# Pivot Interactives Air-track Glider Collisions

**Purpose:** To examine momentum during collisions.

Access the Pivot Interactives lab "Air-track Glider Collisions". If you scroll down to the video window and run the video on the default settings ("Magnet" and "Small masses at equal speed") you will see this:



There are videos for quite a few collision scenarios in this package. There are two "Collision Types" – a collision in which the two gliders don't come in contact but exert forces on each other through magnets mounted to the ends of the gliders, and a collision in which the two gliders stick together after the collision because there is putty on one of the gliders.

For each of the collision types, there are various scenarios involving different glider masses and different glider speeds. We will look at six scenarios altogether – three with putty and three with magnets.

We will begin by examining momentum in each of these scenarios. But then we will move on to looking at kinetic energy before and after the collision.

We will start with putty collisions.

Once you've opened the menu on the bottom of the video window, press "Clear". Then choose "Putty" for Collision Type and "Large mass into stationary large mass". Press "Go". Now open the toolbox, and activate the stopwatch and the two rulers. Your first task will be to measure the velocity of the moving mass using the ruler on the left side of the video window and the

stopwatch.  Then after the collision and while the two gliders are stuck together, measure the velocity again using a ruler and the stopwatch.

Open a spreadsheet and enter your measured distances and times – and your calculated velocities.  Then calculate the momentum before the collision and the momentum after the collision using the velocities you determined and the masses of the gliders, which are located above the video window.  Open a Word file and copy the section of the spreadsheet you just used with the title "Putty and large mass into stationary large mass" into the Word file.  Is momentum conserved in this collision?  Answer this question underneath your table.

Now do the same for two more putty collisions – "Large masses at different speeds" and "Small mass into large mass at half speed".  Like velocity, momentum is a vector quantity.  If you decide to assign a positive sign to motion to the right (and therefore a negative sign to motion to the left), make sure you are consistent with these signs.

Switch the Collision Type to Magnet, and perform your measurements – the velocities of each of the gliders before and after the collisions (although the gliders never touch) – for three scenarios:  "Small mass into stationary large mass"; "Large mass into stationary small mass"; and, "Small masses at different speeds A".  As with the putty collisions, copy screen shots of your tables from your spreadsheet into your Word file, and underneath each answer whether momentum is conserved.

Now we will switch to discussing energy.  Determine the kinetic energy (the total of the two gliders) both before and after each of the six collisions.  Answer this question in your Word file for each of the six collisions:  Is kinetic energy conserved in the collision?  If not, how much kinetic energy is lost in the collision?

Submit your Word file via Canvas.