SNS COLLEGE OF PHYSIOTHERAPY

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Coimbatore– 641035

COURSE NAME: ELECTROTHERAPY II

SUBJECT CODE: 6282

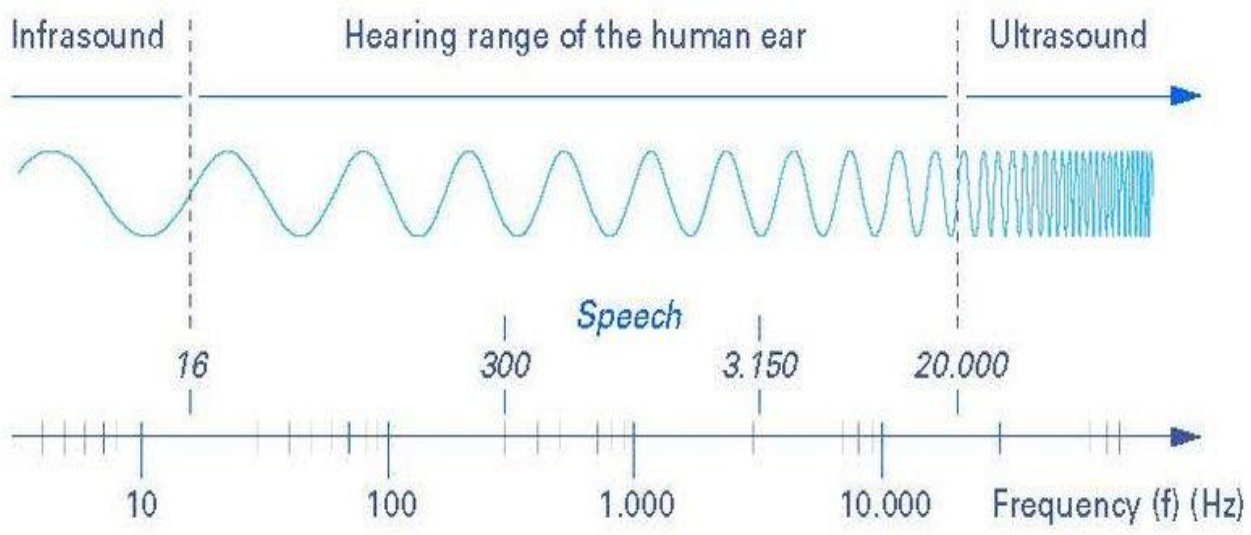
TOPIC: INTRODUCTION TO ULTRASOUND THERAPY

Defining Ultrasound; Acoustic Energy Principles

An overview of the fundamental concepts of ultrasound and acoustic energy principles in therapeutic ultrasound.

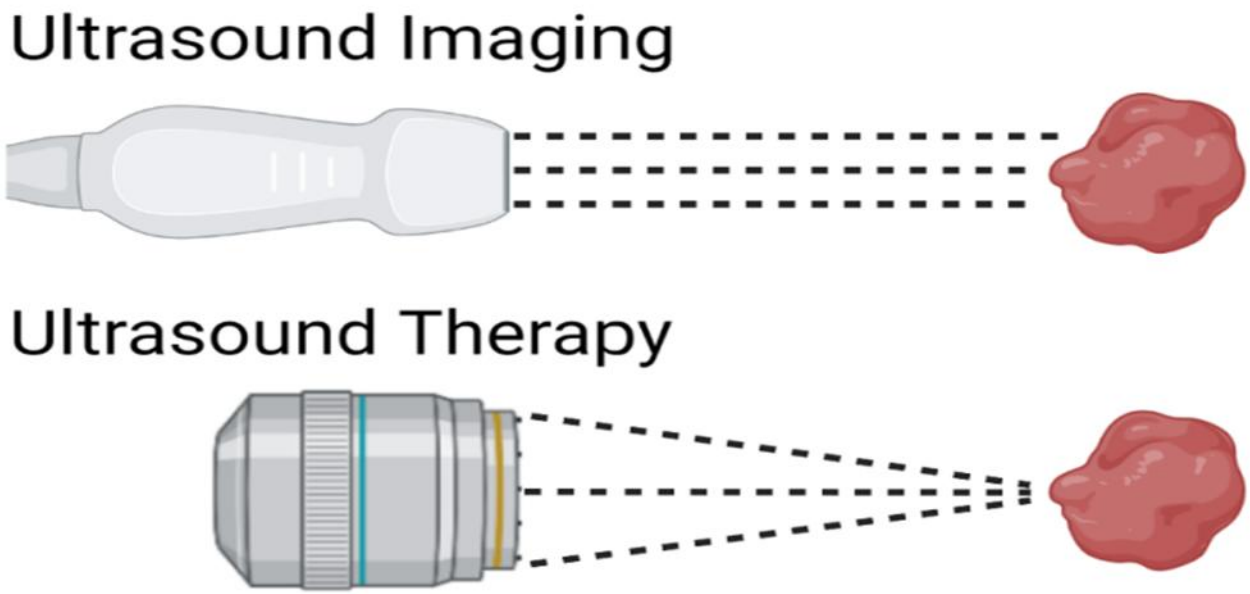
Introduction to Ultrasound

Ultrasound refers to sound waves with frequencies above the audible range of human hearing (>20 kHz).



