

*Adapted from Take-Home Physics by Michael Horton*

**Objective**

- Observe conservation of momentum and energy.

**Materials**

- Grooved ruler
- 5 glass marbles

**Procedure**

1. A Newton's Cradle is a desk toy where five or six balls hang from strings touching each other. When a ball is swung into the others, the first one stops and the last one flies out. You will be making a simple version in this lab.
2. Lay the ruler perfectly horizontal and put the marbles in the center touching each other.
3. From one end, roll a marble so that it hits the other four. What happens? \_\_\_\_\_
4. From one end, roll two marbles so that it hits the other three. What happens? \_\_\_\_\_
5. From one end, roll three marbles so that it hits the other two. What happens? \_\_\_\_\_
6. From one end, roll four marbles so that it hits the other one. What happens? \_\_\_\_\_
7. Roll one marble extra fast to try to get two marbles to come out at half the speed. \_\_\_\_\_
8. If a marble of mass  $m$  comes in at velocity  $v$  and stops and an identical marble flies out the other side, what will its velocity have to be to conserve momentum? \_\_\_\_\_
9. Show that momentum was conserved in steps 3-7. \_\_\_\_\_
10. Show that momentum would be conserved in step 7, but kinetic energy would not be conserved if two marbles came out at half the speed.  
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