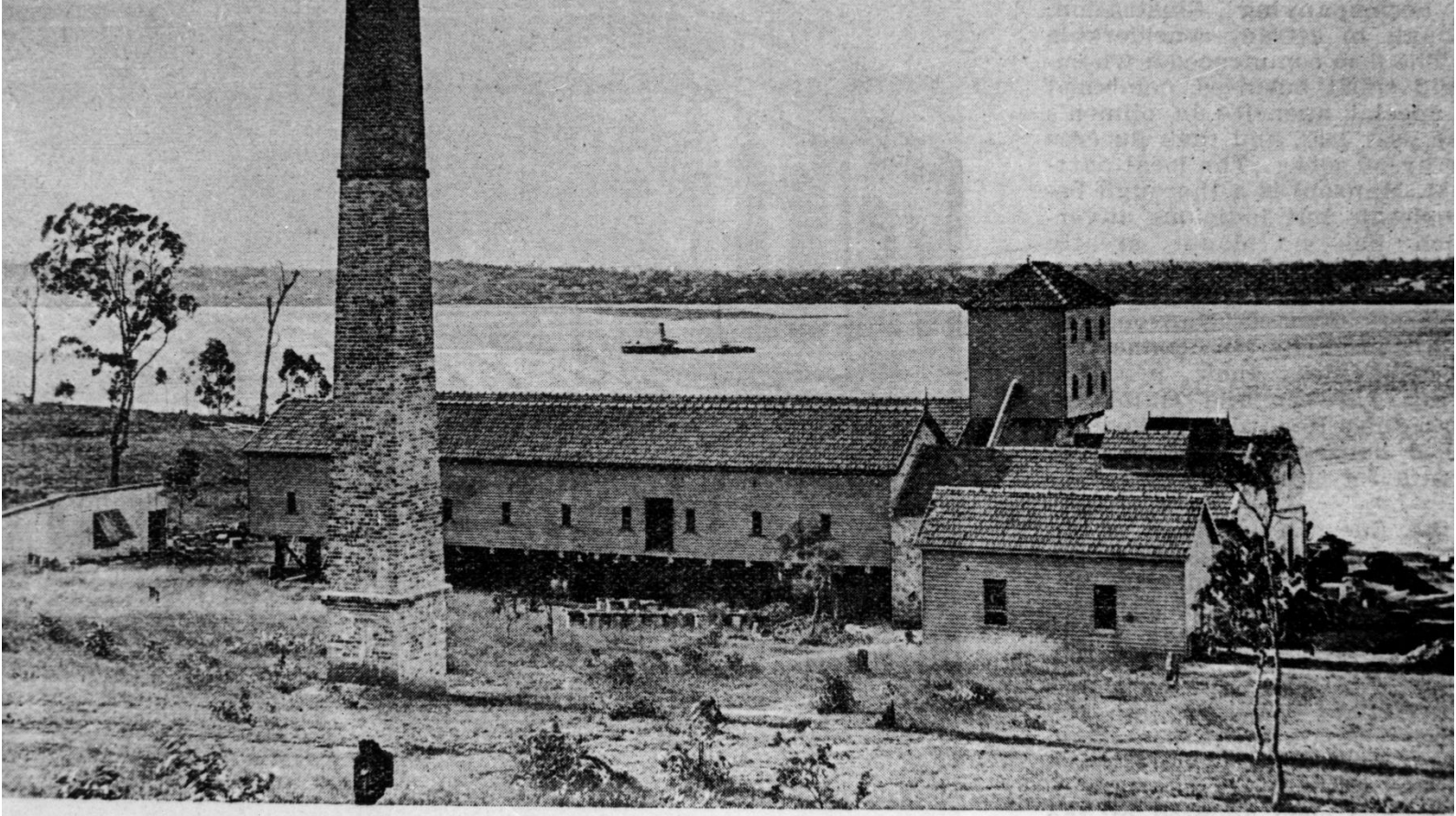




MESSRS. ELLIOTT BROTHERS' CHEMICAL WORKS, BULIMBA.

STATE LIBRARY⁷
QUEENSLAND

Year 9

Chemical Sciences

Student research guide

Cover: [Elliott Brothers Chemical Works at Bulimba, 1896](#), State Library of Queensland. Negative number: 177440.

© 2026. This work is licensed under the Attribution-NonCommercial-ShareAlike 4.0 International Creative Commons ([CC BY-NC-SA 4.0 license](#)) by State Library of Queensland. You are free to share and adapt the work under the following terms: you must give appropriate credit, it is for a non-commercial purpose and, if you remix, transform, or build upon the materials, you must distribute your contributions under the same license as the original.



Date prepared: 24 November 2023

Date revised: 04 March 2026

Copyright information for teachers

This research guide is designed for individual use by students.

Please note, due to licensing arrangements, State Library of Queensland's subscription databases and ebooks are for private research and study purposes only. They may not be used as teaching resources in classroom environments in schools or other educational institutions and students must not be required to access specific databases or ebooks as part of the curriculum.

Teachers can advise students on State Library's resources and encourage their use to help with their studies and research. Students are encouraged to access State Library's resources at school, but not during class time.

