Physical Sciences - Foundation

LEVEL 2	15 TCE CREDIT POINTS
COURSE CODE	PSC215118
COURSE SPAN	2018 — 2023
READING AND WRITING STANDARD	NO
MATHEMATICS STANDARD	NO
COMPUTERS AND INTERNET STANDARD	NO

This course was delivered in 2020. Use A-Z Courses to find the current version (if available).

The physical sciences endeavour to explain natural phenomena and properties of matter that occur in the physical world: physics uses models and theories based on physical laws to visualise, explain and predict physical phenomena; and chemistry uses an understanding of chemical structures, interactions and energy changes to explain chemical properties and behaviours.

Learner Requirement

Learners are required to work responsibly and safely in practical situations – the use of potentially dangerous materials and equipment is required in this course.

Rationale

Knowledge and understanding of science, scientific literacy and scientific methods are necessary for learners to develop the skills to resolve questions about their natural and constructed world.

The purpose of science education is to develop scientific literacy, fostering learners:

- to be interested in, and understand, the world around them
- to engage in discourse about science
- to gain 21st century skills of critical thinking and communication that are increasingly important within the workforce
- to have the skills to inquire into systems, and to be sceptical and questioning of claims made by others about scientific matters: to be able to identify questions and draw evidence-based conclusions; and to make informed decisions about the environment, about their own health and well-being, and about issues arising as a result of the application of science and technology.

The physical sciences endeavour to explain natural phenomena and properties of matter that occur in the physical world:

- physics uses models and theories based on physical laws to visualise, explain and predict physical phenomena
- chemistry uses an understanding of chemical structures, interactions and energy changes to explain chemical properties and behaviours.

Aims

Physical Sciences - Foundation Level 2 aims to equip students with skills and knowledge in physical sciences. These can be applied to explain observations of the properties and behaviour of matter and natural phenomena that occur in the real world. In studying this course, learners will also develop skills in scientific thinking and understanding of scientific terminology.

Learners will be exposed to a range of scientific approaches for inquiring into the physical and chemical nature of their world. Content will have a strong practical basis and, where possible, links with the learners' experiences and lives. A variety of approaches can be used to achieve this purpose.

Learning Outcomes

On successful completion of this course, learners will be able to:

1. undertake and complete scientific activities and tasks individually and as a group, including practical tasks
2. use practical skills and techniques, safely utilising equipment relating to the physical sciences
3. inquire into physical systems by collecting data and finding trends and patterns to draw valid conclusions
4. collect, process, organise and communicate physical sciences data and information following accepted conventions
5. describe the application and impact of physical sciences on society
6. describe and utilise appropriate chemistry concepts to explain chemical structure and properties
7. describe and utilise appropriate principles of physics to explain and solve problems associated with physical behaviours and systems
8. use chemical and mathematical formulae and equations to describe and interpret chemical data and behaviour
9. utilise mathematics, diagrams and symbols to analyse and interpret physical data.

Pathways

This course is designed for learners who are interested in studying the science related to the physical world. Physical Sciences - Foundation, may be studied as a stand-alone course and is a useful preparation for further study of *Physical Sciences* Level 3. It also provides background and support for vocational programs within training packages, where some scientific knowledge and experience is useful. It may complement or provide pathways to VET programs, traineeships and apprenticeships. It is highly recommended that, as a minimum, learners studying this course have studied, or are concurrently studying a Level 2 maths course.

Resource Requirements

This course requires a suitably equipped laboratory and resources to conduct experiments safely and effectively. Learners need to be able to access a wide range of reliable sources of information about the uses and applications of science within the wider community.

Course Size And Complexity

This course has a complexity level of 2.

At Level 2, the learner is expected to carry out tasks and activities that involve a range of knowledge and skills, including some basic theoretical and/or technical knowledge and skills. Limited judgment is required, such as making an appropriate selection from a range of given rules, guidelines or procedures. VET competencies at this level are often those characteristic of an AQF Certificate II.

This course has a size value of 15.

Course Content

OVERVIEW

In *Physical Sciences - Foundation*, the three (3) interrelated strands:

- **Science Inquiry Skills (criterion 2)**
- **Science as a Human Endeavour (criterion 4)**
- **Science Understanding (criteria 5 to 8)**

build on students' learning in F-10 Australian Curriculum: Science.

In the practice of science, the three strands are closely integrated: the work of scientists reflects the nature and development of science; it is built around scientific inquiry; and it seeks to respond to and influence society.

