MOTION MODULE *Physics on the Move*

TRAC™
Leading by Example

This module meets the following National Standards of Learning

National Science Education Standards: Physical Science

Grades 5–8

Science as Inquiry

- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Use technology and mathematics to improve investigations and communications.
- Think critically and logically to make the relationships between evidence and explanations.
- Formulate and revise scientific explanations and models using logic and evidence.

Science Content

Motion and Forces

The motion of an object can be described by its position, direction of motion and speed. That motion can be measured.

If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

Grades 9–12

Science as Inquiry

- Design and conduct scientific investigations.
- Use technology and mathematics to improve investigations and communications.
- Formulate and revise scientific explanations and models using logic and evidence.
- Recognize and analyze alternative explanations and models.

Science Content

Motion and Forces

Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects.

TRAC PAC 2

This module contains six activities and covers the educational topics of momentum and impulse that are normally taught in a high school physics course or an intermediate school physical science course. Transportation topics include automobile collision analysis and roadside crash barrier design.

Activities

Activity 1: Bump N Run

Activity 1 demonstrates the Law of Conservation of Momentum for middle school students using a series of collisions between maglev cars of different mass.

Activity 2: Calculated Collisions

Activity 2 introduces students to the concept of momentum and how to calculate the velocity and momentum of the maglev cars before and after the collisions.

Activity 3: Collision Analysis

Activity 3 requires students to use the Law of Conservation of Momentum to solve for specific variables.

Activity 4: Impulse

Activity 4 introduces the concept of impulse and involves two demonstrations.

Activity 5: Egg Drop

Activity 5 is a hands-on activity in which students are given a limited number of materials to build a structure that will protect an egg during falls from increasing heights.

Activity 6: Major Impacts

Activity 6 is a hands-on activity in which students design and build a crash barrier. The barriers are then tested on an inclined track by a vehicle impacting the barrier.

TRAC™ (TRAnsportation and Civil engineering) is a hands-on education outreach program designed for use in science, math, technology, and social science classes. By engaging students in solving real-world problems, sending volunteer mentors in the classroom, and supplying teachers with the needed materials. TRAC connects K-12 students to the working world of transportation professionals and civil engineers, and inspires them to consider careers in these fields. TRAC PAC 2 is designed for students in middle school and high school. Rides K–8 introduces elementary school students to basic transportation concepts.

Visit **www.tracrides.transportation.org** to learn more about the TRAC program.

AASHTO

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