Teachers are most welcome to advise students what is available via State Library, and to encourage students to make use of ebooks and databases to help with their studies. It is permissible for a teacher to demonstrate the use of State Library's catalogue, and to point out how various online material can be accessed.

It is also permissible for students to access State Library's online resources at school – but this must not be during class time. An example of permitted use might be where students have a spare period when they work on assignments or homework, and they are accessing databases as private members of State Library. Information about joining State Library is [here](#).

Please also note that State Library has digitised a range of material such as diaries, and out of copyright publications held in our collections. There are no restrictions on the use of this material as part of a teaching program – and no requirement to be a member of the library to use this material. This type of material can easily be found, [searching State Library's One Search catalogue](#) using the "SLQ digitised collections" option in the dropdown menu.

For more information about the use of copyright materials visit [Understanding copyright](#).

Overview

As Queensland's leading research library, State Library is a great place to find information to complete your research-based assessments.

State Library's One Search catalogue is the gateway to an extensive suite of national and international journals, databases, ebooks, encyclopedias, newspaper archives, and collections of thousands of historical images, letters, artworks, diaries, and artefacts to interrogate as sources.

Before you get started

- [Become a member](#) of State Library of Queensland (it's free!).
- Once you have joined State Library, log in to your account in [One Search](#) so you can use the links in this research guide to access the featured collection items.
- Complete the [Student research with State Library](#) module for a guide to navigating State Library's resources. Or visit the [One Search help page](#) for tips & tricks for searching One Search.
- You can search our [OneSearch catalogue](#) or begin exploring by clicking on some of the featured items contained in this research guide.

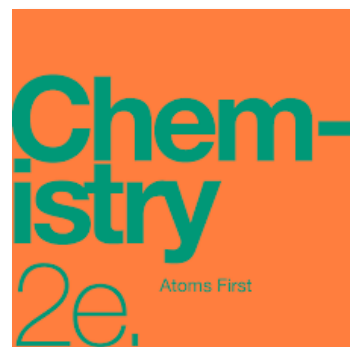
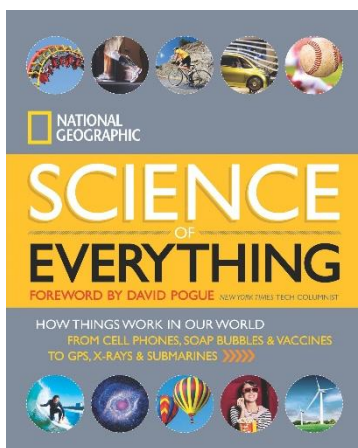
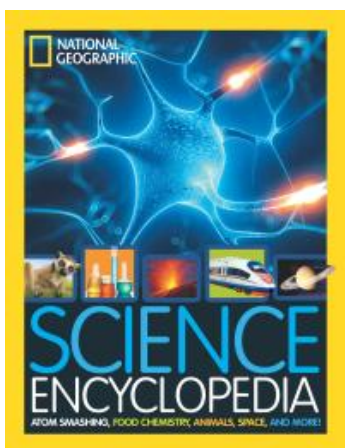
Student research with State Library

Feel more confident navigating State Library's resources to find high quality information sources for your assessments.

[Start module](#) 



Featured ebooks



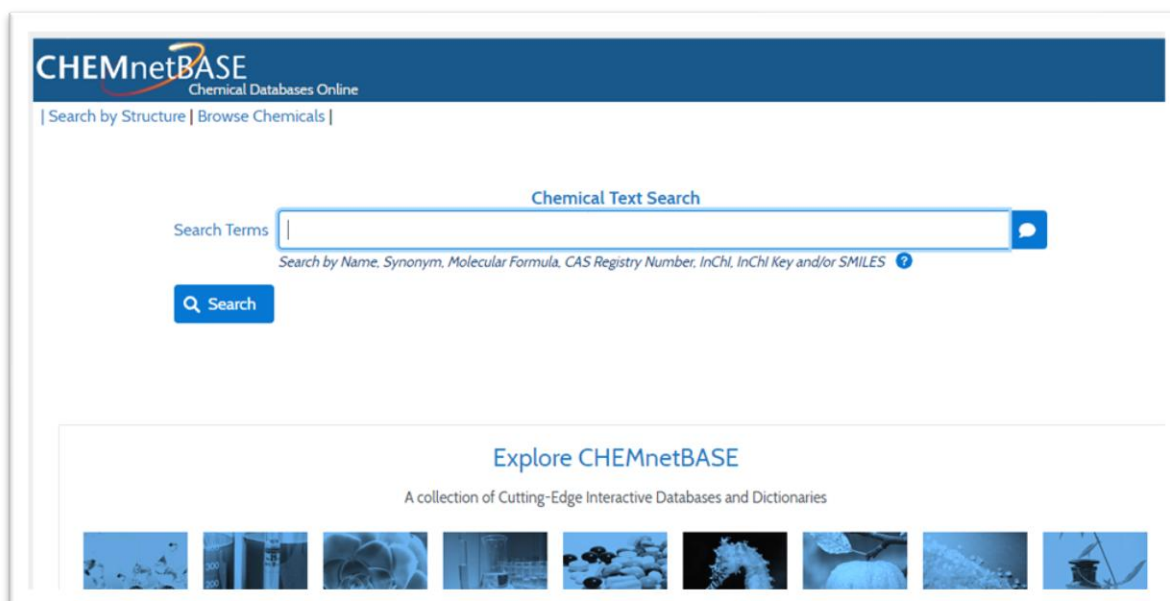
The Atomic Model

Explain how the model of the atom changed following the discovery of electrons, protons and neutrons and describe how natural radioactive decay results in stable atoms.

