

IB PHYSICS -1

Name: _____

Period: _____ Date: _____

***BADDEST CLASS ON CAMPUS***

***PHYSICS DAY AT BUSCH GARDENS
DATA COLLECTION WORKSHEET***

General Guidelines:

1. Data collection is a group effort among your lab team. Completion of the lab is an individual effort. I expect to see identical data between the members of each group. I do not expect to see identical data on the reports of others outside your group and I do not expect to see identical or paraphrased answers on the final report.
2. Your signature at the end of your report affirms that the work on your report is your own. Any instances of cheating will be referred to the IB administrator for disciplinary action.
3. You are expected to collect data for the three primary rides assigned to your group. If one of the assigned rides is closed, you can substitute the 4th ride for the closed ride. There is no excuse for completing the data collection on your assigned rides. Failure to collect the required data will result in a reduced grade on your final report. Once you have completed the data collection for your assigned rides, you are free to do whatever you want to do until departure time.
4. If you do not like to ride roller coasters, you may use the data collected from your teammates.
5. Save this Data Collection Worksheet and attach it to the back of your final report.

IB Physics 1

#	Team Name	Team Members	Primary Rides	Backup Rides
1.			Scorpion	Kumba
			Montu	SheiKra
			Log Flume	Phoenix
2.			Kumba	Cheetah Hunt
			SheiKra	Scorpion
			Phoenix	Tidal Wave
3.			Cheetah Hunt	Montu
			Scorpion	Kumba
			Tidal Wave	Log Flume
4.			Montu	SheiKra
			Kumba	Cheetah Hunt
			Log Flume	Phoenix
5.			SheiKra	Scorpion
			Cheetah Hunt	Montu
			Phoenix	Log Flume

LOG FLUME

WHAT TO MEASURE OFF THE RIDE

1. Time the log from the beginning of the splash to the end. This will be during the period that the log is in the narrow portion of the trough at the end of the hill.
2. Measure the time that it takes the log to pass a point at the end of the trough.

DATA TABLE

	#1	#2	#3	Average Time
Time from beginning to end of splash				
Time for the log to pass a point at the end of the trough				

IF YOU DIDN'T RIDE THE LOG FLUME: BASIC

1. Measure the time on the last drop for a log to go between light pole A and the beginning of the splash B. (See picture on the front page of Log Flume: Basic)

				Average Time
Time from A to B				

PHOENIX

WHAT TO NOTICE ON THE RIDE

1. Notice where the ride makes you feel heavy and where the ride makes you feel light.
2. When you are upside down, pay attention to your observations and feelings.
3. ***PHYSICS DAYS ONLY: Sit on the row in the middle of the boat and note the largest G Force, as indicated on the mounted G Force Meter. (Use your measurement and that of two friends) Record it below.

	#1	#2	#3	Average
G Force				

WHAT TO MEASURE OFF THE RIDE

1. Measure the time for the Phoenix to pass a point at the bottom of its swing. (Measure from one support beam to the other.)
2. Measure the drop time for the Phoenix. (Pick a cycle where the ride moves slow at the top but doesn't stop.)

DATA TABLE

	Time #1	Time #2	Time #3	Average Time
Time to pass at bottom				
Drop time				

TIDAL WAVE

WHAT TO DO OFF THE RIDE

1. Measure the distance of the splash. (The posts in the water are 0.8 meters apart.)
2. Measure the time that it takes the boat to pass a fixed point after the splash is over.

DATA TABLE

	#1	#2	#3	Average
Distance of the splash				
Time to pass a fixed point after the splash				

IF YOU DIDN'T DO TIDAL WAVE: BASIC

1. Time the boat from A to B at the bottom of the drop. (See picture on front page of Tidal Wave: Basic.)

Time from A to B				Average Time

2. Given that the distance from A to B is 10.9 m, compute the speed of the boat at the bottom of the hill.

Speed at bottom of hill _____

3. Ask someone for their Horizontal G Force Meter measurement.

Horizontal G Force _____

SCORPION

WHAT TO MEASURE OFF THE RIDE

1. Measure the time for the coaster to pass a point at the top of the vertical loop.
2. Measure the time for the coaster to pass a point on the top horizontal loop near the end of the ride.
3. Measure the angle of elevation of the top of the coaster hill; walk back a fixed distance and then measure the new angle of elevation.

