

## Schedule of Events

TIME	EVENT LOCATION	LOCATION
8:45	Lagoon Autopark (parking lot) opens	
9:30	Lagoon Main Gates to rides opens	Main Gate
9:00 - 11:00	School & teacher registration	Main Gate
9:30 - 11:00	Contest registration & safety approval inspections	Davis Pavilion
10:00-11:00	Utah/Idaho FIRST Robotics Grudge Match—Semifinals	Davis Pavilion
10:00-2:00	Mindstorm Activities	Maple Terrace
10:00-2:00	Wind Energy Challenge MESA Contest Activities	Oak Terrace
12:00 - 1:00	Faculty and staff complimentary lunch	Canyon Terrace
2:30 - 3:30	Contest winners are posted in as judging is completed Prizes may be picked up then.	Davis Pavilion
2:00-2:45	Utah/Idaho FIRST Robotics Grudge Match—Finals	Davis Pavilion
2:45-3:15	Mindstorm Competition—Finals	Maple Terrace
3:30	Awards Ceremony for Physics Bowl, FIRST, Mindstorm and Wind Energy Challenge	Davis Pavilion
4:30	All rides close	
4:45	Park closes	
<b>Sky Drop Contest</b>		
10:00-11:30	Registration for the Sky Drop	Drop Site
11:30-1:30	Eggs can be dropped from the Sky Coaster. Line will close at 1:00, or as soon as the line is finished.	Drop Site
2:30	Winners announced as soon as the contest is done.	Davis Pavilion
<b>Colossus' Colossal G-Forces Contest</b>		
9:30-10:30	Contest registration & safety approval inspections	Davis Pavilion
10:30-12:30	Colossus open for measurements	Colossus
2:00	Entry forms due	Davis Pavilion
<b>Physics Bowl Competition</b>		
9:30 - 10:30	Contest registration	BighornTerrace
10:30 - 11:00	Preliminary Qualification Round	BighornTerrace
11:00 - 11:45	Round of thirty-two	BighornTerrace
1:15 - 1:45	Round of sixteen	BighornTerrace
1:45 - 2:15	Quarter-final round	BighornTerrace
2:15 - 2:45	Semi-final round	BighornTerrace
2:45 - 3:00	Consolation round	Davis Pavilion
2:45 - 3:00	Championship round	Davis Pavilion
3:30	Scholarships and prizes awarded	Davis Pavilion
<b>Physics Demonstration, Lagoon: Ride Design and Physics Day Logo Design Contests</b>		
9:30 - 11:00	Contest registration & safety approval inspections	Davis Pavilion
11:00 - 3:00	Judging	Davis Pavilion
11:00-2:00	Meet with Judges by appointment as arranged during registration	Davis Pavilion
<b>Student Workbook</b>		
10:00 - 3:00	Workbooks Collected	Davis Pavilion
3:30	All entry forms due. Teachers can pick up solutions.	Davis Pavilion

**All students who turn in their workbook to the table at Davis Pavilion by 3:30 can enter a random drawing to**

**Win Fabulous Prizes**



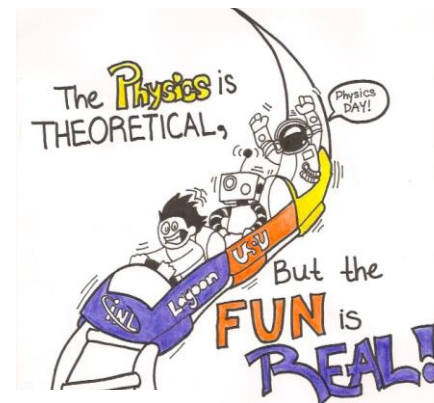
## Middle School Student Workbook

# USU PHYSICS DAY

AT



**May 16, 2014**



**Artist— Emily Ellis  
Kaysville Junior High School  
Advisor—Alex Tolman**

STUDENT \_\_\_\_\_

TEACHER \_\_\_\_\_

SCHOOL \_\_\_\_\_

## WELCOME TO PHYSICS DAY AT LAGOON

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Thank you for coming to Lagoon for a day of physics and fun!

You are one of more than 7000 physics students from more than 100 schools from five states here to enjoy a fun day experiencing Amusement Park Physics first hand.

This Student Workbook is for use in one of many activities that you can participate in today:

Student Workbook Physics Bowl Contest  
Colossus' Colossal G-Forces Contest  
Sky Drop (Egg Drop) Contest  
Physics Demonstration Design Contest  
Lagoon Ride Design Contest  
Physics Day Logo Design Contest

The Physics Department at Utah State University and the Idaho National Laboratory are running today's activities.

The contests are sponsored by ATK Launch Systems, Boeing, Eastern Idaho Regional Medical Center, Hill Air Force Base, Lagoon, Micron, Portage Environment, Rocky Mountain NASA Space Grant Consortium, Space Dynamics Laboratory, US Navy, USU College of Science, USU Emma Eccles Jones College of Education & Human Resources, and USU Admissions Office.

