Phone: 417.374.7431
Fax: 417.374.7442
service@gosciencecrazy.com
2076 James River Court
Nixa, Missouri 65714

Mechanical Wave Kit Deluxe
#WVGEN-DLX

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **California Proposition 65 Warning: This product can expose you to chemicals including lead, nickel, and acrylonitrile, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov.**

Introduction

Waves are an essential part of physics. They are a major means of energy transfer. Mechanical waves are waves of energy traveling through matter, while electromagnetic waves are waves made of charged particles that create oscillating electromagnetic fields.

What's Included

- Mechanical Wave Driver
- Sine Wave Generator
- Longitudinal Wave Spring
- Resonance Wire Loop
- Transverse Wave String
- Chladni Plates (square & round)
- Sand
- Metal Resonance Strips
- Connector Cords
- Support Stand
- Holders and Mounting Hardware

Mechanical Wave Driver & Sine Wave Generator Set Up

1. Slide the locking lever to the "Lock" position on the Mechanical Wave Driver. This protects it from being pulled or pushed too far when you are connecting or disconnecting equipment. Be sure to unlock the drive shaft when running experiments.
2. Insert the banana plug connector into the top of the drive shaft on the Mechanical Wave Driver.
3. Unlock the drive shaft using the locking lever and using the banana plug connector cords, insert the output from the Sine Wave Generator to the Mechanical Wave Driver input.
4. To adjust the frequency and amplitude, use the output knobs on the Sine Wave Generator. This produces mechanical vibrations to drive your experiments.
5. Using your assembly tools provided, attach the Mechanical Wave Driver to the stand.

Attaching Different Components

Longitudinal Wave Spring

- Attach the Longitudinal Wave Spring to the Mechanical Wave Driver by hooking one end through the hole in the banana plug connector that is in the top of the drive shaft. Pull the other end up to the top of the stand provided and feed through the hole. This will put tension on the spring. If you are wanting to find how much force is being applied, you can use N-00001 Digital Force Meter to measure the tension.

Resonance Wire Loop

- The Resonance Wire Loop comes with a banana plug connector attached to it. If you already have the other banana plug connector inserted in the drive shaft of the Mechanical Wave Driver, remove it. Insert the banana plug connector that is attached to the Resonance Wire Loop into the Mechanical Wave Driver.

Transverse Wave String

- Tie the string to a fixed location or ring stand that is slightly higher than the Mechanical Wave Driver. Thread the other end of the string through the hole of the banana plug that is inserted in the Mechanical Wave Driver.

Chladni Plates

- This apparatus comes with a square and round Chladni Plate. Whichever one you are using, secure the metal clip through the plate and attach to the Mechanical Wave Driver shaft.

Metal Resonance Strips

- Adjust the metal strips so that they are equal widths apart. Place the metal strips into the banana plug connector that is in the Mechanical Wave Driver.

Longitudinal Wave Activity

- With the Sine Wave Generator set to low and turned on, notice what happens to the spring. Gradually increase the amplitude and frequency until nodes and antinodes form along the spring.
- Nodes appear in sections that are not moving and the antinodes appear to be vibrating the spring. Measure the spacing between two nodes or two antinodes gives a value that is equal to half the wavelength of the standing wave.
    - speed=distance/time
- The speed of a wave can be determined by an equation. Wave speed (v), frequency (f), wavelength (y)
    - v=y X f
- Continue increasing frequency until you see the pattern start to change. Calculate the speed again and compare to your first calculation.

Resonance Wire Loop Activity

- With the Sine Wave Generator set to 5 Hz, turn up the amplitude until the wire loop is vibrating. Gradually increase the frequency until a standing wave appears. Once you increase it to a certain point, the standing wave will begin to disappear until shorter wavelengths form with high frequencies.

Transverse Wave String Activity

- Turn the Sine Wave Generator on at a low frequency, gradually increasing. Record the measurements between 2 nodes and antinodes. Record the frequency producing the wave.
- Calculate wave speed from the wave equation: v= ( ) x ( ) = __ m/s
- Increase frequency to produce shorter wavelengths and higher frequencies.
- Compare values to see the differences.

Metal Resonance Strips Activity

- Start with the Sine Wave Generator on low frequency. Gradually increase amplitude and frequency until resonance begins in the longest metal strip. Continue until resonance begins in the shorter strips.

Chladni Plates Activity

- Plug your connecting cords into the Sine Wave Generator and the Mechanical Wave Driver.
- Check your Mechanical Wave Driver is set to Lock.
- Insert the rod in the center of the plate into the banana plug connector on the Mechanical Wave Driver.
- Unlock the Mechanical Wave Driver, check that the dial on the Sine Wave Generator is on its lowest setting and turn the generator on.
- Spread an uneven layer of sand on top of the vibrating Chladni Plate, and gradually turn the dial to increase the frequency of the vibrations.
- As you turn the dial, look for patterns forming. At least two patterns should appear.