Science Inquiry Skills and Science as a Human Endeavour strands (respectively):

- undertake, interpret and review physical sciences experiments (criterion 2)
- discuss the application and impact of physical sciences on society (criterion 4)

These three strands will be integrated into four (4) interwoven threads of Science Understanding based on the themes of chemical and physical behaviours in the world:

- describe and utilise concepts of chemical structure and properties (criterion 5)
- describe and utilise concepts of physics (criterion 6)
- describe and interpret chemical behaviour and data related to chemistry (criterion 7)
- describe and interpret data related to physics (criterion 8).

All course content is compulsory.

While each area described in the content is compulsory, the order of delivery is not prescribed. The course may be delivered in a number of ways, for example:

- using a theme-based approach
- on the basis of project work
- unitised in traditional topics
- a combination of these and other strategies.

COMMUNICATION AND ORGANISATION SKILLS

APPLY SKILLS TO ORGANISE AND COMPLETE ACTIVITES (CRITERION 1)

Criterion 1 is to be assessed throughout the course using a range of assessment tasks.

COLLECT, PROCESS AND COMMUNICATE SCIENCE INFORMATION (CRITERION 3)

Criterion 3 is assessed within all threads of the Science Understanding strand requiring learners to complete activities and communicate using the appropriate and agreed conventions, including:

- using Système Internationale Units (SI), scientific notation, standard notation and the correct number of significant figures
- selecting, constructing and using appropriate chemical, physical and mathematical representations to communicate conceptual understanding, solve problems and make predictions
- using and interpreting a range of scientific and media texts and referring to the quality of available evidence
- communicating information to others through selecting and constructing appropriate language, nomenclature, modes and genres, including scientific reports
- recording sources of information.

SCIENCE INQUIRY SKILLS

UNDERTAKE, INTERPRET AND REVIEW PHYSICAL SCIENCES EXPERIMENTS (CRITERION 2)

Learners will:

- conduct laboratory experiments and investigations, to collect reliable data; assess risk associated with these methods
- select and use appropriate equipment to collect and record data systematically and accurately
- analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies
- use knowledge of scientific concepts to draw conclusions that are consistent with evidence
- comment on the validity of conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data.

SCIENCE AS A HUMAN ENDEAVOUR

DESCRIBE THE APPLICATION AND IMPACT OF PHYSICAL SCIENCES ON SOCIETY (CRITERION 4)

Learners will engage with the following concepts, placing the physical sciences firmly as a human endeavour:

- scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community
- advances in scientific understanding often rely on technological advances and are frequently linked to scientific discoveries
- people use scientific knowledge to evaluate whether they accept claims, explanations or predictions
- advances in science can affect people's lives, including generating new career opportunities
- values and needs of contemporary society can influence the focus of scientific research.

SCIENCE UNDERSTANDING

DESCRIBE AND UTILISE CONCEPTS OF CHEMICAL STRUCTURE AND PROPERTIES (CRITERION 5)

Chemical structures and properties can be directly related to how atoms interact with each other. Learners will study:

- the atomic structure and properties of elements are used to organise them in the Periodic Table:
    - describe the structure of atoms in terms of electron shells (shells only)
    - explain how the electronic structure determines the position of an element on the periodic table
    - explain how the position on the periodic table of an element relates to its properties
    - elements in the same group of the periodic table have similar chemical properties
        - for example: investigating the chemical activity of metals
    - the atomic mass tends to increase with atomic number:
        - increasing down a group
        - increasing across a period (left to right.)
- electronic structure of atoms determines whether they have a tendency to lose or gain electrons in chemical reactions:
    - metals undergo reactions where they lose electrons
    - metals form positive ions (cations)
    - non-metals undergo reactions where they gain electrons
    - non-metals form negative ions (anions.)
- properties of elements can be used to predict how they react:
    - non-metals can share electrons with other non-metals to form compounds
    - metals can donate electrons to non-metals to form compounds
    - a mixture of metals can form an alloy
- properties of elements and compounds can be predicted, generalised and observed:
    - similar elements undergo similar chemical reactions
    - compounds containing the same structures undergo similar reactions
- water is a key substance in a range of chemical systems because of its unique properties including its:
    - boiling point
    - density in solid and liquid phases
    - surface tension
    - ability to act as a solvent
- the structure of compounds is determined by how their atoms or ions interact and can be used to predict chemical properties:
    - the number of bonds
    - relative numbers of atoms or ions
    - the shape of compounds
    - further reactions that are possible
- chemistry knowledge and skills are used in the production of many useful everyday materials, for example:
    - fuels
    - metals
    - pharmaceuticals
    - plastics.
- chemistry knowledge can explain biological processes, for example:
    - nutrition
    - nutrient transport
    - nerve cell potential
    - respiration
    - photosynthesis.

