

Fluid Pressure and Flow

Spoken Tutorial Project

<http://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in>

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Learning Objectives



Learning Objectives

- ▶ **Demonstrate Fluid Pressure and Flow, PhET Simulation**



System Requirement



System Requirement

- ▶ **Ubuntu Linux OS v 16.04**



System Requirement

- ▶ **Ubuntu Linux OS v 16.04**
- ▶ **Java v 1.8.0**



Pre-requisites



Pre-requisites

- ▶ **Learner should be familiar with the topics in high school physics**



Learning Goals



Learning Goals

We will demonstrate,



Learning Goals

We will demonstrate,

- ▶ **Change in pressure in the presence and absence of atmosphere**



Learning Goals

We will demonstrate,

- ▶ **Change in pressure in the presence and absence of atmosphere**
- ▶ **Change in pressure in various fluid densities**



Learning Goals

We will demonstrate,

- ▶ Change in pressure in the presence and absence of atmosphere
- ▶ Change in pressure in various fluid densities
- ▶ **Bernoulli's principle**



Learning Goals



Learning Goals

- ▶ **Calculate the pressure at the bottom of the tank**



Learning Goals

- ▶ Calculate the pressure at the bottom of the tank
- ▶ Observe the trajectory of a fluid



PhET Simulation-Link



PhET Simulation-Link

<https://phet.colorado.edu>



Pressure at Different Depths



Pressure at Different Depths

Fluid Density	Depth	Pressure
Water 1000 Kg/m^3	1 m	
	2 m	
	3 m	
Gasoline 700 Kg/m^3	1 m	
	2 m	
	3 m	
Honey 1420 Kg/m^3	1 m	
	2 m	
	3 m	



Pressure at Different Depths



Pressure at Different Depths

Fluid Density	Depth	Pressure
Water 1000 Kg/m ³	1 m	111.0 kPa
	2 m	120.8 kPa
	3 m	130.3 kPa
Gasoline 700 Kg/m ³	1 m	
	2 m	
	3 m	
Honey 1420 Kg/m ³	1 m	
	2 m	
	3 m	



Assignment



Assignment

- ▶ Note the change in the values of pressure for the given values of depth



Assignment

- ▶ Note the change in the values of pressure for the given values of depth
- ▶ Explain your observation



Assignment



Assignment

Change in speed and pressure when,



Assignment

Change in speed and pressure when,

- ▶ **Fluid density is changed to gasoline and honey**



Numerical



Numerical

- ▶ A tank of cubical shape is filled with water to a height of 10.42 m



Numerical

- ▶ A tank of cubical shape is filled with water to a height of 10.42 m
- ▶ Find the pressure exerted at the bottom of the tank



Numerical

- ▶ A tank of cubical shape is filled with water to a height of 10.42 m
- ▶ Find the pressure exerted at the bottom of the tank
- ▶ Atmospheric pressure is 102.3 kPa
Density of water is 1000 kg/m^3 ,
 $g = 9.81 \text{ m/sec}^2$



Calculation of Pressure



Calculation of Pressure

▶ $P = P_o + h\rho g$

P_o = Pressure at the surface

ρ = density of the liquid

h = height of the tank



Calculation of Pressure

- ▶ $P = P_o + h\rho g$

P_o = **Pressure at the surface**

ρ = **density of the liquid**

h = **height of the tank**

- ▶ $P = 102300 + 1000 \times 10.42 \times 9.81$
 $= 204520 \text{ Pascal}/1000$
 $= 204.5 \text{ kPa}$



Assignment



Assignment

- ▶ A Tank of cubical shape is filled with honey to a height of 10.42 m
- ▶ Find the pressure exerted at the bottom of the tank
- ▶ The atmospheric pressure is 102.3 kPa
- ▶ Density of honey is 1420 kg/m^3



Assignment



Assignment

- ▶ A Tank of cubical shape is filled with gasoline to a height of 10.42 m
- ▶ Find the pressure exerted at the bottom of the tank
- ▶ Atmospheric pressure is 102.3 kPa
- ▶ Density of gasoline is $700\text{kg}/\text{m}^3$



Summary

- ▶ We have demonstrated **Fluid Pressure and Flow PhET** simulation



Summary

We have demonstrated,

- ▶ **How pressure changes in presence and absence of the atmosphere**
- ▶ **Pressure in different fluid densities**
- ▶ **Bernoulli's principle**



Summary

- ▶ **Calculated the pressure at the bottom of the tank**
- ▶ **Observed the trajectory of the fluid**



About the Spoken Tutorial Project

- ▶ Watch the video available at http://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

- ▶ Do you have questions in **THIS Spoken Tutorial?**
- ▶ Please visit
<http://forums.spoken-tutorial.org>
- ▶ Choose the minute and second where you have the question
- ▶ Explain your question briefly
- ▶ Someone from our team will answer them



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- ▶ More information on this Mission is available at

<http://spoken-tutorial.org/NMEICT-Intro>

