2025 NATIONAL SCIENCE OLYMPIAD

DIVISION C (HIGH SCHOOL; GRADES 9-12)

EVENT ALIGNMENT TO NATIONAL EDUCATIONAL STANDARDS

AIR TRAJECTORY – Prior to the competition, teams will design, construct, and calibrate a single device capable of launching projectiles onto a target and collect data regarding device parameters and performance.

High School Physical Sciences

HS. Motion and Stability: Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS 2–6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS. Energy

HS-PS 3-1. – 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 component(s) and energy flows in and out of the system are known.

HS-PS 3-3. – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

ANATOMY AND PHYSIOLOGY – Participants will be assessed on their understanding of the anatomy and physiology for the integumentary, skeletal, and muscular systems.

High School Life Science

HS. Structure and Function

HS-LS 1–2. Develop and use a model to illustrate the hierarchical organization of interacting systems to provide specific functions within multicellular organisms.

HS-LS 1–3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

ASTRONOMY – Teams will demonstrate an understanding of Stellar Evolution: Star Formation & Exoplanets.

High School Earth and Space Science

HS. Space Systems

HS-ESS 1–2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-ESS 1–3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.

BUNGEE DROP – Each team will design, construct, and calibrate a single elastic cord to conduct two separate drops at a given height(s) and attempt to get a drop mass placed in a bottle as close as possible to. But without touching, a landing surface.

High School Physical Sciences

HS. Motion and Stability: Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS 2–6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

CHEMISTRY LAB – Teams will complete one or more tasks and answer a series of questions involving the scientific processes of chemistry focused in the areas of equilibrium and chemical reactions/stoichiometry.

High School Physical Science

HS. Structure and Properties of Matter

HS-PS 1–1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS 1–3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS. Chemical Reactions

HS-PS 1–2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS 1–6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

CODEBUSTERS – Teams will cryptanalyze (decode) encrypted messages using cryptanalysis techniques and show skill with advanced ciphers by encrypting or decrypting a message.

K-12 Computer Science Framework

9-12 Computing Systems

Devices - Computing devices are often integrated with other systems, including biological, mechanical, and social systems. These devices can share data with one another. The usability, dependability, security, and accessibility of these devices, and the systems they are integrated with, are important considerations in their design as they evolve.

9-12 Algorithms and Programming

Algorithms - People evaluate and select algorithms based on performance, reusability, and ease of implementation. Knowledge of common algorithms improves how people develop software, secure data, and store information.

9-12 Networks and the Internet

Cybersecurity - Network security depends on a combination of hardware, software, and practices that control access to data and systems. The needs of users and the sensitivity of data determine the level of security implemented.

DISEASE DETECTIVES – Participants will use their investigative skills in the scientific study of disease, injury, health, and disability in populations or groups of people.

High School Life Science

HS. Structure and Function

HS-LS 1–2. Develop and use a model to illustrate the hierarchical organization of interacting systems to provide specific functions within multicellular organisms.

HS-LS 1–3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS. Interdependent Relationships in Ecosystems

HS-LS 2-1. – Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS 2-2. – Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS 2-6. – Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS 2-7. – Design, evaluate, and refine a solution for reducing the impact of human activities on the environment and biodiversity.

HS-LS 2-8. – Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS 4-6. – Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

HS. Natural Selection and Evolution

HS-LS 4-3. – Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait.

HS-LS 4-4. – Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS 4-5. – Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-1. – Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

DYNAMIC PLANET – Participants will demonstrate an understanding of the processes involving the cryosphere of the Earth, with an emphasis on glaciers.

High School Earth and Space Sciences

HS. History of Earth

HS-ESS 1-5. – Evaluate evidence of the past and current movements of continental and oceanic crust and the theory f plate tectonics to explain the ages of crustal rocks.

HS-ESS 2-1. – Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS. Earth's Systems

HS-ESS 2-2. – Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS 2-6. – Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS. Human Sustainability

HS-ESS 3-6. – Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

ECOLOGY – Students will answer questions involving content knowledge and process skills in the area of ecology and adaptations in featured North American biomes.

High School Life Science

HS. Matter and Energy in Organisms and Ecosystems

HS-LS 2–3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS 2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS. Interdependent Relationships in Ecosystems

HS-LS 2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS 2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS 2–6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS 2–7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

ELECTRIC VEHICLE – Teams design, build, and test one vehicle that uses electrical energy as its sole means of propulsion to travel as quickly as possible and stop close to a Target Point.

High School Physical Sciences

HS. Motion and Stability: Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS. Energy

HS-PS 3-3. – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

ENTOMOLOGY – Students will be asked to identify insects and selected immature insects by order and family, answer questions about insects, and use or construct a dichotomous key.

High School Life Science

HS. Interdependent Relationships in Ecosystems

HS-LS 2-8. - Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS. Natural Selection and Evolution

HS-LS 4-1. - Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

HS-LS 4-2. - Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

EXPERIMENTAL DESIGN – This event will determine the participant's ability to design, conduct, and report the findings of an experiment conducted entirely on site.