DESCRIBE AND UTILISE CONCEPTS OF PHYSICS (CRITERION 6)

There are clear principles that underpin the physical behaviours of matter. Learners will study:

- physics utilises measurable, standardised and inter-related quantities to explain, predict and explore physical behaviour, including:
    - time
    - temperature
    - energy
    - force
    - distance
    - speed
    - mass
    - acceleration
- basic physical principles can be used to predict, explore and explain physical behaviours:
    - Law of Conservation of Energy
        - energy in any closed system remains constant; it cannot be created or destroyed, just transformed
        - kinetic, potential and heat energy transformations can cause change within systems
    - force affects the motion of objects:
        - Newton's First Law - a stationary or moving object with constant motion, has balanced forces acting on it (consider in one dimension only)
        - using Newton's Second Law to predict how a net force affects the acceleration of an object
            - i.e. F = ma or F = mg only.
        - applying Newton's Third Law qualitatively to describe the effect of interaction between two colliding objects in one dimension
- physical behaviours within systems can be explained, explored and predicted through the inter-relationships between basic physical principles:
    - temperature is related to the kinetic energy of particles:
        - all systems have thermal energy due to the motion of particles in the system (except at absolute zero)
        - heat transfer occurs between and within systems by conduction, convection and/or radiation
        - temperature is a measure of the average kinetic energy of particles in a system
    - relationships between physical phenomena can be used to describe how energy is transferred and transformed within systems such as:
        - car crashes
        - pendulums
        - lifting and dropping

DESCRIBE AND INTERPRET CHEMICAL BEHAVIOUR AND DATA RELATED TO CHEMISTRY (CRITERION 7)

Chemical behaviour can be represented, explored and generalised using chemical formulae and equations. Measurable data can be used to explore and ascertain chemical data and behaviour. Learners will study:

- compounds can be represented through chemical formula:
    - non-metallic compounds usually have a molecular formula that represents the number of each constituent atom per molecule
    - compounds that have both metallic and non-metallic ions have a formula that represents the ratio of ions in that compound
    - sometimes ions are used to explain simple chemical behaviour (e.g. metal ions)
- chemical reactions can be represented using chemical equations (worded and/or formula):
    - reactants are required for the reaction to take place
    - products are what are produced during the reaction
    - the general format for chemical equations is: reactants ? products
    - chemical reactions involve the formation of new chemical substances (products)
    - states of matter can change during chemical reactions
- constituent atoms or ions within compounds and reactions are present before and after a chemical reaction:
    - during a chemical reaction, the constituent atoms or ions within the reactants are rearranged to form new chemical compounds (products)
    - this is referred to as the law of conservation of mass
    - chemical equations can be balanced
    - balanced chemical equations have the same number of each atom or ions in the reactants and products and represent the law of conservation of mass
- reactions between compounds can be predicted, categorised and observed:
    - similar simple chemical reactions have similar reactants and products
    - word and/or symbol equations can be used to assist with generalising or predicting products of reactions
- chemical formulae can be used with measurable quantities to calculate chemical data, such as:
    - mass can be used to calculate amount in moles
    - mass and volume can be used to calculate concentration in moles per litre
- balanced chemical equations can be used with measurable quantities to find chemical properties, such as:
    - calculating an unknown concentration
    - identifying an unknown element or compound
    - calculating the purity of a sample

DESCRIBE AND INTERPRET DATA RELATED TO PHYSICS (CRITERION 8)

Physics can be explained, explored and modelled using measurable and observable data. Learners will study:

- measuring and manipulating physical quantities requires the use of internationally agreed standardised units, such as:
    - seconds (time)
    - kelvin (temperature)
    - joules (energy)
    - newtons (force)

    - metres (distance)
    - metres per second (speed)
    - kilograms (mass)
    - metres per second per second (acceleration.)
- physical systems can be inquired into by creating and utilising:
    - tables of measurable physical quantities
    - graphs representing the interrelationships between measurable physical quantities
- diagrams and symbols can be used to
    - represent the components of physical systems
    - simplify the interpretation of physical systems
    - explain and explore the underlying nature of physical behaviours
- physical behaviours within systems can be explained, explored and predicted through using equations to manipulate relationships between measurable quantities, for example:
    - distance and time are related to speed
    - mass and velocity are related to kinetic energy
    - change in temperature is related to change in energy
- mathematical models can be used to describe and explore physical behaviour. For example, how energy is transferred and transformed within systems:
    - car crashes
    - pendulums
    - lifting and dropping.

