

Chemistry Stage 6

Draft Writing Brief

October 2015

© 2015 Copyright Board of Studies, Teaching and Educational Standards NSW for and on behalf of the Crown in right of the State of New South Wales.

This document contains Material prepared by the Board of Studies, Teaching and Educational Standards for and on behalf of the Crown in right of the State of New South Wales. The Material is protected by Crown copyright.

All rights reserved. No part of the Material may be reproduced in Australia or in any other country by any process, electronic or otherwise, in any material form, or transmitted to any other person or stored electronically in any form without the prior written permission of the Board of Studies, Teaching and Educational Standards NSW, except as permitted by the *Copyright Act 1968*.

When you access the Material you agree:

- to use the Material for information purposes only
- to reproduce a single copy for personal bona fide study use only and not to reproduce any major extract or the entire Material without the prior permission of the Board of Studies, Teaching and Educational Standards NSW
- to acknowledge that the Material is provided by the Board of Studies, Teaching and Educational Standards NSW
- to include this copyright notice in any copy made
- not to modify the Material or any part of the Material without the express prior written permission of the Board of Studies, Teaching and Educational Standards NSW.

The Material may contain third-party copyright materials such as photos, diagrams, quotations, cartoons and artworks. These materials are protected by Australian and international copyright laws and may not be reproduced or transmitted in any format without the copyright owner's specific permission. Unauthorised reproduction, transmission or commercial use of such copyright materials may result in prosecution.

The Board of Studies, Teaching and Educational Standards NSW has made all reasonable attempts to locate owners of third-party copyright material and invites anyone from whom permission has not been sought to contact the Copyright Officer.

Phone: (02) 9367 8289

Fax: (02) 9279 1482

Email: mila.buraga@bostes.nsw.edu.au

Published by:

Board of Studies, Teaching and Educational Standards NSW

GPO Box 5300

Sydney NSW 2001

Australia

www.bostes.nsw.edu.au

Contents

1.	Introduction	4
	Diversity of learners	4
2.	Broad directions	6
	Australian curriculum	7
3.	Rationale.....	8
	Proposed rationale for Chemistry Stage 6	8
4.	Aim.....	9
	Proposed aim for Chemistry Stage 6	9
5.	Objectives	10
	Proposed objectives for Chemistry Stage 6	10
6.	Outcomes.....	11
	Proposed outcomes for Chemistry Stage 6.....	11
7.	Course structure and options	13
	Proposed course structures and options for Chemistry Stage 6	16
	Practical nature of the Chemistry course	21
	Investigative project(s) (approximately 5–10 hours).....	21
	Extension courses.....	22
8.	Learning across the curriculum	24
9.	Glossary.....	25
10.	Assessment and reporting	26

1. Introduction

In 2014, the Board of Studies, Teaching and Educational Standards NSW (BOSTES) commenced a review of NSW senior secondary syllabuses for English, Mathematics, Science and History learning areas to determine directions for the incorporation of senior secondary Australian curriculum. BOSTES conducted consultation in August and September 2014 on proposed directions outlined in the [NSW Senior Secondary Review & Evaluation: English, Mathematics, Science and History](#) document.

The broad directions for each learning area, developed following consultation, were endorsed by BOSTES in December 2014 and are available in Section 2 of this Draft Writing Brief.

The development of the *Chemistry Stage 6 Draft Writing Brief* takes account of the broad directions.

The Draft Writing Brief:

- proposes the nature and number of courses within each learning area
- proposes options for course structures
- provides information about how Australian curriculum content may be modified, reordered and supplemented for inclusion in the draft syllabus.

Following consultation on the Draft Writing Brief, a Consultation Report, detailing feedback received and the key matters arising from consultation will be published. The BOSTES endorsed final Writing Brief will inform the directions for draft syllabus development.

The draft syllabus for Chemistry will be available for consultation during 2016. It will include the elements of a syllabus and Australian curriculum content identified with codes, learning across the curriculum content identified by icons, further information about meeting the diversity of learners, and internal and external assessment.

A summary of the BOSTES syllabus development process is available at <http://www.boardofstudies.nsw.edu.au/syllabuses/syllabus-development/>.