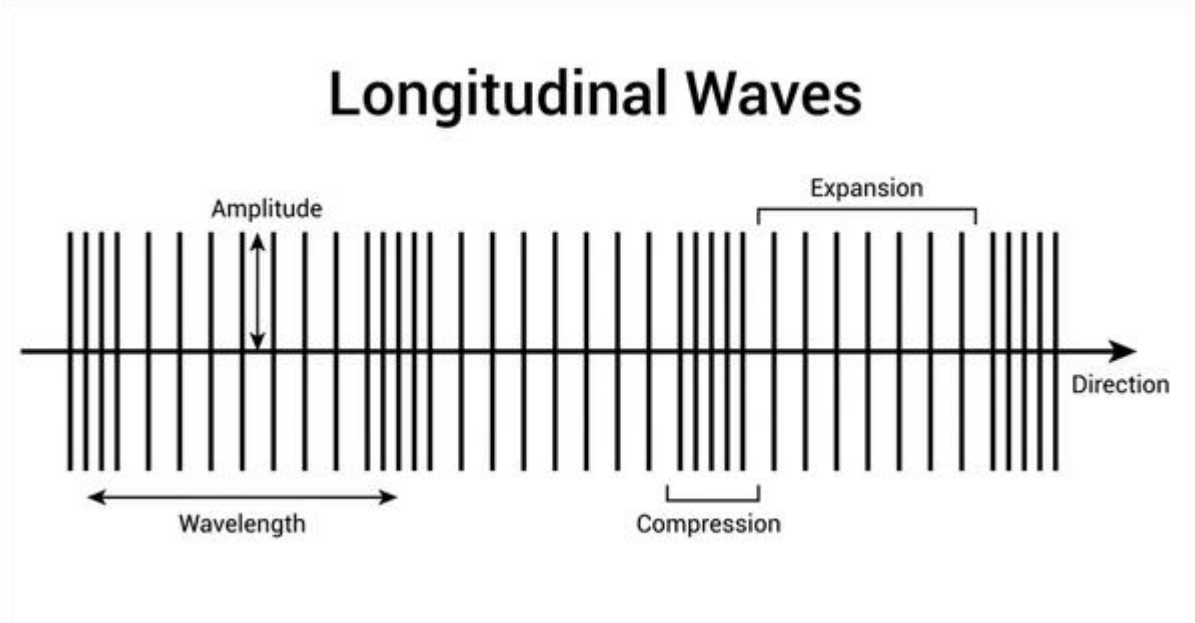
Therapeutic Ultrasound

It is a modality used in physiotherapy to promote tissue healing, reduce pain, and improve tissue extensibility.



Nature of Sound Waves

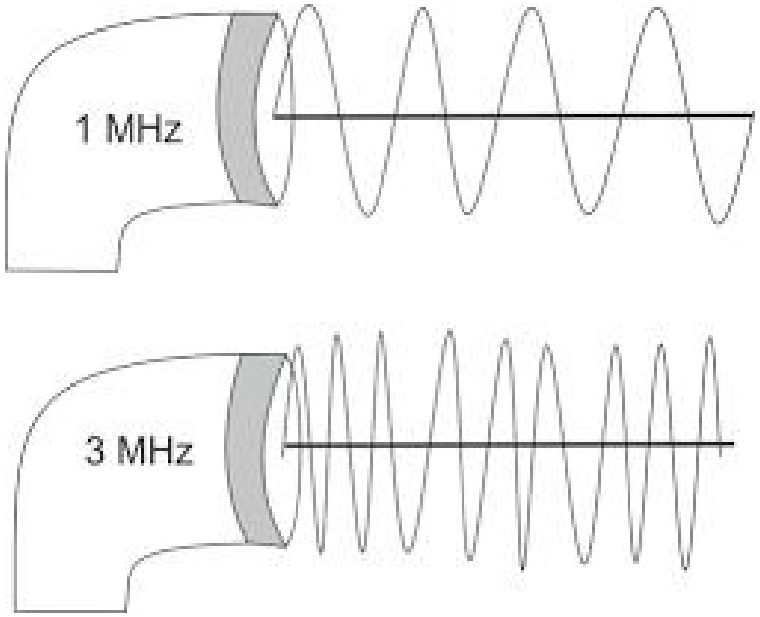
Sound is a mechanical vibration that requires a medium to travel. Ultrasound waves are longitudinal waves.