Work Requirements

PHYSICAL SCIENCES IN SOCIETY INVESTIGATION

Learners will undertake an investigation related to the impact of physical sciences on society (criterion 4). This investigation requires at least 10 hours of course design time and may include a practical component

The investigation will take the form of a written report or presentation. Learners will negotiate a topic for investigation. The topic will be drawn from a current or historical issue related to the application of physical sciences in society. Examples are noted below:

The focus of the investigation and report (or presentation) will be to:

- describe one topic associated with physical sciences that has met or meets a need in society
- describe key components of science and issues related to the topic
- present a balanced discussion of positive and negative impacts
- present reasoned conclusions about the impacts related to this topic using relevant evidence.

If a practical component is included as part of the investigation then it must:

- recreate important experiments related to the chosen topic, or
- illustrate the key physical sciences concepts that underpin the chosen topic.

The relevance and outcomes of the practical work should be clearly documented.

Example themes for topics include, but are not limited to:

- scientific understanding, including models and theories, is contestable and is refined over time, for example:
    - changing models of the atom have led to understanding and utilising radioactive sources
    - buckyballs and nanotubes – carbon allotropes in technology
    - the growing relationship between physics, chemistry and biology
- advances in scientific understanding often rely on technological advances and are linked to scientific discoveries, for example:
    - the new race to space - a story of chemistry and physics
    - the study of physics and chemistry has advanced computational technology and computational technology has allowed physics and chemistry knowledge to advance
    - manipulating atoms and molecules – science and technology moving forward together
- people use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, for example:
    - The chemistry and physics in criminal forensic investigations – how much proof is enough?
    - What were materials of the future a decade ago? Are we using them yet?
    - Free radicals and anti-oxidants - what should we believe?
- values and needs of contemporary society can influence the focus of scientific research, for example:
    - the physics of road safety – simple concepts applied every day
    - Sources, storage, and use of energy – what are the possibilities?
    - Why is at least one billion US dollars spent each year on the Large Hadron Collider?

PRACTICAL WORK

Whichever method of delivery is utilised, at least 40 hours will be spent on practical activities in the laboratory or the field. Practical experimentation and investigation are integral to the course, and are to be used as a means of teaching and consolidating the concepts and ideas as well as a means of assessment. The purpose of practicals throughout the year varies and includes:

- learning and practising scientific techniques
- safe practices to avoid health and safety issues to be used independently throughout the year
- illustration of concepts
- exploring components of experimental practice
- meeting the requirements of experimental practice whilst addressing criterion 2.

On at least three occasions learners will document an experiment to address all elements in criterion 2 in a form that will include:

- the purpose of the experiment
- clearly presented data:
    - representing data in meaningful and useful ways:
        - applying suggested graphic representations

        - using the correct units and symbols
        - identifying trends and relationships
- a discussion including:
    - use of evidence gathered and scientific concepts to draw conclusions
    - identifying any inconsistencies in the data
    - appraisal of the processes and conclusions considering the quality of available evidence
    - comment on the validity of conclusions identifying sources of uncertainty
    - a description of ways to improve the quality of the data.

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative, and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both teacher and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.
Providers offering this course must participate in quality assurance processes specified by TASC to ensure provider validity and comparability of standards across all awards. Further information on quality assurance processes, as well as on assessment, is on the TASC website:
http://www.tasc.tas.gov.au

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

Quality Assurance Process

The following processes will be facilitated by TASC to ensure there is:

- a match between the standards of achievement specified in the course and the skills and knowledge demonstrated by learners
- community confidence in the integrity and meaning of the qualification.

