



Elementary Modules (Pages 1-3)

ES Into the Wild (Wildlife Sciences) **GROUP 1**

Warm blood, cold blood, bones or no bones, these Scouts will go into the wild to discover the variety of animals that inhabit our planet.

Scouts will first explore the biomes of this world and then determine which animal calls each biome home. From there, they will get their "gloves dirty" to experience the food chain in person by dissecting an owl pellet and investigate various bird adaptations. Scouts will get to see how long an alligator actually is, discover which amphibian is clear, and end by building an aquatic marine biome ecosystem, also known as a coral reef!

Meeting 1: Biome and Mammal Basics

Scouts will discover the various biomes on our planet, and then analyze and match each biome to its specific characteristics. They will then gain knowledge on what makes a mammal a mammal, and conclude which mammal makes its habitat in each biome. To put it all together, Scouts will construct a pop-up biome book to summarize their collection.

Meeting 2: Chain, Chain, Chain of Food

To better understand the circle of life, Scouts will shift their focus from biomes to ecosystems. Then they'll be ready for their close-up of the food chain: dissecting an owl pellet and analyzing the animals found inside!

Meeting 3: That's Cold-Blooded

Scouts will now explore vertebrates that run a little cooler than others—reptiles and amphibians! Here they will predict the length of an American alligator by constructing a life-sized diagram, and learning about temperature control and the power of camouflage.

Meeting 4: Underwater Ecosystem

In this meeting, Scouts will look at coral polyps, a type of inconspicuous invertebrate! Scouts will explore this unique underwater ecosystem and then represent their knowledge in a self-constructed model of a coral reef.





ES A Flying Fluid (Aerodynamics) GROUP 1

The fluid dynamics of air can be, well, quite the flight! In this module, Scouts will explore fluid dynamics, the study of the flow of liquids and gases. They will learn how fluids exert forces on moving objects. Using the Engineering Design Process to design various prototype wind vehicles, Scouts will be hands-on in the realm of fluid dynamics!

Meeting 1: Blowing in the Wind

Scouts will explore the differences between fluids and solids, and examine the fluid dynamics of air. They will first experiment with air and seed dispersal, and then use the Engineering Design Process to design and construct their own device that will send a seed on a flying fluid journey!

Meeting 2: The Glide Ride

Scouts will investigate how mass and surface area affect an object's velocity as it falls through the air by conducting experiments with different shapes. Scouts will also explore the aerodynamic properties of drag and lift. Then they will use a glider to demonstrate the ways they can self-manage their emotions with a little "lift"!

Meeting 3: A Fluid Friction Voyage

Scouts will each engineer their own prototype of a double-hulled canoe used by the ancient Polynesian voyagers. They will gain knowledge about fluid friction and will experiment with the construction of their sails by applying what they know about force, air drag, mass, and surface area. To continue their practice of self-management, Scouts will also create a key chain "map" that they can use as an emotional self-management tool.

Meeting 4: Parachute Rescue!

Bringing it all together! Scouts will combine all of their knowledge of surface area, fluid friction, drag, and mass to create a parachute that can safely rescue an animal! Having access to various materials and using the Engineering Design Process, Scouts will brainstorm solutions, design prototypes, and test their chutes.

Scouts will practice self-management as they explore a project without specific instructions. It's engineering time!





ES Engineering Solutions (*Engineering*) **Group 2**

Scouts will explore engineering by learning and applying the engineering design process. From invention to prototype building and from biomedical engineering to water filtration, Scouts will discover engineering fields that might not always come to mind!

Meeting 1: Engineering Equity

Scouts obtain a high-level knowledge of what an engineer is and how they work, based on the Engineering Design Process. Scouts are given a problem and using the Engineering Design Process, will brainstorm and create their very own prototype of a possible solution to the given situation.

Meeting 2: Engineering Knowledge

Scouts learn how to make an informed analysis by comparing strengths and weaknesses of possible solutions. Scouts will then use the data from their analysis of two working catapults to design and build their own catapult.

