

Sound as a Mechanical Wave

Lesson Notes

Learning Outcomes

- What is a mechanical wave?
- In what sense is sound a mechanical wave?

The Nature of a Mechanical Wave

A wave is ...

- ... a disturbance that travels through a **medium**
- ... transporting energy from one location to another
- ... propagating by particle-to-particle interaction

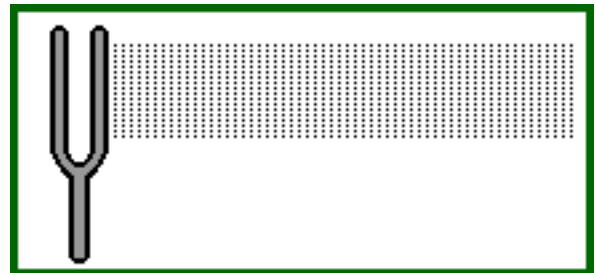


A wave is created by a vibrating object. The vibrations disturb the medium, introduce energy into the medium, and initiate the mechanisms that allow energy transport.

This type of wave is referred to as a **mechanical wave**.

Sound as a Wave

- Sound is a wave created by a **vibrating object**. Examples: vocal cords, guitar string, clanging cymbol, speaker diaphragm, tuning forks
- A **medium** (such as air) carries the wave from the vibrating source to the observer's ear.
- Propagation from one location to another occurs by **particle-to-particle interaction**.
- Particles of the medium vibrate about a fixed position; but **energy is transported** from source to observer.



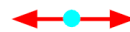
Sound as a Mechanical Wave

Mechanical Wave: A wave that requires a physical material (i.e., medium) in order to propagate from one location to another.

- Sound can move through any material.
- It just can't move through *no material*.
- Mechanical waves require a medium (material).



Felix



*A particle vibrates about its fixed position ...
but energy moves from Felix to Frieda.*



Frieda

Mechanical Waves vs. Electromagnetic Waves

Mechanical waves are created by a vibrating object and propagated through a physical medium.

Electromagnetic waves are created by a vibrating charge and can be propagated through a region void of matter (i.e., a vacuum).

Light waves are electromagnetic waves. Sound waves are mechanical waves that cannot travel through a vacuum.

Physics Demonstration: place a bell inside a vacuum jar and evacuate the air. The sound of the vibrating clapper doesn't reach the microphone since there is no air to transmit it.