Process

TASC will verify that the provider's course-delivery and assessment standards meet the course requirements and community expectations for fairness, integrity and validity of qualifications TASC issues. This will involve checking:

- student attendance records; and
- course delivery plans (the sequence of course delivery/tasks and when assessments take place):
    - assessment instruments and rubrics (the 'rules' or marking guide used to judge achievement)
    - class records of assessment
    - examples of student work that demonstrate the use of the marking guide
    - samples of current student's work, including that related to any work requirements articulated in the course document.

This process may also include interviews with past and present students. It will be scheduled by TASC using a risk-based approach.

Criteria

The assessment for Physical Sciences - Foundation Level 2, will be based on the degree to which the learner can:

1. apply skills to organise and complete activities
2. undertake, interpret and review physical sciences experiments
3. collect, process and communicate science information
4. describe the application and impact of physical sciences on society
5. describe and utilise concepts of chemical structure and properties
6. describe and utilise physics concepts
7. describe and interpret chemical behaviour and data related to chemistry
8. describe and interpret data related to physics

Standards

Criterion 1: apply skills to organise and complete activities

The learner:

Rating A	Rating B	Rating C
selects and uses techniques and equipment to safely, competently and methodically complete practical tasks	selects from familiar techniques and equipment to safely and competently complete practical tasks	safely uses routine techniques and equipment to complete practical tasks
explains the purpose and actions intended by instructions in order to complete tasks	describes the purpose and actions intended by instructions in order to complete tasks	identifies the purpose and actions intended by instructions in order to complete tasks
monitors and assesses progress towards meeting goals and timelines, and plans future actions	monitors progress towards meeting goals and timelines, and plans future actions	monitors progress towards meeting goals and timelines
describes own contribution to the successful completion of group activities.	identifies own contributions to the successful completion of group activities.	identifies own contributions to the successful completion of group activities.

Criterion 2: undertake, interpret and review physical sciences experiments

The learner:

Rating A	Rating B	Rating C
discusses the purpose of experiments	describes the purpose of experiments	identifies the purpose of experiments
collects and records data accurately and systematically	collects and records data accurately	collects and records data accurately in given formats
applies suggested representation of data and explains trends and relationships	applies suggested representation of data and describes trends and relationships	applies suggested representation of data and identifies trends and relationships
draws valid and reasoned conclusions, based on evidence and the correct physical sciences concepts and comments	draws conclusions based on evidence and appropriate physical sciences concepts	draws conclusions based on evidence
comments on the validity of conclusions, identifies sources of uncertainty and describes ways to improve the quality of evidence.	identifies sources of uncertainty and describes ways to improve the quality of evidence.	makes limited suggestions for improvement to experiments.

Criterion 3: collect, process and communicate science information

Rating A	Rating B	Rating C
collects and discusses the reliability of data and information using a variety of relevant resources	collects data and information using a variety of relevant resources	collects data and information using a limited range of relevant resources
selects and uses accurate scientific terminology correctly to clearly communicate key concepts and ideas from physics and chemistry	uses key scientific terminology to communicate key concepts and ideas from physics and chemistry	uses given scientific terminology to clearly communicate key concepts and ideas of physics and chemistry
selects and uses appropriate scientific formats and units for communication of information	from a range, selects and uses appropriate scientific formats and units for communication of information	uses appropriate scientific formats and units for communication of information, as directed
accurately records sources of information.	records sources of information.	records sources of information as directed.

Criterion 4: describe the application and impact of physical sciences on society

Rating A	Rating B	Rating C

discusses how physical sciences meets needs in society	describes ways in which physical sciences meets needs in society	identifies ways in which physical sciences meets needs in society
explains issues related to applications of physical sciences in society	describes issues related to applications of physical sciences in society	identifies issues related to applications of physical sciences in society
describes in detail components of issues, and presents balanced discussions	identifies key components of issues, and presents balanced discussions	identifies components of issues, and lists points in favour, and against
argues reasoned conclusions, articulating links to relevant evidence.	presents reasoned conclusions, using relevant evidence.	uses limited evidence to support conclusions.

Criterion 5: describe and utilise concepts of chemical structure and properties

Rating A	Rating B	Rating C
describes trends in properties of elements within groups and periods of the periodic table	describes properties of elements within periods and groups of the periodic table	correctly identifies properties of elements using the periodic table
describes relationships between properties within classes of chemical compounds	describes properties of classes of chemical compounds	identifies properties of compounds
utilises classes of reactions to identify reactants or predict products	utilise classes of reactions to predict products from given reactants	identifies products of reactions given familiar reactants
selects appropriate common chemicals when utilising concepts of chemical structure and properties to predict bonding, formula and reactions.	utilises concepts of chemical structure and properties of common chemicals to predict bonding, formula and reactions.	utilises concepts of chemical structures and properties of given chemicals to predict bonding, formula and simple reactions.

