

UNIT INFORMATION

UNIT CODE	SC130
UNIT NAME	Physical and Chemical Sciences (7-10)
ASSOCIATED HIGHER EDUCATION AWARDS	Bachelor of Education (Secondary)
DURATION	One Semester
LEVEL	Level 7
CORE / ELECTIVE	Elective
WEIGHTING	Unit credit points 10 (0.125 EFTSL) Course credit points: 320 - Bachelor of Education (Secondary)

LEARNING DELIVERY

Internal/On Campus

- Weekly lecture
- Weekly tutorial (where applicable)

Plus, Learning Portal

External/Online

- Weekly virtual lecture/ tutorial

Plus, Learning Portal

Learning Portal (Moodle™)

- Power Point presentation and resources
- Weekly readings
- Study guides
- Collaborative forums: Student forums and News forum.
- Turnitin assessment and feedback tool

All unit outlines are reviewed prior to the offering of the unit to take account of student and lecturer feedback.

STUDENT WORKLOAD

Contact hours/Directed Online study	30 hours
Reading, study and preparation	50 hours
Assignment preparation	70 hours

Total **150 hours**

Students requiring additional English language support are expected to undertake an additional one hour per week.

PREREQUISITES / COREQUISITES / RESTRICTIONS

Nil

RATIONALE

Enduring Understanding:

Effective science teachers are scientifically knowledgeable and literate and confident in a range of pedagogies that motivate learners and promote scientific inquiry into God's creation.

Developing engaging practices in the classroom will encourage secondary (years 7-10) students to participate in scientific inquiry processes. Pre-service teachers will be equipped to encourage students to develop an ongoing interest in science.

This unit will prepare pre-service teachers to engage learners with the scientific strands of chemistry and physics within the Australian Curriculum in conjunction with developing pedagogical practice and revelation of Christian worldview perspectives.

CONTENT

1. Australian Curriculum Science Understandings 7-10 (Physical and Chemical Sciences):
 - 1.1 Year 7 – Mixtures, solutions and separation processes, forces and gravity
 - 1.2 Year 8 - States of matter, elements, compounds and mixtures, chemical change, energy forms and transformation
 - 1.3 Year 9 - Atomic structure, chemical reactions (acid/base, combustion), energy transfer: heat, electricity, sound and light
 - 1.4 Year 10 – Atomic structure and periodic table patterns, chemical reaction rate and balancing equations, energy conservation and systems, simple motion
2. Science inquiry skills: Questioning, predicting; planning and conducting; data collecting, analysis and processing; evaluating; communicating
3. Science as a human endeavour real-world application, influence upon society
4. Teaching strategies especially upon laboratory practice
5. Laboratory safety and risk management
6. Christian worldview integration and revelation of God's created order

LEARNING OUTCOMES

On completion of this unit, pre-service teachers will have provided evidence that they have:

1. developed Australian Curriculum chemical and physical Science content knowledge and understanding for years 7-10
Graduate Teacher Standards: 2.1
Graduate Attributes: 4, 7
2. acquired and applied scientific inquiry skills for physical and chemical science
Graduate Teacher Standards: 2.1
Graduate Attributes: 4, 7
3. developed innovative teaching strategies for teaching physical and chemical sciences in the years 7-10 context

Graduate Teacher Standards: 2.1

Graduate Attributes: 1, 4

4. examined chemical and physical science applications as a human endeavour
Graduate Teacher Standards: 2.5, 2.6, 4.5
Graduate Attributes: 1, 4
5. investigated the ways physical and chemical sciences reveal God's order in creation and
Graduate Attributes: 3
6. communicated at an appropriate tertiary standard, with special attention to design elements, grammar usage, logical relations, style, referencing and presentation
Graduate Attributes: 6

ASSESSMENT TASKS

In order to receive a passing grade a student must fulfil the following requirements:

- adequate submission/attempt of all assessment tasks
- achieve a summative exit grade of Pass or above

TASK 1: EXPERIMENTAL REPORTS

Undertake three practical scientific investigations and write individual experimental reports. Investigative areas include Chemical reactions; Chemical Energy transformations; Simple motion studies and energy topic practical demonstration.

Word Length/Duration: 2 x 1,000 words
Weighting: 40% total (2 x 20%)
Assessed: Throughout semester weeks 1-10

TASK 2: EXAMINATION: CHEMISTRY KNOWLEDGE

Examination of content, knowledge and understandings, and scientific skills drawn from Australian Curriculum Chemical and physical science 7-10 learning areas.