DATA TABLE

	#1	#2	#3	Average
Time to pass a point at the top of the loop				
Time to pass a point on the top horizontal loop				
Initial angle				
Fixed Distance				
Final angle				

WHAT TO DO IF YOU DIDN'T DO SCORPION BASIC

1. Measure the time for the coaster to pass a point at the bottom of the first hill.

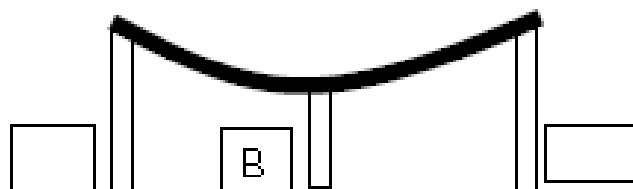
Time to pass a point at the bottom of the hill				Average Time
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2. Find the speed of the coaster at the bottom of the first hill given that the length of the coaster = 10.7 m

MONTU

WHAT TO DO OFF THE RIDE

1. Measure the time for the coaster to pass between post A and post C at the hill bottom following the Immelman, where Post A is the second post in the grass and post B is the lowest point of the track. (Start your stopwatch when the front car passes post A, and stop it when the front car passes post C).



Time to pass between A and C				Average Time
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WHAT TO DO IF YOU DIDN'T RIDE MONTU: BASIC

1. Measure the time for the coaster to pass the top of the second vertical loop (#9).

Time to pass the top of the vertical loop				Average Time
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2. Given that the length of the coaster is 11.6 m, find the speed of the coaster at the top of the loop.

WHAT TO DO ON THE RIDE (Physics Days Only)

1. Sit in the second row where you can see the mounted accelerometer, and note the G Force at the bottom of the hill following the Immel man and at the top of the second loop. Take three readings yourself or use your reading and that of two friends.

DATA TABLE

	#1	#2	#3	Average
Bottom of hill				
Top of loop				

KUMBA

WHAT TO DO ON THE RIDE

1. Ride the coaster near the front and then again near the back. Notice the differences at the tops and bottoms of the hills, especially in the Cobra Roll and in the Vertical Loop.
2. On Physics Days Only: Sit in the second row, in view of the mounted G Force Meter, and record the G Force at the following locations: bottom of the first hill; top of the vertical loop; top of the first corkscrew; carrousel. Record three readings if possible (or use yours and those of two friends) and find the average.

WHAT TO MEASURE OFF THE RIDE

1. Time the descent of the first car from the top of the Cobra Roll to the lowest point. Then do the same thing for the last car. (This is most easily done on the bridge to the Congo)
2. Measure the time it takes the coaster to pass the top of the vertical loop. (Start the stopwatch when the front of the first car reaches the top of the loop, and stop the stopwatch when the back of the last car reaches the top of the loop.)

DATA TABLE

	#1	#2	#3	Average Time
Time of descent of first car				
Time of descent of last car				
Time to pass the top of the vertical loop				

Physics Day Only Ride Data

	#1	#2	#3	Average
Bottom of first hill				
Top of vertical loop				
Top of first corkscrew				
carrousel				

WHAT TO DO IF YOU DIDN'T DO KUMBA: BASIC

1. Measure the time it takes the coaster to pass the top of the first corkscrew.

	#1	#2	#3	Average time
Time to pass the top of the corkscrew				

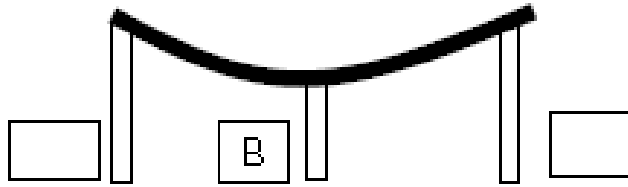
SHEIKRA

WHAT TO NOTICE ON THE RIDE

1. Notice your feelings as the coaster "splashes" through the water.
2. Pay attention to which point on the ride has the most intense G Forces.

