SPH3U UNIVERSITY PHYSICS

WAVES & SOUND

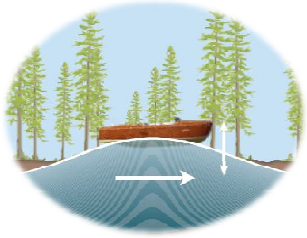
- Wave Motion (P.381-384)

Wave Motion

Waves (mechanical) can be classified according to the direction of the particle motion compared to the direction of the wave motion. There are two basic types of waves: transverse and longitudinal waves.

Transverse Waves

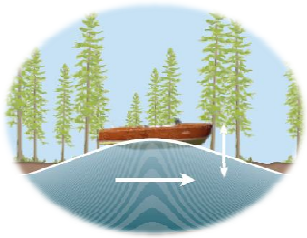
Water waves and waves in a rope are examples of transverse waves. In a ***transverse wave*** *– which consists of crests and troughs – the particles vibrate perpendicular to the direction in which the wave travels.*



Transverse Waves

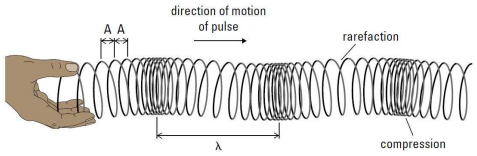
TRANSVERSE WAVE

- particles vibrate perpendicular to the direction of the wave
- consists of crests and troughs



Longitudinal Waves

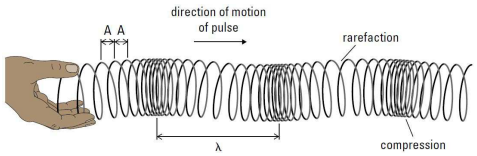
*In some types of waves the particles vibrate parallel to the direction of motion of the wave. Such waves are called **longitudinal waves**. Longitudinal waves – which consist of compressions and rarefactions – can be produced in "slinky" springs by moving one end of the spring back and forth in the direction of its length.*



Longitudinal Waves

LONGITUDINAL WAVE

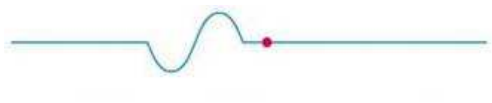
- particles vibrate parallel to the direction of the wave
- consists of compressions and rarefactions



Wave Motion

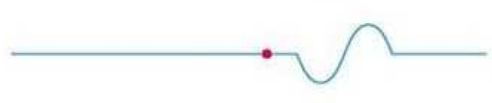
NOTE!

We need to be clear about what is being transmitted. It is a disturbance from some normal value of the medium that is transmitted, not the medium itself.



Wave Motion

When a water wave moves across an ocean or lake, it moves at a uniform speed. But the water itself remains in essentially the same position, merely moving up and down as the wave goes by. Similarly, when a rope is being vibrated at one end, the rope itself does not move in the direction of the wave motion; sections of the rope move back and forth or up and down as the wave travels along it.



REMEMBER!

*It is the disturbance that is transmitted, **not** the medium itself.*

Wave Motion

PRACTICE

1. In sports stadiums an activity called the "wave" is sometimes performed by the crowd. Is this a true mechanical wave? If not, what compromises are being made with respect to the definitions given in the section?

   no – answers will vary (i.e. wave just started, wave is one sided only, particles are not attached, ...)

Wave Motion

PRACTICE

2. The following diagram shows an electric ringer inside a bell jar. A vacuum pump is connected to the jar. The ringer is turned on and the air is slowly removed from the bell jar. Then the air is slowly allowed back in.
   (a) How will the sound from the ringer change as you remove the air? allow the air back in?

(a) air is removed – becomes quieter
air let back in – becomes louder

Wave Motion

PRACTICE

2. The following diagram shows an electric ringer inside a bell jar. A vacuum pump is connected to the jar. The ringer is turned on and the air is slowly removed from the bell jar. Then the air is slowly allowed back in.
   (b) Is sound a mechanical wave? Explain.

(b) yes – answers will vary

✔ Check Your Learning

TEXTBOOK
P.384 Q.1-3