Sound
Learning Guide

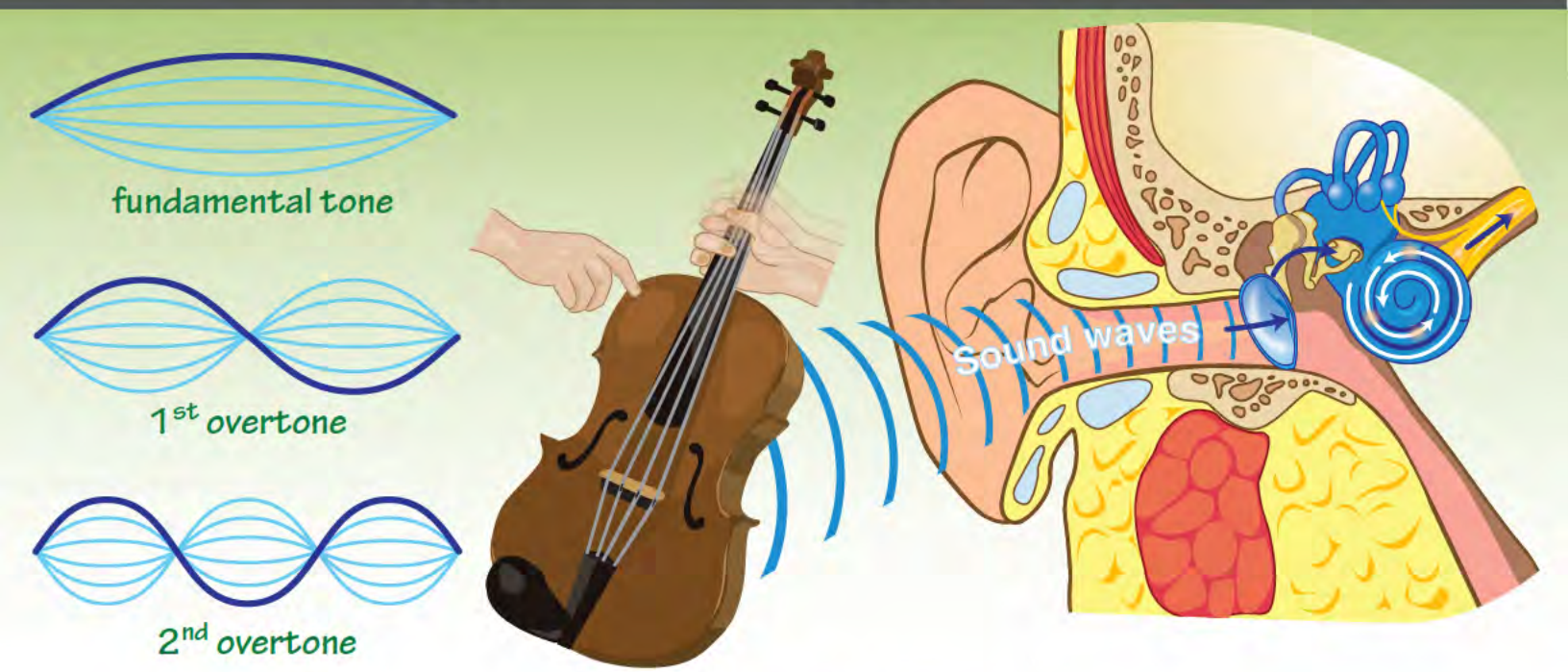

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Table of Contents

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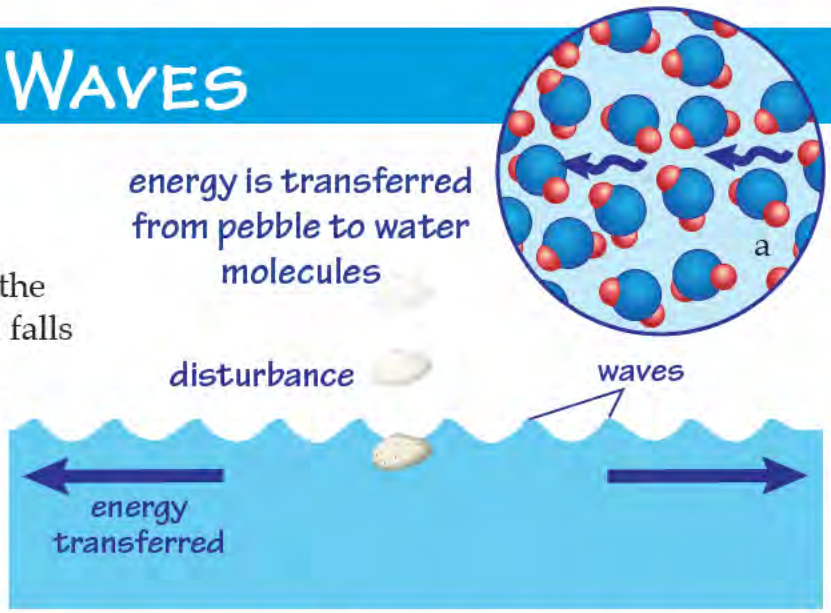
ISBN 978-1-63212-073-1

