



# Tour Outline & Syllabus Outcomes

## Year 11 Chemistry

January 2019

ANSTO is a leader in chemical, materials and environmental research, and produces many of Australia's medical radiopharmaceuticals.

ANSTO conducts Year 11 Chemistry excursions, which cover specific Knowledge and Understanding content from Module 1: Properties and Structure of Matter and Working Scientifically skills from the NSW NESA Stage 6 Chemistry syllabus. These excursions consist of:

- A 75 minute interactive presentation in our Discovery Centre theatrette and display area
- A 15 minute break for students
- A 90-120 minute tour of ANSTO's research facilities, including the OPAL research reactor, the ANSTO Nuclear Medicine production facility, the Australian Centre for Neutron Scattering, and the Centre for Accelerator Science

Students will complete the excursion workbook during the excursion.

Excursion content	Syllabus links
<p><u>Pre-work in excursion workbook:</u></p> <ul style="list-style-type: none"> <li>• Identify the location of protons, neutrons and electrons in the atom</li> <li>• Practise writing isotopes in <math>{}^A_ZX</math> notation</li> <li>• Identify properties of electromagnetic radiation</li> <li>• Give reasons why isotopes are unstable and identify elements that are always unstable on the periodic table</li> <li>• Process information to identify properties of alpha, beta and gamma radiation</li> <li>• Process information and define the concept of “half-life”</li> <li>• Students use online posters about radionuclides at ANSTO to complete the following in a table: <ul style="list-style-type: none"> <li>a) Identify the number of protons and neutrons in the isotope</li> <li>b) Represent the isotope in <math>{}^A_ZX</math> notation</li> <li>c) Record the half-life of the isotope</li> <li>d) Write a balanced nuclear decay reaction for the isotope (including the types of radiation emitted when it decays)</li> <li>e) Describe the use of the isotope <ul style="list-style-type: none"> <li>• hydrogen-3</li> <li>• molybdenum -99</li> <li>• technetium-99m</li> <li>• iodine-131</li> <li>• cobalt-60</li> <li>• carbon-14</li> <li>• uranium-235</li> <li>• beryllium-10</li> <li>• chlorine-36</li> </ul> </li> </ul> </li> </ul>	<p>Investigate the basic structure of stable and unstable isotopes by examining:</p> <ul style="list-style-type: none"> <li>• Their position in the periodic table</li> <li>• The distribution of electrons, protons and neutrons in the atom</li> <li>• Representation of the symbol, atomic number and mass number (nucleon number)</li> </ul> <p>Investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:</p> <ul style="list-style-type: none"> <li>• Types of radiation</li> <li>• Types of balanced nuclear reactions</li> </ul>
<p><u>In their own time:</u></p> <p>Draw traces left by alpha particles, beta particles and protons in the cloud chamber</p>	<p>Working scientifically</p> <ul style="list-style-type: none"> <li>• Questioning and predicting</li> <li>• Conducting investigations</li> </ul>
<p><u>Interactive presentation:</u></p> <ul style="list-style-type: none"> <li>• Learn about ANSTO - our people, our research and our facilities</li> <li>• Observe demonstrations of devices for measuring/detecting radiation (scintillation counter, thermoluminescent device, dosimeter)</li> <li>• Participate in a radiation experiment demonstration</li> <li>• As a class, students either design their own experiment before the excursion (<a href="#">equipment list</a> and <a href="#">suggested experiments</a>) or select an example experiment on the day <ul style="list-style-type: none"> <li>• Volunteer students perform the experiment with help from the Education Officer</li> <li>• The Education Officer leads discussions about concepts such as replication, controls, dependent and independent variables, and sources of error</li> <li>• Students record data in their workbook and analyse the data back at school</li> </ul> </li> </ul>	<p>Working scientifically</p> <ul style="list-style-type: none"> <li>• Questioning and predicting</li> <li>• Planning investigations</li> <li>• Conducting investigations</li> <li>• Processing data and information</li> <li>• Analysing data and information</li> </ul>
<p><u>In the display area</u></p> <p>Simulate a fission reaction with ping pong balls and discuss how this activity models the fission of Uranium-235 in the core of the OPAL reactor</p>	<p>Investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:</p> <ul style="list-style-type: none"> <li>• Types of radiation</li> <li>• Types of balanced nuclear reactions</li> </ul> <p>Working scientifically</p> <ul style="list-style-type: none"> <li>• Problem solving</li> </ul>

<p><u>Tour:</u></p> <ul style="list-style-type: none"> <li>• Students visit the OPAL research reactor, the Australian Centre for Neutron Scattering, and the Centre for Accelerator Science. We discuss how scientists use these facilities to:</li> <li>• Produce nuclear medicines for Australia and other countries in accordance with stringent safety regulations</li> <li>• Conduct first-class scientific research as part of large-scale international collaborations</li> <li>• Provide advice and support to industry</li> <li>• Monitor the environment using naturally-occurring radioisotopes</li> </ul>	<p>Learning across the curriculum:</p> <ul style="list-style-type: none"> <li>• Asia and Australia’s Engagement with Asia</li> <li>• Sustainability</li> <li>• Ethical Understanding</li> <li>• Intercultural Understanding</li> <li>• Literacy</li> <li>• Numeracy</li> <li>• Civics and Citizenship</li> <li>• Work and Enterprise</li> </ul>
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