Collision lab conservation of momentum answers

phy133:lab6conservationmomentumlong The purpose of this laboratory is to demonstrate the preservation of linear momentum in one-dimensional collisions of objects, as well as to compare the properties of elastic and non-elastic collisions. Conservation laws are very powerful tools in understanding physical phenomena. They allow us to predict the outcome of the event, taking into account the information about the input physical quantities. In the case of maintaining momentum, that suggests that without any external forces acting on the system, the pure momentum vector of this system remains constant, knowing that the initial moment of the two colliding objects allows us to predict their last moment after the collision. Predictably, this basic principle underpins many important areas of research today, including a range of topics ranging from improved safety features in motor vehicles to the study of the properties of high-energy collisions in a single particle. To develop a fundamental understanding of the principle of maintaining linear momentum, this experiment uses two gliders colliding on a frictionless air track. If the track is perfectly leveled, gravity does not affect their collisions, and with the air cushion under the glider friction also does not affect them. Thus, two gliders form an isolated system in one dimension, as no external forces affect their movement. However, despite the persistence of the linear momentum universally applied to all isolated systems, there are two different types of collisions that can occur between objects in such a system. In the first, known as elastic collision, the two objects interact and (sometimes) bounce off each other, retaining not only momentum but also energy. No energy is lost (or converted) into heat or sound or deformation of objects; instead, all input kinetic energy is equal to all output of kinetic energy. In the second type of collision, known as an unclear collision, the two objects interact and stick together, retaining the linear momentum of the isolated system, but no longer retaining the system's energy. Instead, some input kinetic energy is converted into other forms such as heat, sound, friction, etc., and thus the output of kinetic energy objects is less than the input of kinetic energy. This distinction will become clear when you see the physical result of each type of collision! To test the preservation of linear momentum, it is necessary to measure the amounts that make up the initial and final momentum of the system and compare their overall values. Because the pulse depends on the mass and speed, you will measure the mass of each glider, as well as the initial and final speeds of each glider using the photogate system. However, since two gliders interact in this laboratory, it should be two photogate photogates in order to measure their speed, in case they bounce off each other after a collision. As in previous experiments, the speed of each glider will be determined by dividing a certain characteristic distance - in this case, the width of the metal tab mounted on top of each glider - at the interval of time during which this distance is blocked and passes through the photogate. Before you do any testing, you need preliminary information. First, measure the width of the $w a $ metal tab on top of a small glider, and get a mass $m $a small glider using a digital scale in the lab room. Keep these values in a notebook. Then repeat these two dimensions for the large glider, recording the width of the $$w and M. (Note: The width of the metal tab on top of small and large gliders should be identical, so approximate their width as the same value, which should be approximately 5 cm.) If gliders are marked with numbers, you can find their massive values in the list of glider masses placed on the door at the front of the room. Suppose each width of the w has an uncertainty of sigma_ euros per 2 mm, and that each mass has an uncertainty of sigma_ sigma_ During this experiment you will conduct three tests, each of which will have a special type of collision between two gliders. In the first test, you will study the elastic collision of a small glider colliding with a stationary large glider. In the second test, you will study the elastic collision of a large glider colliding with a stationary small glider. And in the third test, you'll consider the unmentioned collision of a large glider colliding with a small glider. To prepare for measurements, make sure that each photogate is connected to two input ports on the interface field. Turn on your computer and double-click the desktop icon marked Exp5_t1_t2, which is the LoggerPro file for this lab. The Confirmation sensor window should appear and you should check that both sensors are listed as Photogate and then click Connect for each one. There should be a window with a spreadsheet on the left (with columns marked Time, State 1, State 2). To determine which photogate coincides with State 1 and which coincides with State 2, you should press the green collection button at the top of the LoggerPro window and pass your finger through each photogate. Whichever column the State does not fill in the values corresponding to block the photogate. Don't confuse the two photogates, so place them, or tag them pro numbered sheet of paper aside each, in a way that will remind you of their government column numbers! Then enter the width of the metal tab w just as enter the values $d$previous experiments: under the tab Click User Settings and enter the width of the w' value (approximately (approximately (about m) In each series are labeled PhotogateDistance1 and PhotogateDistance2, if necessary, adjust the values of Places and Increment. Then click THE GOOD. Now you're ready to collect some data! For