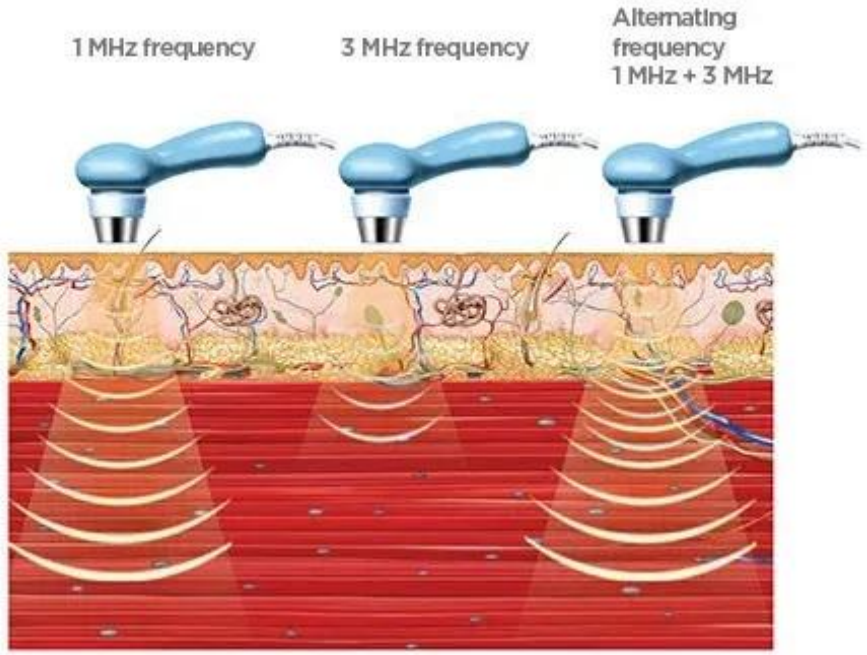


Frequency and Wavelength

Frequency: Number of cycles per second (Hz).

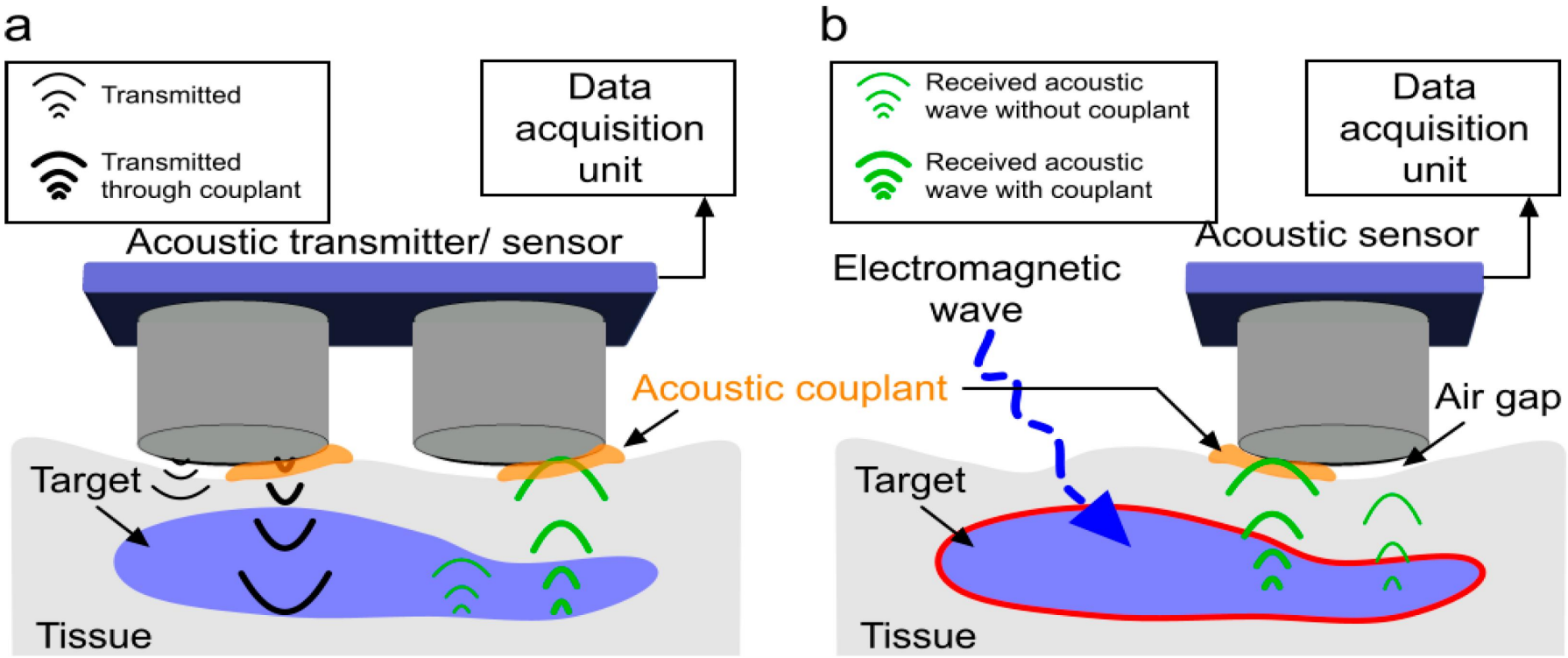
Wavelength: Distance between two consecutive compressions or rarefactions.





