Barrett-Jackson
THE WORLD'S GREATEST COLLECTOR CAR AUCTIONS®

GEARING TOWARDS THE FUTURE

Presented By Honeywell

GEARING TOWARDS THE FUTURE

Science, Technology, Engineering and Math! Barrett-Jackson, The World's Greatest Collector Car Auctions, is partnering with Arizona SciTech Institute to bring you Gearing Towards The Future — a community, education and outreach initiative focused on STEM education.

Barrett-Jackson's Gearing Towards The Future aims to encourage and develop future automotive engineers and technicians through age-appropriate STEM challenges focused on teaching students how to solve problems and develop new skills using real-life scenarios related to automobiles.

SCITECH INSTITUTE

ARIZONA MILK PRODUCERS

https://stem.barrett-jackson.com

2024 CHALLENGES

Grades K-5

Create a Mars Rover That Can Navigate the Martian Terrain Presented by Arizona SciTech.

Grades 6-8

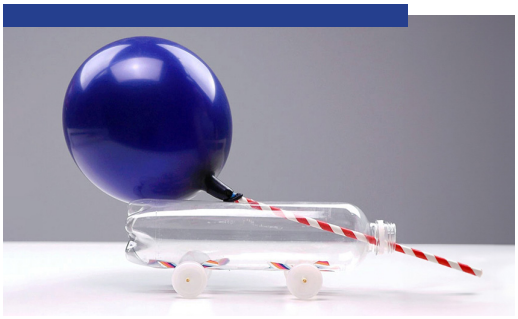
Life Cycle Analysis, Energy Engineering and STEM Careers in Dairy Production Presented by Arizona Milk Producers.

Grades 8-12

Design and Build an Advanced Air Mobility Vehicle Presented by Honeywell.

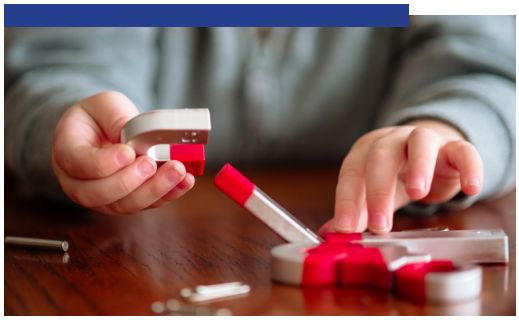
CREATE A MARS ROVER THAT CAN NAVIGATE THE MARTIAN TERRAIN

Congratulations, young engineers! NASA has selected you to design and build a prototype Mars Rover to explore the Red Planet, Mars. Your mission is to create a Mars Rover that can navigate the Martian Terrain.



Option 1. Balloon Powererd Mars Rover

Design a balloon-powered Mars Rover capable of traveling one meter distance on a simulated Martian surface. How can your Rover overcome obstacles?



Option 2. Magnet Powererd Mars Rover

Imagine your Mars Rover powered by magnets! Design a rover that utilizes magnetic forces to move across the Martian surface. Think about how magnets can help your rover navigate along the surface of Mars.

Option 3. Recycled Materials Mars Rover

In this eco-friendly challenge, use recycled materials to construct a Mars Rover. What features will make your Rover resilient and navigate the rocky terrain of Mars?

Safety Crash Test with Mars Rover: Once your Mars Rovwer is built, it's time to ensure its safety during the landing on Mars. Set up a scenario where your Rover will be going down a slope to simulate the Martian rocky surface. How well does your design protect the Rover's astronauts? navigate the Martian Terrain.