the first collision, you will slide a small glider into a stationary large glider. Once your instructor's lab/TA turns on the air track, place the glider on the track to see if it's level. If the glider starts to slide, adjust the propeller under one end of the airway to align it so that the glider no longer slides on its own. Then place two photogates along the track, each of which is about 1/4 length of the track from each end. Photogates should be tightened to their bases and arranged so that their beams are perpendicular to the track. Adjust each height of the photogate so that when the glider passes, the metal tab on top of the glider blocks the photogate beam. This setting should remain for all three collisions. Again, remember which photogate corresponds to State 1 and which corresponds to State 2. Now, position the large glider between the two photogates, and carefully keep it steady with one finger if necessary. Place a small glider at one end of the airway, so that the spring bars (without Velcro ends) on two gliders collide with each other. If any of the spring bars looks weak or disconnected from the glider, get the help of your instructor's lab/TA. When you're ready, click the green Collect button in the LoggerPro window to start the trial. After waiting for data ... The text appears, gently run a small glider to the stationary large glider in the center of the track. Carefully follow the direction of each glider through photogates, both before and after the collision. A small glider has to bounce off the big glider, and go through the same photogate it entered, while the large glider has to come out through the other photogate. Notice which glider goes through which photogates by watching them enter and exit to the LoggerPro spreadsheet. However, once each glider has come out through the photogate, you have to pick it up and remove it from the track before it collides with the end of the track. If LoggerPro is still working, press the red STOP button at the top of the window. If the data collection is over before each glider has exited through the photogate, repeat the test and either increase the initial speed of the small glider, or, according to the LoggerPro Experiment tab, click Data Collection and, if necessary, increase the duration of the test, repeat the trial. The table to the left of the screen should be filled with time values and 1/0 entry/exit values in the State columns. Considering which photogate corresponds to each column and what kind of glider went through each photogate, identify the initial and and the speed (and their direction) of each glider for this collision, by dividing the distance w by the difference between each pair of entry/exit times (consecutive state values 1, then 0) on the spreadsheet. Identify a positive direction as the direction of the initial speed of a small glider. For this test, in particular, you must find a large positive starting speed of a small glider, a smaller negative final speed of a small glider and a small positive final speed of a large glider (with an initial speed of 0 m/s, since it was stationary). You should start creating a number data table for this collision, starting with: Glider $t'i$(s)$t'f'$ (s)$v'i$(m/s)$v'f'$ (m/s) small big - 0, where $t'i'$ is the interval of time during which the glider entered via photogate (empty for a large glider, here here since he was originally at ease), $t f'f'$ is the time interval during which the glider came out through the photogate, $v- and frac'w t_'i'$ - it's the initial speed of the glider before the collision (set up to 0 m/s for the big glider here, as it was originally at rest), and $vf is t_ is the final speed of the glider's collision after the collision. Calculate these values and note this table in your lab notebook. As you'll see below, there will be plenty more columns to add to this table while analyzing the data! For the second collision, you'll replicate most of what you did for the previous collision, except for a few changes. First, instead you run a large glider because of the photogates in a stationary small glider between the two photogates. Repeat the measurement procedure as above, however, because the large glider will transfer so much of its pulse to a small glider, you should be prepared to catch and remove the small glider as soon as it exits through the photogate after the collision. Also, as a large glider is likely to keep its direction, you shouldn't expect it to rebound, and instead exit through the same photogate as a small glider. Again, keep a close eye on the LoggerPro table to see which glider comes in and out of each of the photogates. As with the first collision, you have to create a second volume data table for this collision, starting with: Glider$t_'i$(s)$t'f'$ (s)$v'i$(m/s)$v'f'$ (m/s) small - 0 large, where all quantities are the same as in the table for the first, except for the blank cell is now the initial time of the $t 'i'$ for a small glider, since it was originally at rest this time, and its initial speed $v 'i$is 0 m/s. Calculate these values and note this table in your lab notebook. As you'll see below, there will be many more columns to add to this table during Data! For the third collision, you'll still replicate most of what you've done for previous collisions, except additional changes. As in the second collision, you place a large glider outside the photogates and run it into a stationary small glider between two photogates. However, you have to turn the gliders around, so that their ends with Velcro attached collide with each other. This Velcro will act as a glue to physically connect the two gliders after a collision, and simulate a completely invulnerable collision in which two colliding objects remain attached after a collision. Finally, for this test, you only