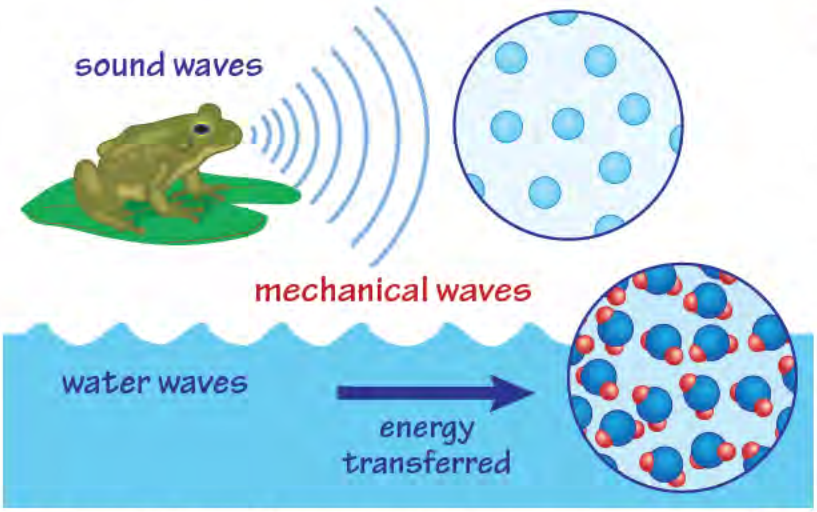
Printed in the United States of America.

INTRODUCTION TO WAVES

What Is a Wave?



If you drop a pebble into a still pond, wave ripples out in all directions across the water. The surface of the water rises and falls in a regular pattern as the wave moves forward. This rising and falling is called a **disturbance**. The falling pebble has energy that is **transferred** to the water molecules. These molecules transfer energy to the molecules near them. The energy from the pebble moves outward as the water rises and falls. Therefore, a **wave** is a **disturbance that transfers energy from one place to another**. Types of waves include water waves, sound waves, and light waves.

