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| In Their Element |
| Outline and syllabus outcomes |
| ANSTO is a leader in chemical, materials and environmental research, and produces many of Australia’s medical radiopharmaceuticals.  ANSTO conducts *In their element* videoconferences, which cover:   * specific Science Understanding content from the Australian Curriculum for Years 9 and 10 Chemical Sciences. Science as a Human Endeavour content descriptions are also addressed. * Components of CW1 and CW2, Chemical World of the Stage 5 NSW Science Syllabus.   ANSTO videoconference outline  The videoconference outlined on the following pages is for a **60 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:   * Review atomic structure (protons, neutrons and electron shells). * View real samples of example elements, hear about their history, properties and uses. * Learn how, in 1869, Dmitri Mendeleev used the properties of known elements to invent the periodic table that forms the basis of our modern periodic table, and even predicted the properties of as yet undiscovered elements. * Listen to ANSTO scientists about careers in STEM and participate in a Q&A session. * Understand that elements have a wide variety of uses, including in engineering, materials science, human health, industry and environmental science. * Discuss the order of elements in today’s periodic table according to atomic number and electronic structure of an atom. * Discuss the electronic structure of elements in the same period and same group. * Discuss periodic trends, such as changes in types of elements across a period (metal/semi-metal/non-metal) and metallic character down a group. * Play a game using the periodic table. |

**Links to the Australian Science Curriculum and NSW Syllabus**

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| **Videoconference content** | **Australian Curriculum links** | **NSW Syllabus links** |
| **Introduction to ANSTO in the context of atoms and elements**   * Introduce that ANSTO does science at the atomic scale. Explain in simple terms that we investigate and manipulate atoms using scientific instruments including nuclear reactors and particle accelerators   **Structure of the atom**   * Review structure of the atom (review of pre-work – protons, neutrons, electron shells) * Relate number of protons and neutrons to atomic number and mass number * Introduce periodic table: a chart of all the currently known elements arranged according to their atomic number and so that elements with similar properties appear in vertical columns | **Science Understanding (Year 9)**  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)  Elaborations   * describing and modelling the structure of atoms in terms of the nucleus, protons, neutrons and electrons | **Chemical World Stage 5**  CW1 a) identify that all matter is made of atoms which are composed of protons, neutrons and electrons (ACSSU177)  b) describe the structure of atoms in terms of the nucleus, protons, neutrons and electrons  CW2 a) identify the atom as the smallest unit of an element and that it can be represented by a symbol |
| **Discovery of elements**   * See real samples of various elements, outline the discovery of elements from ancient times to the mid-20th century and relate this to their properties and uses throughout history   **Arrangement of elements in the periodic table**   * Describe how Dmitri Mendeleev in 1869 arranged elements known at the time according to their mass and properties, and left gaps for elements he recognised had not been discovered yet (e.g. Gallium) | **Science Understanding (Year 10)**  The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186)  **Elaborations**  - recognising that elements in the same group of the periodic table have similar properties  - investigating the chemical activity of metals | **Chemical World Stage 5**  CW2 c) describe the organisation of elements in the Periodic Table using their atomic number  d) relate the properties of some common elements to their position in the Periodic Table  f) outline some examples to show how creativity, logical reasoning and the scientific evidence  available at the time, contributed to the development of the modern Periodic Table |
| **Scientist Q&A**   * Students listen to an introduction from an ANSTO scientist about their career in STEM and how they use selected elements as part of their job   + Students participate in a Q&A | **Science as a Human Endeavour (Year 9)**  People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people’s lives, including generating new career opportunities (ACSHE160)  Elaborations  - investigating how technologies using electromagnetic radiation are used in medicine, such as in the detection and treatment of cancer  - recognising aspects of science, engineering and technology within careers such as medicine, medical technology, telecommunications, biomechanical engineering, pharmacy and physiology | **Stage 5 Chemical World**  CW4 e) describe examples to show where advances in science and/or emerging science and  technologies significantly affect people's lives, including generating new career opportunities in  areas of chemical science such as biochemistry and industrial chemistry. |
| **Today’s periodic table**   * Discuss order of elements according to their atomic number not atomic mass, as the existence of protons and neutrons was not known until the early 20th century. * Briefly introduce the idea of isotopes, which means atoms of same element can have different masses. * Discuss organisation of elements in periods (add another electron shell) / groups (same electron number in outer electron shell). * Discuss change in types of elements and their location on table: metal (left)/semi-metal/non-metal (right) across period, and increase in metallic character down a group.   **Play a Periodic Table Game**   * Referring to the ANSTO periodic table, answer questions to identify elements in the periodic table using their symbol, atomic number and electron configuration | **Science Understanding (Year 10)**  The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186)  **Elaborations**  - recognising that elements in the same group of the periodic table have similar properties  - describing the structure of atoms in terms of electron shells  - explaining how the electronic structure of an atom determines its position in the periodic table and its properties | **Stage 5 Chemical World**  CW2 a) identify the atom as the smallest unit of an element and that it can be represented by a symbol  b) distinguish between the atoms of some common elements by comparing information about the numbers of protons, neutrons and electrons  c) describe the organisation of elements in the Periodic Table using their atomic number  d) relate the properties of some common elements to their position in the Periodic Table  e) predict, using the Periodic Table, the properties of some common elements |