

Know Nuclear

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Girl Scouts Get to Know Nuclear Patch

Introduction

The American Nuclear Society, working with the Girl Scouts of Greater Chicago and Northwest Indiana Council, has established the *Get to Know Nuclear* patch, which can be earned by any Scout in the U.S. who meets the requirements. The *Get to Know Nuclear* patch requirements focus on learning about nuclear science and technology through teamwork, and are flexible so scouts of all ages can *Get to Know Nuclear*!

Requirements

ANS has established requirements for the *Get to Know Nuclear* Patch for the following Girl Scout levels:

- Juniors (grades 4-5)
- Cadettes (grades 6, 7 & 8)
- Seniors (grades 9-10)
- Ambassadors (grades 11-12)

See modifications below for Daisy and Brownie scouts.

Scouts must complete at least 5 of the 7 stations to receive the patch.

Patches can be ordered directly from the [ANS Store \(Item #750082\)](#).



Daisies/Brownies (grades K-3) – Basic concepts: 1 hour (at a scheduled meeting)

The Daisies/Brownies workshop should include the following basic concepts:

- Atoms make up everything.
- We can split atoms to make energy.
- Atoms can also split without our help.
- Splitting atoms releases radiation, a form of energy.
- We live in a world full of natural and man-made radiation.
- When used responsibly, radiation provides reliable, clean energy.
- We use radiation in many other helpful ways: to date fossils, in growing our food, in medicine, and in industry.

It is recommended that troops work directly with an [ANS Local or Student Section](#) to organize a workshop for a group of girls, since many of the activities involve teamwork. However, modified activities are available for girls to complete the requirements on their own. If you have any questions about the patch or ANS's requirements, please contact Janice Lindegard at (708) 579-8290 or by email: jlindegard@ans.org.

Get to Know Nuclear

Prerequisite: Describe the [basics of nuclear science](#).

- Discuss protons, neutrons, and electrons and how atoms are structured
- Discuss fission
- Discuss the difference between atoms and isotopes.
- Discuss isotopes, stability, and decay chains.
- Discuss ionizing –vs- non-ionizing radiation

Station A – Half-life / Do one of the following:

1. [m&m™ Half-Life Demonstration](#)
2. [Licorice Activity](#)
3. [Flip-Out \(pennies\)](#)
4. [Half-Life of Paper](#)

Station B – Fission vs Fusion / Do one of the following:

Discuss how you use fission to make electricity. Discuss the how fusion is different.

1. [Balloon chain reaction](#) (critical mass)
2. [Mouse trap reactor demonstration](#) (long set up time, can only be done once)
3. [Dominoes chain reaction](#)
4. [Fission balloons](#) (energy release)
5. [Nuclear fusion](#) (marshmallows)

Station C – Careers (Girls in Science) / Do one of the following:

Discuss at least 5 careers: job descriptions, required education and training. Visit the [Careers section](#) on this site to learn more. You can also interview nuclear professionals to discuss: what they do, why they chose their career path, and how they prepared for it.

1. Dress up/role playing (team)

- Obtain materials for outfits for at least 5 careers (e.g. lab coat, eye protection, dosimeter, Geiger counter for a radiation worker; radiation training suit, a business suit/ jacket for a manager; a backpack and notebook for a college student, etc.).
- Break the scouts into sub-groups and each group gets one career. The girls work as a team to explain the job that goes with the outfit. After a few minutes have everyone come together and each group can take a turn presenting about their career.

2. Who run the World? Girls

- If you do not have access to career items, write about famous women in nuclear history (Marie Sklodowska Curie, Harriet Brooks, Lise Meitner etc), current women in the field (Shirley Jackson, Allison M. Macfarlane, Kristine L. Svinicki – NRC, J’Tia Taylor – Survivor); or discuss why you are interested in a particular nuclear field.

Resources:

[ANS Careers brochure](#)

Station D – Radiation and radioactivity are a natural part of our world / Do one of the following:

1. Calculate your annual dose

- Complete the ANS [Radiation dose chart](#). An adult should walk the girls through this step-by-step to ensure they know what each item is.
- Explain the concepts of [time, distance, and shielding](#).

2. Detecting Radiation

- Obtain Geiger counters, sources (alpha, beta, gamma), and shielding materials (paper and lead)
- Place sources at different heights/lengths to demonstrate distance.

