Momentum/Impulse Rides

Featured Ride: **Rue le Dodge**

Materials Needed: Stopwatch, horizontal accelerometer and calculator

Hints:

1) Momentum is the product of an object's mass multiplied by its velocity (p=mv).
2) Momentum is always conserved in any physical process ($p_{in}=p_{out}$).
3) In an elastic collision, both momentum and kinetic energy are conserved. In an inelastic collision, momentum is conserved but kinetic energy is not.
4) Impulse is equal to the change in momentum of an object. It is the result of the application of a force for a certain amount of time. The formula to calculate impulse is

$$\Delta p = m \Delta v = F \Delta t$$

5) The bumper cars operate on 90 V DC and each uses a 1-hp motor.

Questions to Be Answered:

Intermediate:

1) What should happen when a moving car hits a stationary car?
2) What should happen when a moving car hits another car moving in the same direction?
3) What should happen when a moving car hits another car moving in the opposite direction?
4) What is the maximum momentum of one car?

Advanced:

5) How much current does a single car use?
6) If each car acts as a resistance in parallel, how much total current is drawn during the ride?
7) What factors affect the outcome of a collision between two bumper cars?
8) Are collisions between two cars completely elastic, completely inelastic, or a combination of these?
9) Does the direction of the car's initial velocity affect the elasticity of the collision?

Investigative Steps: Describe your procedure here.

Data and Observations: Record and organize your results here.

Calculations and Conclusions: Explain your answers to the questions here.

Going Further: Collisions involving more than two objects should exhibit the same momentum behavior as collisions involving only two objects. Design and conduct an experiment to measure this behavior in a multi-object collision and compare the results to those of two-object collisions.

From Kathleen Holley and Cheryl Brooks, Ft. Worth, TX