Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Due Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_

## One World Presentation: How are Radioisotopes used for human gain?

***Goal:*** *To relate the principals of radioactivity to their use in a technology of your choice.*

*Radioactivity refers to the particles which are emitted from nuclei as a result of nuclear instability*[[1]](#footnote-1). *While investigating Becquerel rays scientists found that physical factors, such as pressure and temperature, and chemical changes had no effect on the amount of radiation emitted from the nucleus of an atom. The radiation was coming from the core of the atom and it was Marie Curie who coined the term radioactivity for the spontaneous emission of radiation from the nucleus of an atom[[2]](#footnote-2). Over the past one hundred years, the incredible field of nuclear chemistry has brought us many useful but potentially harmful technologies. We have subsequently derived many benefits from the application of radioactivity and this presentation is a chance for you to research one of those technologies.*

**Topic – Radioisotope and its’ uses (see page 3 for examples): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Your presentation should state the formula of the isotope; if it undergoes fission/fusion; the type of parent/daughter nuclei; and what the half-life is; where isotope comes from; and how it is obtained/isolated?
2. How effective is this isotope in solving the problem it is intended to solve and who uses it? What are the possible unintended (negative or positive) side effects?
3. Make sure to **state** and comment on a ***minimum of two*** of the following factors:
	* Moral - Personal view of what is right or wrong
	* Ethical - Society’s rules or code of conduct
	* Social - Related to people, groups
	* Economic - Related to profitability (the ability to make money)
	* Political - Relate to government
	* Cultural - Ideas, customs and behaviours of a society
	* Environmental - Human impact on the natural world

At home / in class: Find the answers to the questions above – by researching online. Design a presentation that explains what you learned. The criteria are presented below in the assessment rubric.

Website Hints:

<http://www.darvill.clara.net/nucrad/uses.htm>

<http://library.thinkquest.org/27917/content/uses.htm>

<http://www.chem.duke.edu/~jds/cruise_chem/nuclear/uses.html>

<http://www.docbrown.info/page03/3_54radio05.htm#Uses>

The structure of the presentation should follow the following format:

Teacher Email: sdlawson@sd45.bc.ca

1. The video should be submitted to YouTube or a USB electronically in video format before the due date (how you choose to create the video is your choice). ***If submitted to YouTube email link to your teacher.***
2. Include an introduction that eases the viewer into your topic, explaining your topic and why it is important.
3. One to three minutes expanding and/or explaining the topic introduced in the introduction. This should reflect the major component to the video presentation and include the problem that it solves and at least 2 factors that you have researched.
4. The video presentation should be ***around 5 minutes in length***.
5. *Remember to include citations on* ***Noodlebib***. Please go to the Rockridge Library website for directions on siting sources
6. ***Remember to WOW me***. This is your opportunity to both show me what you know, but also do so in such a way that is creative and interesting to the video.

Note: On the due date of the assignment you will be show casing your video’s for peer assessment. Make sure to either have the URL to your video or a USB with your video loaded on the date the assignment is due.

**Criteria:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Beginning (0)** | **Approaching (1-2)** | **Accomplished (3-4)** | **Exemplary(5-6)** |
| **One World** |
| The student does not reach a standard described by any of the descriptors to the right. | The student **states** how radioactivity is applied and how it may be used toaddress a specific problem or issue in a local or global context.The student **states** the effectiveness of radioactivity and its application in solving the problem or issue.The student does **not** describe the implications of the use and application of radioactivity. | The student **describes** how radioactivity is applied and how it may be used to address a specific problem or issue in a local or global context.The student **describes** the effectiveness of radioactivity and its application in solving the problem or issue.The student **describes** the implications of the use and application of radioactivity interacting with at least **one** of the following factors: moral, ethical, social, economic, political, cultural and environmental. | The student **explains** how radioactivity is applied and how it may be used to address a specific problem or issue in a local or global context.The student **discusses** the effectiveness of radioactivity and its application in solving the problem or issue.The student **discusses** and evaluates the implications of the use and application of radioactivity interacting with at least **two** of the following factors: moral, ethical, social, economic, political, cultural and environmental. |
| **States:** give a specific name, value or other brief answer without explanation or calculation**Describes**: give a detailed account or picture of a situation, event, pattern or process**Explains**: give a detailed account including reasons or causes**Discusses:** offers a considered and balanced review that includes a range of argument factors or hypotheses. Options or conclusion should be presented clearly and supported by appropriate evidence. |
| **Communication** |
| The student does not reach a standard described by any of the descriptors given to the right. | The student uses a **limited range** of scientific language **correctly**.The student communicates scientific information with **limited effectiveness**.The student **makes little attempt** to document sources of information. | The student uses **some** scientific language correctly.The student communicates scientific information with **some effectiveness**.The student **partially documents** sources of information. | The student uses **sufficient** scientific language correctly.The student communicates scientific information **effectively**.The student **fully documents** sources of information **correctly**. |
| **Sufficient** = all vocab: isotopes, parent nuclei, daughter nuclei, half-life, type of decay, ray**Effective communication** = speaks clearly, from memory, uses diagrams to supplement explanation, demonstrates full understanding of the material**Fully documents sources** = all sources in Noodlebib, including diagrams/pictures |

