Generating circular water waves (P 1.6.4.1)

P 1.6.4

Propagation of water waves

P 1.6.4.1 Generating circular and straight water waves

P 1.6.4.2 Applying Huygens' principle to water waves

P 1.6.4.3 Propagation of water waves in two different depths

P 1.6.4.4 Refraction of water waves

P 1.6.4.5 Doppler effect in water waves

P 1.6.4.6 Reflection of water waves at a straight obstacle

P 1.6.4.7 Reflection of water waves at curved obstacles

Cat. No.	Description	P 1.6.4.1	P 1.6.4.2	P 1.6.4.3	P 1.6.4.4-7
401 501	Wave trough with stroboscope	1	1	1	1
313 033	Electronic stopclock P	1			
311 77	Steel tape measure, 2 m	1		1	

Fundamental concepts of wave propagation can be explained particularly clearly using water waves, as their propagation can be observed with the naked eye.

The first experiment investigates the properties of circular and straight waves. The wavelength λ is measured as a function of each excitation frequency f and these two values are used to calculate the wave velocity

$$v = f \cdot \lambda$$

The aim of the second experiment is to verify Huygens' principle. In this experiment, straight waves strike an edge, a narrow slit and a grating. We can observe a change in the direction of propagation, the creation of circular waves and the superposing of circular waves to form one straight wave.

The third and fourth experiments aim to study the propagation of water waves in different water depths. A greater water depth corresponds to a medium with a lower refractive index n. At the transition from one "medium" to another, the law of refraction applies:

$$\frac{\sin\alpha_1}{\sin\alpha_2} = \frac{\lambda_1}{\lambda_2}$$

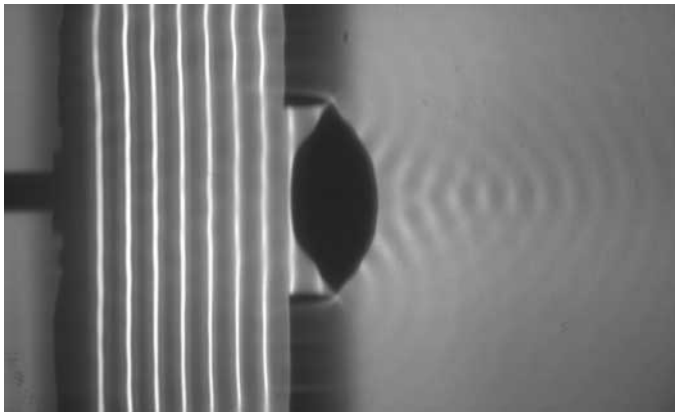
α_1, α_2: angles with respect to axis of incidence in zones 1 and 2

λ_1, λ_2: wavelength in zones 1 and 2

A prism, a biconvex lens and a biconcave lens are investigated as practical applications for water waves.

The fifth experiment observes the Doppler effect in circular water waves for various speeds u of the wave exciter.

The last two experiments examine the reflection of water waves. When straight and circular waves are reflected at a straight wall, the "wave beams" obey the law of reflection. When straight waves are reflected by curved obstacles, the originally parallel wave rays travel in either convergent or divergent directions, depending on the curvature of the obstacle. We can observe a focusing to a focal point, respectively a divergence from an apparent focal point, just as in optics.



Convergent beam path behind a biconvex lens (P 1.6.4.4)