WHAT TO NOTICE OFF THE RIDE

1. Time the coaster at the bottom of the first hill between posts A and C.



2. After the coaster goes underwater, time it between the two blue posts at its highest point.
3. Time the splash of the water brake.

DATA TABLE

	#1	#2	#3	Average
Between A and C				
Between two blue posts				
Water brake				

CHEETAH HUNT

ELEMENTS OF THE RIDE

- 1st Launch: Acceleration in the Station
Overbanked Turn: Immediately after 1st launch. Big looping turn.
2nd Launch: Acceleration before the Tower
Tower: You'll come down the tower and into a trench
Outbound Twister: Parabolic hill with a twist up top. You're going over the skyride.
Heartline Roll: Upside down with the heart line as the pivot
Brake Block: Relatively flat, where the coaster can be stopped if needed
Serpentine turns: Like a snake, undulating back and forth
3rd Launch: Acceleration before Air Time Hill
Air Time Hill: Parabolic Hill with a weightless sensation
Inbound Twister: Sometimes called the over and under Train Track Hill, and then Sharp Left Turn into the brakes at the end.

RF1 (Right Front seat of the 1st coaster car in the four car train)

RR4 (Right Rear seat of the 4th coaster car in the four car train)

WHAT TO DO AND NOTICE ON THE RIDE

1. Ride in the first car of the train and the last car of the train. Notice any differences in where you feel the heaviest on the ride.
2. There are two trains loaded at a time. Ride in the front train, and later ride in the second train. Notice any differences on the first launch.

WHAT TO MEASURE OFF THE RIDE

1. Time the coaster train between the highest two posts off the Outbound Twister (this is just after you come down from the tower). Make three measurements and compute the average.
2. Measure the front to back time of the coaster train as it passes the first post at the top of the tower.

Data

	#1	#2	#3	Average
Time between posts of the Outbound Twister				
Front to back time at the top of the tower				

PARK INFORMATION

Busch Gardens® Tampa will open one hour early on December 4, 2015 exclusively for Physics Day students. Physics students will get one hour of exclusive park ride time, interactive physics stations located around the park, plus a live physics interactive show. Accelerometers are even mounted on select rides for student use. Students will have the opportunity to experience world-class roller coasters and make some of their physics calculations without having to wait in line.

Activity Stations:

- Station 1: This Bites - Students will learn the physics behind the bite force of some of the world's strongest carnivores.
- Station 2: I Feel the Need for Speed - Students will learn how to clock an animal's speed by measuring its body and stride lengths.
- Station 3: The Physics of Superman - Students will take a closer look at the biomechanics of animal movement and discover what it would take for humans to have the same physical abilities, particularly the ability of flight.

Demonstration Stations:

- Station 4: The Power of Oobleck - Students gain "hands-in" knowledge of this and other mysterious non-Newtonian fluids to learn about their unique properties that seem to defy Newton's Laws.
- Station 5: That's How We Roll - Explore conservation of energy and magnetic braking through hands-on challenges at this SheiKra® station.

General Guidelines:

- Students should work in groups. Each group should have a Vertical G Force Meter, a Horizontal G Force Meter, and a Stopwatch. **These instruments cannot be taken on the Montu, Kumba, Phoenix, Gwazi, or SheiKra.**
- Except for the height measurement on the Scorpion, which requires a Horizontal Force Meter, the Advanced sections require only the use of a stopwatch.
- On Physics Days there also will be G-Force Meters mounted on the Montu, Kumba, Phoenix, and Gwazi.