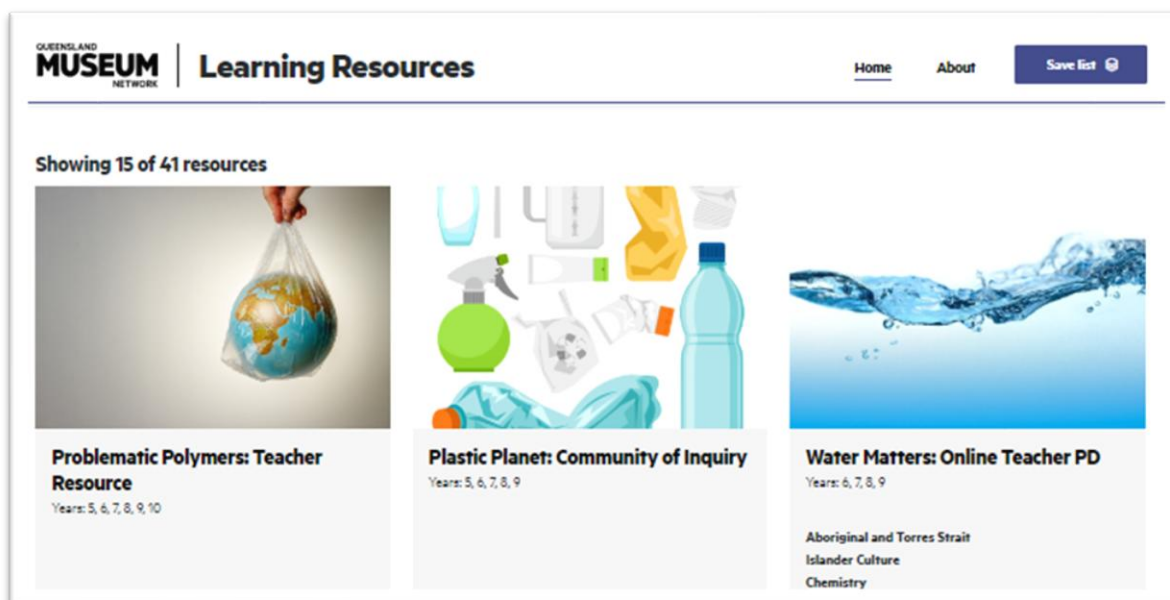
- Comparing the mass and charge of protons, neutrons and electrons.
- Examining how the discovery of electrons, protons and neutrons resulted from experimental evidence and answered questions related to properties and behaviours of atoms.
- Explaining that differences in the number of neutrons in atoms of the same element results in isotopes and that naturally occurring isotopes of some elements are unstable.
- Describing in simple terms how different unstable isotopes decay such as radon-222 releasing an alpha particle, iodine-131 releasing a beta particle and cobalt-60 releasing gamma radiation to form stable atoms.
- Defining half-life, examining the timescales of decay of different elements such as carbon-14 and uranium-238 and simulating or using digital simulations to examine radioactive decay including half-life.
- Investigating how radiocarbon and other dating methods have been used to establish that First Peoples of Australia have been present on the Australian continent for more than 60,000 years.
- Identifying where applications of radioactivity are used in medicine and industry such as diagnosing and treating cancer and checking for faults in materials used in aircraft and spacecraft.
- Discussing how mass and energy are connected at all scales and energy conversion processes within atomic nuclei.

Featured databases

[CHEMnetBASE](#) provides a comprehensive database of chemicals and their uses, as well as chemical equations and properties.



[Queensland Museum](#) provide Learning Resources website students with many activities, fact sheets, images, and videos.