Meeting 3: Engineering Innovation

Scouts get an in-depth look at the field of biomedical engineering and discover the life-changing effects of past and present innovations. Scouts will employ the Engineering Design Method to construct a working prosthesis.

Meeting 4: Engineering Progress

Scouts discover environmental engineering and its role in providing communities with functioning infrastructure, as well as protecting the environment. Scouts will use the Engineering Design Process to design and create a working water filtration system, recognizing that filtration is only one crucial step of the water purification process.





ES Ancient Archaeology (Archaeology sciences) **GROUP 2**

In this module, Scouts will build on their knowledge of archaeology. From making their own artifacts to mummifying an apple, Scouts will understand that archaeology draws on many scientific practices and will be able to explain why the study of archaeology is an important science. They will end by putting together a time capsule for someone in the future to find and learn about what life was like today.

Meeting 1: Archaeological ArtiFACTS

Scouts will begin their ancient exploration into archaeology by starting with the facts—artiFACTS! They will learn why clay artifacts are the most common artifacts found, and what exactly you can learn about a culture from their clay object remains. They will then create their own clay artifacts that they will later use again in this module.

Meeting 2: Digging into Archaeology

After learning about stratigraphy, Scouts will build an archaeological site for another Scout to excavate, and then will use archeological excavation techniques to excavate what the other Scouts have buried. Scouts will follow the three phases of excavation: preparation and planning, on-site work, and post-excavation examination.

Meeting 3: Lasting Impressions

Scouts will have double the exploration in this meeting. First, they will learn how and why a body is mummified, then why will prep an apple to be mummified. (They will bring the apple to the next meeting for examination.) After they prep their apple, they will turn their focus to ancient text found on rocks—pictographs and petroglyphs—and will recreate these ancient rock art texts.

Meeting 4: Preservation: Where Time Stands Still

Scouts will first reveal and examine their mummified apples and make observations on the changes in color, size, texture, etc. They will then review the importance of archaeology and learn about time capsules. They will bring various personal artifacts from home to bury for future archaeologists to discover!





ES Bubbleology (Spring)

Material engineers are people who use their understanding of different materials (such as metals, plastics or wood) to make things that solve problems. In this module, Scouts will experiment with many different materials that can be used to make bubble wands and discover the chemistry behind bubbles!

Using the Scientific Method and the Engineering Design Process, Scouts will become material engineers as they consider which materials are best for making different kinds of bubbles as well as experiment with creating their own bubble solution. They will then use their new skills and knowledge to perform their very own bubble presentation demonstration.

Meeting 1: Bubble Trouble Basics

Scouts will learn the chemistry behind bubbles! They discover what it means to be a material engineer and will combine both engineering and chemistry to make the longest lasting bubble using the Scientific Method and Engineering Design Process.

Meeting 2: All Shapes and Sizes

Scouts will complete two activities in this lab. They will first explore different shapes of bubbles and will try to make bubbles exhibit 12 different effects. Then, they will experiment with different bubble wands. Scouts will learn how molecules of water act and observe how each water molecule attracts its neighbors and even attempt to pass a bubble between their hands!

Meeting 3: Bigger and Better Bubbles

Scouts will continue to learn the trick of the bubble trade as they continue to explore innovative ways to plan their bubble presentation demonstration. Scouts will have the opportunity to learn how to create a bubble shape other than a sphere – a cube! Then they will have a chance to make glow in the dark bubble solutions and then explore putting a bubble inside another bubble. Finally, they will plan out their bubble presentation for the next meeting.

Meeting 4: Bubble Presentation

It's Bubble Presentation Demonstration time – families are welcomed! Scouts will present a bubble demonstration that shows off their newly learned knacks and knowledge. From the Scientific Method and Engineering Design Process to the chemistry of a bubble, and from shapes to sizes, Scouts will show off and demonstrate their new skills to their lab and families!