**Isotopes – choose one isotope and one use for that isotope**

**Americium-241** Used in many smoke detectors for homes and businesses, to measure levels of toxic lead in dried paint samples, to ensure uniform thickness in rolling processes like steel and paper production, and to help determine where oil wells should be drilled.

**Calcium-47** Important aid to biomedical researchers studying the cell function and bone formation of mammals.

**Californium-252** Used to inspect airline luggage for hidden explosives, to gauge the moisture content of soil in the road construction and building industries, and to measure the moisture of materials stored in silos.

**Carbon-14** Helps in research to ensure that potential new drugs are metabolised without forming harmful by-products.

**Cesium-137** Used to treat cancers...to measure correct patient dosages of radioactive pharmaceuticals...to measure and control the liquid flow in oil pipelines...it tell researchers whether oil wells are plugged by sand...and to ensure the right fill level for packages of food, drugs and other products. (The products in these packages do not become radioactive.)

**Chromium-51** Used in research in red blood cell survival studies.

**Cobalt-57** Used in nuclear medicine to help physicians interpret diagnose scans for patients' organs, and to diagnose pernicious anaemia.

**Cobalt-60** Used to sterilise surgical instruments, to improve the safety and reliability of industrial fuel oil burners, and to preserve poultry, fruits and spices.

**Copper-67** When injected with monoclonal antibodies into a cancer patient, helps the antibodies bind to and destroy the tumour.

**Curium-244** Used in mining to analyse material excavated from pits and slurries from drilling operations.

**Iodine-123** Widely used to diagnose thyroid disorders.

**Iodine-129** Used to check some radioactivity counters in *in vitro* diagnostic testing laboratories.

**Iodine-131** Used to diagnose and treat thyroid disorders. (Former President George Bush and Mrs. Bush were both successfully treated for Grave's disease, a thyroid disease, with radioactive iodine.)

**Iridium-192** Used to test the integrity of pipeline welds, boilers and aircraft parts.

**Iron-55** Used to analyse electroplating solutions.

**Krypton-85** Used in indicator lights in appliances like clothes washers and dryers, stereos and coffeemakers to gauge the thickness of thin plastics and sheet metal, rubber, textiles and paper...and to measure dust and pollutant levels.

**Nickel-63** Used to detect explosives...and as voltage regulators and current surge protectors in electronic devices.

**Phosphorus-32** Used in molecular biology and genetics research.

**Plutonium-238** Has safely powered at least 20 NASA spacecraft since 1972.

**Polonium-210** Reduces the static charge in production of photographic film and phonograph records.

**Promethium-147** Used in electric blanket thermostats...and to gauge the thickness of thin plastics, thin sheet metal, rubber, textiles and paper.

**Radium-226** Makes lightning rods more effective.

**Selenium-75** used in protein studies in life science research.

**Sodium-24** Used to locate leaks in industrial pipelines...and in oil well studies.

**Strontium-85** Used to study bone formation and metabolism.

**Strontium-90** Used in survey meters by schools, the military and emergency management authorities.

**Technetium-99m** The most widely used radioactive isotope for diagnostic studies in nuclear medicine. Different chemical forms are used for brain. bone, liver, spleen and kidney imaging and also for blood flow studies.

**Thallium-204** Measures the dust and pollutant levels on filter paper...and gauges the thickness of plastics, sheet metal, rubber, textiles and paper.

**Thorium-229** Helps fluorescent lights to last longer.

**Thorium-230** Provides colouring and fluorescence in coloured glazes and glassware.

**Tritium** Used for life science anti drug metabolism studies to ensure the safety of potential new drugs for self luminous aircraft and commercial exit signs...for luminous dials, gauges and wrist watches...and to produce luminous paint.

**Uranium-234** Used in dental fixtures like crowns and dentures to provide a natural colour and brightness.

**Uranium-235** Fuel for nuclear power plants and naval nuclear propulsion systems...also used to produce fluorescent glassware, a variety of coloured glazes and wall tiles.

**Xenon-133** Used in nuclear medicine for lung ventilation and blood flow studies.

1. http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/radact.html [↑](#footnote-ref-1)
2. http://www.nelson.com/nbcsp10otr/bcsp10otr/Attachments/a\_student\_book/sp10\_275.pdf [↑](#footnote-ref-2)