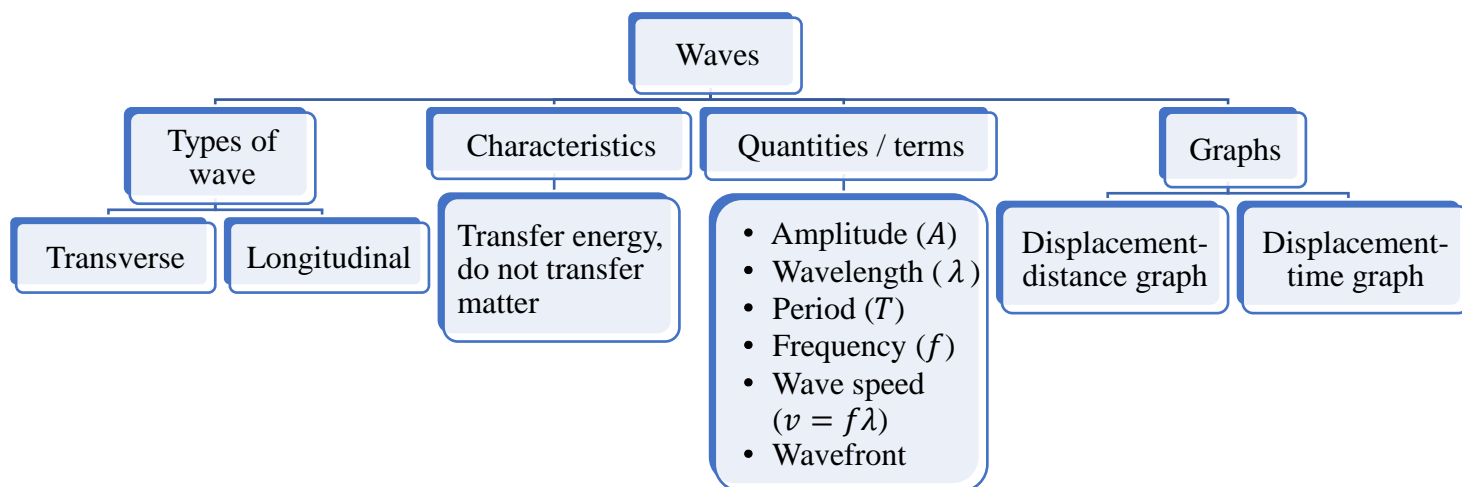


## Chapter 13 – Waves

### Definitions

Phrase	Definition	SI unit
<b><u>wave</u></b>	Periodic disturbance that transfers energy from one place to another through vibrations without the transfer of matter	
<b>crest</b>	Highest point of transverse wave	
<b>trough</b>	Lowest point of transverse wave	
<b>wavelength (<math>\lambda</math>)</b>	Shortest distance between any two points in phase	m
<b>amplitude (<math>A</math>)</b>	Maximum displacement of a point from its rest position	m
<b>points in phase</b>	Points that have same: 1. direction of motion 2. speed 3. displacement from rest position	
<b>period (<math>T</math>)</b>	Time taken to produce one complete wave	s
<b>frequency (<math>f</math>)</b>	Number of complete waves produced per second	Hz
<b>wave speed (<math>v</math>)</b>	Distance travelled by a wave per second	$\text{ms}^{-1}$
<b><u>wavefront</u></b>	An imaginary line on a wave that joins all adjacent points in phase	



### 13.1 Introducing Waves

#### What a wave is

##### Wave

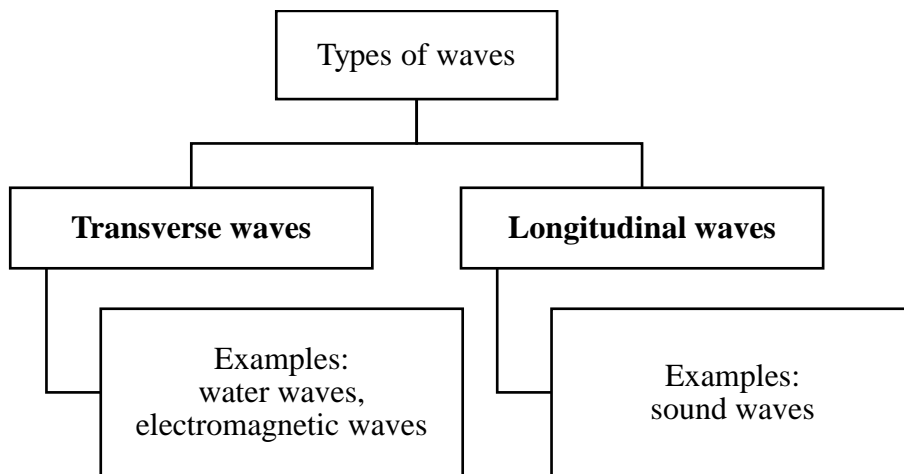
a periodic disturbance that transfers energy from one place to another through vibrations without the transfer of matter

##### Periodic motion

a motion repeated at regular intervals


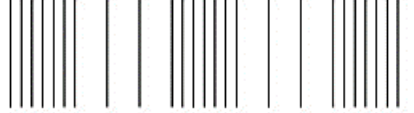
Characteristics of wave:

- The **source** of wave: **vibration** / oscillation
- Wave **transfers energy** from one point to another
- In waves, energy is transferred **without the medium / matter being transferred**



