



Teacher's Pre- and Post-Program Visit Guide

Program	Toying with Physics
Grade Level	5 - 9
Time	50 minutes
Location	Museum of Natural History & Science Classrooms

Program Objectives

- Students will observe and record the movement of a toy and define which of Newton's Laws of Motion it relates to.
- Students will observe and record the different types of mechanical energy demonstrated in each experiment.
- Students will identify how energy is transferred as a result of mechanical motion.

Program Description

Explore physics through toy-based science activities. Students investigate the laws of motion with emphasis on gravitational and kinetic energy. Through scientific inquiry, students use the skills of prediction, observation, explanation and summary.

Major Vocabulary and concepts

Newton's 1 st Law	Friction	Energy
Newton's 2 nd Law	Kinetic energy	Potential energy
Newton's 3 rd Law	Force	Motion
Gravitational potential energy	Speed	Acceleration
Elastic potential energy	Inertia	Mass
Centripetal force	Momentum	Velocity

Activity Stations

Station # 1: Darda Race Car Track - Observe how a racecar maneuvers a track when you vary its speed using force and elastic potential energy, which is converted into kinetic energy. See how gravitational potential energy and friction send the car zooming to the finish line or come to a crashing halt.

Station # 2: Crash Test - You will observe what happens when you place different objects on a roller-skate then apply a force to the skate.

Station # 3: Poppers - You will measure how high the popper toys go on a smooth and textured surface. Answer the questions about what kinds of energy are used and which of Newton's Laws of Motion the toy demonstrates.

Station # 4: Ramps, Balls and Cars - You will use three different types of balls of varying mass and roll them down a ramp one at a time on two different surfaces. This is to test which ball accelerates the fastest on which type of surface (smooth or rough) to push the toy car the farthest.

Suggested things to do in your classroom before the program

- Review vocabulary and Newton's Laws of Motion.
- Practice the skills of predicting, observing, recording results and explaining a scientific experiment.
- Research the history and scientific discoveries of Galileo and/or Newton. Present one of their significant discoveries as a journal entry, newspaper article, skit or song.

Suggested things to do after the program

- Write a story, poem, rap, etc. that explains one of Newton's Laws of Motion.
- Create a television commercial, advertisement, billboard, magazine or newspaper ad that emphasizes the concept of inertia and Newton's First Law of Motion as it relates to seat belt safety.
- Repeat one of the physics lab experiments. Use bar graphs, charts, or mathematical equations to explain the results.
- Design your own scientific experiments that relate to the Laws of Motion. Share your results with your classmates.

Curriculum and Standards Addressed

Ohio - Physical Science, Science and Technology, Scientific Inquiry, Scientific Ways of Knowing

Kentucky - Physical Science, Scientific Inquiry, Applications and Connections

Indiana - The Mathematical World, Nature of Science and Technology, Scientific Thinking

Resources

- *Exploring Energy with Toys: Complete Lessons for Grades 4-8* by Beverly A.P. Taylor. McGraw-Hill, 1997
- *Teaching Physics with Toys: Activities for Grades K-9* by Beverly A.P. Taylor, James Poth and Dwight J. Portman. McGraw-Hill, 1995.
- *Foundations of Physical Science* by Tom Hsu. CPO Science, 2005.
- *Science Fair Success Using Newton's Laws of Motion* by Madeline Goodstein. Enslow Publishers, 2002.
- *Inexpensive Science Activities* by Glenn Marble, Khadin Hashmi, Sandar Tanveer and Piyush Swami.