Schedule of Events

TIME	EVENT	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	Main Gate
9:30 - 11:00	Contest registration & safety approval inspections	Davis Pavilion
10:00-11:00	Utah/Idaho FIRST Robotics Grudge Match—Semifinals	
10:00-2:00	Mindstorm Activities	Maple Terrace
10:00-2:00	MESA Arduino Clean Air Solutions and Mouse Trap Car	Oak Terrace
12:00 - 1:00	Faculty and staff complimentary lunch	Canyon Terrace
2:30 - 3:30	Contest winners are posted as judging is completed Prizes may be picked up then.	Davis Pavilion
2:00-2:45	Utah/Idaho FIRST Robotics Grudge Match—Finals	
2:30-3:45	Mindstorm Competitions	Maple Terrace
3:30	Awards Ceremony in Davis Pavilion	Davis Pavilion
9:30	All rides close	
10:00	Park closes	
Sky Drop Contest		
10:00-12:00	Registration for the Sky Drop is open	Drop Site
11:00-1:30	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 will be announced as soon as the contest is judged.	Drop Site
Colossus' Colossal G-Forces Contest		
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
Physics Bowl Competition (Bighorn Pavilion)		
9:30 - 10:30	Contest registration	Bighorn Pavilion
10:20	Rules Review/Contest Information/Round 1 time slots Drawing	Bighorn Pavilion
10:30 – 11:00	Preliminary Qualification Round in	Bighorn Pavilion
11:00 - 11:45	Round of thirty-two	Bighorn Pavilion
1:15 - 1:45	Round of sixteen	Bighorn Pavilion
1:45 - 2:15	Quarter-final round	Bighorn Pavilion
2:15 - 2:45	Semi-final round	Bighorn Pavilion
2:45 - 3:00	Consolation round	Bighorn Pavilion
2:45 - 3:00	Championship round	Bighorn Pavilion
3:30	Scholarships and prizes awarded	Davis Pavilion
Physics Demonstration, Lagoon: Ride Design and Physics Day Logo Design Contests		
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
USU Physics Day Photo Contest		
2:00	All photo entries due with ***#USUPhysicsDay***	Online
3:00	Contest winners posted ***@USUAggies***	Online
Student Workbook		
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

UtahState University
DEPARTMENT OF PHYSICS

INL
Idaho National Laboratory

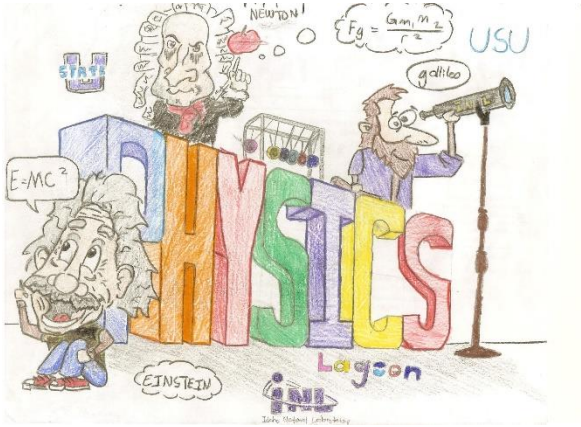
Middle School Student Workbook

USU PHYSICS DAY

AT

Lagoon

May 15, 2020



Artist - Seth Thatcher
School - Centennial Jr. High School
Advisor - Clark

STUDENT _____

TEACHER _____

SCHOOL _____

WELCOME TO PHYSICS DAY AT LAGOON

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

You are one of more than 10,000 physics students from more than 125 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 Aerostructures, Albany, Apogee, ARDUSAT, ASI, Boeing, Campbell Scientific, Eastern Idaho Regional Medical Center, Embry-Riddle, Hill Air Force Base, Idaho Virtual Academy, IM Flash Technologies, Lagoon, Micron, Northrop Grumman, Ophir-Spiricon, Parker-Hannifin Aerospace, 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, USU Admissions Office, Utah Virtual Academy, and WiTricity.

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

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

Table of Contents

GENERAL QUESTIONS

FILL IN THE BLANKS WITH THE TERMS IN THE GLOSSARY ON PAGES 4 & 5

Insert questions here.

