Scout Name: _____ **Unit #:** _____ **Date:** _____

ATOMIC ENERGY

Merit Badge Requirements

1) Tell the meaning of the following: alpha particle, atom, background radiation, beta particle, curie, fallout, half-life, ionization, isotope, neutron, neutron activation, nuclear energy, nuclear reactor, particle accelerator, radiation, radioactivity, roentgen, and X ray.

2) Make three-dimensional models of the atoms of the three isotopes of hydrogen. Show neutrons, protons, and electrons. Use these models to explain the difference between atomic weight and number.

3) Make a drawing showing how nuclear fission happens. Label all details. Draw a second picture showing how a chain reaction could be started. Also show how it could be stopped. Show what is meant by a "critical mass."

4) Tell who five of the following people were. Explain each of the five discovered in the field of atomic energy: Henri Becquerel, Niels Bohr, Marie Curie, Albert Einstein, Enrico Fermi, Otto Hahn, Ernest Lawrence, Lise Meitner, William Roentgen, and Sir Ernest Rutherford. Explain how any one person's discovery was related to one others persons work.

5) Draw and color the radiation hazard symbol. Explain where it should and should not be used. Tell why and how people must use radiation or radioactive materials carefully.

6) Do any THREE of the following:

A) Build and electroscope. Show how it works. Put a radiation source inside it. Explain any difference seen.
B) Make a simple Geiger counter. Tell the parts. Tell which types of radiation the counter can spot. Tell how many counts per minute of what radiation you have found in your home.
C) Build a model of a reactor. Show the fuel, the control rods, the shielding, the moderator, and any cooling material. Explain how a reactor could be used to change nuclear into electrical energy or make things radioactive.
D) Use a Geiger counter and a radiation source. Show how the counts per minute change as the source gets closer. Put three different kinds of material between the source and the detector. Explain any differences in the counts per minute. Tell which is the best to shield people from radiation and why.
E) Use fast-speed film and a radiation source. Show the principles of autoradiography and radiography. Explain what happened to the films. Tell how someone could use this in medicine, research, or industry.
F) Use a Geiger counter (that you have built or borrowed), find a radiation source that has been hidden under a covering. Find it in at least three other places under the cover. Explain how some one could use this in medicine, research, agriculture, or industry.
G) Visit a place where X ray is used. Draw a floor plan of the room in which it is used. Show where the unit, the person who runs it, and the patient would be when it is used. Describe the radiation dangers from X ray.
H) Make a cloud chamber. Show how it can be used to see the tracks caused by radiation. Explain what is happening.
I) Visit a place where radioisotopes are being used. Explain by drawing how and why it is used.
J) Get samples of irradiated seeds. Plant them. Plant a group of nonirradiated seeds of the same kind. Grow both groups. List any differences. Discuss what irradiation does to seeds.

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Scout Name: _____ **Unit #:** _____ **Date:** _____

Requirement 1

Tell the meaning for the following:

Alpha Particle: _____

Atom: _____

Background Radiation: _____

Beta Particle: _____

Curie: _____

Fallout: _____

Half-Life: _____

Ionization: _____

Isotope: _____

Neutron: _____

Neutron Activation: _____

Nuclear Energy: _____

Nuclear Reactor: _____

Particle Accelerator: _____

Radiation: _____

Radioactivity: _____

Roentgen: _____

X-Ray: _____

Requirement 2

Make three-dimensional models of the atoms of the three isotopes of hydrogen. Show neutrons, protons, and electrons. Describe your models: _____
_____
_____
_____
_____
_____

__ Show your models to your counselor.

Explain the difference between atomic weight and number: _____
_____
_____
_____
_____

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Requirement 3

In the space below make a drawing showing how nuclear fission happens. Label all details.

Make a second drawing showing how a chain reaction could be started. Also, show how it could be stopped.

