**The Impulse-Momentum Theorem**

**Name and section number:**

**Partner’s name and section number:**

1. Make free-body diagrams of the ball and the force plate just before and during an impact. Label the forces. Ignore air resistance. You may enlarge the drawing canvas and move captions.

Ball and force plate just before an impact

Ball and force plate during an impact

2. Calculate the maximum height h21 after the first bounce and before the second bounce from the time difference between the first two bounces, t2 – t1. Calculate the speed just after the first bounce and just before the second bounce, v21. Similarly, write the expressions for h32 and v32. Also, write the y-component of the change in momentum, Δpy2.

h21 = h32 =

v21 = v32 =

Δpy2 =

3. Paste your raw data here. Data boxes for the second, third, and fourth bounces should show the integral of the first peak and half valley in the set of peaks corresponding to one bounce.

4. Enter your raw data into the yellow boxes and your calculated data in the green boxes. Enter the units in the square brackets. All data in the table should have at least four significant figures.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time [] | | Mass = | | [] | Description: | |  | | | |
| t1 = |  | Speed [] | | | Δpyi [] | | Jyi [] | | Δpyi/Jyi | |
| t2 = |  | v21 = |  | | Δpy2 = |  | Jy2 = |  | Δpy2/Jy2 = |  |
| t3 = |  | v32 = |  | | Δpy3 = |  | Jy3 = |  | Δpy3/Jy3 = |  |
| t4 = |  | v43 = |  | | Δpy4 = |  | Jy4 = |  | Δpy4/Jy4 = |  |
| t5 = |  | v54 = |  | |  |  |  |  | Average: |  |
|  |  |  |  | |  |  |  |  | Std dev: |  |
|  |  |  |  | |  |  |  |  | Sd/ave: |  |

5. *Individually* report your result in standard form. Discuss what you expected in comparison with your experimental result. Mention possible reasons for any difference.