Criterion 6: describe and utilise physics concepts

The learner:

Rating A	Rating B	Rating C
explains physics concepts* related to observations and theories	describes physics concepts* related to physical observations and theories	recognises and identifies physics concepts* related to physical observations and theories
correctly identifies, utilises and appropriately converts units of measure when solving problems	correctly identifies and utilises appropriate units of measure when solving problems	identifies appropriate units of measure when solving problems
explains and utilises appropriate physics concepts when solving problems	describes and utilises appropriate physics concepts when solving problems	identifies appropriate basic physics concepts* and utilises them when solving problems
explains relationships and ideas that connect physics in a system and utilises them to solve problems.	describes simple relationships and ideas that connect physics in a system and utilises them to solve problems.	identifies simple relationships and ideas that connect physics in a system to explore problems.

*for physics concepts continued in Physical Sciences Foundation see: Science Understanding Section, Describe and Utilise Physics Concepts

Criterion 7: describe and interpret chemical behaviour and data related to chemistry

Rating A	Rating B	Rating C
accurately interprets complex chemical data and information	accurately interprets chemical data and information	utilises chemical data and information, as directed
generalises chemical reactions to generate and describe classes of reactions	describes chemical reactions identifying reactants and products	identifies key reactants and products within given chemical reactions
utilises, explains and interprets constant proportions	utilises, describes and interprets constant	uses constant proportions within

within ions, compounds and reactions	proportions within compounds and reactions	compounds and reactions
interprets mathematical data and information to select and utilise appropriate mathematical techniques when solving problems	interprets mathematical information and data and utilises simple mathematical techniques when solving problems	uses mathematical information and data to solve simple problems
correctly transposes mathematical equations to calculate answers.	correctly selects appropriate transpositions of mathematical equations to calculate answers.	substitutes correctly into given mathematical equations to calculate answers.

Criterion 8: describe and interpret data related to physics

Rating A	Rating B	Rating C
interprets mathematical information and data to select and apply appropriate mathematical techniques when solving problems	interprets mathematical information and data to apply basic mathematical techniques when solving problems	uses mathematical information and data to solve simple problems
correctly transposes linear mathematical equations, or selects appropriate transpositions from non-linear equations, to calculate answers	correctly selects appropriate transpositions of mathematical equations to calculate answers	substitutes correctly into given mathematical equations to calculate answers
accurately reads and interprets complex data from a graph/table	accurately reads and interprets data from a graph/table to describe physical behaviour	accurately reads data from a graph/table to illustrate physical behaviour
constructs appropriate graphs or tables from data	selects from a range of given formats and constructs graphs and tables from data	constructs graphs and tables from data, as directed
accurately interprets diagrams and symbols, and uses them to correctly explain physical behaviour when solving problems.	accurately and appropriately interprets diagrams and symbols to describe physical behaviour when solving problems.	accurately uses diagrams and symbols to explore physical behaviour when solving problems.

Qualifications Available

Physical Sciences - Foundation Level 2 (with the award of):

EXCEPTIONAL ACHIEVEMENT
HIGH ACHIEVEMENT
COMMENDABLE ACHIEVEMENT
SATISFACTORY ACHIEVEMENT
PRELIMINARY ACHIEVEMENT

Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 8 ratings from the internal assessment.

The minimum requirements for an award in Physical Sciences - Foundation Level 2 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
7 ‘A’ ratings, 1 ‘B’ rating

HIGH ACHIEVEMENT (HA)
3 ‘A’ ratings, 4 ‘B’ ratings, 1 ‘C’ rating

COMMENDABLE ACHIEVEMENT (CA)
4 ‘B’ ratings, 3 ‘C’ ratings

SATISFACTORY ACHIEVEMENT (SA)
6 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)
4 ‘C’ ratings

A learner who otherwise achieves the ratings for a CA (Commendable Achievement) or SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria (‘z’ notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

The Department of Education's Curriculum Services will develop and regularly revise the curriculum. This evaluation will be informed by the experience of the course's implementation, delivery and assessment. In addition, stakeholders may request Curriculum Services to review a particular aspect of an accredited course.

