



Class: 2nd stage

Subject: Physical Chemistry



**Ministry of Higher Education and Scientific
Research
Al-Mustaqbal University College**

**Chemical engineering and petroleum industries
(Physical Chemistry lab)**

**Experiment No.3
(Refractive index)**

Prepared by

Asst.Lect. Sarah Ali Abdul Hussein

Asst.Lect. Zainab Salam Obied

Asst.Lect. Rand Fadel Kadim

Eng. Ahmed Abbas Mohammed



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Refraction of light

Refraction is the bending of light as it passes from one transparent substance into another. This bending is measured by the refractive index, it is **dimensionless number** that describe how fast the light travels through the material, it is defined as

$$n = \frac{c}{v}$$

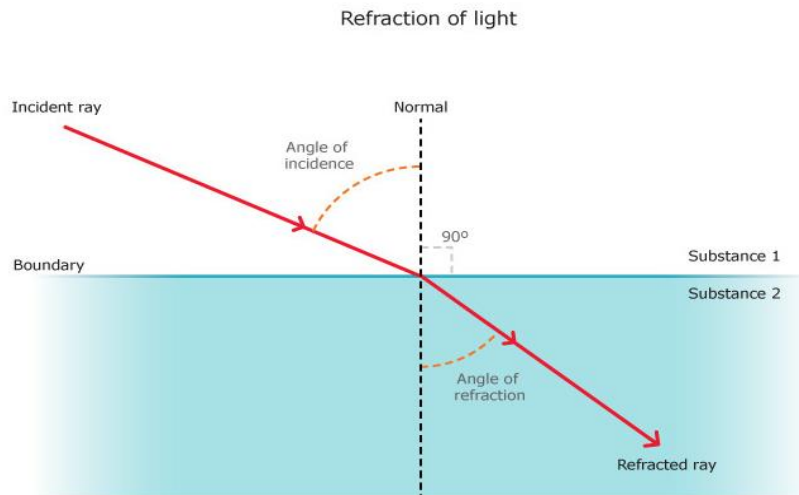
Where c is the speed of light in vacuum and v is the phase velocity of light in the medium.

Light refracts whenever it travels at an angle into a substance with a different refractive index (optical density). This change of direction is caused by a change in speed. For example, when light travels from air into water, it slows down, causing it to continue to travel at a different angle or direction. This change of direction is called refraction. When light enters a more dense substance (higher refractive index), it 'bends' more towards the normal line.



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The amount of bending depends on two things:

- Change in speed – if a substance causes the light to speed up or slow down more, it will refract (bend) more.
- Angle of the incident ray – if the light is entering the substance at a greater angle, the amount of refraction will also be more noticeable. On the other hand, if the light is entering the new substance from straight on (at 90° to the surface), the light will still slow down, but it won't change direction at all.

Measuring the refractive index of a liquid carries important information about its physical properties, including concentration and density, thus making it possible to determine and monitor the composition of the solution.

Aim: To find refractive index of the given liquid samples



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Apparatus: Abbe's refractometer, light source, weighing scale and samples.

Procedure:

1. Clean the surface of prism first with alcohol and then with aetone using cotton and allow it to dry.
2. Using a dropper put 2-3 drops of given liquid between prisms and press them together
3. Allow the light to fall on mirror.
4. Adjust the mirror to reflect maximum light into the prism box
5. Rotate the prism box by moving lever until the boundary between shaded and bright parts appear in the field of view.
6. If a band of colors appears in the light shade boundary make it sharp by rotating the compensator.
7. Adjust the lever so that light shade boundary passes exactly through the center of cross lines.
8. Read the refractive index directly on the scale.

Discussion:

1. What is the refractive index?
2. How do you measure refractive index?
3. What is the unit of the refractive index?
4. What does the amount of bending of light depend on?
5. Why do you measure the refractive index of liquid?