Note: *The exact nature of the experiment conducted during the Experimental Design event changes depending upon the tournament site. Therefore, matching this event to exact standards can be problematic. The standards listed below might be addressed at a given tournament.*

High School Physical Science

HS. Chemical Reactions

HS-PS 1-4. – Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS 1-5. – Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS 1-6. – Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

HS. Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS 2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

HS-PS 2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS. Energy

HS-PS 3-3. – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS 3-4. – Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

HS-PS 3-5. – Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

High School Life Science

HS. Structure and Function

MS-LS 1–3. – Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS. Earth's Systems

HS-ESS 2-6. – Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

FORENSICS – Given a scenario and some possible suspects, students will perform a series of tests. These tests, along with other evidence or test results, will be used to solve a crime.

High School Physical Science

HS. Structure and Properties of Matter

HS-PS 1-1. – Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS 1-3. – Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

High School Life Science

HS. Inheritance and Variation of Traits

HS-LS 3-1. – Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS 3-3. – Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

FOSSILS – Teams use fossils to date and correlate rock units as well as demonstrate their knowledge of ancient life by completing tasks related to fossil identification and classification.

High School Earth and Space Science

HS. Earth's Systems

HS-ESS 2-5. – Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

HS-ESS 2-7. – Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

GEOLOGIC MAPPING – Teams will demonstrate understanding in the construction and use of topographic maps, geologic maps, and cross sections, and their use in forming interpretations regarding subsurface structures and geohazard risks especially with respect to subduction zones.

High School Earth and Space Sciences

HS. Earth's Systems

HS-ESS 2-1. – Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS. Earth and Human Activity

HS-ESS 3-1. – Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HELICOPTER – Prior to the tournament, teams will construct, collect data on test fights, analyze and optimize free flight rubber-powered helicopters to achieve maximum time aloft.

High School Physical Science

HS. Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS. Energy

HS-PS 3-3. – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

MATERIALS SCIENCE – Teams will build and bring 1 puck, complete lab activities and answer a series of questions related to the materials science of ceramics with an emphasis on chemical and crystalline structure, and behavior.

High School Physical Science

HS. Matter and Its Interactions

HS-PS1–3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS. Forces and Interactions

HS-PS2–6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

MICROBE MISSION – Teams will answer questions, solve problems, and analyze data pertaining to microbes.

High School Life Sciences

HS. Structure and Function

HS-LS 1–1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS 1–3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS. Inheritance and Variation of Traits

HS-LS 1–4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS. Matter and Energy in Organisms and Ecosystems

HS-LS 1–5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS 1–6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS 1–7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

OPTICS – Teams will participate in an activity involving positioning mirrors to direct a laser beam towards a target and complete a written test on the principles of geometric and physical optics.

High School Physical Sciences

HS. Waves and Electromagnetic Radiation

HS-PS 4–1. Use mathematical representations to support a claim regarding relationships among the frequency wavelength, and speed of waves traveling in various media.

HS-PS 4–3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

ROBOT TOUR - Teams design, build, program and test one Robotic Vehicle to navigate a track to reach a target in a set amount of time as accurately and efficiently as possible.

High School Physical Sciences

HS. Forces and Interactions

HS-PS 2-1. – Analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS. Energy

HS-PS 3-3. – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS: Waves and their Applications in Technologies for Information Transfer

HS-PS 4–2. Evaluate questions about the advantages of using a digital transmission and storage of information.

HS-PS 4–5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

TOWER – Teams will design and build a Tower (Structure) meeting requirements specified in these rules to achieve the highest structural efficiency.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

WIND POWER - Teams construct a blade assembly device prior to the tournament that is designed to capture wind power and complete a written test on the principles of alternative energy.

High School Physical Science

HS. Energy

HS-PS 3-1 – 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 component(s) and energy flows in and out of the system are known.

HS-PS 3-3 – Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy

High School Earth and Space Science

HS. Human Sustainability

HS-ESS 3-2 – Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS 3-3 – Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS 3-4 – Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

High School Engineering Design

HS. Engineering Design

HS-ETS 1-2. – Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

HS-ETS 1-3. – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS 1-4. – Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

WRITE IT/DO IT – One participant will write a description of an object and how to build it. The other participant will attempt to construct the object from this description.

Common Core English Language Arts Standard

Writing

Writing. Grade 9-10.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

Writing. Grade 11-12.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

K-12 Computer Science Framework

9-12 Algorithms and Programming

Algorithms - People evaluate and select algorithms based on performance, reusability, and ease of implementation. Knowledge of common algorithms improves how people develop software, secure data, and store information.

Program Development – Diverse teams can develop programs with a broad impact through careful review and by drawing on the strengths of members in different roles. Design decisions often involve tradeoffs. The development of complex programs is aided by resources such as libraries and tools to edit and manage parts of the program. Systematic analysis is critical for identifying the effects of lingering bugs.