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| Year 11 Chemistry Videoconference |
| Outline and syllabus outcomes |
| ANSTO is a leader in chemical, materials and environmental research, and produces many of Australia’s medical radiopharmaceuticals.ANSTO conducts Year 11 Chemistry videoconferences, which cover specific Knowledge and Understanding content from the NSW NESA Stage 6 Chemistry syllabus Module 1: Properties and Structure of Matter, specifically the section ‘Atomic structure and atomic mass*,* **Inquiry question:** Why are atoms of elements different from one another?’Working Scientifically skills from the NSW NESA Stage 6 Chemistry syllabus are also addressed. We recommend students use our *Year 11 Chemistry Depth Study Guide* for ideas and resources for depth study activities after their videoconference.ANSTO videoconference outlineThe videoconference outlined on the following pages is for an **80 minute lesson**, however, it **can be adjusted to suit shorter or longer lesson times.**A **videoconference workbook** which complements what is presented has also been developed for students to complete during the videoconference. The workbook also includes pre- and post- videoconference activities.Students will: * Investigate the properties of the types of radiation (alpha, beta and gamma)
* Observe background radiation in our cloud chamber
* Collect data during a demonstration of a radiation experiment, using low level radioactive sources and radiation detection equipment.
* Understand the operation and uses of OPAL (Open Pool Australian Lightwater) Research Reactor
* Understand that radioisotopes have a wide variety of uses, including in nuclear medicine, radiotherapy and in dating in geology and palaeobiology
* Understand the production and use of radioisotopes used in nuclear medicine, including Technetium-99m
* Understand the use of ANSTO’s tandem particle accelerators in relation to dating and the environment
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**Links to NSW NESA Stage 6 Chemistry syllabus**

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| **Videoconference content** | **Syllabus links** |
| **Radiation Investigation*** Why some atoms radioactive – discussion of neutron to proton graph

 * Demonstration of the properties of alpha, beta and gamma (penetration through paper, aluminium, lead) using alpha, beta and gamma radioactive sources and scintillation counter.

**Detectors of radiation*** How a cloud chamber detects radiation
* Students draw traces left by alpha particles, beta particles and muons in the cloud chamber
* Monitoring radiation levels in the workplace
 | * investigate the basic structure of stable and unstable isotopes by examining:
	+ their position in the periodic table
	+ the distribution of electrons, protons and neutrons in the atom
	+ representation of the symbol, atomic number and mass number (nucleon number)
* investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:
	+ types of radiation
	+ types of balanced nuclear reactions

**Working scientifically*** Questioning and predicting
* Processing data and information
* Analysing data and information
* Conducting investigations
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| **OPAL*** Virtual tour of the OPAL research reactor to discuss the reactor components and their function, and the operation of OPAL
	+ Animation model of the process of nuclear fission
	+ The purpose of OPAL reactor to produce nuclear medicines, irradiate silicon and produce neutrons for research
 | * investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:
	+ types of radiation
	+ types of balanced nuclear reactions
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| **Videoconference content** | **Syllabus links** |
| **Radioisotopes for use in nuclear medicine*** Production of nuclear medicine in OPAL
* Molybdenum processing at ANM (show ANM manufacture presentation 2019)
* explain how Gentech generator works
* use of Tc-99m as a diagnostic radionuclide
* Use of some other reactor produced radionuclides – Lu-177, Iodine-131 as examples of therapeutic radionuclides
 | * investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:
	+ types of radiation
	+ types of balanced nuclear reactions
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| **Particle accelerators*** operation and role of ANSTO particle accelerators
* Linear particle accelerators are used to conduct dating of materials and environmental research using accelerator mass spectrometry
 | * investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:
	+ types of radiation
	+ types of balanced nuclear reactions
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| **Videoconference content** | **Syllabus links** |
| **Radiation penetration Investigation*** Detect radiation produced by some radioactive sources to investigate
* How radioactive are different household objects?
* Which of these sources should we should choose for the experiment and why?
* Carry out a scientific investigation, including a discussion of the scientific method applied, to investigate one of the following (selected by the teacher prior to the videoconference):
	+ How does radioactivity change with distance from the source?
	+ How does the thickness of a shielding material affect radiation penetration?
	+ How do different types of shielding material affect radiation penetration?
 | **Working scientifically*** Questioning and predicting
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* Analysing data and information
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