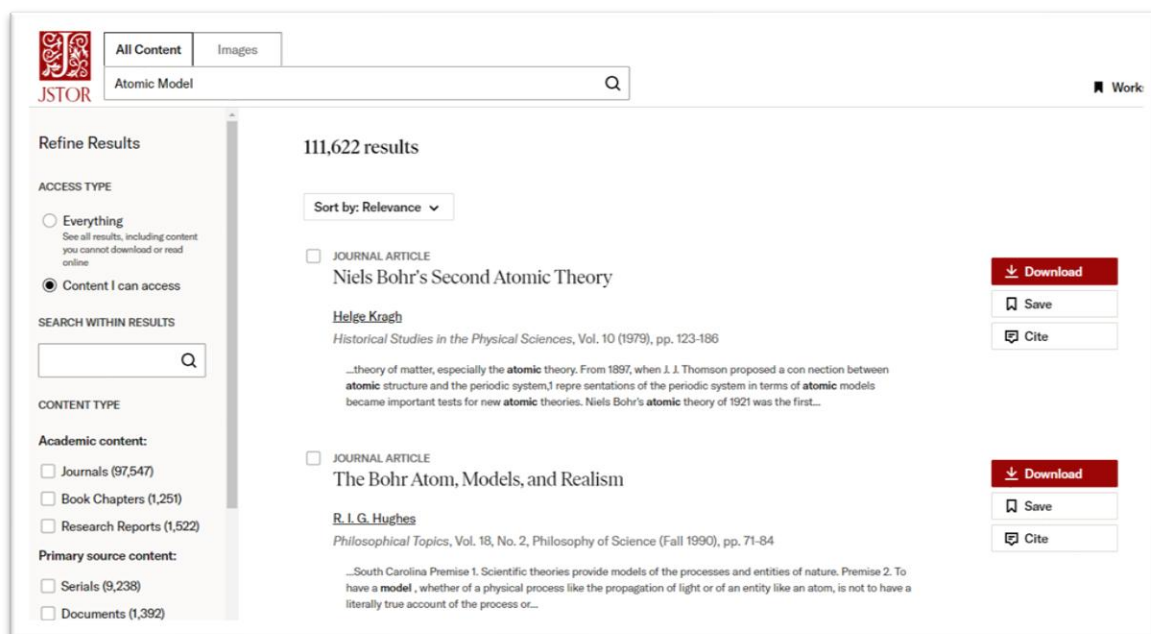
[Oxford Reference](#) spans 25 different subject areas, bringing together 2 million digitised entries across Oxford University Press's dictionaries, companions, and encyclopedias.

The screenshot shows the Oxford Reference website interface. At the top, the 'Oxford Reference' logo is on the left, and a search bar is on the right. Below the logo, there are tabs for 'Subject' and 'Reference Type'. The search results are for 'The atomic model', showing 244 entries and 2 books. The results are sorted by 'Relevance'. A sidebar on the left allows for refining terms, with 'The atomic model' entered in the search box. The main content area displays the first result, 'Hantaro Nagaoka', with a brief overview of his life and work.

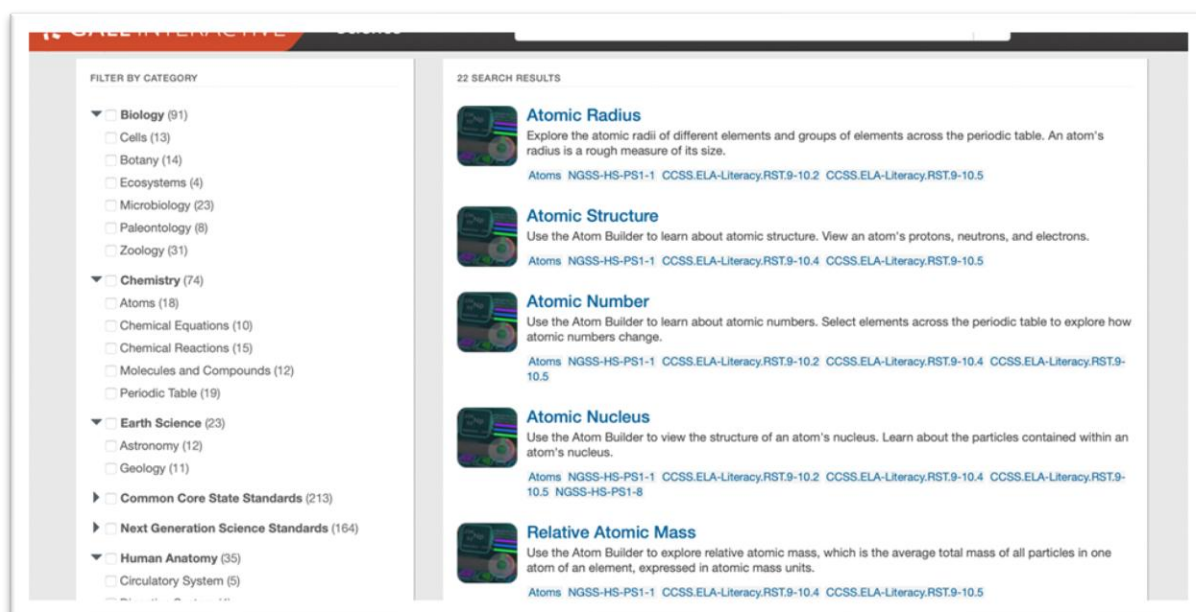
The [Britannica Library](#) has articles, images and more, with a selection of resources especially for teenagers.

The screenshot shows the Britannica Library website interface. At the top, there are tabs for 'Articles', 'Images', 'Videos', and 'More'. The search results are for 'atomic model (physics)'. The first result is 'atom (matter)', which is the top 3 result. Below this, there are sections for 'Atomic model', 'Models of atomic structure', and 'Rutherford's nuclear model'. Each section provides a brief overview of the concept. At the bottom, there is a section for 'images related to this search', which includes four images: a blue sphere, a black and white photograph of a person, a red sphere with white dots, and a blue sphere with red and white dots.

[JSTOR](#) provides access to more than 12 million scholarly journal articles and ebooks, and is especially good for primary sources.



