

## Raw Data Sheet

Student Name: \_\_\_\_\_

Team members:

1.- \_\_\_\_\_ 2.- \_\_\_\_\_

3.- \_\_\_\_\_ 4.- \_\_\_\_\_

Instructor: \_\_\_\_\_

### Orbiting Puck

Follow the instructions on page 47 of the lab manual and collect the following information below.

1. Mass of the puck: \_\_\_\_\_
2. Spark frequency: \_\_\_\_\_
3. Record the semi-major ( $r_{\max}$ ) and the semi-minor ( $r_{\min}$ ) axes.

$r_{\max}$ : \_\_\_\_\_  $r_{\min}$ : \_\_\_\_\_

4. Record the distance between the two adjacent dots at  $r_{\max}$  and  $r_{\min}$ .

At  $r_{\max}$ : \_\_\_\_\_ At  $r_{\min}$ : \_\_\_\_\_

### Changing of Moment of Inertia

Follow the instructions on page 48 in the manual and record your observations.

## Spinning Bicycle Wheel

1. Describe what happens after you re-orient the wheel in step 4.
2. Describe what happens after you re-orient the wheel in step 6.
3. Describe what happens after you re-orient the wheel in step 9.
4. Describe what happens after you re-orient the wheel in step 10.
5. Describe what happens after you stop the wheel in step 11.
6. Describe what happens after you re-orient the wheel in step 13.

## Introduction<sup>1</sup>

## Analysis

### Orbiting Puck

1. Calculate the velocities at  $r_{\max}$  and  $r_{\min}$ , using the distance between the two dots and the spark frequency. This is the perpendicular component of the velocity at those points.
2. Calculate the angular momentum using  $|L| = mrv_{\perp}$  at both  $r_{\max}$  and  $r_{\min}$ .
3. Calculate the percent error of the angular momentum above. If the angular momentum is conserved, they should be equal, so make one of them the theoretical and the other the experimental.

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<sup>1</sup>This is an adaption from S. Sugaya's original version



## Spinning Bicycle Wheel

1. Sketch and explain what happened in steps 4 and 6.
2. For the steps 9 and 10, sketch and explain why re-orienting the wheel left to right, and front to back produces the same effect.
3. Sketch and explain what happened in step 11.
4. If the initial spin rate of the wheel were same for the steps 9, 10, and 11, would your rotation rate be the same in each? Explain why.

5. We stated in the background that the angular speed of the wheel does not change when reoriented even though it induces rotation in you; kinetic energy is clearly not conserved. If the initial kinetic energy of the system was the rotational energy of the wheel - which remains constant - where did your rotational energy come from?

## Conclusions