Dynamics Carts (Set of 2)
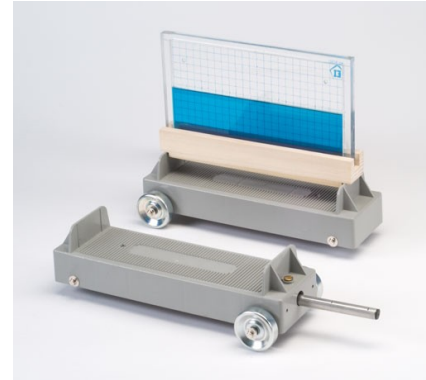
P3-3530

MATERIALS INCLUDED:

2 Dynamics Cart Assemblies
1 Piston
1 Spring
10 Rubber Bands
1 Plastic Plug

ASSEMBLY INSTRUCTIONS:

The Dynamics Carts come completely assembled except for the spring bumpers.

To attach a spring bumper to each cart:

1. These may be attached to the carts by inserting one screw, from the inside of the cart, through the hole in the bumper.

2. Secure the screw with a wing nut.

3. Bend the bumper into a loop until the second hole in the bumper lines up with that of the cart.

4. Insert the second screw into this hole and secure with the wing nut.

5. Repeat steps 1-4 to attach the spring bumper to the second car.

To attach the spring to the piston:

Note: Only one cart requires a piston and spring assembly.

1. Attach spring to the piston by slipping the loop through the piston end with the holes. Do not stretch the spring loop out of shape; make sure it is securely attached to the piston.

2. Turn the cart assembly and screw near the rear wheel. With a twisting motion, insert the spring and piston into the metal cylinder (spring first) until you see the loop in the free end of the spring through the opening. Check to make sure that the small slot on the extending end of the piston faces the top of the cart body.

3. Pass the screw back through the cart, spring loop and metal tube. Make sure that the screw securely holds the spring.

4. To operate, push the piston into the metal tube as far as it will go, until you hear a click. This will be the metal retainer engaging the slot near the end of the piston. To release, simply press down the release post on the front end.

5. For soft collisions, repeat Step 4 but push the piston in only about two-thirds until it locks.
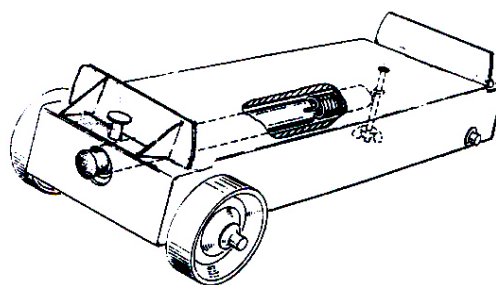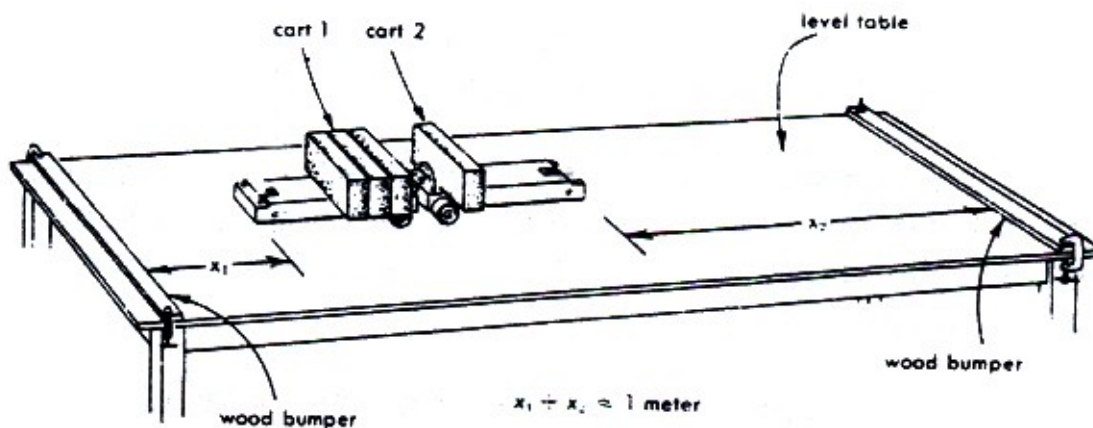
ACTIVITIES:

Momentum Changes in an Explosion

How do the momenta of two carts change as a result of an explosive force?

1. This explosive force is accomplished by releasing the spring when the cart is at rest. What do you observe? Try with different loads on the cart and observe.

2. Place a second cart in front of the spring-loaded cart and release the spring. What do you observe? Try different loads and observe the results.

3. You can determine the ratio of momenta of the carts after explosion by the following formulas since the velocities are proportional to the distances moved in the same time interval:

$$V_1 = X_1/t \qquad V_2 = X_2/t \qquad \text{and} \qquad V_1/V_2 = X_1/X_2$$

cart 1   cart 2   level table

x_1

x_2

wood bumper

wood bumper

$x_1 \div x_2 \approx 1$ meter

4. Try moving the rest positions as shown in X1 and X2 and record your observations.

Velocity Changes

Try loading a cart with bricks and apply a constant pulling force by attaching one of the rubber bands to the front of the cart. Be sure to keep the rubber band stretched at the constant length as the cart is pulled along. Attach a paper tape to the other end of the cart and run the tape through a recording timer in order to record the dots as the cart is pulled. Plot a curve f velocity vs. time.

1. Change the loaded weights using a constant force and plot a curve from the dots on the tape.