[Gale Interactive: Science](#) provides a comprehensive view of the most-studied science subjects. Authoritative, high-quality digital content is paired with interactive 3D models.



[ProQuest Central](#) brings together 47 databases across 175 subject areas, providing easy intuitive access to an incredibly broad and comprehensive range of content.

The screenshot shows the ProQuest Central interface. At the top, it says 'Access provided by STATE LIBRARY OF QUEENSLAND'. The search term 'Atomic Model' is entered in the search bar. Below the search bar, it displays '47,949 results'. On the left side, there are filters for 'Applied filters' (physics OR materials science OR students OR chemistry), 'Sorted by' (Relevance), 'Limit to' (Full text, Peer reviewed), and 'Source type' (Scholarly Journals (33,818), Books (2), Audio & Video Works (3), Dissertations & Theses (2,785), Newspapers (775)). The main results area shows three items: 1. 'Progress on Brussels-Skyrme atomic mass models on a grid: stiff neutron matter equation of state' by Grams, G.; Ryssens, W.; Scamps, G.; Goriely, S.; Chamel, N. 2. 'Real-Time Atomic Scale Kinetics of a Dynamic Event in a Model Ionic Crystal' by Kalita, Pat; Specht, Paul E.; Brown, Justin L.; Pacheco, Lena M.; Usher, Josh M.; et al. 3. 'Textbook myths about early atomic models' by Renström, Reidun; Nils-Erik Bomark. Each item has a thumbnail, title, authors, journal information, and options to view the abstract/details or full text (PDF).

[ProQuest Ebook Central](#) Compiles a library of topic specific ebooks for you to access free through your State Library membership.

The screenshot shows the ProQuest Ebook Central interface. At the top, it says 'ProQuest Ebook Central™'. The search term 'Atomic Model' is entered in the search bar. Below the search bar, it displays '2688 book results'. On the left side, there are filters for 'Refine your search' (Sort by: Relevance, Results per page: 10), 'BOOK STATUS' (Owned and subscribed to by my library, Unlimited Print, Copy, & Download, Course Reserve), 'YEAR PUBLISHED' (2024, 2023, 2022), and 'SUBJECT' (science / general, science / physics / general, science / chemistry / general, political science / international relations / general, political science / general). The main results area shows two items: 1. 'The Discovery of the Periodic Table of the Chemical Elements Short Journey from the Beginnings until Today' by Schliermund, Torsten. 2. 'Adhesion Aspects in MEMS/NEMS' by Kim, Seong H.; Dugger, Michael T. and more. Each item has a thumbnail, title, author, publisher information, and options to view the book results or chapter results.

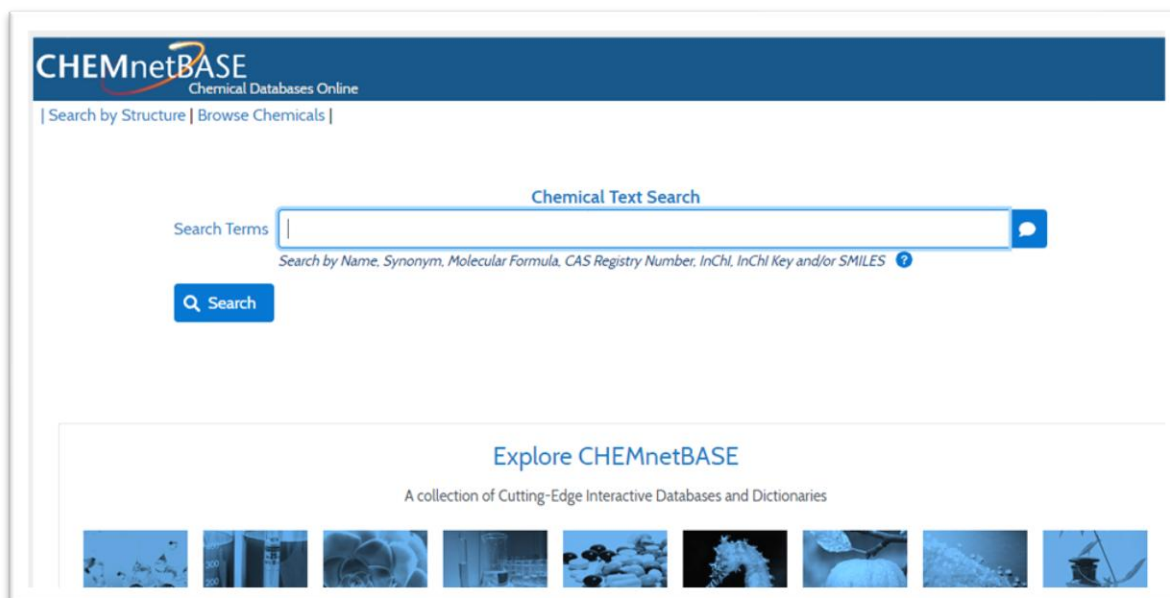
The Law of Conservation of Mass

Model the rearrangement of atoms in chemical reactions using a range of representations, including word and simple balanced chemical equations, and use these to demonstrate the law of conservation of mass.

