366850

# Great American Balloon Car Race Lab Activity

Aligned with All Published National Standards

IMGN 250-6417

# table of contents




Ward's in-house scientists are always on call to assist you with your questions. Our expert can provide personal solutions and product advice for your curriculum.
Email sciencehelp@vwr.com
or call 800-962-2660 to get started.

# framework for K-12 science education © 2012

* The Dimension I practices listed below are called out as **bold** words throughout the activity.

**DIMENSION 1** Science and Engineering Practices

| | | | |
|---|---|---|---|
| × | Asking questions (for science) and defining problems (for engineering) | × | Use mathematics and computational thinking |
| × | Developing and using models | × | Constructing explanations (for science) and designing solutions (for engineering) |
| × | Planning and carrying out investigations | × | Engaging in argument from evidence |
| × | Analyzing and interpreting data | × | Obtaining, evaluating, and communicating information |

**DIMENSION 2** Cross Cutting Concepts

| | | | |
|---|---|---|---|
| | Patterns | × | Energy and matter: Flows, cycles, and conservation |
| | Cause and effect: Mechanism and explanation | | Structure and function |
| × | Scale, proportion, and quantity | | Stability and change |
| × | Systems and system models | | |

× Indicates standards covered in activity

**DIMENSION 3** Core Concepts

| Discipline | Core Idea Focus |
|---|---|
| Physical Science | PS2: Motion and Stability: Forces and Interactions |
| | PS3: Energy |
| Engineering, Technology & Applications of Science | ETS1: Engineering Design |

**NGSS STANDARDS © 2013**

| Middle School Standards Covered | High School Standards Covered |
|---|---|
| MS.PS2-2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. | HS.PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other compoent(s) and energy flows in and out of the system are known. |
| MS.PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. | HS.PS3-3: Design, build, and refine a device that works with given constraints to convert one form of energy into another form of energy. |
| MS.PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. | HS.ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |
| MS.PS3-4: Plan an investiation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. | |
| MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | |
| MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. | |
| MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved. | |

# standards/learning objectives

## national science education standards © 1996

| Content Standards (K-12) | | | |
|---|---|---|---|
| | Systems, order, and organization | | Evolution and equilibrium |
| × | Evidence, models, and explanation | × | Form and Function |
| × | Constancy, change, and measurement | | |

| Physical Science Standards Middle School | | Physical Science Standards High School | |
|---|---|---|---|
| × | Motions and Forces | × | Motions and Forces |
| × | Transfer of Energy | × | Interactions of Energy and Matter |

× Indicates standards covered in activity

## benchmarks for science literacy (AAAS, © 1993)

| | |
|---|---|
| 1. The Nature of Science | 1B. Scientific Inquiry |
| 2. The Nature of Mathematics | 2B. Mathematics, Science, and Technology |
| 4. The Physical Setting | 4E. Energy Transformations |
| | 4F. Motion |
| 9. The Mathematical World | 9A. Numbers |
| 11. Common Themes | 11A. Systems |
| | 11B. Models |

## activity objectives:

- Design and build a balloon race car.
- Explore and test different race car designs.
- Race the cars on a racecourse.
- Evaluate the performance of the balloon race car.

## time requirement:

This activity can generally be completed in two 45-minute class periods or over several class periods.

First Class Period: Building balloon race car.

Second Class Period: Testing/racing balloon race car.