Diversity of learners

NSW senior secondary syllabuses will be inclusive of the learning needs of all students. The draft syllabuses will be designed to accommodate teaching approaches that support student diversity under the sections 'Students with special education needs', 'Gifted and talented students' and 'Students learning English as an additional language or dialect (EAL/D)'.

For example:

Special education needs

All students with special education needs are entitled to participate in and progress through the curriculum. Some students may require additional support or adjustments to teaching, learning and assessment activities. Adjustments are measures or actions taken in relation to teaching, learning and assessment that enable a student to access syllabus outcomes and content and demonstrate achievement of outcomes.

Most students with special education needs will undertake regular Board Developed courses and/or Board Endorsed courses. Students with special education needs can access Years 11 and 12 outcomes and content in a range of ways. They should choose the most appropriate courses for the HSC in keeping with their goals, interests and learning needs.

Students may engage with:

- syllabus outcomes and content with adjustments to teaching, learning and/or assessment activities
- selected outcomes and content appropriate to their learning needs
- selected Years 11–12 Life Skills outcomes and content appropriate to their learning needs.

2. Broad directions


The following broad directions for syllabus development have been informed through consultation with stakeholders. These broad directions guide development of the NSW Science Stage 6 syllabuses.

1. In the revision and development of the courses, consideration be given to how the courses provide flexibility to meet the needs of all students.
2. In the revision of the current content-heavy courses, provision be made for the reduction and integration of content. This may be organised using the concept of 'Big Ideas' of science.
3. The nature and practice of Science is reflected in the inclusion of working scientifically using first-hand investigations, secondary sources, models and modelling.
4. The Science courses be reviewed to allow flexibility of pedagogy and delivery. This may include cross-disciplinary study, project-based research and STEM learning.
5. Opportunities be considered to extend students' learning in Science by revising each course's content and requirements.
6. The Senior Science course rationale, structure and assessment requirements be reviewed to focus on developing scientifically literate students.
7. The Senior Science course rationale, structure and assessment requirements be reviewed with a focus to support a range of post-school contexts.
8. Assessment and HSC examination specifications be reviewed to ensure appropriate opportunities for assessment of a wide range of student performance including assessing analytical and critical thinking, first-hand investigations, the use of secondary sources and research projects.
9. The Science syllabuses should provide for the continual inclusion of contemporary and relevant material.
10. The rationale, outcomes and content of the Science Life Skills Stage 6 course be reviewed to better meet the needs of the students for whom the course is intended, as well as to provide an appropriate progression from Science Life Skills Stage 5 outcomes and content and alignment with the regular Science Stage 6 courses where appropriate.

Australian curriculum


BOSTES began its syllabus development process for Stage 6 English, Mathematics, Science and History in 2014. This follows state and territory education Ministers' endorsement of senior secondary Australian curriculum in these learning areas as the agreed and common base for development of state and territory senior secondary courses. It was also agreed that states and territories would have the flexibility to integrate the approved senior secondary Australian curriculum as appropriate. The development of Draft Writing Briefs will determine how Australian curriculum content can be modified, reordered and supplemented in each learning area while remaining compatible with the NSW senior years assessment and examinations structures.

3. Rationale

 for your information

The rationale describes the distinctive nature of the subject and outlines its relationship to the contemporary world and current practice. It explains the place and purpose of the subject in the curriculum:

- why the subject exists
- what the theoretical underpinnings are
- what makes the subject distinctive
- why students would study the subject
- how it contributes to the purpose of the Stage 6 curriculum.

 consult

Proposed rationale for Chemistry Stage 6

Students of Chemistry Stage 6 will, as chemists, they will develop and utilise a range of skills including the ability to communicate succinctly and concisely, to think logically, to make evidence-based judgements and to think creatively and imaginatively. This subject provides a foundation for students to critically consider information and to make informed decisions about contemporary chemical issues in their everyday lives.


The course is designed for students who have substantial achievement in Science Stage 5 including those who wish to continue with the study of science and specifically chemistry at tertiary level.

Scientific knowledge and understanding and methods of working scientifically have led chemists to gain a better understanding of how substances interact in the real world. By working scientifically students design and conduct qualitative and quantitative investigations both individually and collaboratively. They investigate questions and hypotheses, manipulate variables, analyse data, evaluate claims, solve problems and develop and communicate evidence-based arguments and models.

