Engineer Physical Science Excitement in Your Classroom with a Carolina STEM Challenge®

#carolinaNSTA
Workshop Overview

Carolina STEM Challenge® Subject Areas

- Physical Science
- Emerging Energies
- Life Science
- Chemistry

Today’s Challenges

- Chemical Rockets
- Balloon Race Cars
Learning Context

- **Elementary School**
  - General science and inquiry

- **Middle School**
  - **Physical Sciences**: Energy transformations, forces and motion, and mathematical models

- **High School**
  - **Physical Science**: Energy transformations, Newton’s laws, forces, and mathematical models
  - **Physics**: Energy transformations, Newton’s laws, forces, and mathematical models
  - **Earth and Space Sciences**: Power generation, alternative energies

- **Science Competitions**
  - Science fairs
  - Science Olympiad
  - Science and engineering competitions and projects
Designed with ease of use in mind, Carolina STEM Challenge® kits have the materials and information needed for classroom success!

- Warm-ups and demonstrations
- Science content (teachers and students)
- 3-dimensional learning
- Notebooking and differentiated instruction
- Grading and scoring rubrics
- Real-world connections
- Extensions (literacy and STEM activities)
Workshop Rules

Safety
- PPE
- Latex

Liquids and Rocket Spray
- Clear tabletops
- Stow electronic devices

Stations
- Find a partner
- Share tool kits
- Keep your work space clean

HAVE FUN!
## Chemical Reaction Rockets

<table>
<thead>
<tr>
<th>Scientific and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Developing and using models:</td>
<td>PS1.B: Chemical reactions:</td>
<td>• Systems and system models:</td>
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<tr>
<td>Develop a model to describe unobservable mechanisms.</td>
<td>Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.</td>
<td>Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.¹</td>
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</tbody>
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Activities Overview

Chemical Reaction Rockets

Activity:
Optimize the rocket design and chemical reaction of the “rocket fuel”

Challenge:
Highest launch with a payload

SEPs: Asking questions, planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence

Rocket Test Procedures

1. Observe all safety protocols: Wear PPE, and keep rockets pointed away from people at all times.
2. One team member approaches the launch site with rocket pointed down and uncapped.
3. At the test site, you will receive your “launch training.”
4. Once the rocket is set to launch, step back, and wait for the rocket to ascend.
5. Use the stopwatch to measure the time of descent between the rocket’s highest altitude and its landing on the floor.

In case of a FAILURE TO LAUNCH, a Carolina representative will disengage the rocket and return it to you.
# Building Toward 3-Dimensional Learning

## Balloon Race Cars

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<td>• Developing and using models</td>
<td>PS 2A: Forces and motion: The motion of an object is determined by the sum of the forces acting on it.</td>
<td>• Cause and effect: Mechanism and explanation</td>
</tr>
<tr>
<td>• Planning and carrying out investigations</td>
<td>PS 3C: When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.</td>
<td>• Scale, proportion, and quantity</td>
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<tr>
<td>• Analyzing and interpreting data</td>
<td></td>
<td>• Energy and matter: Flows, cycles, and conservation¹</td>
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Balloon Race Cars

Carolina STEM Challenge®

Balloon Race Cars

TEACHER’S MANUAL AND STUDENT GUIDE
Activities Overview

Balloon Race Cars

Activity: Build a balloon-powered race car
Challenge: Go the farthest distance

SEPs: Asking questions, planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence
Workshop Summary

What did you learn?

• Chemical Rockets
• Balloon Race Cars

Newton’s Laws, Gas Laws, Stoichiometry, Chemical Reactions

Newton’s Laws, Force, Motion, Friction, Speed, Acceleration
Carolina STEM Challenge®

✓ Easy to integrate
✓ High student engagement
✓ Engineering and STEM concepts
✓ Excite with real-world scenarios
<table>
<thead>
<tr>
<th>PHYSICAL SCIENCE</th>
<th>EMERGING ENERGIES</th>
<th>CHEMISTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balloon Race Cars</td>
<td>Boats &amp; Buoyancy</td>
<td>Battery Dilemma</td>
</tr>
<tr>
<td>Build It Write</td>
<td>Cartesian Divers</td>
<td>Biofuels</td>
</tr>
<tr>
<td>Egg Drop</td>
<td>Motors</td>
<td>Geothermal</td>
</tr>
<tr>
<td>Mousetrap Cars</td>
<td>Paint Stirrer Catapult</td>
<td>Hydroelectric Power</td>
</tr>
<tr>
<td>Projectile Launcher</td>
<td>Roller Coasters</td>
<td>Passive Solar Design</td>
</tr>
<tr>
<td>Sound Off</td>
<td>Balloon Rockets</td>
<td>Solar Car Design</td>
</tr>
<tr>
<td>Structures</td>
<td>Keep It Hot</td>
<td>Wind Farm</td>
</tr>
<tr>
<td>Bubbles</td>
<td>Trebuchets</td>
<td>Solar Water Distillation</td>
</tr>
<tr>
<td>Take Flight</td>
<td></td>
<td>Emerging Energies Set</td>
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<tr>
<td></td>
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<td>Make It Bounce</td>
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<td></td>
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<td>Separation of a Mixture</td>
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<td></td>
<td></td>
<td>Chemical Reaction Rockets</td>
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<td>Crystal Growing</td>
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<td></td>
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<tr>
<td>LIFE SCIENCE</td>
<td></td>
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<tr>
<td>Circulatory System</td>
<td>How to Train Your Isopod</td>
<td></td>
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<tr>
<td>Hydroponics</td>
<td>How to Train a Plant</td>
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<td>3-D Art and Human Vision</td>
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www.carolina.com
Carolina Offers Free Resources to Support Teachers

Carolina Knowledge Center
https://knowledge.carolina.com
Evaluations: Share Your Thoughts!

We are striving to make our workshops great!

Please evaluate this session and presenter on a scale from 0 to 10 (10 = best).
Please help us reset the room by gathering your belongings and exiting between sessions.

THANK YOU!