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| Course Title | Chemistry | Course Code | 2426 |
| Unit Title | Chemical Fundamentals | Unit Code | 23220 |
| Semester Unit | Unit 1: Chemical Fundamentals | Unit code/Unit Value | 23220 /1.0 |
| Term 1 Unit | Chemical Fundamentals 1a | Unit code/Unit Value | 23221 /0.5 |
| Term 2 Unit | Chemical Fundamentals 1b | Unit code/Unit Value | 23222 /0.5 |

GOALS

By the end of this unit, students:

- understand how the atomic model and models of bonding explain the structure and properties of elements and compounds
- understand the concept of enthalpy, and apply this to qualitatively and quantitatively describe and explain energy changes in chemical reactions
- understand how models and theories have developed based on evidence from a range of sources, and the uses and limitations of chemical knowledge in a range of contexts
- use science inquiry skills to design, conduct, evaluate and communicate investigations into the properties of elements, compounds and mixtures and the energy changes involved in chemical reactions
- evaluate, with reference to empirical evidence, claims about chemical properties, structures and reactions
- communicate, predict and explain chemical phenomena using qualitative and quantitative representations in appropriate modes and genres

CONTENT

Properties and structure of atoms

- trends in the observable properties of elements are evident in periods and groups in the periodic table
- the structure of the periodic table is based on the electron configuration of atoms, and shows trends, including in atomic radii and valencies
- atoms can be modelled as a nucleus surrounded by electrons in distinct energy levels, held together by electrostatic forces of attraction between the nucleus and electrons; atoms can be represented using electron shell diagrams (all electron shells or valence shell only) or electron charge clouds
- flame tests and atomic absorption spectroscopy are analytical techniques that can be used to identify elements; these methods rely on electron transfer between atomic energy levels
- the properties of atoms, including their ability to form chemical bonds, are explained by the arrangement of electrons in the atom and in particular by the stability of the valence electron shell
- isotopes are atoms of an element with the same number of protons but different numbers of neutrons; different isotopes of elements are represented using atomic symbols (for example, ${}_{6}\text{C}^{12}$, ${}_{6}\text{C}^{13}$)
- isotopes of an element have the same electron configuration and possess similar chemical properties but have different physical properties, including variations in nuclear stability
- mass spectrometry involves the ionisation of substances and generates spectra which can be analysed to determine the isotopic composition of elements
- the relative atomic mass of an element is the ratio of the weighted average mass per atom of the naturally occurring form of the element to 1/12 the mass of an atom of carbon-12; relative atomic masses reflect the isotopic composition of the element

Properties and structure of materials

- materials are either pure substances with distinct measurable properties (for example, melting and boiling point, reactivity, strength, density) or mixtures with properties dependent on the identity and relative amounts of the substances that make up the mixture
- differences in the properties of substances in a mixture, such as particle size, solubility, magnetism, density, electrostatic attraction, melting point and boiling point, can be used to separate them
- the type of bonding within substances explains their physical properties, including melting and boiling point, conductivity of both electricity and heat, strength and hardness
- nanomaterials are substances that contain particles in the size range 1–100 nm and have specific properties relating to the size of these particles
- chemical bonds are caused by electrostatic attractions that arise because of the sharing or transfer of electrons between participating atoms; the valency is a measure of the number of bonds that an atom can form
- ions are atoms or groups of atoms that are electrically charged due to an imbalance in the number of electrons and protons; ions are represented by formulae which include the number of constituent atoms and the charge of the ion (for example, O^{2-} , SO_4^{2-})
- the properties of ionic compounds (for example, high melting point, brittleness, ability to conduct electricity when liquid or in solution) are explained by modelling ionic bonding as ions arranged in a crystalline lattice structure with forces of attraction between oppositely charged ions
- the characteristic properties of metals (for example, malleability, thermal conductivity, electrical conductivity) are explained by modelling metallic bonding as a regular arrangement of positive ions (cations) made stable by electrostatic forces of attraction between these ions and the electrons that are free to move within the structure
- covalent substances are modelled as molecules or covalent networks that comprise atoms which share electrons, resulting in electrostatic forces of attraction between electrons and the nucleus of more than one atom
- elemental carbon exists as a range of allotropes, including graphite, diamond and fullerenes, with significantly different structures and physical properties
- carbon forms hydrocarbon compounds, including alkanes and alkenes, with different chemical properties that are influenced by the nature of the bonding within the molecules