Thinking in Chemistry involves using differing scales, including macro-scales, micro-scales and nano-scales, using specialised representations such as chemical symbols and equations; and being creative, as when designing new materials or models of chemical systems. The study of Chemistry provides a foundation for undertaking investigations in a wide range of scientific fields often providing the unifying link across interdisciplinary studies.


The application of chemical knowledge is required to tackle major global issues and challenges now and into the future. These include issues of sustainability, supply of clean drinking water, efficient production and use of energy, management of mineral resources, increasing acidification of the oceans, and climate change.

4. Aim

 for your information

In NSW syllabuses, the aim provides a succinct statement of the overall purpose of the syllabus. It indicates the general educational benefits for students from programs based on the syllabus.

The aim, objectives, outcomes and content of a syllabus are clearly linked.


 consult

Proposed aim for Chemistry Stage 6

The aim of the Chemistry Stage 6 Syllabus is to develop students':

- appreciation of chemistry as an experimental science where models and theories are refined and new models and theories are developed through independent and collaborative research that has significant impacts on society
- abilities to debate and critically evaluate scientific arguments and claims, communicate to a range of audiences chemical understanding or findings and propose possible solutions
- understanding of the theories and models used to describe, explain and make predictions about chemical systems, structures and properties by considering the factors that affect these and how they can be controlled to produce desired products or outcomes
- respect for the environment through an understanding of how chemistry and chemical practices have developed, interact and are integral to the developments in the other sciences.

5. Objectives

 for your information

In NSW syllabuses, objectives provide specific statements of the intention of a syllabus. They amplify the aim and provide direction to teachers on the teaching and learning process emerging from the syllabus. They define, in broad terms, the knowledge, understanding, skills, values and attitudes to be developed through study in the subject. They act as organisers for the intended outcomes.

 consult

Proposed objectives for Chemistry Stage 6

Values and attitudes

Students:

- develop positive, informed values and attitudes towards chemistry
- recognise the importance and relevance of chemistry in their lives now and for the future.

Skills

Students:


- develop skills in applying the processes of Working Scientifically.

Knowledge and understanding


Students:

- develop knowledge and understanding of the fundamentals of chemistry
- develop knowledge and understanding of the trends in chemistry
- develop knowledge and understanding of the interactions in chemistry
- develop knowledge and understanding of the applications of chemistry.

6. Outcomes

 for your information

In NSW syllabuses, outcomes provide detail about what students are expected to achieve at the end of each Stage in relation to the objectives. They indicate the knowledge, understanding and skills expected to be gained by most students as a result of effective teaching and learning. They are derived from the objectives of the syllabus.

 consult

Proposed outcomes for Chemistry Stage 6

Outcomes will be developed for each year. The following table presents a sample of some of the proposed outcomes.

Values and attitudes

Objectives

Students:

- develop positive, informed values and attitudes towards chemistry
- recognise the importance and relevance of chemistry in their lives now and for the future

Skills

Objective

Students:

- develop skills in applying the processes of Working Scientifically

Preliminary course outcomes

A student:

CHP-1 proposes questions or hypotheses to be investigated scientifically and predicts outcomes

CHP-2 designs investigations, considers risks and ethical issues, identifies appropriate materials and suggests related data for collection

HSC course outcomes

A student:

CHH-1 evaluates questions and/or hypotheses to be investigated scientifically and predicts evidence-based outcomes

CHH-2 justifies the design of risk-assessed, ethical investigations involving appropriate materials and selects and collects relevant primary- and secondary-sourced data

Knowledge and understanding

Preliminary course unit 1
<p>Objective Students: develop knowledge and understanding of fundamentals of Chemistry</p>
<p>Preliminary course outcomes A student:</p>
<p>CHP-8 explores the physical, structural and chemical aspects of matter</p>

HSC course unit 3
<p>Objective Students: develop knowledge and understanding of interactions in Chemistry</p>
<p>HSC course outcomes A student:</p>
<p>CHH-8 explains the characteristics of equilibrium systems, and the factors that affect this system</p>

Preliminary course Unit 2
<p>Objective Students: develop knowledge and understanding of the trends in Chemistry</p>
<p>Preliminary course outcomes A student:</p>
<p>CHP-10 develops explanations for trends and relationships between elements in terms of atomic structure and bonding</p>


HSC course Unit 4
<p>Objective Students: develop knowledge and understanding of the applications of Chemistry</p>
<p>HSC course outcomes A student:</p>
<p>CHH-10 describes and predicts reactions involving carbon compounds</p>

7. Course structure and options

 for your information

Rather than stipulate a single approach the Draft Writing Brief proposes options for possible course structure. The consultation process will inform the final structure which may be one of the options, or may involve a combination of the ideas presented.