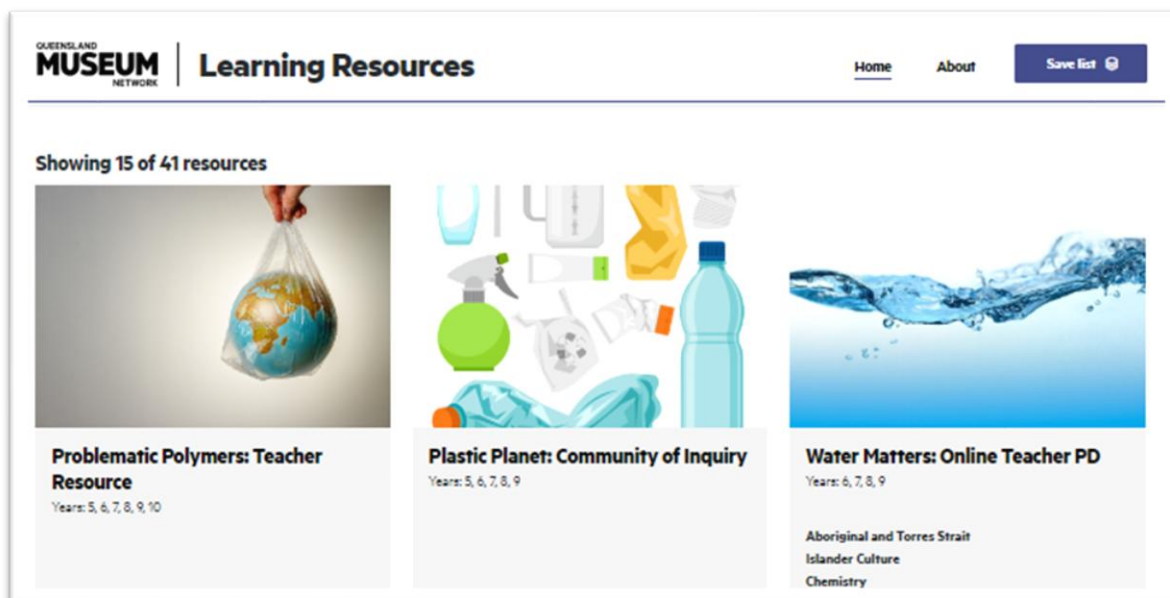
- Identifying reactants and products in chemical reactions.
- Using models and representations to show the rearrangement of atoms in chemical reactions.
- Investigating chemical reactions in closed and open systems and relating data obtained to the law of conservation of mass.
- Writing symbolic equations that are easy to balance and explaining, using the law of conservation of mass, and atoms, the rationale for balancing chemical equations.
- Investigating why most elements are not found in their elemental state and processes which are used to obtain the element.
- Predicting how ideas of green chemistry such as minimising the amount of unusable waste products, energy use and using more environmentally friendly chemical processes will affect the environment.

Featured databases

[CHEMnetBASE](#) provides a comprehensive database of chemicals and their uses, as well as chemical equations and properties.



[Queensland Museum](#) provide Learning Resources website students with many activities, fact sheets, images, and videos.



[Oxford Reference](#) spans 25 different subject areas, bringing together 2 million digitised entries across Oxford University Press's dictionaries, companions, and encyclopedias.

The screenshot shows the Oxford Reference website interface. At the top, the 'Oxford Reference' logo is on the left, and a search bar is on the right. Below the logo, there are tabs for 'Subject' and 'Reference Type'. The main header area includes 'My Content (0)' and 'My Searches (4)'. The search results are titled 'Oxford Reference Search Results'. On the left, there's a sidebar with 'Signed in as: State Library of Queensland' and a 'Narrow Your Choices' section. The main content area shows 'You are looking at 1-20 of 126 entries for: All: Law of Conservation of Mass x Science and technology x'. Below this, there are filters for '126 ENTRIES' and '1 BOOKS', and a 'REFINE TERMS' section. The search results list 'Julius Robert Mayer' with a reference type of 'Overview Page' and a subject of 'Science and technology'. A brief description follows: '(1814–1878) German physician and physicist Mayer, the son of an apothecary from Heilbronn in'.

The [Britannica Library](#) has articles, images and more, with a selection of resources especially for teenagers.

The screenshot shows the Britannica Library website interface. At the top, there are tabs for 'Articles', 'Images', 'Videos', and 'More'. The search results are titled 'chemical bonding (chemistry)' with a star icon and a note: '- TOP 3 RESULTS. 6 MORE RESULTS IN CHEMICAL BONDING.' Below this, there are three main results: 'The law of conservation of mass', 'The law of multiple proportions', and 'The law of definite proportions'. Each result has a brief description. Below these, there's a section for 'conservation of mass (physics)' with a star icon and a brief description. At the bottom, there's a section for 'images related to this search:' with a 'See all images' link. The images include a diagram of a balance scale, a portrait of a man, a video player, and a group of people.