Word Length/Duration: 2 hours
Weighting: 25%
Assessed: Week 5-7

TASK 3: EXAMINATION: PHYSICS KNOWLEDGE AND SCIENTIFIC ENQUIRY

Examination of content, knowledge and understandings, and scientific skills drawn from Australian Curriculum Chemical and physical science 7-10 learning areas.

Word Length/Duration: 2.5 hours
Weighting: 35%
Assessed: Examination week

ASSESSMENT ALIGNMENT

Assessment Task	Learning Outcome	Content	Graduate Teacher Standards	Graduate Attributes
Task 1	1-6	1-6	2.1,3.3,3.4	1, 3, 4, 6, 7
Task 2	1-2, 4-6	1,3,6	2.1	3, 4, 6, 7
Task 3	1-6	1,2,3,6	2.1	1, 3, 4, 6, 7

ASSESSMENT ELABORATION

Task 1: Experimental Reports

Undertake three practical scientific investigations and write individual experimental reports. Investigative areas:

- Chemical reactions
- Chemical Energy transformations
- Simple motion studies.
 - a) On-campus students will undertake experiments in a supervised laboratory context
 - b) Online student will undertake pre-approved experiments suitable for a laboratory or non-laboratory context

On campus and online students will submit Experimental Reports of the same format which is summarised below but is elaborated in course material

- Title – The reader should be able to tell what the experiment is about from your title.
- Introduction – This will summarise basic information on the topic including any relevant background information of a technical nature that may need to be expressed to place the experiment in context.
- Aim/Objective – What do you want to discover? What is your goal?
- Hypothesis – This is based on your prior knowledge or your observation. It is a statement, not a question, which predicts the outcome of the experiment
- Material – The equipment can be presented in a list/bullet format.
You must list all the procedures and equipment/reagents used.
Where possible, state size, type of material and exact quantity used. For example; 1x 250mL glass, 25g of castor sugar, 25mL of distilled water.
You may include diagrams or photographic evidence showing how the experiment is set up.
- Method – It will be written in list format that is numbered and sequenced in order that the actions were carried out
This will be a logical, step by step recount of how you conducted this experiment.
How many times did you repeat this experiment? How many samples did you use per trial?
- Results
This will include the raw data from the observations you made during the experiment which can be presented in a tabular format. Sometimes results may also be documented in photographs.
Tables of quantitative results and graph(s) (if applicable to the nature of the data). This should be correctly labelled with consistent used of scientific notations and the information should be easily read.
- Discussion – several paragraphs long.
This section is for you to demonstrate your ability to conceptualise and develop an insight on the topic of interest, whilst employing the inquiring skill to evaluate the experimental results in order to assert your proposed hypothesis.

Your discussion must revolve around the expected outcomes and whether or not they were achieved.

If the expected outcome was not obtained, then an explanation should be discussed. This may include critiquing the experimental design if it was contributory to anomalies.

You might also use information from other experts that helps with your explanations and/or supports your conclusions. Therefore, it would not be uncommon to see referencing in this section.

The inclusion of a one paragraph discussion on the relevance of Christian perspective related to your specific scientific investigation is required.

- Conclusion –
Summarising your work in one short paragraph, ensuring a linkage with the aim and hypothesis.
- Future studies (optional dependent upon nature of experiment)
It allows you to plan/design further experiments to support or disprove your extended hypothesis based on your current experimental results. Therefore, any extended study you wish to expand on from your current study will be included here.
- References –
The list of references must be in the alphabetical order and should be included at the end of your assignment.
Your referencing should comply with the College's referencing system.
- Appendix –
Any supplementary information such as 'Glossary of Terms', should be included here.

Task 2 & 3: Examination

Assessment of content, knowledge and understandings, and scientific inquiry drawn from Australian Curriculum Chemical and physical science 7-10 learning areas in a formal examination context.

The examination will contain a range of questions requiring short and extended responses, diagrams and calculations. The content of the examination will be consistent with the lecture coverage, practical studies and associated reading and resources.

- a) On-campus students will undertake examination on campus
- b) Online students will undertake examination in controlled online conditions
Weekly topic-centred revision throughout the semester combined with focused study and practise of supplied examination preparation material is strongly recommended.

SPECIALIST FACILITIES OR EQUIPMENT

Nil

PRESCRIBED TEXTS

Nil

Selected readings will be available via the Moodle™ site for this unit.

RECOMMENDED READINGS

CURRICULUM READINGS

Blackman, A., Bottle, S., Schmid, S., Mocerino, M., & Wille, U. (2019). *Chemistry*. (4th ed.). Milton, QLD: John Wiley and Sons.

