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| Inquiry Skills High School Videoconference |
| Outline and syllabus outcomes |
| ANSTO is a leader in nuclear science research, operating Australia’s only nuclear reactor, the Open Pool Australian Light water (OPAL) research reactor. ANSTO manufactures and produces nuclear medicines for Australia and the world, investigates the origins of disease, and develops new diagnostic and therapeutic nuclear medicines. Through this work, ANSTO improves human health and enables life-saving outcomes.ANSTO conducts nuclear science inquiry skills online learning sessions, which cover specific skill outcomes from the Year 9 and Year 10 Australian Curriculum and Working Scientifically skills from the NSW NESA Stage 5 syllabus. ANSTO program outlineThis is a two-lesson plus homework program. A **videoconference workbook** has been developed for students to complete during the videoconference. The workbook also includes post-experiment questions. During the program, students will:**Lesson 1 (teacher-led, in class)*** Develop an aim and hypothesis for their investigation
* Select appropriate equipment from the list provided
* Write an experimental method

\*\*Please send us the experiment designed by your students at least 48 hours before your scheduled online class. This will give us time to prepare the necessary equipment.**Lesson 2 (ANSTO-led, 60 minute online class)*** Investigate and revise the properties of alpha, beta and gamma radiation
* Identify the aim, hypothesis, independent, dependent and controlled variables of their designed experiment
* Record data collected during their radiation experiment in a table
* Discuss the precision, reliability, validity, and accuracy of their results
* Identify potential sources of error in their experiment
* Suggest ways to improve their experiment
* Discuss the real-world applications of the results

**Post-work/homework*** Present results in a graph or diagram (as appropriate)
* Write a discussion for the experiment
* Write a conclusion for the experiment
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**Links to the Australian Science Curriculum and NSW Syllabus**

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| **Learning content**  | **Australian Curriculum links**  | **NSW Syllabus links** |
| **Lesson 1 (in class)**As a class, students design their experiment before the videoconference using the available equipment list and suggested experiments | **Science Inquiry Skills (Year 9 and 10)**Formulate questions or hypotheses that can be investigated scientifically (ACSIS164/198)Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165/199)Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS166/200)**Science Understanding (Year 9)****Chemical Sciences**All matter is made of atoms that are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177) | **Working Scientifically (Stage 5)** ***Questioning and Predicting***Develops questions or hypotheses to be investigated scientifically SC5-4WS***Planning Investigations***Produces a plan to investigate identified questions, hypotheses or problems, individually or collaboratively SC5-5WS**Chemical World (Stage 5)**CW1d) identify that natural radioactivity arises from the decay of nuclei in atoms, releasing particles and energy (ACSSU177) |
| **Lesson 2 (videoconference)**Learn what ANSTO does at the atomic scale using scientific instruments, including nuclear reactors and particle acceleratorsDiscuss the experiment aim, hypothesis, independent, dependent and controlled variablesObserve demonstration of the equipment and devices for measuring/detecting radiation (scintillation counter)Discuss the experimental method and construct a table to record resultsInvestigate the properties of alpha, beta and gamma radiationParticipate in the radiation experiment and record data in the workbookDiscuss the precision, reliability, validity, and accuracy of the resultsIdentify potential sources of error in the experiment and suggest ways to improve the experimentDiscuss the real-world applications of the results | **Science Inquiry Skills (Year 9 and 10)**Formulate questions or hypotheses that can be investigated scientifically (ACSIS164/198)Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165/199)Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS166/200)Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169/203)Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170/204)Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171/205)**Science Understanding (Year 9)****Chemical Sciences**All matter is made of atoms that are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177) | **Working Scientifically (Stage 5)*****Questioning and Predicting***Develops questions or hypotheses to be investigated scientifically SC5-4WS***Planning Investigations***Produces a plan to investigate identified questions, hypotheses or problems, individually or collaboratively SC5-5WS***Conducting investigations***Undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively SC5-6WS***Processing and analysing data and information***Processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions SC5-7WS**Chemical World (Stage 5)**CW1 d) identify that natural radioactivity arises from the decay of nuclei in atoms, releasing particles and energy (ACSSU177)CW1e) evaluate the benefits and problems associated with medical and industrial uses of nuclear energy |
| **Lesson 3 (in class)**Further analyse the data with the teacher in classGraph results (if appropriate)Write a discussion of the resultsWrite a conclusion for the experiment | **Science Inquiry Skills (Year 9 and 10)**Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169/203)Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170/204)Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171/205)Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174/208) | **Working Scientifically (Stage 5)*****Processing and analysing data and information***Processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions SC5-7WS***Communicating***presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations SC5-9WS**Chemical World (Stage 5)**CW1 d) identify that natural radioactivity arises from the decay of nuclei in atoms, releasing particles and energy (ACSSU177)CW1e) evaluate the benefits and problems associated with medical and industrial uses of nuclear energy |