GUIDED INQUIRY: MINI PROJECT  
Topic: Applications of Nuclear Energy

❖ There are many applications of nuclear chemistry today. Here is a list of a portion of them:

- Medicine
  - Treatment
  - Diagnosis
- Warfare/weapons
- Reactors: Energy
- Scientific analysis
  - Radioactive Dating
  - Tracing
  - NMR
- Food and Agriculture
  - Insect Control
  - Food Preservation and Treatment
- Industrial Uses

This assignment is adapted from Mrs Mucci BUT follow this instruction sheet as there are MANY differences! Go to: http://www.binghamtonschools.org/NuclearChemistryGuidedInquiry.aspx

Nuclear Chemistry Guided Inquiry

Please use the following links to learn about Radioactivity and the properties of alpha, beta, and gamma radiation. * Note - Learning the basics > we can discuss this in class as we go *

Open the notebook file in the attached link, on page 2 click on the arrow, allow blocked content, follow through the tutorial. Write down any pertinent definitions as you go. * this forms part of your NOTES *

When finished, proceed to page 3 of the file and test you understanding with the review questions.

Nuclear Chemistry Webquest

Please use the following copy of the WEBQUEST with direct links to complete your research.

Introduction:

ABC’s of Nuclear Science http://www.lbl.gov/abc/Basic.html

“Nuclear chemistry is the most powerful and misunderstood topic in chemistry. The mention of the word nuclear puts most people in fear and their first and sometimes only picture is that of a nuclear explosion. What comes first to your mind when the term nuclear chemistry is brought up? Are the bomb, nuclear power and radiation poisoning the only things nuclear chemistry has to offer?”

Completing this quest will allow you to understand many aspects of nuclear chemistry while also working with your classmates to determine your stance on a specific use of nuclear chemistry in our world.

Goal:

- The end result of your quest will be an informed perspective from which to form an opinion for or against the use of nuclear chemistry in our world.
- This will be a group project (you and your partner).
- Your persuasive argument can be in any written form. For example, your group may choose to do a pamphlet, a newspaper article, an essay, or any other written form of communication you choose.

Albert Einstein said: “Concern for man and his fate must always form the chief interest of all technical endeavors.”
Procedure:

- The first task your group should complete is deciding who will complete which part of the project and decide on a specific goal or use of nuclear chemistry.
- You should research about the history of nuclear chemistry and about your specific topic.
- Keep track of all additional resources you use about your topic – to be listed in a bibliography. (This includes any images you are finding about your topic and the reasons why you picked each site – is it up to date? valid info from an educational institute or trusted source? is it unbiased? Etc…)
- The second task your group should complete is the research for your paper. This should be separated into two portions:
  1. Research about the history of nuclear chemistry. This must include:
     - The scientists involved in the advancement of nuclear chemistry
     - Stable vs. unstable nuclei
     - Types of radiation emitted during nuclear reactions
     - Nuclear Fission vs. Nuclear Fusion (Compare and contrast these two processes)
     ** Note we can discuss some of this in class!**
  2. Research about the specific use of nuclear chemistry your group will focus on. Pick a topic listed in the introduction section or find another use of nuclear chemistry in our world. You should research the following 5 ESSENTIAL QUESTIONS about your topic:
     - What are the nuclear reactions involved in this use of nuclear chemistry? Is it fission or fusion? What energy transformations are involved in your application?
     - What is the purpose of this use of nuclear chemistry in our world?
     - What are the benefits of this use of nuclear chemistry in our world?
     - What are the detriments of this use of nuclear chemistry in our world?
     - What is your opinion? For or against?

Resources:

The following resources are additional good resources for your research:
- Nuclear Chemistry: An Introduction, good site! Watch animation of U fission reactions controlled vs uncontrolled - make sure you try the quiz and submit your answers. my quiz score first try was __/8.
- Nuclear Reactors (How they work! - a great site for those of you that choose this as your project topic) > be sure to include the aboriginal opinions about nuclear reactors

Questions to guide your Quest:

What do they mean by the term 'everyday radiation'. Explain and give specific examples


Answer the following questions:

1. What are the commonly used units to measure radiation dosage?

2. What is considered a lethal dose of radiation?

3. What are some of the common effects of radiation exposure?

4. What specifically happened to people in Hiroshima and Nagasaki?

5. What happened to the people of Chernobyl?
Part III – Go to: http://www.nrc.gov/about-nrc/radiation/rad-around-us.html

Calculate the Personal Annual Radiation Dose for at least one of your group members. What is it? __________

How much does the NRC allow you to be exposed to each year? ________________

Part IV – Go to: http://nuclearconnect.org/know-nuclear/applications/medical-uses

1. How is nuclear medicine useful in diagnosing illnesses?

2. How is nuclear medicine useful in treating illnesses?

Part V - Go to http://physicsquest.homestead.com/nuclear.html (nuclear power)