Bonomo, R., Tabbi, G., & Guiffrida, A. (2013). *A conceptual approach to the teaching of chemistry*. New York, NY: Novinka.

Haysom, J., & Bowen, M. (2014). *Predict, observe, explain: Activities enhancing science understanding*. (Revised Australian edition). Moorabbin, VIC: Hawker Brownlow Education.

Mader, J. & Winn, M. (2012). *Teaching physics for the first time*. (2nd ed.). College Park, MD: American Association of Physics Teachers.

Walker, J. (2018). *Fundamentals of physics: Halliday & Resnick*. (11th ed., Australia and New Zealand edition.). Milton, QLD: John Wiley and Sons.

Young, S. (2016). *Gourmet Lab: The scientific principles behind your favourite foods*. Moorabbin, VIC: Hawker Brownlow Education.

JOURNALS

The Australian Science Teachers' Journal
Journal of Technology Education
Perspectives on Science and Christian Faith
Christian

WEBSITES

Australian Academy of Science:
<https://www.science.org.au/>

Commonwealth Scientific and Industrial Research Organisation:
<https://www.csiro.au/>

Scoutle Science:
<https://www.scoutle.edu.au/ec/search?q=science&field=title&field=text.all&field=topic>

Australian Science Teachers Association:
<http://asta.edu.au/>

Australasian Science Magazine:
www.australasianscience.com.au/

ABC Science Online:
www.abc.net.au/science

OTHER

In addition to the resources above, students should have access to a Bible, preferably a modern translation such as The Holy Bible: The New International Version 2011 (NIV 2011) or The Holy Bible: New King James Version (NKJV).

These and other translations may be accessed free on-line at <http://www.biblegateway.com>. The Bible app from LifeChurch.tv is also available free for smart phones and tablet devices.

UNIT REVIEW

SEMESTER	FEEDBACK AND RESPONSE

RUBRIC

TASK 1: EXPERIMENTAL REPORTS

LO	CRITERIA	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
	Depth of and breadth of knowledge relating to the specific area under investigation	Concise & comprehensive explanations and connections have been made to relevant scientific theories and concepts	Detailed & useful explanations and connections have been made to a range of relevant scientific theories and concepts	Appropriate explanations and connections have been made to a range of relevant scientific theories and concepts	Appropriate explanations and connections have been made to some scientific theories and concepts	Limited or inaccurate explanations of relevant scientific theories and concepts
	Experimental design: alignment with aim, hypothesis and control of variables	Thorough and logical design that controls variables and tests the hypothesis with clear procedures	Logical design that controls variables and tests the hypothesis with clear procedures	Satisfactory design that controls variables and tests the hypothesis with adequate procedures	Design generally controls variables and tests the hypothesis with adequate procedures	Design lacks adequate control of variables to test the hypothesis; has unconcise procedures
	Collation and communication of results (descriptions, tables, graphs, diagrams, photos or videos)	Extensive and accurate collation of results utilising multiple modes of presentation	Accurate collation of results utilising multiple modes of presentation	Satisfactory collation of results utilising a range of presentation modes	Satisfactory collation of results but with only a limit range of presentation modes	Inadequate/limited collation of results
	Analysis and discussion of results including a Christian perspective	Insightful analysis and discussion of results which are strongly linked to scientific concepts and display authentic connection to a Christian worldview perspective	Logical analysis and discussion of results which are strongly linked to scientific concepts and display authentic connection to a Christian worldview perspective	Analysis and discussion of results are linked clearly to scientific concepts and display a connection to a Christian worldview perspective	Analysis and discussion of results are linked generally to scientific concepts and display some connection to a Christian worldview perspective	Analysis and discussion of results are inadequately linked to scientific concepts and display limit/no connection to a Christian worldview perspective
	Experimental report conventions and standard of academic writing and referencing	Consistently controls conventions of an experimental report and academic writing. Well supported through extensive referenced sources to create a superior level of meaning	Consistently controls conventions of an experimental report and academic writing. Supported through a range of referenced sources to create a high level of meaning	Minor lapses in controlling conventions of an experimental report and academic writing. Supported through a range of referenced sources to create meaning	Overall satisfactory control of conventions of an experimental report and academic writing. Contains a range of referenced sources to create a generalised meaning	Writing demonstrates frequent lapses of control with language and experimental report conventions. Limited meaning and/or lack of adequate referencing.



COMMENT



RUBRIC

TASK 2 AND 3: EXAMINATIONS

LO	CRITERIA	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
	Overall percentage	85 % or above	75% or above	65% or above	50 % or above	Below 50%

COMMENT