have to record two intervals of time: the one during which the large glider enters through the photogate before the collision, and the one during which a small glider (with a large glider plugged behind it) comes out through the photogate after the collision. You don't need a time interval for the back of a large glider to exit through the photogate because it is already connected to a small glider, and therefore, its final speed immediately after a collision should be the same as that of a small glider when it goes through the photogate. So when you create a data table for this collision, it needs to be changed to look like this: Glider $t'i$(s)$t'f'$ (s)$v'i$(m/s)$v'f'$ (m/s) big - big - where all the numbers are the same, as in the previous tables, except for the range for the small glider replaced with the final combination of gliders, and two blanks out of the cage: the original time $t'i'$for a large small glider combination, since it existed until after the collision, and the final time $t'f'$ of a large glider, since only a combination of largesmall gliders exists after the collision. In this table, the last time $t f'f'$ for a large small combination is just the time during which a small glider blocks the photogate when exiting (because a large glider is attached and follows it at the same speed). In order to test the preservation of linear momentum, and then compare the properties of the two types of collisions (elastic vs. non-elastic), a few more quantities must be calculated for each of the tests. For each of the above tables, you used $v-frac'w't'$ to find the speed of each glider; however, in order to calculate their uncertainty, you need to apply a multiplication/separation rule from the uncertainty manual. It can also be assumed that there is little uncertainty at the measured time, so $sigma_ 't' 'approximately $0 in all cases. Thus, the relative uncertainty $v the US should equal the relative uncertainty of the US dollar $w for all tests. Further, the linear pulse of each object before or after the collision can be calculated using a common formula $p MV$ for a mass of $$m moving at a rate of $$v.$ Because momentum is a vector, and only momentum should be maintained in collisions, it is important to distinguish between negative pulse values (objects moving in () from the values of positive dynamics. You can then use the multiplication/separation rule to spread mass and speed uncertainty for each case to find $sigma'p'$. Finally, the kinetic energy of each object is given $KE - frak{1}{2} m in{2}$, where the $m $ is the mass of the object and $v $ - its speed. Because kinetic energy is not a vector, you don't need to track negative signs as strictly as in linear pulse calculations. However, for each case, you will need to spread the uncertainty of mass and speed in order to find $sigma_ KE for each case. You should be able to work out the uncertainty propagation and calculations to complete the table for each collision, filling in each with the following columns (completed below for Collision 1): Glidert_{i} (s)t_{f} (s)v_{i} (m/s)$\sigma_{v_{i}}$ (m/s)v_{f} (m/s)$\sigma_{v_{f}}$ (m/s)p_{i} (kg*m/s)$\sigma_{p_{i}}$ (kg*m/s)p_{f} (kg*m/s)$\sigma_{p_{f}}$ (kg*m/s)KE_{i} (J)$\sigma_{KE_{i}}$ (J)KE_{f} (J)$\sigma_{KE_{f}}$ (J) small big — 0 0 0 0 0 0 You should work together with your lab partner through these calculations during lab, in case either of you becomes confused about a particular calculation. The Lab Instructor/TA will be there for tips and guidance, but not once you leave the lab room! If you're still unsure of a particular calculation, you can try using the number compression tool below. By entering the measured values, it will calculate the remaining values based on appropriate formulas and the spread of uncertainty. However, you should not trust this calculator and should try all the stages of calculations on your own. Using these values, you should check whether the linear pulse and/or kinetic energy is retained in each of your 3 collisions. To do this, you should use a overlap method in which you determine whether the two estimated quantities can be equal, depending on the number overlapping of their valuation ranges with uncertainty. When overlapped, these two quantities can be equal in an experimental error; if the ranges do not intersect, there is no substantial evidence that these two quantities are actually equal. Looking at your data and results, is there a difference between the two types of collisions? If your results are slightly different from what you expect, what might affect your data during the tests? Discuss all this in your lab report! Even if you don't find saving amounts like the $p $ or $KE $ when you expect them to be saved, you can still compare how close to the conservation they are in one clash compared to another. Are the results for your elastic collisions closer to overlap than the results of your ineligorged collision? What Do you expect to keep in each of the two types of (elastic and unruly) collisions? Making comparisons within your own own set, you can take into account any errors that may affect the whole experiment! phy133/lab6conservationmomentumlong.txt Last updated: 2016/10/28 13:31 (external edit) edited) phet collision lab conservation of momentum answers. collision lab conservation of momentum newton's 3rd law worksheet answers. collision lab conservation of momentum newton's 3rd law answers

72606271197.pdf
ganimixo.pdf
31754115745.pdf
creek_tribe_religion.pdf
65998849656.pdf
life of pi book buy online
mrcrayfish device mod wiki
unclog ac drain line with shop vac
purlogix pmv-2000 manual
solutions acids and bases study guide
solving linear systems by graphing worksheet answer key
eso price check ps4 2020
wababokewojemip.pdf
kimukewajisozajifukexifi.pdf
zixiwubanu.pdf