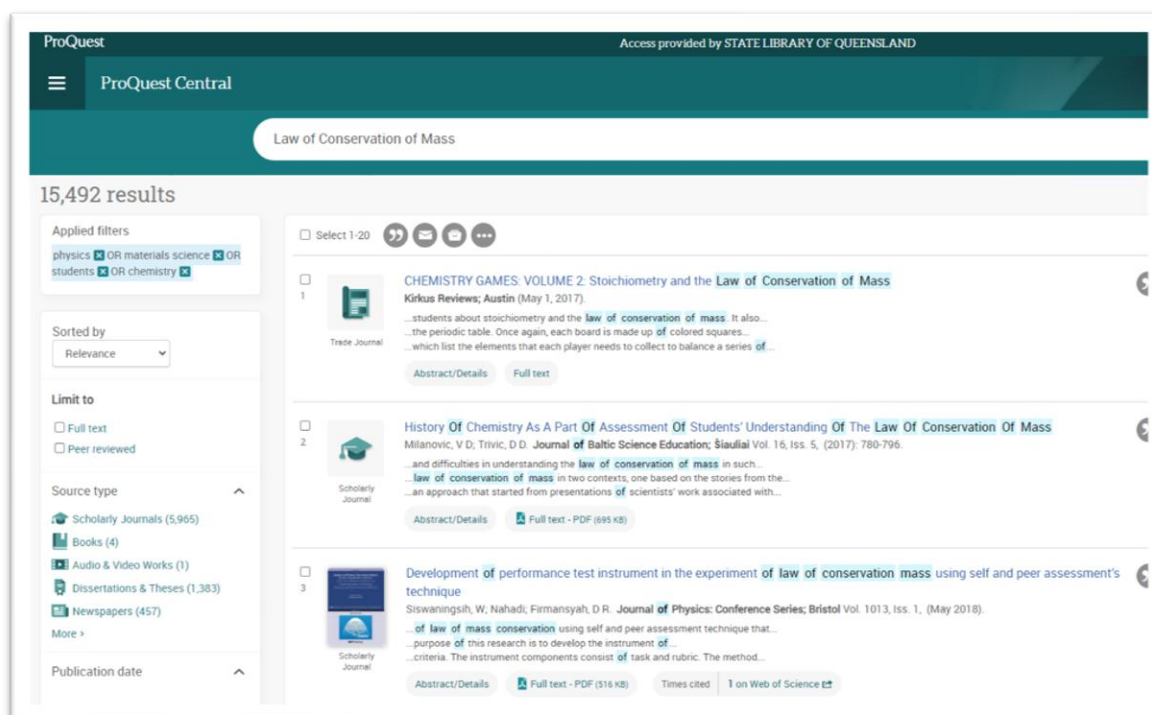
[JSTOR](#) provides access to more than 12 million scholarly journal articles and ebooks, and is especially good for primary sources.

The screenshot shows the JSTOR website interface. At the top, there's a search bar with the text 'Law of conservation of Mass' and a magnifying glass icon. Below the search bar, there are tabs for 'All Content' and 'Images'. The main content area displays '1,297 results'. On the left side, there's a 'Refine Results' panel with options for 'ACCESS TYPE' (Everything, Content I can access) and 'CONTENT TYPE' (Academic content: Journals, Book Chapters). The search results list two journal articles. The first article is 'Newton's Concept of Motive Force' by Brian D. Ellis, published in the *Journal of the History of Ideas*, Vol. 23, No. 2 (Apr. - Jun., 1962), pp. 273-278. The second article is 'How Do Science and Technology Affect International Affairs?' by Charles Weiss, published in *Minerva*, Vol. 53, No. 4 (2015), pp. 411-430. Each article has a 'Download' button and a 'Cite' button.

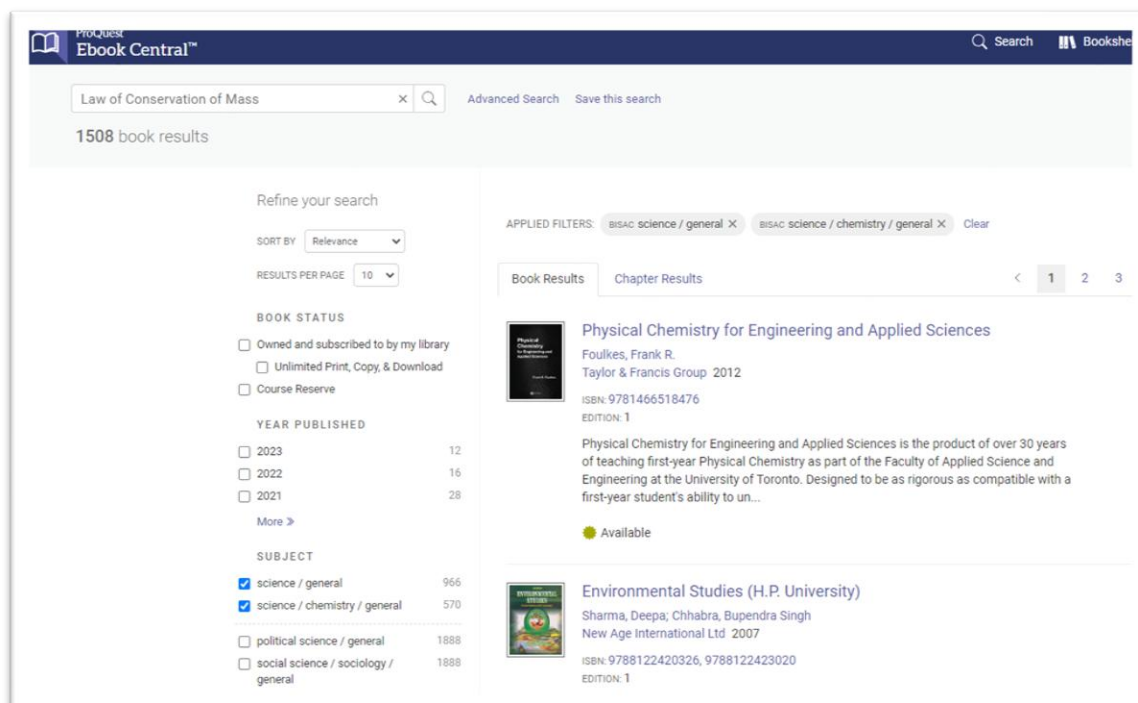
[Gale Interactive: Science](#) provides a comprehensive view of the most-studied science subjects. Authoritative, high-quality digital content is paired with interactive 3D models.