Requests for amendments to an accredited course will be forward by Curriculum Services to the Office of TASC for formal consideration.

Such requests for amendment will be considered in terms of the likely improvements to the outcomes for learners, possible consequences for delivery and assessment of the course, and alignment with Australian Curriculum materials.

A course is formally analysed prior to the expiry of its accreditation as part of the process to develop specifications to guide the development of any replacement course.

Course Developer

The Department of Education acknowledges the significant leadership of Stephen Dodge, Brendon Gourlay, Peter Smythe and Peter Wright in the development of this course.

Expectations Defined By National Standards In Content Statements Developed by ACARA

The statements in this section, taken from documents endorsed by Education Ministers as the agreed and common base for course development, are to be used to define expectations for the meaning (nature, scope and level of demand) of relevant aspects of the sections in this document setting out course requirements, learning outcomes, the course content and standards in the assessment.

SCIENCE UNDERSTANDING
CHEMISTRY

Unit 2 – Aqueous solutions and acidity

- Water is a key substance in a range of chemical systems because of its unique properties, including its boiling point, density in solid and liquid phases, surface tension, and ability to act as a solvent (ACSCH061)

PHYSICS

Unit 1 – Heating processes

- Heat transfer occurs between and within systems by conduction, convection and/or radiation (ACSPH016)
- The kinetic particle model describes matter as consisting of particles in constant motion, except at, absolute zero (ACSPH017)
- All systems have thermal energy due to the motion of particles in the system (ACSPH018)
- Temperature is a measure of the average kinetic energy of particles in a system (ACSPH019)
- Two systems in contact transfer energy between particles so that eventually the systems reach the same temperature? that is, they are in thermal equilibrium (ACSPH022)
- Energy transfers and transformations in mechanical systems (for example, internal and external combustion engines, electric motors) always result in some heat loss to the environment, so that the usable energy is reduced and the system cannot be 100 percent efficient (ACSPH025)

Accreditation

The accreditation period for this course has been renewed from 1 January 2022 until 31 December 2023.

During the accreditation period required amendments can be considered via established processes.

Should outcomes of the Years 9-12 Review process find this course unsuitable for inclusion in the Tasmanian senior secondary curriculum, its accreditation may be cancelled. Any such cancellation would not occur during an academic year.

Version History

Version 1 – Accredited on 30 July 2017 for use from 1 January 2018. This course replaces *Physical Sciences* (SPW215114) that expired on 31 December 2017.

Version 1.i - Accreditation renewed on 22 November 2018 for the period 1 January 2019 until 31 December 2021. Amendment on 14 December 2018 to move Investigation and Practical work to 'Work Requirements' section of course document.

Version 1.ii - Renewal of Accreditation on 14 July 2021 for the period 31 December 2021 until 31 December 2023, without amendments.

Appendix

Term	Explanation
Analyse	To examine, scrutinise, explore, review, consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences.
Anomalous data	Data that does not fit a pattern; outlier.
Communicates	Conveys knowledge and/or understandings to others.
Complex	Consisting of multiple interconnected parts or factors.
Critically analyse	Examine the component parts of an issue or information, for example, identifying the premise of an argument and its plausibility, illogical reasoning or faulty conclusions.
Critically evaluate	Evaluation of an issue or information that includes considering important factors and available evidence in making critical judgement that can be justified.
Data	The plural of datum; the measurement of an attribute, for example, the volume of gas or the type of rubber. This does not necessarily mean a single measurement: it may be the result of averaging several repeated measurements. Data may be quantitative or qualitative and be from primary or secondary sources.
Demonstrate	Give a practical exhibition as an explanation.
Describe	Give an account of characteristics or features.
Evaluate	Provide a detailed examination and substantiated judgement concerning the merit, significance or value of something.
Evidence	In science, evidence is data that is considered reliable and valid and which can be used to support a particular idea, conclusion or decision. Evidence gives weight or value to data by considering its credibility, acceptance, bias, status, appropriateness and reasonableness.
Explain	Provide additional information that demonstrates understanding of reasoning and/or application.
Familiar	Previously encountered in prior learning activities.
Genre	The categories into which texts are grouped; genre distinguishes texts on the basis of their subject matter, form and structure (for example, scientific reports, field guides, explanations, procedures, biographies, media articles, persuasive texts, narratives).
Identify	Establish or indicate who or what someone or something is.
Investigation	A scientific process of answering a question, exploring an idea or solving a problem that requires activities such as planning a course of action, collecting data, interpreting data, reaching a conclusion and communicating these activities. Investigations can include observation, research, field work, laboratory experimentation and manipulation of simulations.
Law	A statement describing invariable relationships between phenomena in specified conditions, frequently expressed mathematically.
Mode	The various processes of communication – listening, speaking, reading/viewing and writing/creating.
Model	A representation that describes, simplifies, clarifies or provides an explanation of the workings, structure or relationships within an object, system or idea.
Primary data	Data collected directly by a person or group.
Random error	Uncontrollable effects of the measurement equipment, procedure and environment on a measurement result; the magnitude of random error for a measurement result can be estimated by finding the spread of values around the average of independent, repeated measurements of the quantity.
Reasoned	Reasoned argument/conclusion: one that is sound, well-grounded, considered and thought out.
Reliability	The degree to which an assessment instrument or protocol consistently and repeatedly measures an attribute achieving similar results for the same population.
Reliable data	Data that has been judged to have a high level of reliability; reliability is the degree to which an assessment instrument or protocol consistently and repeatedly measures an attribute achieving similar results for the same population.
Representation	A verbal, visual, physical or mathematical demonstration of understanding of a science concept or concepts. A concept can be