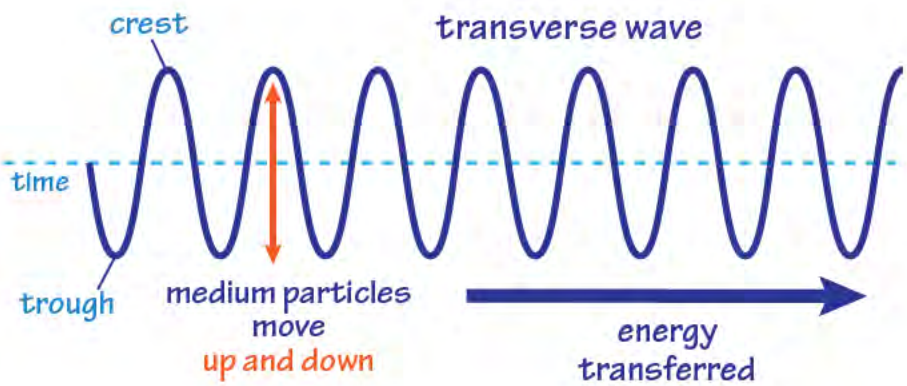


Energy and Waves

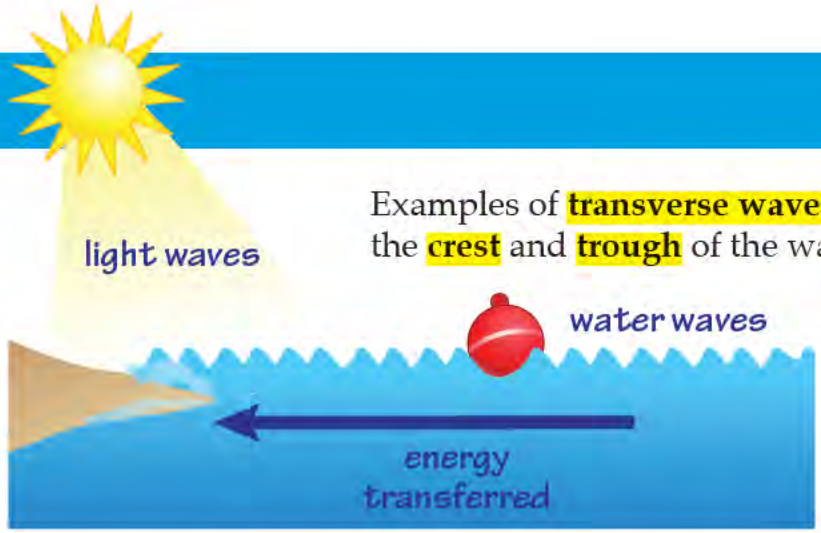
For a water wave, **energy** is **transferred** by the water molecules. For sound waves, energy is transferred by air molecules. A wave that needs a **substance** to travel or transfer its energy is called a **mechanical wave**. The **substance** that the waves travel through is called the **medium**. A **medium** can be a **solid**, **liquid**, or **gas**. Not all waves need a **medium** to transfer energy. **Light** is a wave that can travel through a **vacuum**. A wave can cause the particles of the **medium** to move in two ways, **up and down** or **side to side**. These movements produce two different kinds of waves, **transverse** and **longitudinal**.

Transverse Waves

In a **transverse wave**, the particles of the **medium** move **up and down** while the **energy** moves **forward**. The wave has a **high point** called the **crest** and a **low point** called the **trough**.

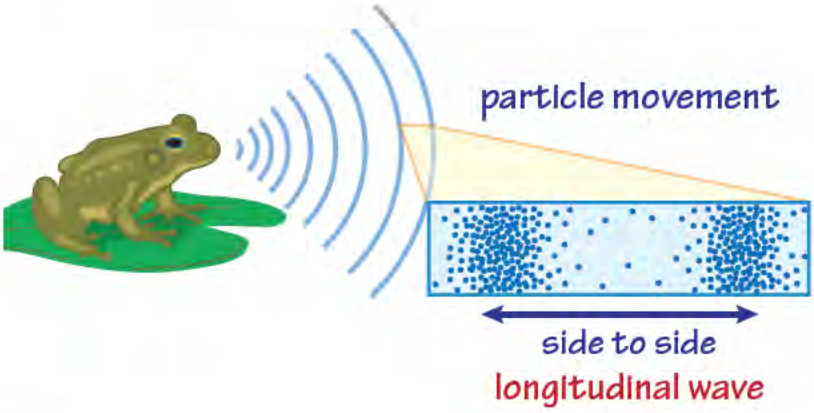


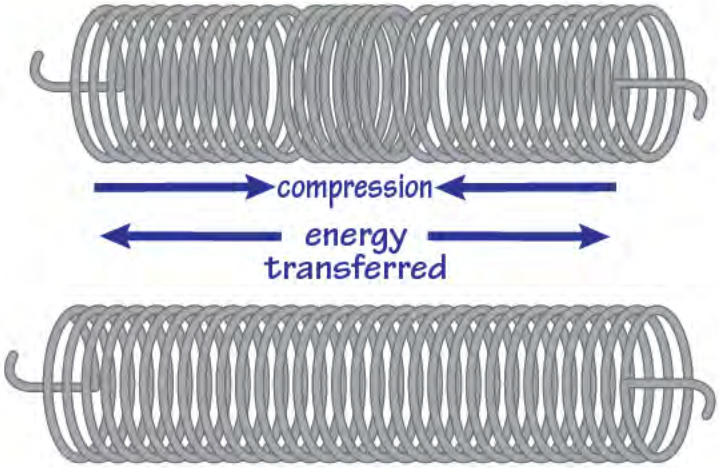
Examples of **transverse waves** are **light** and **water waves**. You can see the **crest** and **trough** of the water wave as it approaches the shore.



Longitudinal Waves

In a **longitudinal wave**, the particles of the **medium** move **back and forth** horizontally, while the **energy** moves **forward**. When the particles are pushed together, it is called **compression**. When the particles are spread apart, it is called **rarefaction**. An example of a **longitudinal wave** is **sound**.





You can observe the motion of a **longitudinal wave** in a **spring**. Stretch out the spring and then pinch some of the coils together. When you let go, the energy will move through the spring with the compressions and rarefactions.

Amplitude

Properties of waves include **amplitude**, **wavelength** and **frequency**. **Amplitude** is a measure of **how big** the wave is. In a **transverse wave**, the **amplitude** is the **height** of the wave from the rest position to the point of greatest displacement. In a **longitudinal wave**, **amplitude** is related to how **compressed** the particles are in the medium. The more energy a wave has, the higher the **amplitude**.