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| Year 12 Investigating Science Videoconference |
| Outline and syllabus outcomes |

ANSTO is a leader in nuclear, neutron and environmental research. It operates Australia’s only nuclear reactor, the Australian Synchrotron, cyclotrons and linear accelerators. It produces most of the nuclear medicines used in the region and is advisor to Government on all nuclear matters.

ANSTO conducts Year 12 Investigating Science videoconferences, which cover specific Knowledge and Understanding content from NSW NESA Stage 6 Investigating Science syllabus:

* Module 6: Technologies, specifically the inquiry question “How have developments in technology led to advances in scientific theories and laws that, in turn, drive the need for further developments in technology?”
* Module 8: Science and society, specifically the inquiry questions “How do science-related events affect society’s view of science?”, “Why is scientific research regulated?” and “How do economic, social and political influences affect scientific research?”

Working Scientifically skills from the NESA Stage 6 Chemistry syllabus are also addressed.

ANSTO videoconference outline

The videoconference outlined on the next page is for an **80 minute lesson**, however, it can be adjusted to suit shorter or longer lesson times. The content can also be modified to suit individual teacher requirements.

A **videoconference workbook**, that complements what is presented, has been developed for students to complete during the videoconference. The workbook also includes post- videoconference activities. Answers for the activities in the workbook are available on request.

During the videoconference, students will:

* Discover how to monitor radiation using several detection technologies
* Investigate the properties of alpha, beta and gamma radiation and of neutrons
* Collect data during a demonstration of a radiation experiment, using low level radioactive sources and radiation detection equipment and different shielding material
* Understand the design, operation and primary function of the OPAL (Open Pool Australian Lightwater) research reactor and compare it with power reactors
* Investigate the creation of key products of the nuclear industry, including nuclear medicines, and their significance to society
* Using historical nuclear research experiments understand the technology that was used in the science discoveries and how that led to enhanced technology that is used today
* Investigate some major nuclear incidents and public reaction to them
* Discuss economic, societal and political factors that affect the regulation and funding of scientific research

# Links to NESA Stage 6 Investigating Science syllabus

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| **Videoconference content** | **Syllabus links** |
| **Radiation Investigation*** 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*** See examples of radiation detectors used at ANSTO to measure radiation levels in the workplace
 | **Working scientifically*** Questioning and predicting
* Processing data and information
* Analysing data and information
* Conducting investigations

**Module 6*** Using examples, assess the impact that developments in technologies have had on the accumulation of evidence for scientific theories, laws and models, including but not limited to: technology to detect radioactivity and the development of atomic theory
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| **OPAL*** Virtual tour of the OPAL research reactor to discuss the reactor components and their function
* Compare OPAL with power reactors
	+ Explain the purpose of the OPAL reactor to produce nuclear medicines, irradiate silicon and produce neutrons for research
 | **Module 6*** Using examples, assess the impact that developments in scientific theories, laws and models have had on the development of new technologies, including but not limited to: radioactivity and radioactive decay on the development of radiotherapy and nuclear bombs

**Module 8*** evaluate how scientific research aids economic development and human progress in relation to, for example: nuclear power generation
* Investigate and assess ethical issues surrounding current scientific research in, for example: use of radiation
* Investigate the need for the regulation of scientific research in, for example: products and processes of the nuclear industry
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| **Other research facilities**Students will observe animations and slides that demonstrate the operation of the ANSTO Nuclear Medicine production facility, the Australian Centre for Neutron Scattering, and the Centre for Accelerator Science.We discuss how:* Neutrons are used in diffraction experiments to investigate crystal structures of materials
* Linear accelerators are used to conduct environmental research
* Nuclear medicines are designed, produced and used to diagnose and treat disease
 | **Module 8*** Investigate and assess ethical issues surrounding current scientific research in, for example: use of radiation
* Investigate the need for the regulation of scientific research in, for example: products and processes of the nuclear industry
* evaluate the impacts of scientific research, devices and applications on world health and human wellbeing
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| **Interaction of technology and science*** Using historical nuclear research experiments, understand the technology that was used in science discoveries and how that led to enhanced technology that is used today
 | **Module 6*** Using examples, assess the impact that developments in technologies have had on the accumulation of evidence for scientific theories, laws and models, including but not limited to: technology to detect radioactivity and the development of atomic theory
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| **Public perception of nuclear science*** Investigate some major nuclear accidents and the public reaction to them
* Discuss reasons for tight regulation on nuclear research and its impact on the development of new technologies
* Discuss economic, social and political influences on scientific research and what projects are funded
 | **Module 8*** investigate case studies of past events to consider how they have affected the public image of science, including but not limited to: meltdowns of nuclear reactors
* Investigate and assess ethical issues surrounding current scientific research in, for example: use of radiation
* Investigate the need for the regulation of scientific research in, for example: products and processes of the nuclear industry
* using examples, analyse the impacts that governments and large corporations have on scientific research, including but not limited to: − corporations and market opportunities − university research project budgets − governmental budgets and limited time priorities
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