Season 7 Module Names and Meeting Descriptions

Middle School Modules (Pages 3-7)

MS Criminal Case Files

Crime investigators use forensic science to help solve crimes. Scouts will be introduced to the different branches of forensic science and careers in these fields.

In this module, Scouts will learn about forensic science as it relates to DNA, fingerprints, graphology, and blood spatter. Meetings 1–3 will equip Scouts to play detective and use forensic techniques and critical thinking skills to identify the No. 1 suspect of a crime.

Meeting 1: Introduction to Forensics

Scouts will be introduced to forensic science and forensics evidence by first learning the basic components of DNA. They will then conduct bite mark and DNA experiments followed by an analysis, and will be able to conclude which one is more reliable.

Meeting 2: The Power of a Print

To better understand the application of pattern matching in forensic science, Scouts will conduct experiments and a visual analysis of two types of prints: fingerprints and shoeprints.

Meeting 3: What You Leave Behind

Scouts will continue their investigation in pattern matching by applying the practice to handwriting. They will then learn how blood spatter is an important aspect of forensic science and will test various types of spatters to form scientific conclusions based on their pattern.

Meeting 4: No. 1 Suspect

Using evidence found at a crime scene, Scouts will play the role of forensic scientists in a lab by using the skills they learned in previous meetings to help identify a No. 1 suspect to the crime. Scouts will analyze evidence, use critical-thinking skills, and draw conclusions based on their observations and analysis.





MS Microbiology Coming into Focus (Microbiology) GROUP 1

Scouts will take a closer look at what it means to be “alive” and will examine the smallest form of life, the cell. Scouts will assemble and learn how to use a Foldscope – the paper microscope! From onion cells to bacteria, they will explore prokaryotic and eukaryotic cells, and will use their Foldscope to see what is usually too small to be seen. It’s microbiology coming into focus!

Meeting 1: Coming into Focus!

Scouts will learn about and assemble a Foldscope, the paper microscope! They will then practice using the Foldscope by examining a living specimen brought from home (a leaf, plant, grass, etc.), clothing particles, and more. Scouts will be using their Foldscope throughout this module.

Meeting 2: Cells—Everything Comes Down to It

In this meeting, Scouts will explore the foundation of life: cells. They will gain knowledge of the two types of cells, prokaryotic and eukaryotic. They will then explore the eukaryotic cells of a red onion using a microscope and will be able to identify the nucleus and walls of the cell!

Meeting 3: The Good, the Bad, the Bacteria!

Scouts will explore the important role that tiny bacteria play in our big world. They will culture their own bacteria, taking it home and monitoring the growth throughout the rest of this module. Lastly, Scouts will prepare bread to grow mold, as well as a Protozoan Kit to grow protists to bring and examine during the next meeting.

Meeting 4: The Kingdoms of Protists and Fungi

In this last meeting, Scouts will explore two of the kingdoms in the eukaryote domain – fungi and protists! They will use their bread mold and Protozoan Kits that they started growing last week to take samples and will then examine them under their Foldscope.





MS Reactions in Action (Chemistry) GROUP 2

In this module, Scouts will explore the concept that chemical reactions involve the breaking of bonds between atoms in the reactants, and the rearrangement and rebonding of these atoms to make the products. Scouts will investigate reactions which produce a gas, form a precipitate, and cause a color change!

Meeting 1: Let's Form a New Bond

By conducting two, very different chemical experiments, Scouts will learn that when a chemical reaction takes place, a new product is formed – in this, a gas! They will gain understanding that for a chemical reaction to take place, the bonds between atoms in the reactants are broken, the atoms rearrange, and new bonds between the atoms are formed to make the products. Let's form a new bond with chemistry!

Meeting 2: Stay Calm & Don't OVERreact

In this meeting, Scouts will continue to experiment with baking soda and vinegar to produce a gas but this time, they will apply the Scientific Method. Their objective is to measure and test various amounts of their reactants while using an indicator (soap) to try and control the amount of gas that is produced. This could get messy but stay calm and try not to OVERreact!