Engineering Design Thinking: Project must demonstrate the use of the Engineering Design Process and include evidence of each of the following elements:

1. Identify: What is the problem you want to solve with your rover?

2. Brainstorm: Brainstorm what your vehicle could look like.

3. Select a Design: Choose a plan that your teammates come up with. Sketch the plan for your vehicle.

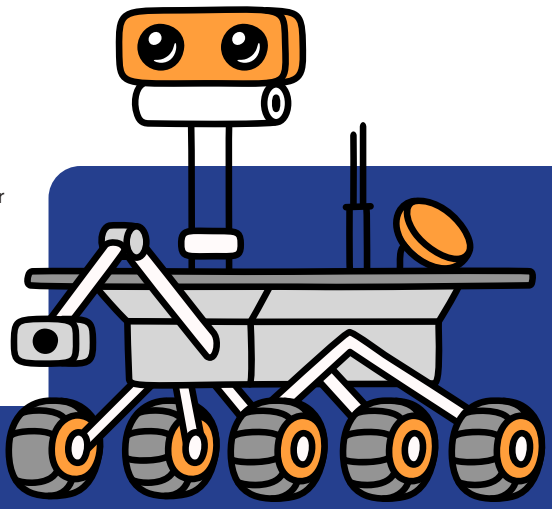
4. Build: Build your rover using the materials on the list

5. Test and Evaluate: Test your rover by going through a crash test. Evaluate & add notes to your plan.

6. Optimize: Redesign your rover based on your notes.

Materials List: This challenge is designed to be cost-effective for both teachers and students. Below, you'll find a list of recommended items to construct the rover and ramp. Please explore your classroom (or house!) for recycled materials or utilize resources readily available in your classroom (or house).

- Ramp - Books, white-boards, cardboard, etc. Ramp should simulate the Mars surface - crumple up paper and bottle caps to represent paper on the ramp
- 4 Astronauts - Pipe cleaners, clay or playdough, Bottle Cap, Lego, Printed
- Plastic Bottles
- Paper Cups
- Paper Clips
- Straws
- Rubber Bands
- String
- Paper Clips
- Tape (Masking, Duct)
- Scissors
- Markers or Paint
- Balloons
- Plastic Drinking Straws
- Magnets
- Metal Washers
- Recycled Materials: bottle caps, paper scraps, or small plastic containers etc
- Old CDs or DVDs
- Egg Cartons



ENERGY ENGINEERING IN THE MILK PRODUCTION LIFE CYCLE

In this challenge, students will delve into the comprehensive world of life cycle analysis, specifically focusing on a dairy product. The goal is to create an informative overview of the product's life cycle, highlighting key stages from materials sourcing to disposal, while incorporating examples of people, places, and products involved at each step

Life Cycle Stages:

1. Materials:

Identify the raw materials involved in producing the dairy product. Consider the environmental and social aspects of material extraction.

2. Production:

Explore processes turning raw materials into the final product. Discuss energy use and waste during production.

3. Distribution:

Examine getting the product to consumers. Consider transportation, packaging, and environmental impacts.

4. Marketing & Sales:

Analyze strategies to market and sell. Explore advertising, packaging, and consumer choices.

5. Use:

Investigate how consumers use the product.Consider environmental and social impacts.

6. Disposal:

Examine the end-of-life stage and how consumers dispose. Explore recycling, waste management, and environmental consequences.

Presentation Options:

1. Video: Show each life cycle stage
Use Visuals, graphics, and narrations.

2. Flyer: Design a concise flyer
Use visuals for effective communication

3. Blog: Craft a detailed blog post
Incorporate images or infographics

Required Information:

1. Identification of Dairy Product: Clearly state the specific dairy product (e.g., milk, cheese, yogurt).

2. Life Cycle Analysis Examples: Provide concrete examples of people, places, and products at each stage. Consider social, economic, and environmental aspects.

ENERGY ENGINEERING IN THE MILK PRODUCTION LIFE CYCLE

In this challenge, students will explore the intersection of energy engineering and milk production. The focus is on identifying a specific stage in the life cycle of milk where energy is created, transformed, or consumed. Participants will then propose an invention, whether newly conceptualized or already existing, to enhance energy efficiency at this stage. The challenge concludes with the marketing of this energy-efficient product through a video, flyer, or blog.

Challenge Steps:

1. Identify the Stage in the Life Cycle:

Pinpoint where energy is created, transformed, or consumed in milk production.