Principle of Acoustic Energy

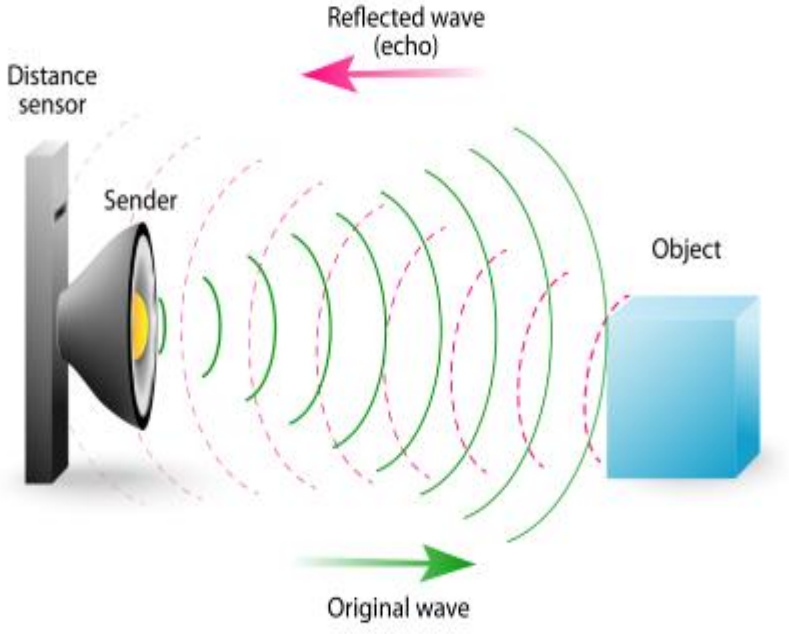
Acoustic energy is transmitted through molecular vibration within a medium, transferring energy from one molecule to another.



Acoustic Impedance

It is the resistance a material offers to sound wave transmission.

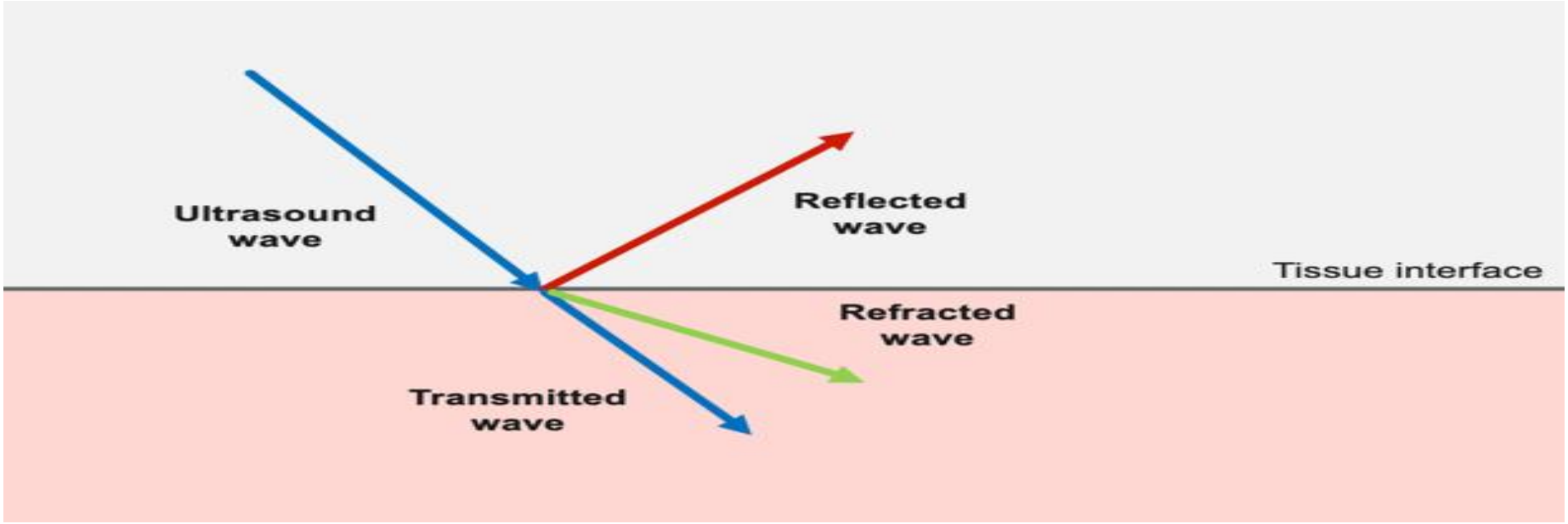
$Z = \rho \times c$ (where ρ is density, c is velocity).



