

Physics of Sports

Lesson 4: Energy and its Measurement Teacher's Guide

Connections:

Previous Lesson	Current Lesson	Next Lesson
Quality Assurance and Physics	Energy and its Measurement	Momentum and its Measurement

Objectives:	<ul style="list-style-type: none"> To review and apply the law of conservation of energy To explain the concept of potential energy and its measurement To explain the concept of kinetic energy and its measurements To explore the ways in which energies seem to 'disappear'
Resources required:	<ul style="list-style-type: none"> A ruler The stencil provided with the activity A pair of scissors A pencil or marker Student's Worksheet Lesson 4
Useful data:	<p>Table dimensions</p> <ul style="list-style-type: none"> Length = 274 cm Width = 152.5 cm Height = 76 cm Net height = 15.25 cm <p>The Olympics size ping-pong balls have:</p> <ul style="list-style-type: none"> Diameter = 4 cm = 0.04 m Wall thickness vary but is approximately 0.04 cm. Mass of the ping-pong ball = 2.7 g = 0.0027 Kg Material used: Celluloid (generally) <p>Speeds:</p> <ul style="list-style-type: none"> Rotational speed of the ball, $v = 1.0$ m/s (average), Linear speed of the ball $v = 12$ m/s (linear, at tracking limit or the maximum speed at which you can still see it moving)
Video(s):	<p>Start by showing a short video clip where the game is played at a high speed:</p> <p>https://www.youtube.com/watch?v=46OahVA7GNc</p>
Physics Review:	<p>Kinetic Energy $= \frac{1}{2}mv^2 = \frac{1}{2} \times mass \times (velocity)^2$</p> <p>Potential Energy $= mgh$ where $g = 10\text{m/s}^2$ (approximately)</p>
Discussion Questions:	<p>The activity starts with some questions:</p> <ol style="list-style-type: none"> Do you have any idea of the speed of the ball in a real ping-pong game (12 m/s)? Do you think the ball is rotating while flying? And if yes, can you estimate its rotational speed? (No, not without some special arrangements)

Fun fact	The earliest surviving action game of Tennis on a table is a set made by David Foster, patented in England in 1890. Visit the ITTF site, http://www.ittf.com/museum/history.html to see some historical paintings and photos of the game dating back to 15 th century
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