The following provides an outline of some proposed Preliminary and HSC course structures for the Chemistry Stage 6 Syllabus with indicative course hours and the arrangement of course content, along with outlining relationships between specific components and between core and options.

 consult

Overview of Preliminary course structures – Chemistry 2 Unit course 120 hours

Preliminary course	Option 1	Option 2	Option 3
Structure	Maintain the current (120 hour) Preliminary course structure	Four topics of equal length (30 hours)	Four topics of equal length (25 hours) and a depth study component (20 hours)
Content	Review and update the content to include the relevant aspects of the Australian curriculum Eg: <ul style="list-style-type: none"> • The Chemical Earth (30 hours) • Metals (30 hours) • Water (30 hours) • Energy (30 hours) 	Revise the course content to integrate the relevant aspects of the Australian curriculum and consider the quantitative analytical aspects of the course	
		Eg: <ul style="list-style-type: none"> • Properties and Structures (30 hours) • Quantitative Measurements (30 hours) • Arrangement of the Periodic Table (30 hours) • Types of Chemical Interactions (30 hours) 	Eg: <ul style="list-style-type: none"> • Properties and Structures (25 hours) • Quantitative Measurements (25 hours) • Arrangement of the Periodic Table (25 hours) • Types of Chemical Interactions (25 hours) • Depth Study (20 hours)
Practical content	Update practical experiences to reflect revised content	Focus on delivering content through practical experiences	
Investigation/	Maintain at least ONE open-ended investigation		Include practical

Chemistry Stage 6 Draft Writing Brief

(PBL)	(OEI)	investigation/depth study component related to core (20 hours)
--------------	--------------	---

Overview of HSC course structures – Chemistry 2 Unit course 120 hours

HSC course	Option 1	Option 2	Option 3
Structure	Maintain the current HSC course structure	Four topics of each of equal length (30 hours)	Four topics of equal length (25 hours) with a PBL component (20 hours) and an opportunity for depth study
Content	Review and update content to include the relevant aspects of the Australian curriculum Eg: <ul style="list-style-type: none"> • Production of Materials (30 hours) • The Acidic Environment (30 hours) • Chemical Monitoring & Management (30 hours) • One of five options (30 hours) 	Revise the course and integrate the relevant aspects of the Australian curriculum content Eg: <ul style="list-style-type: none"> • Equilibrium Reactions (30 hours) • Acid/Base Reactions (30 hours) • Properties & Structures of Organic Materials (30 hours) • Chemical Synthesis & Design (30 hours) 	Revise the course and integrate the relevant aspects of the Australian curriculum content Eg: <ul style="list-style-type: none"> • Equilibrium Reactions (25 hours) • Acid/Base Reactions (25 hours) • Properties & Structures of Organic Materials (25 hours) • Chemical Synthesis & Design (25 hours) • Depth Study (20 hours)
Practical content	Update practical experiences to reflect revised content	Focus on delivering content through practical experiences	
Investigation/ PBL	Maintain at least ONE open-ended investigation (OEI)		Includes a practical investigations/projects/ (depth study) component (20 hours)
Options	Update the current five options	No options	

Proposed options for course structure for Chemistry Stage 6

Option 1 – Chemistry 2 Unit (240 hours) course

This model maintains the current course structures with a view to review and update the content where required. Consideration would be given to providing for greater depth of study and allowing more time for practical learning.

The subject matter of the Chemistry course would recognise the different needs and interests of students and provide a structure that builds upon the foundations laid in Stage 5, yet would acknowledge that students entering Stage 6 have a wide range of abilities, circumstances and expectations.

The proposed Chemistry 2 Unit course would be examined for the HSC.