Reflection and Refraction

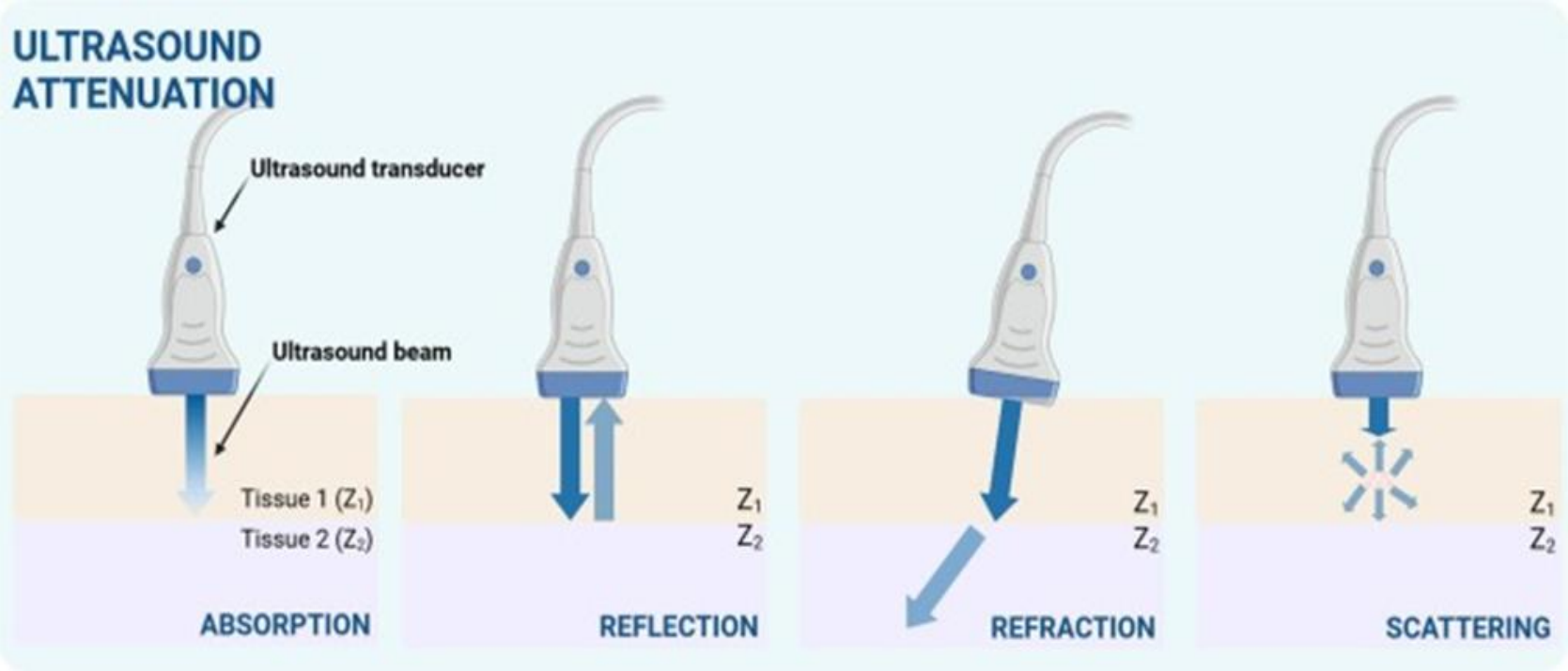
Reflection occurs at interfaces with different acoustic impedances.

Refraction is the bending of sound waves as they pass through media of different densities.