FERMI QUESTIONS

Enrico Fermi was one of this country's greatest physicists. Among his accomplishments were the 1938 Nobel Prize for nuclear and particle physics and the title, "Father of the Atomic Age" for his role in building the first nuclear reactor. He had a rare talent as both a gifted theorist and experimentalist. One of his legacies is the "Fermi Question," an insightful question requiring both an understanding of physics principles and estimation skills.

Enrico Fermi
1901-1954

The Fermi Questions given below require information gathered for this workbook, estimation and some clever thinking.

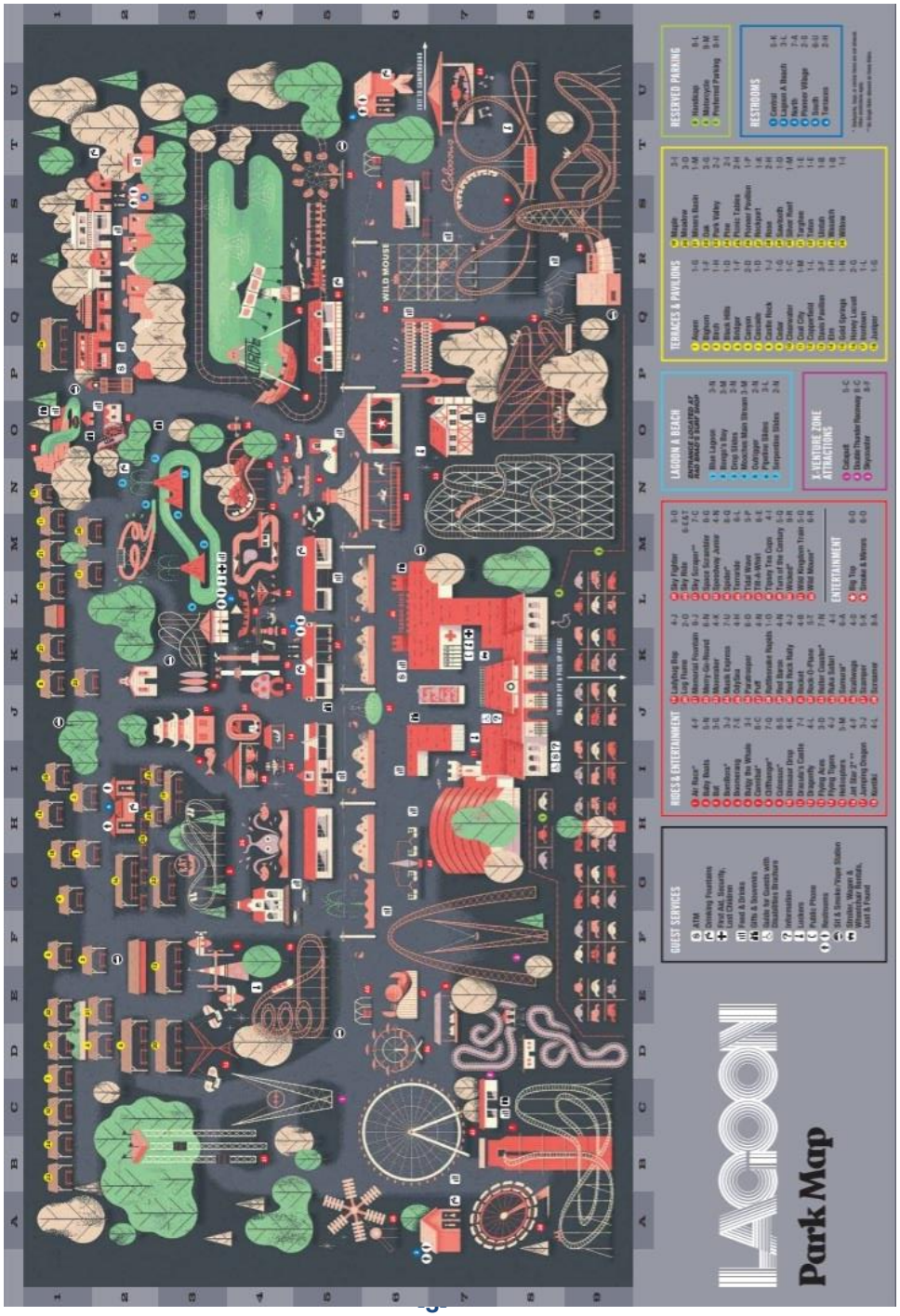
1. This is the 15th year anniversary of the Sky Drop. A contest that challenges students to protect an egg from cracking after it is dropped from the Sky Coaster. Estimate how many eggs have been used for this contest over the years.

   a. First measure how many eggs are dropped per minute. Go to the drop site, set a timer for a minute and count how many eggs dropped.

   b. This contest is only open from 11:00 to 1:30, or 150 minutes. Using your answer in part a, estimate how many eggs will be dropped today.

   c. Using your answer in part b, how many eggs have been dropped for the Sky Drop over the last 15 years?