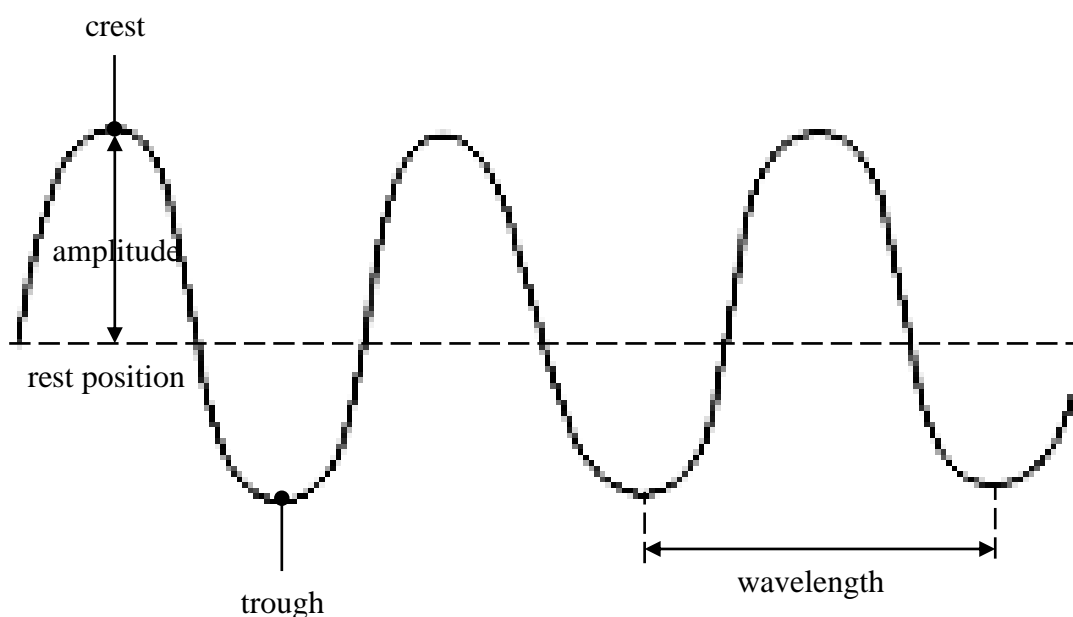
**Transverse waves:** waves travel in a direction **perpendicular** to direction of vibration of particles

**Longitudinal waves:** waves travel in a direction **parallel** to direction of vibration of particles

Transverse waves	Longitudinal waves
<ul style="list-style-type: none"> <li>• Particles move up and down</li> <li>• Kinetic energy transferred from left to right</li> </ul>	<ul style="list-style-type: none"> <li>• Particles move left and right</li> <li>• Kinetic energy transferred from left to right</li> </ul>
	

## 13.2 Properties of Wave Motion

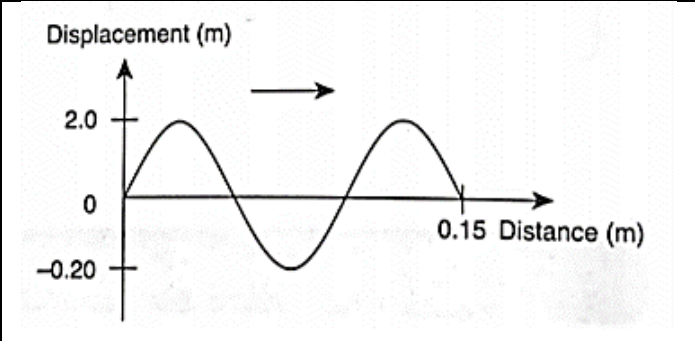
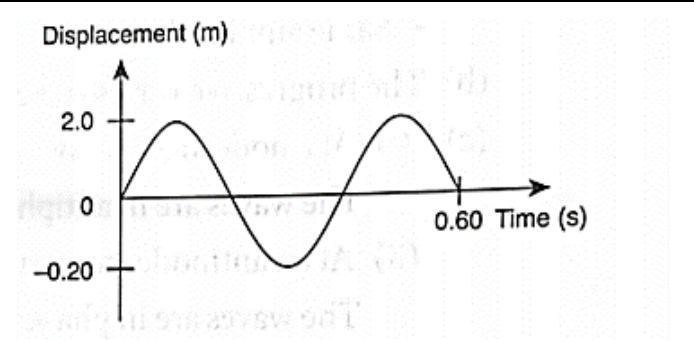
### Describing waves



## Graphs

Graphs:

1. **Displacement-distance graph**
2. **Displacement-time graph**

Displacement-distance graph	Displacement-time graph
<ul style="list-style-type: none"><li>• Describes displacements of all particles at a particular point in time</li><li>• Can obtain amplitude &amp; wavelength</li></ul>	<ul style="list-style-type: none"><li>• Describes displacement of one particle over a time interval</li><li>• Can obtain amplitude &amp; period</li></ul>
 <p>A graph showing Displacement (m) on the vertical axis and Distance (m) on the horizontal axis. The vertical axis has markings at 2.0, 0, and -0.20. The horizontal axis has a marking at 0.15. The graph shows a sinusoidal wave starting at (0,0), reaching a peak at 0.15 m, crossing the x-axis at 0.30 m, reaching a trough at 0.45 m, and returning to the x-axis at 0.60 m. An arrow above the wave points to the right, indicating the direction of wave propagation.</p>	 <p>A graph showing Displacement (m) on the vertical axis and Time (s) on the horizontal axis. The vertical axis has markings at 2.0, 0, and -0.20. The horizontal axis has a marking at 0.60. The graph shows a sinusoidal wave starting at (0,0), reaching a peak at 0.15 s, crossing the x-axis at 0.30 s, reaching a trough at 0.45 s, and returning to the x-axis at 0.60 s.</p>

Formulas:

Frequency to period	Wave speed
$f = \frac{1}{T}$	$v = f\lambda$

## **Wavefront**

An **imaginary line** on a wave that joins all **adjacent points in phase**