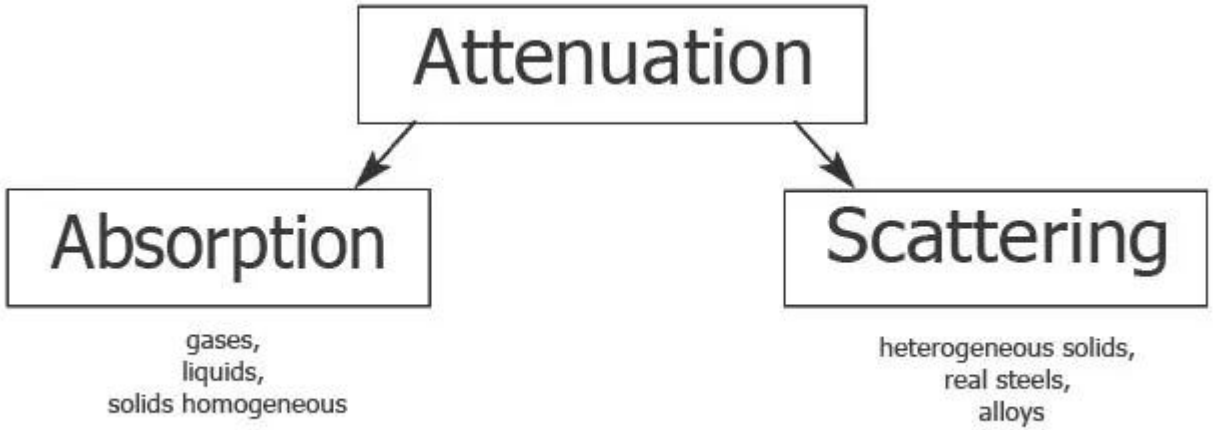
Absorption

The conversion of ultrasound energy into heat within the tissue. The rate of absorption increases with frequency.



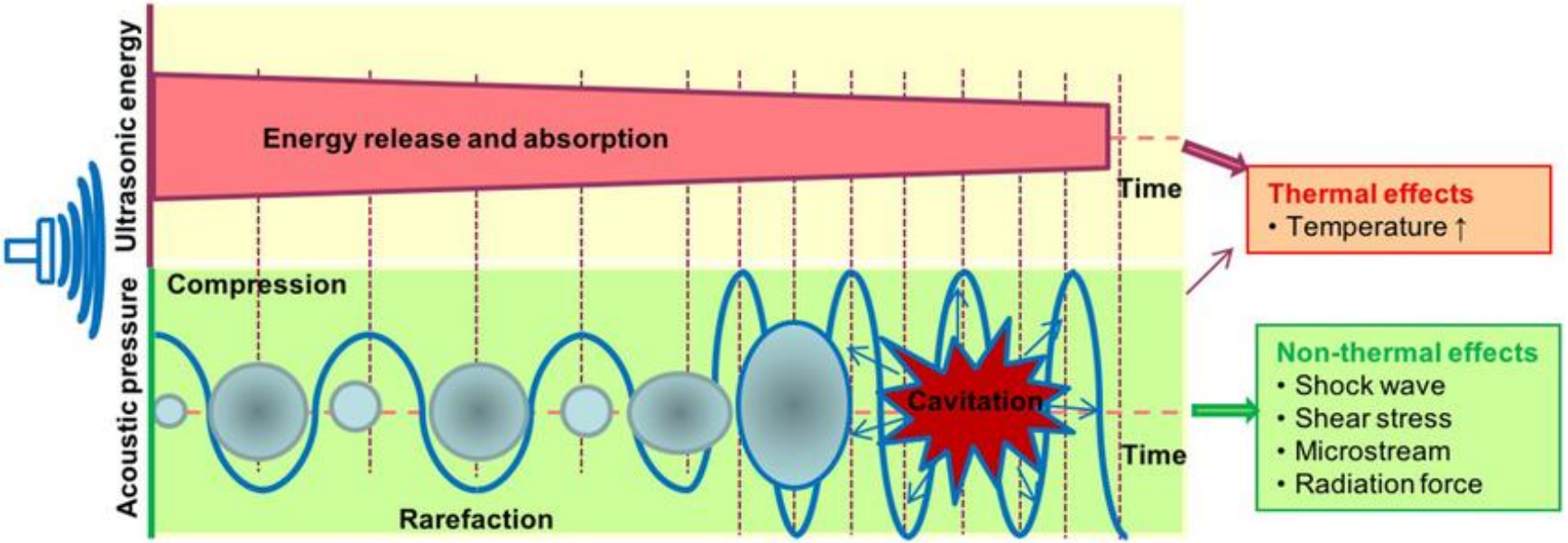
Attenuation

Loss of ultrasound intensity as it travels through tissue due to absorption, reflection, and scattering.