Revise current Preliminary course – 120 indicative hours

- The Chemical Earth (30 indicative hours)
- Metals (30 indicative hours)
- Water (30 indicative hours)
- Energy (30 indicative hours)

Revise current HSC course – 120 indicative hours

- Production of Materials (30 indicative hours)
- The Acidic Environment (30 indicative hours)
- Chemical Monitoring and Management (30 indicative hours)
- Choice of one option (30 indicative hours):
 - Industrial Chemistry
 - Shipwrecks, Corrosion and Conservation
 - The Biochemistry of Movement
 - The Chemistry of Art
 - Forensic Chemistry

Option 2 – Chemistry 2 Unit (240 hours) course

This model proposes a revision of course content to allow for practical-based learning to encourage students to learn science as it is practised.

The quantitative analytical demands of the content in this course will be considered.

The proposed Chemistry 2 Unit course would be examined for the HSC.

Example Preliminary course (120 indicative hours)

Example unit	Example modules and areas of study
Unit 1 Fundamentals of Chemistry (60 hours)	Properties and Structures (30 hours) <ul style="list-style-type: none"> • Properties of matter • Atomic structure • Types of compounds • Simple reactions
	Quantitative Measurements (30 hours) <ul style="list-style-type: none"> • Simple chemical interactions • Mole concept • Stoichiometry • Energy in chemical reactions
Unit 2 Trends in Chemistry (60 hours)	Arrangement of the Periodic Table (30 hours) <ul style="list-style-type: none"> • Types of matter • Structure of the periodic table • Types of intermolecular bonding
	Types of Chemical Interactions (30 hours) <ul style="list-style-type: none"> • Types of chemical interactions • Rates of chemical reactions • Factors affecting reaction rates
Nature of the course The Chemistry Preliminary course is designed to focus on learning science as it is practised. It is suggested that at least 50% of the Preliminary course time is allocated to practical aspects of the course including project work. At least ONE open-ended investigation is to be completed.	

Example HSC course (120 indicative hours)

Example unit	Example modules and areas of study
Unit 3 Interactions in Chemistry (60 hours)	Equilibrium Reactions (30 hours) <ul style="list-style-type: none"> • Equilibrium • Types of equilibrium systems • Calculating the equilibrium constant • Factors that affect equilibrium
	Acid/Base Reactions (30 hours) <ul style="list-style-type: none"> • Types of acids • pH and pOH • Strength of acids • Volumetric analysis
Unit 4 Applications of Chemistry (60 hours)	Properties and Structures of Organic Materials (30 hours) <ul style="list-style-type: none"> • Nomenclature • Functional groups • Reaction types • Uses of carbon compounds
	Chemical Synthesis and Design (30 hours) <ul style="list-style-type: none"> • Identification of materials • Production of materials • Chemical monitoring • Redox reactions
Nature of the course The Chemistry HSC course is designed to focus on learning science as it is practised. It is suggested that at least 40% of the HSC course time is allocated to practical aspects of the course including project work. At least ONE open-ended investigation is to be completed.	

Option 3 – Chemistry 2 Unit (120 hours) course with depth studies

This model introduces an investigative/project/depth study opportunity in the Preliminary and HSC course years.

The investigative depth study is designed to allow time for all students to engage more deeply with chosen aspects of the course content and to study in depth aspects of chemistry they may continue with at the tertiary level.

Example Preliminary course (120 indicative hours)

Example unit	Example modules and areas of study	
Unit 1 Fundamentals of Chemistry (60 hours)	Properties and Structures (25 hours) <ul style="list-style-type: none"> • Properties of matter • Atomic structure • Types of compounds • Simple reactions 	Depth study related to core (10 hours)
	Quantitative Measurements (25 hours) <ul style="list-style-type: none"> • Simple chemical interactions • Mole concept • Stoichiometry • Energy in chemical reactions 	
Unit 2 Trends in Chemistry (60 hours)	Arrangement of the Periodic Table (25 hours) <ul style="list-style-type: none"> • Types of matter • Structure of the periodic table • Types of intermolecular bonding 	Depth study related to core (10 hours)
	Types of Chemical Interactions (25 hours) <ul style="list-style-type: none"> • Types of chemical interactions • Rates of chemical reactions • Factors affecting reaction rates 	
Nature of the course The Chemistry Preliminary course is designed to focus on learning science as it is practised. It is suggested that at least 50% of the Preliminary course time is allocated to practical aspects of the course including project work.		

