## Stage 2 PhysicsAssessment Type 1: Investigation Folio

Assessment type and task clearly identified.

**Science as a Human Endeavour Investigation**

Specifies investigation of *contemporary* example.

**Introduction**

The knowledge, understanding, and application of physics can affects human lives in many different ways. In this task you will investigate a *contemporary* example of how science interacts with society.

Particle accelerators, including, for example, synchrotrons, the Large Hadron Collider, and cyclotrons, have developed over recent time and are fundamental to the work of research scientists. They have had a considerable impact on the understanding of how the universe works and are used in many different medical and industrial contexts.

Specific context for the SHE investigation has been chosen.

**Task**

You will select one (or more) of the key concepts for Science as a Human Endeavour listed below to investigate the interaction between science and society based on particle accelerators. You will use and acknowledge a variety of relevant sources as you investigate your chosen topic.

**Report**

You will use the information, data gathered, and feedback provided by your teacher to write a report to demonstrate your understanding of the interactions between science and society as a result of your investigation.

Your report *must* include:

Specifications for the report taken from the subject outline.

* An introduction, which links the focus of your analysis to the SHE key concept(s) chosen
* Relevant physics concepts and background information *(this should support your report but not be the focus)*
* An explanation of how the focus of the investigation illustrates the interaction between science and society, including a discussion of 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
* A conclusion that summarises how the SHE key concept(s) has been addressed.
* In text referencing and reference list using Harvard Referencing

Word count clearly specified.

*Word Count:* The report is a maximum of 1500 words or 10 minutes for an oral presentation.

This does not include in-text referencing or your reference list.

Specific features identified.

**Assessment Design Criteria** Knowledge and Application: KA 1, 3, 4

**Note 1:**

Advice for students.

This is *not* simply a research task on particle accelerators. Your research, findings, and report must focus on **at least one** of the key concepts of Science as a Human Endeavour listed below and demonstrate your understanding of how the focus of your investigation illustrates the interaction between science and society.

**Note 2:**

Opportunity for negotiation.

If you wish to explore a different recent discovery, innovation, issue, or advancement, you may negotiate this with your teacher before you begin your investigation.

**Science as a Human Endeavour Key Concepts**

**Communication and Collaboration**

* Science is a global enterprise that relies on clear communication, international conventions, and review and verification of results.
* Collaboration between scientists, governments and other agencies is often required in scientific research and enterprise.

**Development**

* Development of complex scientific models and/or theories often requires a wide range of evidence from many sources and across disciplines.
* New technologies improve the efficiency of scientific procedures and data collection and analysis. This can reveal new evidence that may modify or replace models, theories, and processes.

**Influence**

* Advances in scientific understanding in one field can influence and be influenced by other areas of science, technology, engineering, and mathematics.
* The acceptance and use of scientific knowledge can be influenced by social, economic, cultural, and ethical considerations.

 **Application and Limitation**

* Scientific knowledge, understanding, and inquiry can enable scientists to develop solutions, make discoveries, design action for sustainability, evaluate economic, social, and environmental impacts, offer valid explanations, and make reliable predictions.
* The use of scientific knowledge may have beneficial or unexpected consequences; this requires monitoring, assessment, and evaluation of risk, and provides opportunities for innovation.
* Science informs public debate and is in turn influenced by public debate; at times, there may be complex, unanticipated variables or insufficient data that may limit possible conclusions.

**Planning record**

Supporting student progress with regular checkpoints.

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|  | **Evidence** | **Due date** | **Teacher signature** |
| Topic selection | Identify the new use of the particle accelerator on which you will focus |  |  |
| Research | * SHE concept focus
* Relevant physics research
* Evidence of interaction between science and society
* Record of resources used
 |  |  |
| Report plan | 1 page outline of report for feedback |  |  |
| Final report | 1500 words |  |  |

**Performance Standards**

| - | Investigation, Analysis, and Evaluation | Knowledge and Application |
| --- | --- | --- |
| A | Critically deconstructs a problem and designs a logical, coherent, and detailed physics investigation.Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.Critically and logically evaluates procedures and their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of physics concepts.Applies physics concepts highly effectively in new and familiar contexts.Critically explores and understands in depth the interaction between science and society.Communicates knowledge and understanding of physics coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear physics investigation.Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.Logically evaluates procedures and their effect on data. | Demonstrates some depth and breadth of knowledge and understanding of a range of physics concepts.Applies physics concepts mostly effectively in new and familiar contexts.Logically explores and understands in some depth the interaction between science and society.Communicates knowledge and understanding of physics mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear physics investigation.Obtains, records, and represents data, using generally appropriate conventions and formats with some errors but generally accurately and effectively.Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.Evaluates procedures and some of their effect on data. | Demonstrates knowledge and understanding of a general range of physics concepts.Applies physics concepts generally effectively in new or familiar contexts.Explores and understands aspects of the interaction between science and society.Communicates knowledge and understanding of physics generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a physics investigation.Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.Describes data and undertakes some basic interpretation to formulate a basic conclusion.Attempts to evaluate procedures or suggest an effect on data. | Demonstrates some basic knowledge and partial understanding of physics concepts.Applies some physics concepts in familiar contexts. physicsPartially explores and recognises aspects of the interaction between science and society.Communicates basic physics information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a physics investigation.Attempts to record and represent some data, with limited accuracy or effectiveness.Attempts to describe results and/or interpret data to formulate a basic conclusion.Acknowledges that procedures affect data. | Demonstrates limited recognition and awareness of physics concepts.Attempts to apply physics concepts in familiar contexts.Attempts to explore and identify an aspect of the interaction between science and society.Attempts to communicate information about physics. |

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| *Notes for teachers:*The following may provide some starting points for students* http://www.synchrotron.org.au/news/latest-news
* <http://theconversation.com/the-australian-synchrotron-is-great-but-what-does-it-do-5704>
* <http://www.abc.net.au/news/2015-02-09/scientists-use-synchrotron-to-reveal-human-skin-inner-workings/6079590>
* <https://www.quora.com/What-are-particle-accelerators-used-for>
* <http://www.accelerators-for-society.org/about-accelerators/index.php?id=21>
* https://study.com/academy/lesson/particle-accelerators-history-types-uses.html
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