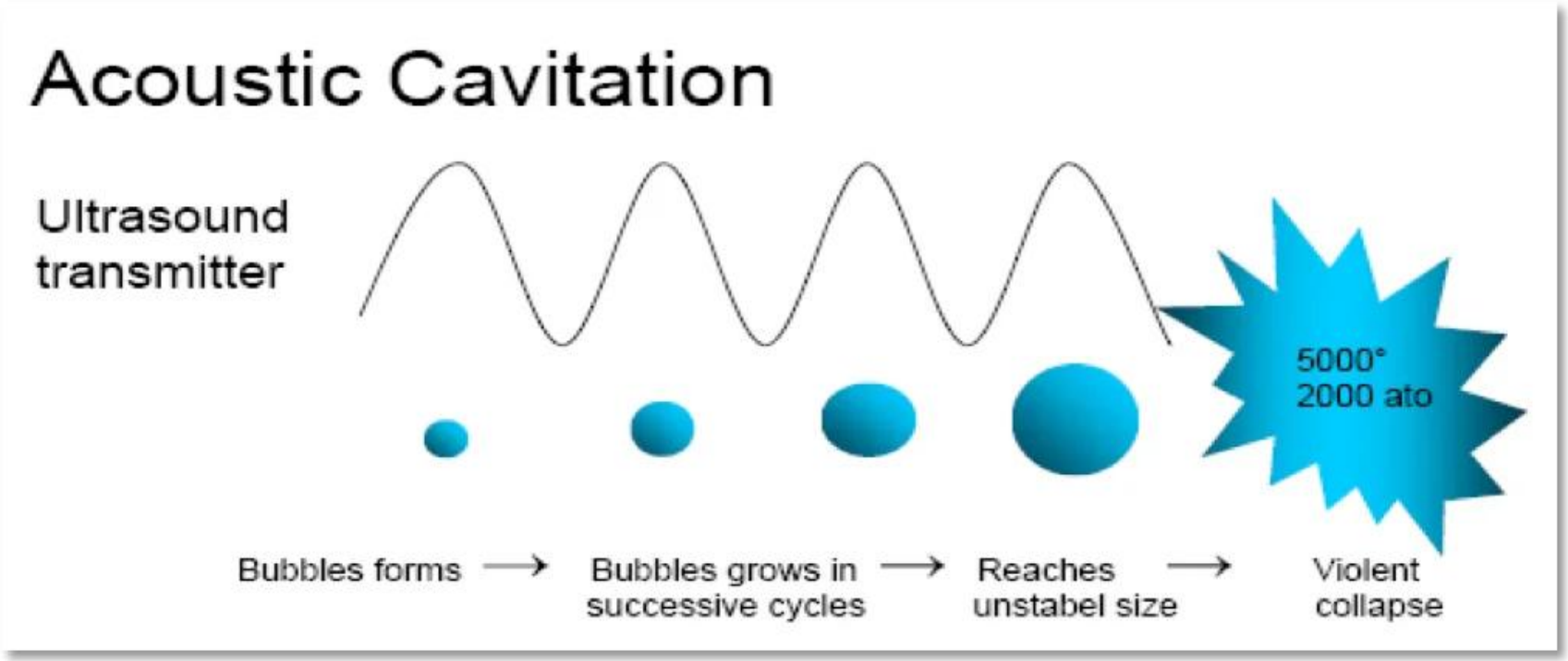
Thermal Effects and Non thermal effects

- Increase in tissue temperature leads to increased metabolism, reduced pain, and enhanced tissue healing.
- Include cavitation and acoustic streaming, which promote cellular activities and tissue repair.