View the short video at http://www.teachersdomain.org/resource/phy03.sci.phys.energy.fission/

1. What is the major source of energy in a nuclear reactor?

2. List 3 hazards of nuclear power.

3. List 2 alternatives of nuclear power.

4. Describe what happens in nuclear fission.

Part VI - Go to http://physicsquest.homestead.com/nuclear.html (nuclear power)


1. What nuclei are fused in the nuclear reaction of a hydrogen bomb?

2. What function does Styrofoam perform in a hydrogen bomb?

3. Describe the reaction in a fusion bomb?
Part VII - Definitions to be used in your notes for this Unit.

Radioactivity:

Radiation:

Radioisotopes:

Nuclear Force:

Natural Radioactive Decay:

Artificial Transmutation:

Nuclear Force:

Alpha Particle:

Beta Particle:

Gamma Radiation:

Fusion:

Fission:

Alternate site

Map of Canada showing locations of nuclear powerplants and other nuclear research facilities etc...
http://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/results.cfm?category=research-facilities

30 years after Chernobyl > wildlife thrives
https://science.howstuffworks.com/30-years-chernobyl-wildlife-thrives.htm

EVALUATION RUBRIC:
<table>
<thead>
<tr>
<th>CONTENT</th>
<th>4 excellent</th>
<th>3 good</th>
<th>2 developing</th>
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<tbody>
<tr>
<td><strong>Intro</strong></td>
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<tr>
<td>- Title is descriptive and informative</td>
<td>- Title is somewhat descriptive and informative</td>
<td>- Title is not descriptive and not informative</td>
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<tr>
<td>- Brief definition and history of the topic</td>
<td>- Definition and history of the topic is present at times</td>
<td>- No definition or history of the topic</td>
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<tr>
<td>- Connection to science and scientific background is clear</td>
<td>- Connection to science and scientific background is unclear at times</td>
<td>- Connection to science and the scientific background is unclear</td>
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<td>- Why did you choose the topic</td>
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<tr>
<td><strong>'Body'</strong></td>
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<tr>
<td>- Uses relevant, well-chosen descriptions, facts, details, and examples to support and answer the 5 essential Q's to your chosen topic</td>
<td>- Attempts to use descriptions, facts, details and examples to support and answer the 5 essential questions</td>
<td>- Uses too few, inappropriate, or irrelevant descriptions, facts, details, or examples to support the big ideas</td>
<td></td>
</tr>
<tr>
<td>- Amount &amp; Level of detail is grade 10 appropriate and is expressed in your own words.</td>
<td>- Details may be insufficient / Some content may be irrelevant</td>
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<tr>
<td><strong>Conclusion &amp; Personal Opinion about the use of this nuclear technology</strong></td>
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<tr>
<td>- Uses relevant, well-chosen descriptions, facts, details, and examples to support the answer to your chosen perspective</td>
<td>- Attempts to use descriptions, facts, details and examples to support the answer to an chosen perspective</td>
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<tr>
<td><strong>Creativity</strong></td>
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</table>
| - Visually exciting media is used to clarify information, emphasize important points, strengthen arguments and add interest- ie use of colour, pictures etc… | - Attempts to add interesting touches to the presentation media / Some visuals may be distracting or irrelevant | - Presents ideas in typical ways (examples: text-heavy, copy of notes, not enough or no interactive features/ additions such as colour and pictures etc…)
| - Explained in own words to appropriate grade 10 level | - Explained in own words to appropriate grade 10 level | |
| **Organization** | |        |             |
| - Submitted when due-without issues | - Submitted when due -minor issue | - Not ready to submit on time – major issues/ not completed |
| - Effective hook and introduction to the topic you have chosen | - Simple introduction to the topic | - No introduction is provided |
| - Clearly states the main idea / Moves from one idea to the next in a logical order, emphasizing the main points in a focused, coherent manner | - States the main idea / Sequencing of ideas and arguments may sometimes be confusing | - The main idea is not effectively communicated / Ideas are presented in a sequence that does not make sense. |
| - Concise conclusion / Effective summary, includes your position on the use of nuclear chemistry | - Simple conclusion/summary | - No concluding statements have been included |
| - Is an appropriate length | - Is an appropriate length | - Is not an appropriate length – too skimpy |
| - All images are cited | - Not all images are cited | - Few or no images cited |

<table>
<thead>
<tr>
<th>BIBLIOGRAPHY</th>
<th>4 excellent</th>
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<tr>
<td><strong>APA and annotations</strong></td>
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<tr>
<td>- 4 or more properly cited sources (APA) including relevant, thoughtful,</td>
<td>- 4 sources have been provided / citations and/or annotations may have some errors</td>
<td>- Student has attempted to provide</td>
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**Sc10 Nuclear Reactions**

**Topic** __________

**Name(s)** __________
| annotations that say why you used each site | ● some reasons for using sites | references without annotations |