LAGOON PARK MAP



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: How fast the velocity (either speed or direction) of motion changes with time.

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.

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

DENSITY: The mass of a material per unit volume.

CHARGE: The amount of electric charge determines the force due to an electric field.

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

CURRENT: The charge flow rate or amount of charge passing a certain point per unit time.

DENSITY: The mass of a material per unit volume.

ELECTRIC POTENTIAL (VOLTAGE): The potential energy of a body due to electric force, per unit charge.

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

FLOW RATE: The amount (or number) of something going past a certain point in a certain amount of time.

FLUX: The same as Flow Rate. The amount (or number) of something going past a certain point in a certain amount of time.

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 ($g = 9.8\ m/s^2$).

GRAVITATIONAL POTENTIAL ENERGY: The potential energy of a body associated with its position due to the force of gravity

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.

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

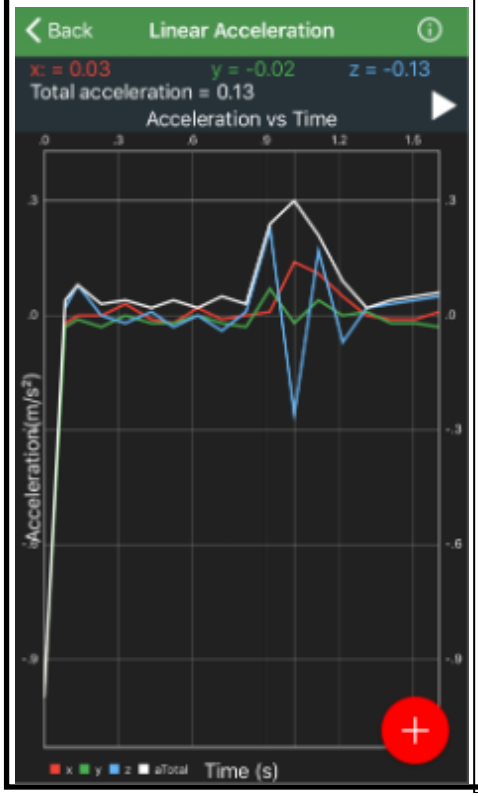
Bored? Do some Physics on your Phone!

Scan QR code to load App

Physics Toolbox Sensor Suite

Your smart phone has a whole host of sensors built into it in order to make your life easier. There are a number of apps available to utilize these sensors to take real data.

Linear Accelerometer – The linear accelerometer measures acceleration in a straight line in three different dimensions.



Download the app and open the Linear Accelerometer.

1) Think about how you can secure your phone while riding your favorite ride. Hold your phone in the position it will be in while you collect data so we can determine what direction will be measured by which axis.

   a) Which axis changes when you move your phone up and down? What color is it?

   b) Which axis changes when you move your phone right and left? What color is it?

   c) Which axis changes when you move your phone forward and backward? What color is it?

2) Now ride your favorite ride and collect data. ***Make sure you safely secure your phone in the same position you held it for part 1.*** (If you need it, tape is available in the Davis pavilion).

   a) What part of the ride had the biggest acceleration?

   b) What direction was it in?

Insert Page

Amusement Park Physics Glossary

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

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.

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

POWER: Rate of work done per unit time.

SPEED: The magnitude of velocity.

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

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 m = 3.28 ft
1 hr = 3600 sec
1 m/s = 3.6 km/hr = 2.24 mi/hr
1 g = 9.8 m/s^2 = 32 ft/s^2
1in = 2.54 cm
1 km = 0.621 miles
1 kg = 2.2 lbs
1 N = 0.225 lbs
1 Cal = 1 kcal = 1000 cal = 4184 J

Common Densities (g/cm^3)

air	0.001
water	1
aluminum	2.7
iron	7.9
lead	11
plastic	0.9
wood	0.9

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