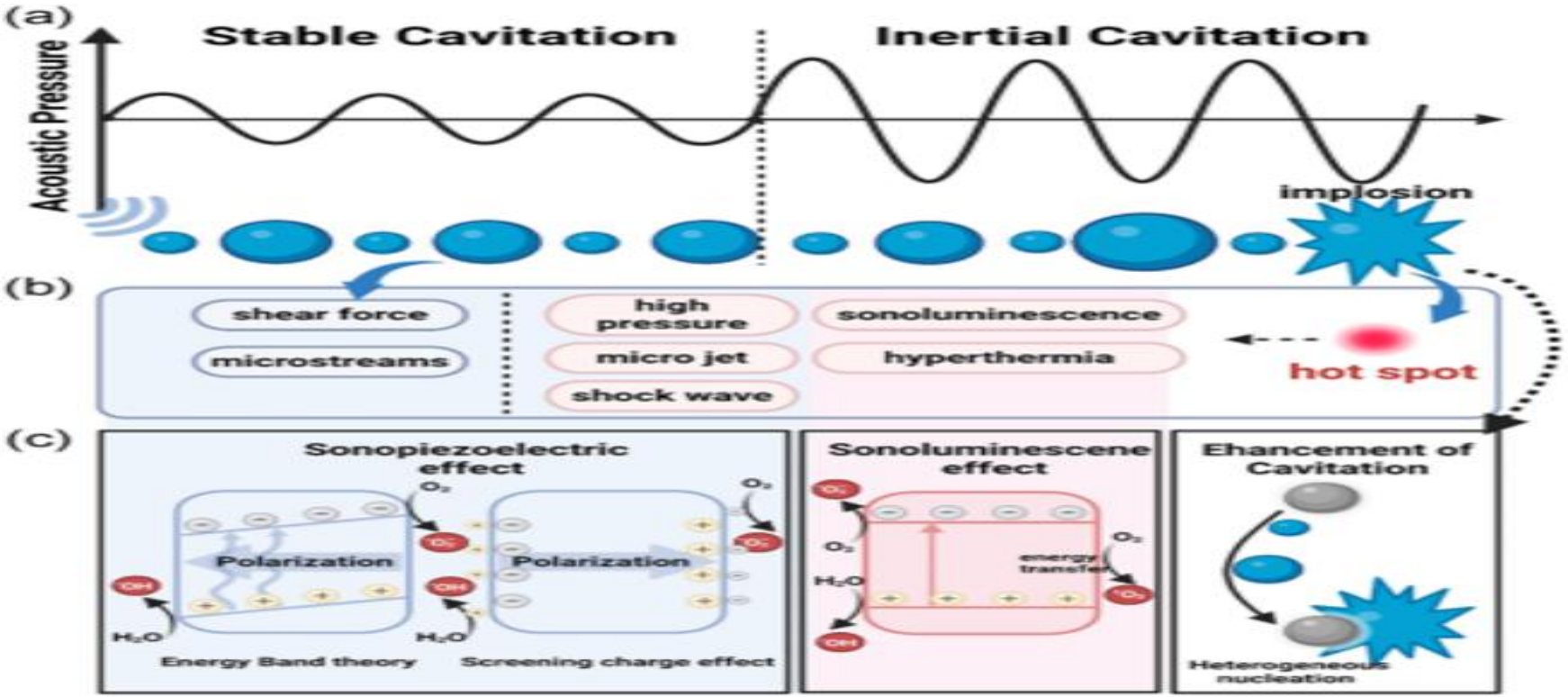
Cavitation

Formation and oscillation of small gas bubbles in tissues; stable cavitation aids healing, unstable can cause damage.



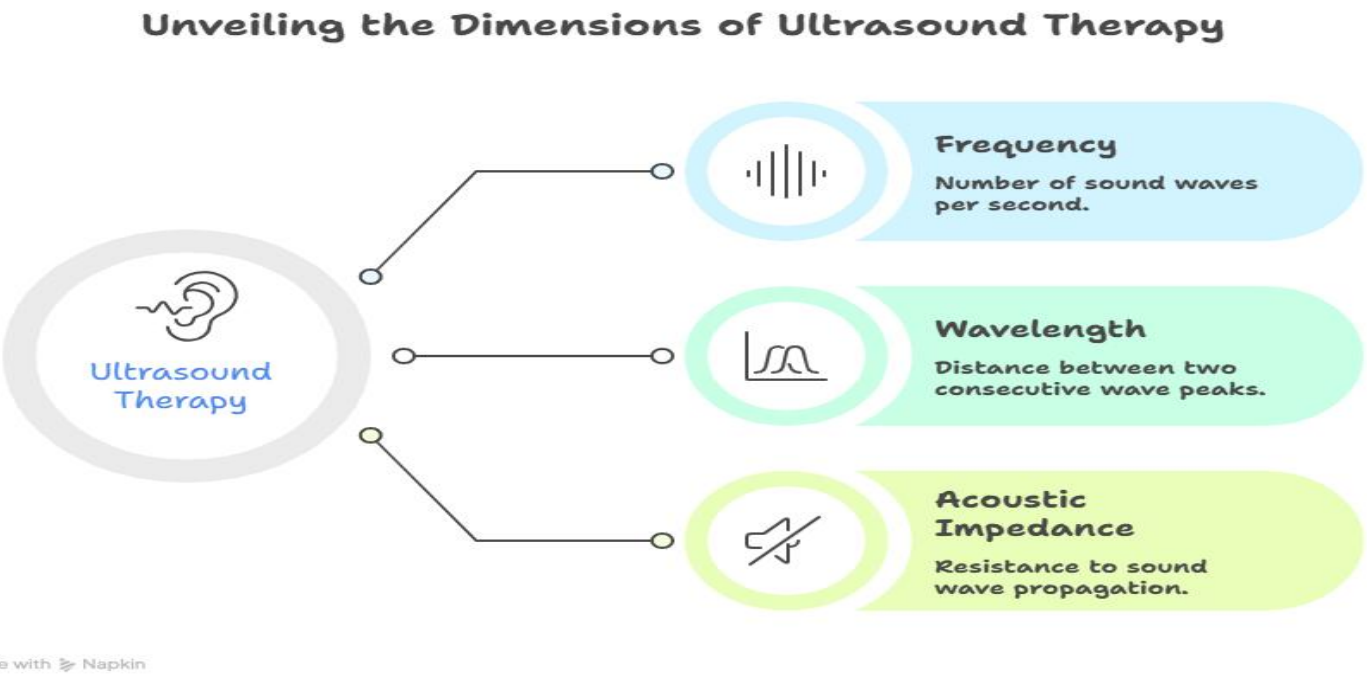
Acoustic Streaming

The steady movement of fluid caused by ultrasound, enhancing cell membrane permeability and nutrient exchange.



Summary

Ultrasound is an effective therapeutic tool that uses acoustic energy principles to promote healing and recovery in physiotherapy.



Thank you