2. Type of Energy Involved:

Define the energy type involved (e.g., chemical, kinetic, electrical, heat).

3. Invention for Improved Energy Efficiency:

Create or find a solution to boost energy efficiency. Explain how it works and its impact on energy consumption.

4. Marketing the Product:

Develop a strategy to market the energy-efficient invention. Choose video, flyer, or blog for effective communication.

Required Information:

1. Timing of the Identified Stage: Clearly specify when the identified stage occurs in milk production.

2. Type of Energy Involved: Describe the energy being created, transformed, or consume.

3. Invention Details: Clarify if it's new or existing. Explain how it improves energy efficiency.

4. Strengths and Weaknesses: Highlight two strengths. dentify two potential challenges with the invention.

STEM CAREER HIGHLIGHT

Students will explore and highlight a specific STEM (Science, Technology, Engineering, or Mathematics) career in the dairy industry. The focus is on providing insights into the daily life of professionals in this field, the educational path required, and the STEM skills acquired in high school that are applied in the job. Students have the option to conduct an interview with someone in the chosen career and are tasked with creating a captivating “Day in the Life” commercial, flyer, or blog

Challenge Components:

1. Identify a STEM Career in the dairy industry

2. “Day in the Life” Overview

Describe a typical day for professionals in the chosen career. Highlight key responsibilities, tasks, and challenges.

3. Educational Requirements:

Outline post-high school education needed. Specify if a certificate, degree, apprenticeship, or other is required.

4.STEM Skills from High School:

Identify and discuss STEM skills from high school applicable to the career. Explain how these skills contribute to success.

5. (Optional) Interview:

If possible interview someone in the chosen STEM career. Share insights, advice and experiences from the interviewee.

6. Create a Presentation:

Develop a commercial, flyer, or blog about the STEM career. Clearly communicate the appeal and significance of pursuing it.

Required Information:

1. Day in the Life” Details: Offer a comprehensive overview of the daily routine and tasks.

2. Educational Path: Clearly state post-high school educational requirements

3. High School STEM Skills: Identify specific valuable STEM skills from high school.

4. (Optional) Interview Insights: If interviewed, share relevant insights, anecdotes, and advice.

DESIGN AND BUILD AN ADVANCED AIR MOBILITY VEHICLE

Use the Engineering Design Process to design and build an advanced air mobility vehicle capable of transporting 4 passengers and 1 pilot at least 2 ft in the air and landing safely.

Related Standards:

6.P2U1.4: Develop and use a model to predict how forces act on objects at a distance.

7.P3U1.4: Use non-algebraic mathematics and computational thinking to explain Newton's laws of motion.

8.P4U1.3: Construct an explanation on how energy can be transferred from one energy store to another.

Engineering Design Thinking: Project must demonstrate the use of engineering design thinking. Submissions can utilize an engineering design process of your choosing, as long as it encompasses some form of the following steps:

1. Situating- show evidence of background research

2. Choice- show evidence of brainstorming, prototyping, and use of a decision matrix for design elements

3. Defending- show evidence of iteration and improvements

4. Communicating/Connecting- demonstrate product and how it aligns to the problem statement

Team Roles:

Project Engineer: The project manager is responsible for planning, executing, and closing the project. They coordinate team members, set goals, create schedules, and ensure that the project is completed within the budget and on time.

Design Engineer: A design engineer is someone who uses creative thinking and technical knowledge to solve problems, design projects, or create the prototype.

Test Engineer: A test engineer is a student who is responsible for evaluating and assessing the functionality, performance, or effectiveness of the project

Documentarian: The Documentarian is responsible for capturing and documenting the journey of your design, learning, and achievements.

Criteria:

Must transport 4 paper clips (passengers) and 1 paper clip (pilot) Must achieve vertical take-of.

The passengers and pilot must still be in the vehicle when it lands.

Constraints:

Weight- cannot exceed 5.5 oz (about the weight of a banana).

*Materials posted online.