

**Radiology Techniques
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Radiation Physics Lab

Third stage- Radiology Techniques Department

Experiment 6

By

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Finding the graphical representation between the incident angle and the refraction angle of sound

The objective of the experiment:

Applying Snell's law to find the angle of refraction of sound in water.

The theory:

When the sound wave travels from the medium (1) and its velocity in it is (v_1) to the medium (2) and its velocity in it is (v_2) through the acoustic boundary between the two media, so that $v_2 > v_1$, the angle of incidence in the medium(1) is (θ_i), which is the angle between the incident wave and the vertical line on the acoustic boundary, the sound wave is refracted in the medium(2)away from the vertical line, which means that the angle of refraction (θ_r) is greater than the angle of incidence(θ_i), and where the angle of refraction is the angle between the refracted wave and the vertical line on the acoustic boundary, and the relationship between (v_1) , (v_2) , (θ_i) and (θ_r) are expressed by the following equation

$$\sin \theta_i / \sin \theta_r = v_1 / v_2 \dots\dots\dots (*)$$

and where the above equation is called Snell's law of refraction.

The experimental procedure:

- 1- We take the medium (1) is the air, and the medium (2) is the water.
- 2- We take the velocity of sound in the air at (25C°) where it is (346m/sec).
- 3- We take the velocity of sound in the water at (25C°) where it is (1492m/sec).
- 4- We take the following angles, which represent the angles of incidence of sound waves in the medium (1) which (5°, 8°,10°,13°).

The calculations and results:

- 1-We find the sine of the angle of incidence (5°).
- 2- We apply the equation(*) to get the value of the (sinΘ_r), and then we find the value of (Θ_r) by the function(sin⁻¹).
- 3-We repeat steps 1 and 2 for angles (8°,10°,13°) and then arrange the results in the following table

Θ _i	sin Θ _i	sinΘ _r	Θ _r	sin Θ _i ×10 ⁻³	sinΘ _r ×10 ⁻³

- 5- We plot (sin Θ_i×10⁻³) versus (sinΘ_r×10⁻³) , where (sinΘ_r×10⁻³) is on y-axis, and (sinΘ_i×10⁻³) is on x-axis , and then we get the straight line.