Chemical reactions: reactants, products and energy change

1. all chemical reactions involve the creation of new substances and associated energy transformations, commonly observable as changes in the temperature of the surroundings and/or the emission of light
2. endothermic and exothermic reactions can be explained in terms of the Law of Conservation of Energy and the breaking and reforming of bonds; heat energy released or absorbed can be represented in thermochemical equations
3. fuels, including fossil fuels and biofuels, can be compared in terms of their energy output, suitability for purpose, and the nature of products of combustion
4. a mole is a precisely defined quantity of matter equal to Avogadro's number of particles; the mole concept and the Law of Conservation of Mass can be used to calculate the mass of reactants and products in a chemical reaction

ASSESSMENT

| TASK | DUE DATE | WEIGHTING |
|---------------------|----------|-----------|
| Experimental Report | Week 6 | 20% |
| Exam 1 | Week 8/9 | 30% |
| Asses | Week 13 | 20% |
| Exam 2 | Week 18 | 30% |

Specific Entry & Exit Requirements for Term Units

It is possible to enter this course at term 2.

To exit at term 1 you must complete test 1 and the Practical Log Book by week 9.

UNIT GRADES FOR COURSES

| Grade | Descriptor |
|---|---|
| A student who achieves the grade A typically | <p>Knowledge and understanding:</p> <ul style="list-style-type: none"> demonstrates broad knowledge and deep understanding of scientific concepts presented. Applies this knowledge to familiar and unfamiliar contexts, displaying originality and lateral thinking in problem solving <p>Critical thinking:</p> <ul style="list-style-type: none"> describes patterns and trends in data observations and makes valid inferences. Discriminates between ideas by assessing the value of the scientific evidence presented <p>Investigative skills:</p> <ul style="list-style-type: none"> plans and performs scientific investigations with skill and initiative. Selects and uses appropriate resources and equipment efficiently and in a safe and correct manner. Displays an ability to collect data and assess its validity and accuracy <p>Communication:</p> <ul style="list-style-type: none"> collects information, organises it logically and presents data in a range of forms to reveal patterns and relationships. Presents complex ideas and information clearly by the appropriate use of scientific terminology. Uses language appropriate to various audiences <p>Work practices:</p> <ul style="list-style-type: none"> organises time and resources to work in a productive manner independently and in a team environment. Facilitates effective outcomes in other team members |
| A student who achieves the grade B typically | <p>Knowledge and understanding:</p> <ul style="list-style-type: none"> demonstrates sound knowledge and understanding of scientific concepts presented and applies this knowledge in familiar and unfamiliar contexts to solve problems <p>Critical thinking:</p> <ul style="list-style-type: none"> describes patterns and trends in data observations and can make some valid inferences. Compares the validity of ideas by assessing the value of the scientific evidence presented <p>Investigative skills:</p> <ul style="list-style-type: none"> plans and performs scientific investigations. Selects and uses appropriate resources and equipment in a safe and correct manner. Displays an ability to collect data and assess its validity <p>Communication:</p> <ul style="list-style-type: none"> collects information, organises it and presents data in a range of forms to reveal patterns. Can present ideas and information clearly by the use of scientific terminology. Can use language appropriate to various audiences <p>Work practices:</p> <ul style="list-style-type: none"> works in a productive manner independently and in a team environment |
| A student who achieves the grade C typically | <p>Knowledge and understanding:</p> <ul style="list-style-type: none"> demonstrates knowledge of scientific concepts presented and applies this to familiar contexts to solve problems <p>Critical thinking:</p> <ul style="list-style-type: none"> describes trends in data observations and can make inferences. Compares the validity of ideas with assistance <p>Investigative skills:</p> <ul style="list-style-type: none"> demonstrates an ability to perform scientific investigations. Can plan investigations with guidance. Uses appropriate resources and equipment in a safe and correct manner. Displays an ability to collect data <p>Communication:</p> <ul style="list-style-type: none"> collects information, organises it and presents data effectively in some forms. Can present ideas and information by the use of scientific terminology <p>Work practices:</p> <ul style="list-style-type: none"> works in a productive manner independently and in a team environment, with assistance |
| A student who achieves the grade D typically | <p>Knowledge and understanding:</p> <ul style="list-style-type: none"> demonstrates knowledge of some scientific concepts presented and applies this to familiar contexts with assistance <p>Critical thinking:</p> <ul style="list-style-type: none"> recognises trends in data observations and makes inferences with assistance <p>Investigative skills:</p> <ul style="list-style-type: none"> demonstrates an ability to perform scientific investigation with assistance. Uses equipment in a safe and correct manner under supervision. Displays an ability to collect data <p>Communication:</p> <ul style="list-style-type: none"> collects information and presents data in some forms with assistance. Can present ideas and information by the use of simple scientific terminology <p>Work practices:</p> <ul style="list-style-type: none"> works in a productive manner on guided tasks with assistance |
| A student who achieves the | <p>Knowledge and understanding:</p> <ul style="list-style-type: none"> can recall some scientific concepts with assistance |

