proportional to the velocity of the particle relative to the fluid, and is given by:

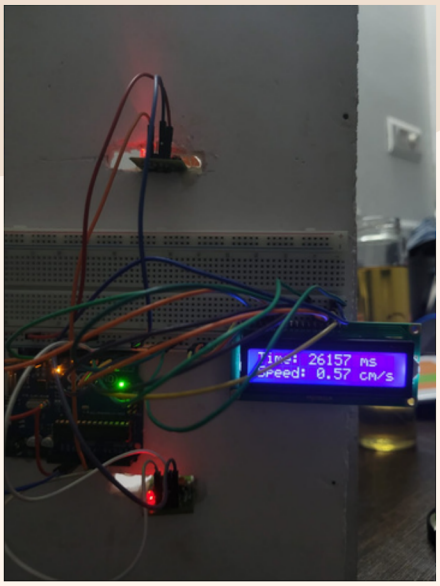
$F = 6\pi\eta rv$

F - drag force ,η - viscosity of fluid , r -radius of the spherical particle ,v -instantaneous velocity of the particle

Stokes law assumes that the particle is so small that its motion does not affect the fluid surrounding it and cause turbulence . In other words, the particle is assumed to be in a regime where its Reynolds number is small, which means that the viscous forces in the fluid are greater than the inertial forces. This is why Stokes law is generally applicable only to small particles moving at low velocities through a fluid.

Specification Of IR Sensor

- **Angular range: 35 deg**
- **Voltage: 3.3v - 5v**
- **Linear range : 2-10cm**
- **Current: 3mA - 5mA**

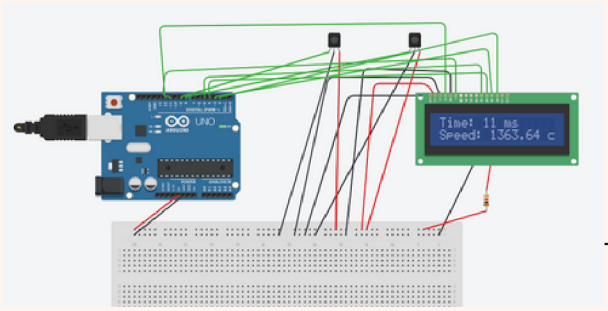


Process

We need to measure the terminal velocity of the ball in the honey using IR Sensor.

Proper caliibaration of the IR Sensor should be done before measuring the velocity and necessary changes should be made in the code.

Proper setup should be made before starting the experiment. Ball should be dropped right in the middle of the measuring cyllinder.



LIMITATATIONS:

- The IR sensors can be affected by environmental conditions.
- The consistency of honey is uneven.
- Due to cohesive forces, the ball sticks to the walls of the beaker/tube.

Result

Terminal Velocity

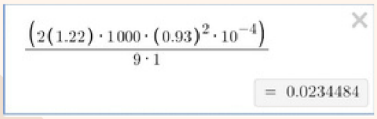
Terminal Velocity can be easily calculated using the IR Sensor. The LED display will display the velocity.

CALCULATION OF DENSITY

Density will be calculated using weigh machine for mass and a box of known volume.
Theoretical density will be compared with the experimental density to verify the Stoke's law.

Calculation

https://docs.google.com/spreadsheets/d/17i-_8jrLpmiNoMMVG0PrUVXlSifAAPnth9aAQtE_7i8/edit?usp=sharing




THANK YOU
SO MUCH!