PHYSICS PRACTICAL SHEETS

Date 2023/03/23 ..... KU ..... CAMPUS
Class CE
Roll No. 25
Shift Morning
23-03-2023
Experiment No. 4
Group I
Sub. Physics
Set

Object of the Experiment (Block Letter)

MEASUREMENT OF THE REFRACTIVE INDEX OF SUGAR SOLUTION AT DIFFERENT ~~TEMPERATURE~~ CONCENTRATIONS USING A SPECTROMETER

Apparatus Required:

i) Spectrometer ii) Spirit level
iii) Source of monochromatic light iv) Sugar
v) Electronic balance, beaker, measuring cylinder.

Theory:

Refractive index of a liquid can be measured by placing the liquid in a hollow glass prism of thin walls and measuring the angle of minimum deviation of the light ray passing through the liquid. When the ray of light passes through a prism, it suffers refraction and finally emerges from the prism. The deviation produced by the prism depends on the angle of ~~incidence~~ incidence. For a certain value of angle of incidence, the angle of deviation is minimum.

If Dm denotes the angle of minimum deviation for a given prism of refracting angle A, the refractive index is given by;

$$\mu = \frac{\sin\left(\frac{A + D_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

Refractive index of the medium is a function of the density of the medium. The density of a salt solution is proportional to concentration of solution. Hence, the change in concentration leads to a change in refractive index.

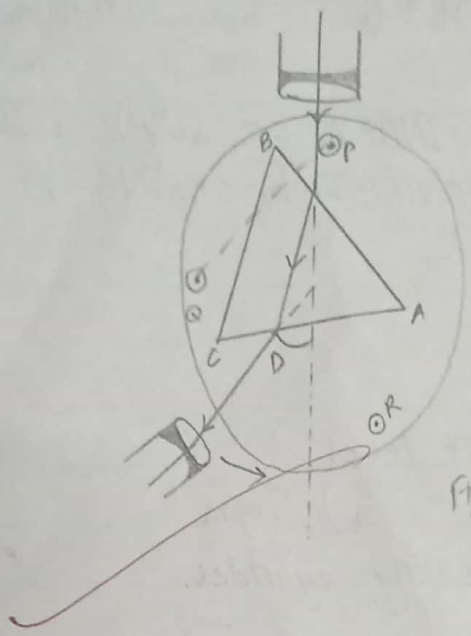

Fig: Measurement of angle of minimum deviation.

Observations:

Vernier constant (VC) = $(1/60)^\circ$

Temperature of solution = 23°C

Measurement of angle deviation:

Conc of the solution	Vernier (V_1)			Vernier (V_2)		
	Telescope reading		Difference.	Telescope reading		Difference
	Min Dev	Direct	Dm	Min Dev	Direct	Dm
0%	195·15	171·83	23·82	15·166	351·47	23·196
40%	199·5	171·83	27·67	19·5	351·47	27·53
20%	197.75	171·83	25·92	17·27	351·47	25·30
10%	196·68	171·83	24·85	16·25	351·47	24·28
5%	195·67	171·83	23·84	15·58	351·47	23·61

Concentration & Refractive Index

Conc. of sol^n	Angle of minimum deviation (Dm)	Refractive index (μ)
0%	23·49	1·331
40%	27·60	1·384
20%	25·61	1·359
10%	24·56	1·345
5%	23·73	1·334

Precautions:

i) The axis of telescope, collimator and the plane of the prism table should be horizontal

ii) The cross-hairs should be clearly visible and adjusted accordingly.

iii) The telescope should be focused for infinity and the collimator should be adjusted to give a beam of light

iv) The slit should be narrow.


h
350
345
340
335
330
325
320
315
310
305
300
295
290
285
280
0