More information about Physics Day is available at [physicsday.usu.edu](http://physicsday.usu.edu). If you have questions or would like to find out more about physics at Utah State University ([www.physics.usu.edu](http://www.physics.usu.edu)), please stop by the Davis Pavilion. We will be glad to see you!

**ABOVE ALL, HAVE A FUN AND SAFE DAY!!!**

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## GENERAL QUESTIONS (con't)

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**FILL IN THE BLANKS WITH THE VOCABULARY IN THE GLOSSARY ON PAGE 3**

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Insert questions here.

## GENERAL QUESTIONS

FILL IN THE BLANKS WITH THE VOCABULARY IN THE GLOSSARY ON PAGE 3

Insert questions here.

## AMUSEMENT PARK PHYSICS GLOSSARY

Here are some physics concepts that you will encounter today. Most of them should be familiar to you after the exciting physics class you've been in this year.

**ACCELERATION:** Time rate of change of velocity (either speed or direction) of motion.

**ACCELEROMETER:** A device to measure acceleration.

**AIR RESISTANCE:** Force resisting motion of a body through air due to the frictional forces between the air and body.

**AMPLITUDE:** The maximum height of the wave above or below zero level.

**ANGULAR ACCELERATION:** Time rate of change of angular velocity.

**ANGULAR VELOCITY:** Time rate of change of angular position.

**CENTRIPETAL FORCE:** A force on an object pulling or pushing the object towards the center of its curved path.

**CONSERVATION OF ENERGY:** Basic tenet of physics stating that energy can neither be created nor destroyed in any process, though it may change form.

**CONSERVATION OF MOMENTUM:** The total momentum of a system is constant whenever the net external force on the system is zero.

**ELASTIC COLLISION:** A collision in which kinetic energy is the same before and after the collision.

**FORCE:** A push or pull. The time rate of change (direction and magnitude) of momentum.

**FREQUENCY:** The number of waves that pass a particular point in one second.

**FRICTION:** A retarding force that resists the motion of a body.

**G-FORCE:** Ratio of the magnitude of acceleration on a body to the acceleration of gravity at sea level on Earth ( $g = 9.8 \text{ m/s}^2$ ).

**GRAVITY:** Attractive force between two bodies, proportional to their masses.

**IMPULSE:** Product of the magnitude of a force on a body times the time over which the force acts on the body.

**INELASTIC COLLISION:** A collision in which kinetic energy decrease as a result of the collision.

**INERTIA:** Tendency of a body to remain at rest or in uniform motion in a straight line.

**KINETIC ENERGY:** The energy of a body associated with its motion.

**LONGITUDINAL WAVE:** A wave that vibrates or oscillates in the same direction that the wave pattern is moving (example: sound wave).

**MASS:** The amount of material a body contains. A quantitative measure of the inertia of a body.

**MOMENTUM:** The product of mass times velocity.

**NEWTON'S LAWS OF MOTION:** Physical laws governing the motion of bodies (at speed much less than the speed of light) expressed in terms of force, mass, and acceleration.

**PERIOD:** The amount of time for one complete wave oscillation to pass a point in space.

**POTENTIAL ENERGY:** Energy of a body associated with its position.

**POWER:** Rate of work done per unit time.

**SPEED:** The magnitude of velocity.

**TRANSVERSE WAVE:** A wave in which the vibration or oscillation is perpendicular to the direction that the wave pattern is moving (example: stadium wave football cheer).

**VELOCITY:** The magnitude and direction of the time rate of change of position.

**WAVELENGTH:** The distance between successive crests or troughs of a wave.

**WEIGHT:** A force proportional to the mass of a body. Measurement of the gravitational attraction of a body to the Earth.

**WEIGHTLESSNESS:** A condition under which a body feels no net force proportional to its mass.

**WORK:** Product of the magnitude of force on a body times the distance through which the force acts.

### Useful Conversion Factors

1 in = 2.54 cm	1 J = 2.78 x 10 <sup>-7</sup> kw hr = 9.5 x 10 <sup>-4</sup> BTU
1 km = 0.621 miles	1 W = 1J/s = 1.3 x 10 <sup>-3</sup> horsepower
1 liter = 0.264 gal	1 W = 1.3 x 10 <sup>-3</sup> horsepower
1 hr = 3600 sec	1 g = 9.8 m/s <sup>2</sup> = 32 ft/s <sup>2</sup>
1 fortnight = 1.728 x 10 <sup>6</sup> sec	1 N = 0.225 lbf
1 m/s = 3.6 km/hr = 2.24 mi/hr	1 atm = 1 x 10 <sup>5</sup> Pa = 14.7 lb/in <sup>2</sup>
1 Cal = 1 kcal = 1000 cal = 4186J	1 kg/liter H <sub>2</sub> O = 8.35 lb/gal H <sub>2</sub> O

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