Erindale College

UNIT OUTLINE SEMESTER 1, 2019

ACADEMY of SCIENCE and MATHEMATICS

Course Title	Chemistry	Course Code	2426
Unit Title	Equilibrium and Redox Reactions	Unit Code	23226
Semester Unit	Unit 3: Equilibrium and Redox Reactions	Unit code/Unit Value	23226 / 1.0
Term 1 Unit	Equilibrium and Redox Reactions 3a	Unit code/Unit Value	23227 /0.5
Term 2 Unit	Equilibrium and Redox Reactions 3b	Unit code/Unit Value	23228 /0.5

GOALS

By the end of this unit, students:

- understand the characteristics of equilibrium systems, and explain and predict how they are affected by changes to temperature, concentration and pressure
- understand the difference between the strength and concentration of acids, and relate this to the principles of chemical equilibrium
- understand how redox reactions, galvanic and electrolytic cells are modelled in terms of electron transfer
- understand how models and theories have developed over time and the ways in which chemical knowledge interacts with social, economic, cultural and political considerations in a range of contexts
- use science enquiry skills to design, conduct, evaluate and communicate investigations into the properties of acids and bases, redox reactions and electrochemical cells, including volumetric analysis
- evaluate, with reference to empirical evidence, claims about equilibrium systems and justify evaluations
- communicate, predict and explain chemical phenomena using qualitative and quantitative representations in appropriate modes and genres

CONTENT

Chemical equilibrium systems

- chemical systems may be open or closed and include physical changes and chemical reactions which can result in observable changes to the system
- all physical changes are reversible, whereas only some chemical reactions are reversible
- over time, physical changes and reversible chemical reactions reach a state of dynamic equilibrium in a closed system, with the relative concentrations of products and reactants defining the position of equilibrium
- the reversibility of chemical reactions can be explained by considering the activation energies of the forward and reverse reactions
- the effect of changes of temperature on chemical systems at equilibrium can be explained by considering the enthalpy changes for the forward and reverse reactions
- the effect of changes of concentration and pressure on chemical systems at equilibrium can be explained and predicted by applying collision theory to the forward and reverse reactions
- the effects of changes of temperature, concentration of chemicals and pressure on equilibrium systems can be predicted using Le Chatelier's principle
- equilibrium position can be predicted qualitatively using equilibrium constants
- acids are substances that can act as proton (hydrogen ion) donors and can be classified as monoprotic or polyprotic depending on the number of protons donated by each molecule of the acid
- the strength of acids is explained by the degree of ionisation at equilibrium in aqueous solution, which can be represented with chemical equations and equilibrium constants (Ka)
- the relationship between acids and bases in equilibrium systems can be explained using the Brønsted-Lowry model and represented using chemical equations that illustrate the transfer of hydrogen ions
- the pH scale is a logarithmic scale and the pH of a solution can be calculated from the concentration of hydrogen ions; K_w can be used to calculate the concentration of hydrogen ions from the concentration of hydroxide ions in a solution
- acid-base indicators are weak acids or bases where the acidic form is of a different colour to the basic form

- volumetric analysis methods involving acid-base reactions rely on the identification of an equivalence point by measuring the associated change in pH, using chemical indicators or pH meters, to reveal an observable end point

Oxidation and reduction

- a range of reactions, including displacement reactions of metals, combustion, corrosion, and electrochemical processes, can be modelled as redox reactions involving oxidation of one substance and reduction of another substance
- oxidation can be modelled as the loss of electrons from a chemical species, and reduction can be modelled as the gain of electrons by a chemical species; these processes can be represented using half-equations
- the ability of an atom to gain or lose electrons can be explained with reference to valence electrons, consideration of energy, and the overall stability of the atom, and can be predicted from the atom's position in the periodic table
- the relative strength of oxidising and reducing agents can be determined by comparing standard electrode potentials
- electrochemical cells, including galvanic and electrolytic cells, consist of oxidation and reduction half-reactions connected via an external circuit that allows electrons to move from the anode (oxidation reaction) to the cathode (reduction reaction)
- galvanic cells, including fuel cells, generate an electrical potential difference from a spontaneous redox reaction; they can be represented as cell diagrams including anode and cathode half-equations
- fuel cells can use metal nanoparticles as catalysts to improve the efficiency of energy production
- cell potentials at standard conditions can be calculated from standard electrode potentials; these values can be used to compare cells constructed from different materials
- electrolytic cells use an external electrical potential difference to provide the energy to allow a non-spontaneous redox reaction to occur, and can be used in small-scale and industrial situations

ASSESSMENT

TASK	DUE DATE	WEIGHTING
Research Assignment	Week 5	20%
Exam 1	Week 8/9	30%
Practical Report	Week 16	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 the Research Assignment and Exam 1 by week 9.

ASSESSMENT CRITERIA FOR ASSESSMENT AND REPORTING OF STUDENT ACHIEVEMENT

The following assessment criteria are a focus for assessment and reporting in this unit. Criteria are the essential qualities that teachers look for in student work. These criteria must be used by teachers to assess student's performance, however not all of them need to be used on each task. Assessment criteria are to be used holistically on a given task and in determining the unit grade.

Students will be assessed on the degree to which they demonstrate:

- ♦ knowledge and understanding
- ♦ critical thinking
- ♦ investigative skills
- ♦ communication skills
- ♦ effective work practices

UNIT GRADES FOR COURSES

Grade	Descriptor
A student who achieves the **grade A** typically	**Knowledge and understanding**: • 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 **Critical thinking:**

	• describes patterns and trends in data observations and makes valid inferences. Discriminates between ideas by assessing the value of the scientific evidence presented **Investigative skills:** • 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 **Communication:** • 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 **Work practices:** • 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	**Knowledge and understanding:** • demonstrates sound knowledge and understanding of scientific concepts presented and applies this knowledge in familiar and unfamiliar contexts to solve problems **Critical thinking:** • 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 **Investigative skills:** • 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 **Communication:** • 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 **Work practices:** • works in a productive manner independently and in a team environment
A student who achieves the **grade C** typically	**Knowledge and understanding:** • demonstrates knowledge of scientific concepts presented and applies this to familiar contexts to solve problems **Critical thinking:** • describes trends in data observations and can make inferences. Compares the validity of ideas with assistance **Investigative skills:** • 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 **Communication:** • collects information, organises it and presents data effectively in some forms. Can present ideas and information by the use of scientific terminology **Work practices:** • works in a productive manner independently and in a team environment, with assistance
A student who achieves the **grade D** typically	**Knowledge and understanding:** • demonstrates knowledge of some scientific concepts presented and applies this to familiar contexts with assistance **Critical thinking:** • recognises trends in data observations and makes inferences with assistance **Investigative skills:** • 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 **Communication:** • collects information and presents data in some forms with assistance. Can present ideas and information by the use of simple scientific terminology **Work practices:** • works in a productive manner on guided tasks with assistance
A student who achieves the **grade E** typically	**Knowledge and understanding:** • can recall some scientific concepts with assistance **Critical thinking:** • recognises trends in data observations with assistance **Investigative skills:** • can perform guided tasks with assistance. Uses equipment under supervision to collect data **Communication:** • collects information and presents data with guidance and assistance **Work practices:** • can work on guided tasks with direction

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