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| <p>grade E typically</p> | <p>Critical thinking:</p> <ul style="list-style-type: none"> • recognises trends in data observations with assistance <p>Investigative skills:</p> <ul style="list-style-type: none"> • can perform guided tasks with assistance. Uses equipment under supervision to collect data <p>Communication:</p> <ul style="list-style-type: none"> • collects information and presents data with guidance and assistance <p>Work practices:</p> <ul style="list-style-type: none"> • can work on guided tasks with direction |
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Teachers will consider, when allocating grades, the degree to which students demonstrate their ability to complete and submit tasks within a specified time frame.

ATTENDANCE AND PARTICIPATION

Students are expected to submit all assessment items and attend all classes, participate in a positive manner and seek support whenever it is required. Excursions, simulations and presentations by visitors (including lunchtime) may form part of class work. It is your responsibility to catch up on missed work when absent from class.

Any student whose attendance falls below the 90% of the scheduled classes/contact time and has not provided substantial documentary evidence to cover the absence will be awarded a V grade. This means that 4 unexplained absences in a term or 8 unexplained absences in a semester could mean that a V grade may be awarded. However, the Principal has the right to exercise discretion in special circumstances if satisfactory documentation is supplied.

LATE SUBMISSION OF WORK

Students are encouraged to submit work on time, as it is a valuable organisational skill. Students are also encouraged to complete work even if it is late, as there are educational benefits in doing so.

Late work will receive a penalty of 5% (of possible marks) per calendar day late, unless an extension is granted by the class teacher prior to the deadline. This means that 5% is taken off the possible marks that could have been achieved e.g. If a student achieved a score of 75/100, and the item is one day late, then five marks (5% of 100) would be taken from 75, which leaves the score as 70/100.

'Per calendar day late' means each day late whether it be a weekend or public holiday. Items due on any date must be submitted to the class teacher, faculty staff room, or front office at the college by 3.30pm on that day. After 3.30pm, the item will attract the late penalty. Submission of work on a weekend or public holiday is not acceptable. If you do not submit your work to your class teacher, make sure that it is signed and dated by either another member of staff in the faculty staffroom, or a member of the front office staff.

No work will be accepted after marked work has been returned, or accepted after the unit has completed. Computer and/or printer failure will not be accepted as a valid reason for late work. Make sure you backup, keep hard copies and rough notes.

Unless prior approval is granted, any student who fails to submit assessment tasks worth in total 70% or more of the assessment for the unit will be considered to be unassessable and will receive a V grade. The Principal has the right to exercise discretion in the application of the late penalty in special circumstances where satisfactory documentation is supplied.

CHEATING AND DISHONEST PRACTICE

The integrity of the College's assessment system relies upon all involved acting in accordance with the highest standards of honesty and fairness. Any departure from such standards will be viewed very seriously. Accordingly:

- Plagiarism - claiming authorship of someone else's work (intentionally or otherwise) - is a serious misdemeanour, and attracts severe penalties.
- Students are required to acknowledge the source of all material that is incorporated into their own work.
- Students may not submit the same item for assessment in more than one unit, unless specific agreement has been reached with the class teacher.

MODERATION

Throughout the semester, moderation in the form of common marking schemes, cross marking and joint marking occurs across all units in the Moderation Group to ensure comparability of standards. Moderation is a process whereby student's work is compared so that student performance can be graded fairly and consistently. Moderation takes some time, and so students may not receive their work back until ACT wide moderation of grades across all colleges has occurred. Small Group Moderation is carried out in courses with small class sizes.

RIGHT TO APPEAL

You can appeal against your assessment if you feel that the result you obtained is not fair. You should first talk to your class teacher, and if you are not satisfied with the explanation you must discuss the situation with the Executive Teacher of the faculty concerned. If you still do not feel that your result is fair you should talk to the Deputy Principal Programs for further advice on the 'appeal process'.

Executive Teacher
Ruth Edge

Class Teacher
Ingrid Bean