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Ripple and Wave Tank with Stroboscope #WVRPS01

Warning:



- **Not a toy; use only in a laboratory or educational setting.**
- **Choking Hazard: Contains small parts.**
- **Produces stobe lighting. Make sure no observers are negatively effected by strobe lighting.**
- **California Proposition 65 Warning: This product can expose you to chemicals, including lead, ethyl acrylate, and nickel, 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

This apparatus provides a simple and effective method for students to investigate the properties of waves. The tank is completely self-contained, requiring no setting-up apart from the addition of water. A stroboscope is built-in to provide stationary or slowly moving images.

Use this apparatus to study the following:

- Properties of water waves
- Properties of waves in general
- Diffraction, refraction, reflection, and interference

Waves are generated in a small, rectangular tank which is placed on a raised shelf over the internal illumination source. The wave generator is built into the body of the unit and has an electronic drive circuit to vary the frequency which can also be synchronized to the light source. Dippers can be attached to the generator by simply pushing them onto the stem. A hinged lid is situated above the tank and images of the waves are projected on to this for study. When access to the tank is required the lid is hinged out of the way.

The sides of the tank are designed to absorb waves thus avoiding multiple reflections which could cause confused patterns.

Strobe Warning: Take care to ensure that no user or observer of the apparatus is adversely affected by stroboscopic light.



Setting Up

1. Place the unit on a level bench and connect the power supply lead to the side socket. Plug the power unit in to a mains supply and switch on.
2. Set the wave generator and strobe switches to OFF.
3. Lift the hinged lid to gain access to the wave generator.
4. Remove the accessories from the unit.
5. Half fill the tank with clean water (A small amount of surfactant can help to reduce the surface tension of the water).
6. The dippers are a friction fit on the stem. Install a dipper onto the generator stem and adjust until the dipper just touches the surface of the water.
7. Switch on the waves and strobe. Adjust as required.

How to Use

Illumination:

The light source should be set to OFF when setting up the device.

When set to **SYNC** the light flashes at the same frequency as the wave generator. This produces perfectly stationary images.

When set to **FREE** the strobe frequency can be controlled independently of the waves. By choosing a frequency close to the wave frequency the wave patterns can be made to move slowly across the screen.

Investigations:

The various accessories allow different wave effects to be studied. Higher frequencies give shorter wavelengths, meaning with the waves will be closer together. Since the patterns can be made stationary, a sheet of tracing paper or OHP film may be placed on the viewing screen so that drawings can be made for subsequent analysis. In all cases, certain wavelengths give better results than others – adjust the wave frequency to best demonstrate the phenomenon in question.

Reflection:

Use a plane wave dipper and metal L-plate in the tank.

Observe the incident and reflected wave directions. Vary the plate angle to see the effect. The curved reflector can be used to demonstrate converging and diverging waves. A single point dipper generates circular waves and the reflection of these can also be studied.

Diffraction:

Use a plane wave dipper and metal L-plate parallel to the waves.

Diffraction around and behind the plate will be seen. If two L-plates are used with a narrow gap between them, circular waves will be seen generated at the gap.

Interference:

Use the twin point dipper with nothing else in the tank.

Constructive and destructive interference will be seen where the two sets of circular waves meet.

Refraction:

This effect relies on the different speeds of water waves in different depths of water. The effects are only seen when there is a significant difference of depth within the tank. To achieve this, one of the transparent shapes is submerged in the tank and the level of the water is reduced until there is just a film over the shape (a syringe will prove invaluable for this purpose). We should then have about 0.5mm depth above the shape and 8mm depth elsewhere, i.e. a ratio of about 16:1.

1. Place the 5-sided block at the back of the tank so that it presents an angle to plane waves. As the waves slowdown in the shallow water they are refracted towards the normal.
2. Place the convex or concave lens shape in the tank. Again adjust the water depth until there is a thin film over the shape. With plane waves there is a converging or diverging effect respectively.

Care, Maintenance, and General Tips

- At the end of the session carefully lift the tank from the unit, pour away the water, and dry the tank with a soft tissue. Use **non-abrasive cloths** to clean any of the tank surfaces.
- The best waves are generated when the dipper just touches the water surface. This can be achieved by adjusting the dipper height or the water depth.
- Strobe light can be dangerous to some observers. Be aware of the audience using this apparatus and any strobe sensibilities they may have.

