TASK PLANNER

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| LEARNING AREA | Science -Physics |
| TEACHER |  S Panjwani |
| YEAR / SUBJECT | Stage 1 Physics |
| TASK NAME | SHE task: Radioisotopes and their Role in Modern Society |
| **DUE DATE** | Week 2 Term 4 |

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| LEARNING DESIGN |
| **Task Outline*****Background Information*** *Radioisotopes are playing an increasingly important part in Australian Life. They are widely used in medicine, industry and scientific research, and new applications for their use are constantly being developed. In many cases, radioisotopes have no substitute and in most of their applications they are more effective and cheaper than alternative techniques and processes (ANSTO, 2006).***Your Task:****Research an application of radioisotopes and its role in modern society and write an individual report of 1000 words.** **You will need to access information from different sources, select relevant information, analyse your findings, explain the connection to science as a human endeavour, and develop and explain your own conclusions from the investigation. Based on your investigation, prepare a scientific report that include the components below**.**Step 1: Choosing an application**Choose an application of radioisotopes used in modern society. Be specific e.g., carbon dating rather than radiometric dating, PET scans rather than medical imaging. Ideas are listed on the last page of this document.*Each student must select a different application and have it approved by the teacher.***Step 2: Planning and Research**Research your chosen application by completing the *Planning and Research Template.* Remember to utilise the databases from The Hub (library website via the school intranet) and Google Scholar. Please do not use Wikipedia **Step 3: Presentation**Based on your investigation, present your work as a written report. The final product should be pitched for an audience at senior high school level with basic physics knowledge. It must include the following components from Requirement and Format. Possible topics are pasted on third page of the task sheet for you to consider and research.

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| **Requirements and Format:** |
| **Word Count /Length** | The science as a human endeavour written report should be a maximum of 1000 words  |
| **Format/Text Type** | This report could take the form of an article for a scientific publication |
| **Components** | **Introduction:** Identify the focus of the investigation and the key concept(s) of science as a human endeavour that it links to **(1 short paragraph** $≈$ **150 words)****Physics Background: explain** any relevant physics concepts needed to understand your application **(1 paragraph** $≈$ **250 words)****Discussion: SHE paragraphs: Explain** how your chosen application illustrates the interaction between science and society, focusing on one SHE key concept. Include a discussion of the impact or potential impact of your application e.g. further development, effect on quality of life, environmental implications, economic impact **(2 or 3 paragraphs** $≈$ **450 words)****Conclusion:** Summarise the topic and present a solution or final opinion based on the researched points covered in the report **(1 short paragraph** $≈$ **150 words)****References**In-text citations and a Harvard reference list are required. The use of appropriate diagrams, graphs or tables will improve the effectiveness of your communication |

