

Sound Waves

Spoken Tutorial Project

<https://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in>

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Learning Objectives



Learning Objectives

- **Form a standing wave**



Learning Objectives

- **Form a standing wave**
- **Form nodes and antinodes**



Learning Objectives

- Form a standing wave
- Form nodes and antinodes
- View various types of harmonics of a standing wave



Learning Objectives

- Form a standing wave
- Form nodes and antinodes
- View various types of harmonics of a standing wave
- Calculate the wavelength and frequency of standing waves



System Requirements



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- **Ubuntu Linux OS v 16.04**



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- **Ubuntu Linux OS v 16.04**
- **Firefox web browser v 62.0.3**



Pre-requisites



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- Learner should be familiar with **Apps on Physics**



Pre-requisites

- Learner should be familiar with **Apps on Physics**
- For pre-requisites tutorials please visit this site
<https://spoken-tutorial.org>



Link for Apps on Physics



Link for Apps on Physics

<https://www.walter-fendt.de/html5/phen>



Apps on Physics



Apps on Physics

- **Standing Wave**



Apps on Physics

- **Standing Wave**
- **Standing Longitudinal Waves**



Node and Antinode



Node and Antinode

- Node is the point where the particles do not have any motion



Node and Antinode

- **Node** is the point where the particles do not have any motion
- **Antinode** is the point where the particle oscillates with maximum amplitude



Assignment



Assignment

- Using **Reflection from free end** option, show the formation of standing waves



Assignment

- Using **Reflection from free end** option, show the formation of standing waves
- Observe the reflection by selecting various time period options



Assignment

- Using **Reflection from free end** option, show the formation of standing waves
- Observe the reflection by selecting various time period options
- **Explain your observation**



Wavelength



Wavelength

- $L = (n/4) \times \lambda$



Wavelength

- $L = (n/4) \times \lambda$
- $L =$ **length of tube**
 $\lambda =$ **wavelength**
 $n = 1, 2, 3, \dots, n$



Wavelength

- $L = (n/4) \times \lambda$
- $L = \text{length of tube}$
 $\lambda = \text{wavelength}$
 $n = 1, 2, 3, \dots, n$
- $\lambda = 4L/n$



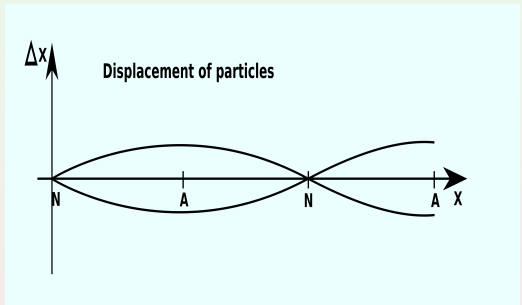
Wavelength



Wavelength

$$\lambda = \frac{4L}{n}$$

$$\lambda = \frac{4 \times 1}{3} = 1.33 \text{ m}$$



Frequency



Frequency

- The number of complete oscillations per second is the frequency of a sound wave



Frequency

- The number of complete oscillations per second is the frequency of a sound wave
- It is measured in hertz(Hz)



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Frequency

- The number of complete oscillations per second is the frequency of a sound wave
- It is measured in hertz(Hz)
- $f = c/\lambda$
- $\lambda =$ wavelength
 $c =$ speed of sound wave



Tabular Column



Tabular Column

Length of tube = 1 m

Vibrational mode	Wavelength (m)	Frequency (Hz)
Fundamental		
1 st overtone		
2 nd overtone		
3 rd overtone		
4 th overtone		
5 th overtone		



Tabular Column



Tabular Column

Length of tube = 1 m

Vibrational mode	Wavelength (m)	Frequency (Hz)
Fundamental	4.00	85.87
1 st overtone	1.333	258.27
2 nd overtone	0.800	429.37
3 rd overtone	0.571	602.63
4 th overtone	0.444	773.64
5 th overtone	0.363	946.28



Assignment



Assignment

Length of tube = 8 m

Vibrational mode	Wavelength (m)	Frequency (Hz)
Fundamental		
1 st overtone		
2 nd overtone		
3 rd overtone		
4 th overtone		
5 th overtone		



Assignment



Assignment

- Change the **Form of tube to both sides closed** and explain the graphs



Summary

- Formed a standing wave
- Formed nodes and antinodes
- Viewed various types of harmonics of a standing wave
- Calculated the wavelength and frequency of standing waves



Acknowledgement

- **These Apps were created by Walter-fendt and his team**



About the Spoken Tutorial Project

- Watch the video available at https://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- It summarises the Spoken Tutorial project



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- If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- Conducts workshops using spoken tutorials
- Gives certificates to those who pass an online test
- For more details, please write to contact@spoken-tutorial.org



Forum for specific questions

- Questions in THIS Spoken Tutorial?
- Visit <https://forums.spoken-tutorial.org>
- Choose the minute and second where you have the question
- Explain your question briefly
- The Spoken Tutorial project will ensure an answer

You will have to register to ask questions



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