Meeting 3: Participating in a Precipitate

Scouts will learn the difference between a solution and a chemical reaction and then conduct several experiments that will later produce a precipitate: one of the four clues to a chemical reaction. They will take their product home to dry and bring it back to the next meeting for further investigation.

Meeting 4: Not So Basic

Scouts will experiment further with pH by adding carbon dioxide gas (CO₂) to water to gain knowledge on how when carbon dioxide gas is dissolved in water, it can cause water to become acidic. They will then use and demonstrate the color changes of universal indicator to monitor the changing pH of a solution during a chemical reaction.





Season 7 Module Names and Meeting Descriptions

MS Human Space Exploration (Astronomy) GROUP 2

Scouts will take a dive into deep space by becoming human space explorers and taking their first mission to the moon in the Human Space Exploration Mission. They will gain knowledge about the engineering behind space suit safety, will engineer a balloon rocket that will take a payload to the moon, and then design a 3D lunar habitat. They will also learn and explore NASA's Artemis Mission to the moon!

Meeting 1: Human Space Exploration Mission

Scouts will take their first mission to the moon in the Human Exploration Space mission. Their mission starts with safety of their astronauts. Scouts will use the engineering design process to build a prototype astronaut suit for a potato that they will then test its level of success against various impacts. They will then build a model of the moon that they will bring to every meeting throughout this module as they expand their knowledge about our moon and NASA's mission Artemis – mission to the moon – in 2024.

Meeting 2: Space Launch System

Scouts will use the engineering design process to design and build a Space Launch System, a balloon rocket, to experiment with thrust, propulsion, and weight. Their Space Launch System must lift-off out of Earth's atmosphere while carrying a heavy payload.

Meeting 3: Human Landing System

Scouts will learn about human landing systems (HLS) and will gain knowledge to better understand velocity, throttling, and soft landing. They will then design and engineer an HLS that can achieve a soft landing while keeping budget in mind. After a successful test landing, they will write a proposal for their innovative design.

Meeting 4: Lunar Habitat

In this last meeting, Scouts will complete their Human Space Exploration Mission by designing a 3D lunar habitat on the moon using TinkerCad. After exploring a little more about the surface of the moon, they will learn about the organization ICON who is currently working with NASA to design a lunar habitat that is printed in 3D by year 2030!





MS Science Behind the Sport (Science, Math, Engineering) **Group 2**

In this module, Scouts will discover the science behind some commonly known sports. They will explore the related math, physics, and engineering principles behind archery, zip lining, cycling, and skateboarding and will learn how to apply various math equations along the way. Let's learn more, behind the sport!

Meeting 1: The Science Behind Archery

The Science Behind Archery allows Scouts to take aim on learning how principles of STEM can help them hit the bullseye! Discovering the science behind bows and arrows is not only fun, but it can also help improve their accuracy on the range. In this meeting, Scouts will be using some simple materials to construct and then launch a projectile similar to an arrow being released from a bow.

Meeting 2: The Science Behind Zip Lining

Not only is riding a zip line fun, but it can also be educational as well. By applying the Pythagorean Theorem and other trigonometry functions to a model zip line, Scouts will take a deep dive into the science, math, and engineering principles related to riding a traditional outdoor zip line.

Meeting 3: Coming Soon!

Whether you are sitting on the saddle for the first time, a daily commuter, an elite cyclist, or somewhere in between, understanding the science behind cycling can deepen your passion for riding. In this meeting, Scouts will focus on BMX and applications of STEM principles based on one of the greatest inventions of all time, the bicycle! They'll start by designing and constructing their very own model BMX track and then will use the track to investigate the transfer of energy between each feature.

Meeting 4: The Science Behind Skateboarding

Scouts will 'drop in' and discover STEM as it relates to riding a skateboard. The final meeting focuses on studying the principles of linear and angular motion. Using a fingerboard, Scouts will analyze the displacement, velocity, and acceleration of the board as it cruises through their homemade skatepark.