	represented in a range of ways and using multiple modes.
Research	To locate, gather, record, attribute and analyse information in order to develop understanding.
Research ethics	Norms of conduct that determine ethical research behaviour; research ethics are governed by principles such as honesty, objectivity, integrity, openness and respect for intellectual property and include consideration of animal ethics.
Risk assessment	Evaluations performed to identify, assess and control hazards in a systematic way that is consistent, relevant and applicable to all school activities. Requirements for risk assessments related to particular activities will be determined by jurisdictions, schools or teachers as appropriate.
Secondary data	Data collected by a person or group other than the person or group using the data.
Significant figures	The use of place value to represent a measurement result accurately and precisely.
Solve	Work out a correct solution to a problem.
System	A group of interacting objects, materials or processes that form an integrated whole. Systems can be open or closed.
Systematic error	The contribution to the uncertainty in a measurement result that is identifiable and quantifiable, for example, imperfect calibration of measurement instruments.
Theory	A set of concepts, claims and/or laws that can be used to explain and predict a wide range of related observed or observable phenomena. Theories are typically founded on clearly identified assumptions, are testable, produce reproducible results and have explanatory power.
Unfamiliar	Not previously encountered in prior learning activities.
Validity	The extent to which tests measure what was intended; the extent to which data, inferences and actions produced from tests and other processes are accurate.

Line Of Sight

Line of Sight - *Physical Science Foundation*

Learning Outcomes	Criteria	Criteria and Elements	Content / Work Requirements
undertake and complete scientifics activities and tasks individually and as a group including practical tasks	1. apply skills to organise and complete activities	all	all content
use practical skills and techniques safely utilising equipment relating to the physical sciences	2. undertake, interpret and review physical sciences experiments	elements 2 and 3 of C2 standards	Content: Science Inquiry Skills, Work requirements: Practical Work
inquire into physical systems by collecting data and finding trends and patterns to draw valid conclusions	2. undertake, interpret and review physical sciences experiments	elements 1, 3, 4, 5, 6 of C2 standards	Content: Science Inquiry Skills, Work requirements: Practical Work
collect, process, organise and communicate physical sciences data and information following accepted conventions	3. collect, process and communicate science information	all	all
describe the application and impact of physical sciences on society	4. describe the application and impact of physical sciences on society	all	Content : Science as a Human Endeavour, Work requirements: Physical sciences in society investigation
describe and utilise appropriate chemistry concepts to explain chemical structure and properties	5. describe and utilise concepts of chemical structure and properties	all	Content: Describe and utilise concepts of chemical structure and properties
describe and utilise appropriate principles of physics to explain and solve problems associated with physical behaviours and systems	6. describe and utilise physics concepts	all	Content: Describe and utilise concepts of physics
use chemical and mathematical formulae and equations to describe and interpret chemical data and behaviour	7. describe and interpret chemical behaviour and data related to chemistry	all	Content: Describe and interpret chemical behaviour and data related to chemistry
utilise mathematics, diagrams and symbols to analyse and interpret physical data	8. describe and interpret data related to physics	all	Content: Describe and interpret data related to physics

Tasmanian Government

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