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Show or describe what is meant by a "critical mass": _____
_____
_____
_____

Requirement 4

Select five of the following people and tell who they were. Also, explain what each discovered in the field of atomic energy:

Who was ***Henri Becquerel***? _____
_____

What did he discover? _____
_____

Who was ***Niels Bohr***? _____
_____

What did he discover? _____
_____

Who was ***Marie Curie***? _____
_____

What did she discover? _____
_____

Who was ***Albert Einstein***? _____
_____

What did he discover? _____
_____

Who was ***Enrico Fermi***? _____
_____

What did he discover? _____
_____

Who was ***Otto Hahn***? _____
_____

What did he discover? _____
_____

Who was ***Ernest Lawrence***? _____
_____

What did he discover? _____
_____

Who was ***Lise Meitner***? _____
_____

What did she discover? _____
_____

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Who was ***William Roentgen***? _____
_____

What did he discover? _____
_____

Who was ***Sir Ernest Rutherford***? _____
_____

What did he discover? _____
_____

Explain how one person's discovery was related to another person's work: _____
_____
_____
_____
_____
_____
_____

Requirement 5

Draw and color the radiation hazard symbol.

Where should this symbol be used? _____

Where should this symbol not be used? _____

Tell why and how people muse use radiation or radioactive materials carefully: _____
_____
_____
_____
_____
_____
_____

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Requirement 6

You have been given ten options for this requirement. Select and complete three of them.

If you selected ***Option A***:

Build an electroscope. Briefly describe how you did this: _____
_____
_____

Show/Describe how your electroscope works: _____
_____
_____

Put a radiation source inside it. What was your source that you used? _____

Explain any difference seen: _____
_____
_____

If you selected ***Option B***:

Make a simple Geiger counter. Briefly describe how you made it: _____
_____
_____

List all the parts of your Geiger counter: _____
_____
_____

Tell which types of radiation the counter can spot: _____
_____
_____

Tell how many counts per minute of what radiation you have found in your home: _____
_____
_____

If you selected ***Option C***:

Build a model of a reactor: Describe your model: _____
_____
_____

Make sure your model includes the following: fuel, control rods, shielding, the moderator, and any cooling material.

__ Show your model your counselor. Point out the above parts.

Explain how a reactor could be used to change nuclear into electrical energy or make things radioactive: _____
_____
_____
_____
_____
_____
_____
_____
_____
_____

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If you selected ***Option D***:

Use a Geiger counter and a radiation source. Show how the counts per minute change as the source gets closer. Briefly describe this exercise: _____
_____
_____
_____

Put three different kinds of material between the source and the detector. Tell about the counts per minute for each material:

Material: _____ Counts Per Minute: _____

Material: _____ Counts Per Minute: _____

Material: _____ Counts Per Minute: _____

Tell why there were differences between the materials: _____
_____
_____

Tell which is the best material to shield people from radiation and why: _____
_____
_____
_____

If you selected ***Option E***:

Using fast-speed film and a radiation source, show the principles of autoradiography and radiography. Give a brief summary of how you did this: _____
_____
_____
_____

Explain what happened to the films: _____
_____
_____
_____

Tell how someone could use this in medicine, research, or industry: _____
_____
_____
_____

If you selected ***Option F***:

Using a Geiger counter (that you have built or borrowed), find a radiation source that has been hidden under a covering. What did you find? _____

Find at least three other places under the cover and list them:

_____ _____ _____

Explain how someone could use this in medicine, research, agriculture, or industry: _____
_____
_____
_____
_____

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If you selected ***Option G***:

Visit a place where X-ray is used. Where did you visit? _____ Date: _____

Draw a floor plan of the room in which the X-ray is used. Show where the unit, the person who runs it, and the patient would be when it is used:

Describe the radiation dangers from X-ray: _____
_____
_____
_____
_____
_____
_____
_____
_____

If you selected ***Option H***:

Make a cloud chamber. Describe how you did this: _____
_____
_____
_____

Tell/Show how it can be used to see the tracks caused by radiation: _____
_____
_____
_____

Explain what is happening: _____
_____
_____
_____

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If you selected ***Option I***:

Visit a place where radioisotopes are being used. Where did you visit? _____ Date: _____

Explain by drawing how and why it is used:

If you selected ***Option J***:

Get samples of irradiated seeds. Plant them. Plant a group of nonirradiated seeds of the same kind. Grow both groups.

What kind of seeds did you plant? _____

What differences did you see between the irradiated and nonirradiated seeds when they grew? _____
_____
_____

Tell what irradiation does to seeds: _____
_____
_____