Example HSC course (120 indicative hours)

Example unit	Example modules and areas of study	
Unit 3 Interactions in Chemistry (60 hours)	Equilibrium Reactions (25 hours) <ul style="list-style-type: none"> • Equilibrium • Types of equilibrium systems • Calculating the equilibrium constant • Factors that affect equilibrium 	Depth study related to core (10 hours)
Acid/Base Reactions (25 hours) <ul style="list-style-type: none"> • Types of acids • pH and pOH • Strength of acids • Volumetric analysis 		
Unit 4 Applications of Chemistry (60 hours)	Properties and Structures of Organic Materials (25 hours) <ul style="list-style-type: none"> • Nomenclature • Functional groups • Reaction types • Uses of carbon compounds 	Depth study related to core (10 hours)
Chemical Synthesis and Design (25 hours) <ul style="list-style-type: none"> • Identification of materials • Production of materials • Chemical monitoring • Redox reactions 		
Examples of depth studies/investigative projects Beyond the Bohr Model – ‘Sub-atomic particles – what we know?’ Improving yield – ‘What can you do to improve the yield in a chemical process?’		
Nature of the course The depth study/investigative project aspect is designed to allow for deeper engagement with specific content of interest to the students. The HSC course includes 20 hours of depth study using investigative project(s) related to the core units. These could be implemented through a range of approaches with a minimum of 5 hours and a maximum of 10 hours for each depth study. The Chemistry course is designed to focus on learning science as it is practised. It is suggested that at least 40% of the HSC course time is allocated to practical aspects of the course including project work.		

Practical nature of the Chemistry course

Practical experiences are a core component of the Chemistry course.

Practical experiences should be designed to integrate the skills and knowledge and understanding outcomes in both the Preliminary and HSC courses.

Practical experiences should emphasise hands-on activities including:

- undertaking laboratory experiments including the use of appropriate ICT technologies
- fieldwork
- the use of computer simulations for modelling or manipulating data
- use of, reorganisation and representation of acknowledged secondary data
- the extraction and reorganisation of information in the form of flow charts, tables, graphs, diagrams, prose and keys
- the use of digital media to capture, obtain, manipulate, calculate and present data, information and solutions to problems.

Depth study - Investigative project(s) (5–10 hours)

It is proposed that investigative project(s) be incorporated into each of the Preliminary and HSC courses based upon the principle of learning science as it is practised. This may be a single 10 hour project or two 5 hour projects completed anytime within each unit.

Investigative project(s) opportunities are suggested for inclusion to allow schools to cater for the full range of students undertaking the course. They are incorporated to provide a vehicle for content coverage, to aid engagement and to provide students with further opportunities to demonstrate what they know and can do.

Investigative projects in both the Preliminary and HSC years may be considered for inclusion in the school-based assessment components for the HSC.

The investigative projects are to focus on:

- reviewing current knowledge/literature review
- producing an explanation or proof of a problem(s) posed or area researched
- including evidence of validity, reliability and precision in data analysis
- involving students in peer review of other students' work
- formulating logical explanations/conclusions and suggesting further research
- developing skills in designing and managing projects
- developing communication skills, including presentation skills, using relevant forms of media and reporting techniques.

The project may be a product, design, system, model, report or solution to problems posed and may be associated with fieldwork undertaken.

Extension courses

Extension courses build on the content of the 2 Unit courses. They are set at a more demanding level and have a more intensive focus. Extension courses involve complex levels of conceptualisation and provide the opportunity for students to work in increasingly independent ways. They enable high performing students to reach their potential in their senior secondary years.

BOSTES criteria ensure that Extension courses are only developed where there is a compelling educational justification. Equity across subjects is not in itself a reason for the development of Extension courses. The following criteria are applied to the establishment and maintenance of Extension courses:

- There is additional subject content necessary to achieve the purpose of the subject beyond that which can be accommodated in the 2 Unit course; which build on the content of the 2 Unit course; which is at a more demanding level; and which requires additional curriculum time for students to learn.
- It can be demonstrated that study of the Extension course will lead particular target groups to substantial, positive gains in relation to the prime purpose for each course.
- Study of the Extension course may be required or assumed necessary by tertiary institutions for study in courses beyond those in the same subject area.
- The likely candidature for the Extension course and whether there are significant resource constraints or issues in developing and offering the extended study course.