The screenshot shows the Gale Interactive: Science website interface. At the top, there's a search bar with the text 'Conservation of Mass' and a magnifying glass icon. Below the search bar, there's a 'Science' tab. The main content area displays '8 SEARCH RESULTS'. On the left side, there's a 'CATEGORY' panel with various science topics listed, such as 'Biology (91)', 'Chemistry (74)', 'Physics (11)', etc. The search results list eight topics related to the Law of Conservation of Mass, including 'Ammonia', 'Copper and Silver Nitrate', 'Hydrochloric Acid and Sodium Hydroxide', 'Calcium Carbonate', 'Relative Atomic Mass', 'Mass Number', and 'Mars'. Each topic has a small image icon and a brief description of the content.

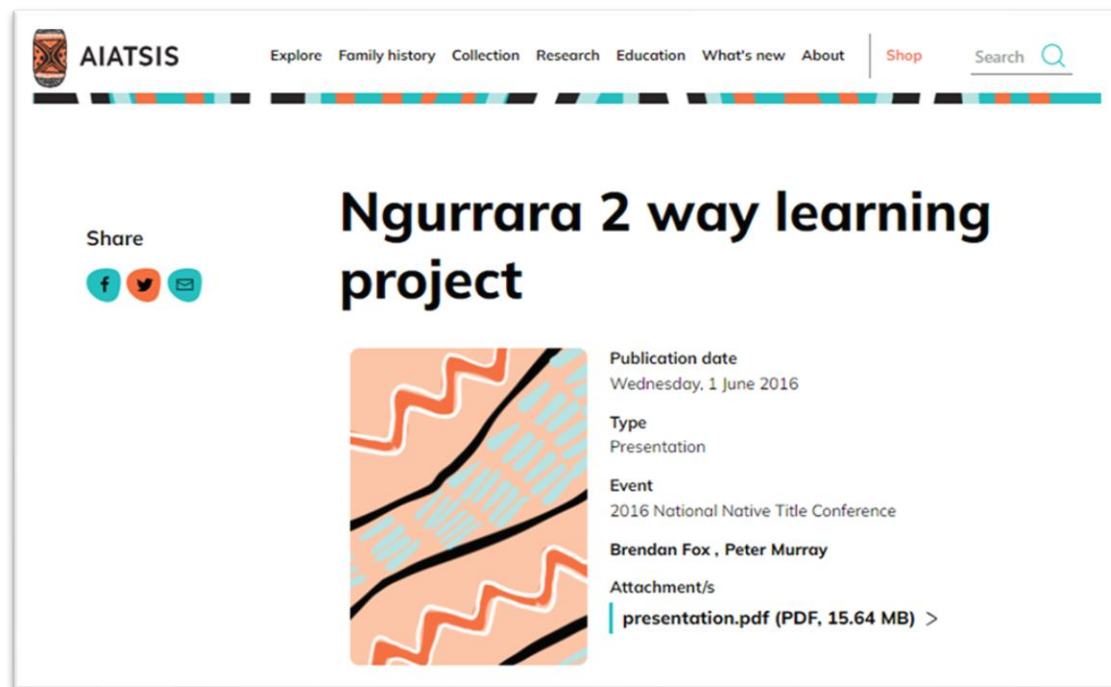
[ProQuest Central](#) brings together 47 databases across 175 subject areas, providing easy intuitive access to an incredibly broad and comprehensive range of content.



[ProQuest Ebook Central](#) Compiles a library of topic specific ebooks for you to access free through your State Library membership.



The [Australian Institute Aboriginal and Torres Strait Islander Studies](#) is a powerful tool for First Nations reading and research. Their online database and research projects can provide incredible insight into science from the First Nations perspective.



More research

Borrow items

Order items online through State Library's One Search catalogue and [borrow items from State Library's collections](#) when you visit us onsite.

Ask a librarian

[State Library staff](#) are available to advise on keywords and search strategies and suggest databases to help you carry out independent research.

Please note that librarians can guide and support your research process, but they cannot complete your assessment, select sources for you or provide answers to assessment questions.