Station E – Seeing the Unseen / Do one of the following:

1. [Build a cloud chamber](#)
2. [Build an electroscope](#) (ionization chamber)
3. [Radiation photographs](#)

Station F – Modeling an Atom / Do one of the following:

1. [Rutherford Boards](#)

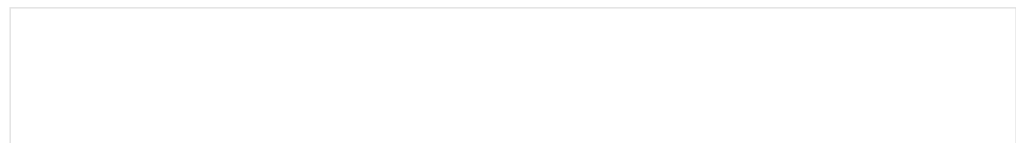
2. [Modeling atoms \(marshmallows\)](#)
3. [3D Anatomy of an atom \(cut-out\)](#)

Station G – Nuclear technology works / Do one of the following: (Cadets/Seniors/Ambassadors Only)

Since it is difficult to organize a plant tour on your own, scout troops are encouraged to coordinate tours with nuclear professionals through one of ANS's Local or Student Sections. To locate and contact a section in your area, please visit the [ANS website](#). If you are working with a facility for a tour, they may have restrictions on when the girls can tour. This session can be moved to accommodate the facility. If a tour is not possible, Cadettes/Seniors/Ambassadors can complete option #4.

1. Visit a local nuclear power plant training facility
 - During the tour discuss, how a reactor works, what a reactor operator's job is like, and what training is needed.
 - For Cadettes/Seniors/Ambassadors, discuss the [nuclear fuel cycle](#) and how fuel is made. Make sure to include mining, processing, enrichment, fuel assembly (or fuel bundle), nuclear reactor, nuclear waste, and reprocessing.
 - Discuss the importance of a diverse [energy mix](#) (including coal, nuclear, gas, and renewables).
2. Visit a local laboratory (national labs) or research reactor (universities).
 - During the tour discuss the variety of experiments performed at the facility, what a researcher's job is like, and what training is needed.
 - Discuss current research in the field, where famous experiments occurred (i.e Argonne, CERN etc), and what the future holds for new research.
3. Visit a hospital that uses nuclear techniques for diagnosis and treatment of diseases.
 - During the tour interview professionals you meet and learn about the different parts of nuclear medicine.
 - Discuss the various types of nuclear-medicine tests that are performed, the protection used by people who work with radioactive materials at the hospital, and how they dispose of their radioactive waste.
4. If a site visit is not available, discuss the various applications of nuclear technology (space, consumer products, industry, food, health/medicine, archaeology, power generation) and how they benefit your everyday life.
 - **Resources:**
 - [Day with the Atom](#)
 - [Sustainable Solutions for Our World](#)
 - [Medical Use of Radioisotopes](#)
 - [Fuel Cycle](#)
 - [Boiling Water Reactor](#)
 - [Pressurized Water Reactor](#)
 - **Activities to substitute for a tour:**
 - [Playing Energy Action Game](#) (team)
 - Playing an energy inspired quiz game (team)
 - Make a human power plant, with each girl being a part of the reactor (team)
 - [No more empties \(isotopes in consumer products demo\)](#)
 - [How thick is it? \(isotopes in industry demo\)](#)
 - Nuclear Science & Technology kiosk – set up items (or pictures) illustrating uses of nuclear technology (i.e. space vehicles, events, a smoke detector, a soft drink can, permanent press clothes, non-stick frying pan, ice cream, computer disks, etc.) Each item should have a card with a caption explaining the connection to nuclear technology. This can be done as a team or as an individual project.

Read more about nuclear matters



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KNOW NUCLEAR

Science

- Radiation
- Radiation Detection
- Protecting Against Exposure
- Biological Effects
- Isotopes
- Nuclear Fission
- Nuclear Fusion

Technology

- Propulsion
- Medical Radioisotopes
- Fusion Progress
- Reactors
- Next Generation of Reactors
- Transporting Nuclear Waste

Applications

- Agriculture
- Art and Science
- Commercial
- Energy
- Hydrogen Generation
- Industry
- Medical
- Space

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