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| Section | Performance Standard | Evidence |
| **Introduction**identify the focus of the investigation and the key concept(s) of science as a human endeavour that it links to **Physics Background**Include information about the relevant physics concepts the topic relates to  | KA1A: Demonstrates deep and broad knowledge and understanding of a range of physics concepts.B: Demonstrates some depth and breadth of knowledge and understanding of a range of physics concepts.C: Demonstrates knowledge and understanding of a general range of physics concepts.D: Demonstrates some basic knowledge and partial understanding of physics concepts.E: Demonstrates limited recognition and awareness of physics concepts. | * Explanation of the physics behind the topic, with clear links to role of Radioisotopes in the society.
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| **Science and Society**Explain how the focus of the investigation illustrates the interaction between science and society**Discussion**Discuss the purpose, potential impact, or application of the focus of the investigation, e.g. further development, effect on quality of life, environmental implications, economic impact, intrinsic interest | KA3 A: Critically explores and understands in depth the interaction between science and society.B: Logically explores and understands in some depth the interaction between science and society.C: Applies physics concepts generally effectively in new or familiar contexts.Partially explores and recognises aspects of the interaction between science and society.D: Partially explores and recognises aspects of the interaction between science and society.E: Attempts to explore and identify an aspect of the interaction between science and society. | * Clear connections made to at least one Science as a Human Endeavour key concept
* The impact of the chosen application on society (e.g. environmental implications, economic impacts, social impacts, effect on quality of life) and/or possible future developments.
* Evidences in terms of Data : chart , graphs , tables etc to show the impact.
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| **Conclusion**Summarise the topic and present a solution or final opinion based on the research | IAE3A Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.B Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.C Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.D Describes data and undertakes some basic interpretation to formulate a basic conclusionE Attempts to describe results and/or interpret data to formulate a basic conclusion. | * Inclusion of data and evidence including statistics, tables, graphs, diagrams and/or images from a range of credible sources
* Analysis and interpretation of this data and evidence to justify
* how the topic works
* how the topic demonstrates the SHE key concept
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| **Communication and References**In-text citations and a Harvard reference list are required. The use of appropriate diagrams, graphs or tables will improve the effectiveness of your communication. | KA4A: Communicates knowledge and understanding of physics coherently, with highly effective use of appropriate terms, conventions, and representations.B: Communicates knowledge and understanding of physics mostly coherently, with effective use of appropriate terms, conventions, and representations.C: Communicates knowledge and understanding of physics generally effectively, using some appropriate terms, conventions, and representations.D: Communicates basic physics information, using some appropriate terms, conventions, and/or representations.E: Attempts to communicate information about physics. | * Properly formatted report with logical and coherent flow
* Within word count/time limit
* Correct spelling and grammar
* Captions for any tables, graphs, diagrams or images
* Use of appropriate and relevant physics terminology
* Properly formatted references (with in-text citation for relevant formats)
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**STEP 1: You can choose from Possible application as below :**

* Gamma irradiation
* for sterilization of medical devices
* for food preservation
* to induce mutation for crop improvement
* Insect control via Sterile Insect Technique (SIT)
* Ionising smoke detectors
* Radiotherapy for treating cancer or other medical conditions (choose a specific example e.g. targeted

 alpha therapy)

* Radioactive tracers and PET or SPECT scans
* Radioisotope thermoelectric generators (RTGs)
* Non-destructive testing (NDT) for industry: gamma radiography

- testing for structural integrity (e.g. inspecting welded joints, testing jet engine turbines)

- quality control for thickness of materials

- cargo inspection and airport baggage screening

- nuclear moisture/density gauge

* “Labelling” fertilisers with radioisotopes for soil management and crop nutrition
* Studying passage and pace of pollutants through groundwater
* Radiometric dating (e.g. carbon dating)
* dating artefacts
* authenticating paintings/identifying forgeries from nuclear bomb tests
* Nuclear powered submarines
* The Rhisotope project (preventing rhino poaching)

The following resources may provide additional ideas:

<https://www.world-nuclear.org/information-library/non-power-nuclear-applications/overview/the-many-uses-of-nuclear-technology.aspx>

<http://www.world-nuclear.org/information-library/non-power-nuclear-applications/radioisotopes-research.aspx>

<https://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0217/r1/br0217r1.pdf>

**Step 2 : Planning Template ( You have to research )**

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| **Application** |  |
| **Relevant Radioisotope(s)** |  |
| **Physics Background** | *Consider the following:** *How is the radioisotope produced or manufactured?*
* *What is the half-life of the radioisotope used?*
* *How does the application work?*
* *What properties of the radioisotope make it suitable for this application?*
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| **SHE Key Concept : Chose Influence mainly it then connects with discussion** | *Copy your chosen key concept as* ***Influence*** *here from the task sheet.**In the space below, take research notes to show how your research addresses the key concept.* |
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| **Discussion of impact on society** | *The impact of the chosen application on quality of life. Consider some of the following:** *social impacts*
* *economic impacts*
* *cultural impact*
* *environmental implications*
* *possible future developments*

*Avoid repeating information from the previous section.* |
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| **Credible Resources** |  |
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**Step 3: Present the final article as a SHE tasks as per components on page 1.**