An argument for a new Extension course would have to establish that the current 2 Unit courses are not sufficiently challenging. It would need to be shown that a new Extension course could cover completely new higher level content with higher order outcomes without overlapping with the content of University courses.

Extension courses in Science could take the form of one of the following options:

- A. An Extension Chemistry course and an Extension Physics course
- B. A combined Extension course drawing on elements of Chemistry and Physics
- C. A combined Extension course that draws from across the four science disciplines.


Some advantages and disadvantages for each option include:

- A. Chemistry and Physics are high demand courses that are important to the nation's STEM initiatives. More demanding study in these sciences will better prepare students to engage in related courses at university. Some schools will be forced to make a decision about which course they can support as an Extension course.
- B. These two high candidature subjects complement each other in cross discipline aspects of science. There may be a perception that this Extension course is only accessible by students who study both Chemistry and Physics.
- C. This course could appeal to a broader range of students. A breadth in working across disciplines could act against the essential requirement of greater depth.

Extension course content could include:

A. Extension Chemistry	A. Extension Physics	B. Extension Chemistry & Physics	C. Extension Science
<ul style="list-style-type: none"> • Equilibrium constants and the effect of temperature on their value • Design an industrial process that could be used for producing an economically viable chemical 	<ul style="list-style-type: none"> • Effects of gravity on photons of light • Emerging technologies that use the quantum theory 	<ul style="list-style-type: none"> • Equilibrium constants and the effect of temperature on their value • Effects of gravity on photons of light 	<ul style="list-style-type: none"> • Research emerging technologies and manipulation of DNA • Equilibrium constants and the effect of temperature on their value • Renewable and non-renewable resources in terms of cost, extraction methods & environmental impacts • Effects of gravity on photons of light

8. Learning across the curriculum

 for your information

NSW syllabuses provide a context within which to develop core skills, knowledge and understanding considered essential for the acquisition of effective, higher-order thinking skills that underpin successful participation in further education, work and everyday life including problem-solving, collaboration, self-management, communication and information technology skills.

BOSTES has described learning across the curriculum areas that are to be included in syllabuses. In Stage 6 syllabuses, the identified areas will be embedded in the descriptions of content and identified by icons. Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the BOSTES *Statement of Equity Principles*, the *Melbourne Declaration on Educational Goals for Young Australians (December 2008)* and in the Australian Government's *Core Skills for Work Developmental Framework (2013)*.

Knowledge, understanding, skills, values and attitudes derived from the learning across the curriculum areas will be included in BOSTES syllabuses, while ensuring that subject integrity is maintained.

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face.

The cross-curriculum priorities are:

- Aboriginal and Torres Strait Islander histories and cultures 🖐️
- Asia and Australia's engagement with Asia 🌐
- Sustainability 🌱

General capabilities encompass the knowledge, skills, attitudes and behaviours to assist students to live and work successfully in the 21st century.


The general capabilities are:

- Critical and creative thinking ⚙️
- Ethical understanding ⚖️
- Information and communication technology capability 💻
- Intercultural understanding 🌐
- Literacy 📖
- Numeracy 📊
- Personal and social capability 👥

BOSTES' syllabuses include other areas identified as important learning for all students:

- Civics and citizenship 🗳️
- Difference and diversity 🏳️
- Work and enterprise ⭐

9. Glossary

 for your information

A glossary will be developed for the draft Chemistry Stage 6 Syllabus which explains terms that will assist teachers in the interpretation of the subject.

10. Assessment and reporting

BOSTES continues to promote a standards-referenced approach to assessing and reporting student achievement in NSW, and the importance of assessment for, of and as learning as essential components of quality teaching and learning.

Information on assessment and reporting for Preliminary and HSC courses will be developed for the draft syllabus consultation in 2016.

The information will include:

- suggested components and weightings for school-based assessment of the Preliminary course
- mandatory components and weightings for school-based assessment of the HSC course
- HSC examination specifications which describe the format of the HSC examination program for Chemistry.

Advice about assessment in relation to the Chemistry syllabus is contained in [Assessment and Reporting in Science Stage 6](#). This document provides general advice on assessment in Stage 6 as well as the specific requirements for the Preliminary and HSC courses.

Consultation on assessment and reporting during the Draft Writing Brief phase will focus on providing feedback about assessment and reporting practices in schools, school-based assessment requirements, the use of technology in assessment, and external assessment programs.