Tutorial Letter 101/3/2018

General Chemistry 1A

CHE1501

Semesters 1 and 2

Chemistry Department

This tutorial letter contains important information about your module.

BARCODE

CONTENTS

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Dear Student

1 INTRODUCTION

Welcome to the subject General Chemistry 1A. I trust that you will find this module both stimulating and personally enriching.

2 PURPOSE AND OUTCOMES

2.1 Purpose

Students credited with this module can explain and apply general chemistry principles. These principles include basic atomic theories, the electronic structure of atoms, the periodic table and periodicity, chemical bonding, behaviour of matter, stoichiometry, acids and bases, types of chemical reactions, concentrations, kinetics, gases, thermochemistry and chemical equilibrium.

2.2 Outcomes

The Learning Outcomes for General Chemistry are: to understand the molecular nature of all phases of matter, to understand the various ways of depicting chemical compounds and chemical reactions, to develop an ability to solve basic quantitative problems regarding the properties of molecules, chemical equilibria, and chemical kinetics, and to develop the ability to appropriately apply this knowledge to general scientific problems in various fields of science and engineering.

Upon completion, the student should be able to:

- Explain and apply principles related to the foundations of chemistry, atomic structure and the periodic table.
- Explain and apply basic principles of Quantum Chemistry and Periodicity.
- Apply chemical bonding and bonding theories.
- Explain acid-base theories, and analyse, compare and balance different types of chemical reactions.
- Apply principles of stoichiometry and the mole concept.
- Define and calculate various expressions of concentrations.
- Explain and demonstrate how collision theory and energy considerations affect the rate of reactions.
- Explain and apply basic chemical equilibrium concepts
- Apply concepts relating to acid-base equilibrium and perform relevant calculations.
- Apply thermo-chemical principles (temperature, heat and energy) when analysing substances.
- Define and evaluate the gaseous state and the Gas Laws.

3 LECTURER(S) AND CONTACT DETAILS

3.1 Lecturer(s)

The following lecturer will be responsible for this module.

Mr M G Smith

Unisa Science Campus, Florida

Eureka Building, K-M-007

Tel: (011) 670-9314

E-mail: smithm2@unisa.ac.za

Unisa is dedicated to service. Students are advised to resend their queries to the respective lecturers and then carbon copy the Chair of Department (mphahmj@unisa.ac.za) on queries that are not addressed by the lecturers within 3 working days.

3.2 Department

If you have any problem in contacting your lecturer you may contact the secretary on (011) 670-9318 or (011) 670-9327 and leave a message for the relevant lecturer.

Should you prefer to write to me, the letter should be sent to:

The CHE1501 Lecturer
Department of Chemistry
Private Bag X 6
UNISA (Florida Campus)
1710

Alternatively, you can e-mail the secretary on chemistry@unisa.ac.za.

If you want to contact me via e-mail, please make sure that you give us the module code and your student number. Lecturers work on a number of modules each, and we many get e-mails to which we must reply: "Which module are we talking about?" Also make sure that your subject line is descriptive, like "CHE1501 - Query about Assignment 2". If your subject is something like "hello", your message may be viewed as junk e-mail by the system and deleted before it even gets to us.

All queries that are not of a purely administrative nature but are about the content of this module should be directed to us.

3.3 University

Communication with the University

If you need to contact the University about matters not related to the content of this module, please consult the publication *my Studies @ Unisa* that you received with your study material. This booklet contains information on how to contact the University (e.g. to whom you can write for different queries, important telephone and fax numbers, addresses and details of the times certain facilities are open).

Always have your student number at hand when you contact the University.

4 RESOURCES

4.1 Prescribed books

READ THIS ENTIRE SECTION CAREFULLY BEFORE BUYING THE PRESCRIBED BOOK

The prescribed book and material that must be purchased for this module is as follows:

Chemistry: The Central Science with Masteringchemistry, 14th Edition

ISBN: Not yet available – will be posted on myUnisa

Authors: Theodore E. Brown; H. Eugene H LeMay; Bruce E. Bursten; Catherine Murphy; Patrick Woodward

Publisher: Pearson

IMPORTANT!!!: Please ensure that you purchase the book with MasteringChemistry® access, as this is required to complete your assignments. The same edition is also sold without MasteringChemistry®, so please be extra careful that you do not purchase the wrong one.

The UNISA chemistry pack can be purchased at the following bookshops: Van Schaiks, Protea, Juta, Armstrong and on-line at http://www.takealot.com:

http://www.takealot.com/chemistry-13th-edition-the-central-science-with-masteringchemist/PLID32856971

The University does not provide copies of this book. Students are expected to obtain their own copies. As most of the study material for this module is included in this book, it is essential to have access to a copy.

4.2 Recommended books

If you feel that you need an additional textbook to help you understand the work better, a recommended textbook is:

Chemistry & chemical reactivity : John C. Kotz, Paul M. Treichel, John R. Townsend, David A. Treichel., 9th edition, Cengage Learning, ISBN: 9781133949640

Note that the recommended book covers the same concepts and topics as the prescribed book, and is not compulsory. Some students simply prefer a different author's style to the prescribed book, and some topics are explained in a different way which may aid your understanding.

4.3 Electronic reserves (e-reserves)

There are no electronic reserves for this module.

4.4 Library services and resources information

For brief information, go to www.unisa.ac.za/brochures/studies
For detailed information, go to the Unisa website at http://www.unisa.ac.za/ and click on **Library**.
For research support and services of personal librarians, go to
http://www.unisa.ac.za/Default.asp?Cmd=ViewContent&ContentID=7102.

The library has compiled a number of library guides:

- finding recommended reading in the print collection and e-reserves – http://libguides.unisa.ac.za/request/undergrad
- requesting material – http://libguides.unisa.ac.za/request/request
- postgraduate information services – http://libguides.unisa.ac.za/request/postgrad
- finding, obtaining and using library resources and tools to assist in doing research – http://libguides.unisa.ac.za/Research_Skills
- how to contact the library/finding us on social media/frequently asked questions – http://libguides.unisa.ac.za/ask

5 STUDENT SUPPORT SERVICES

For information on the various student support systems and services available at Unisa (e.g. student counselling, tutorial classes, language support), please consult the publication *my Studies @ Unisa,* which you received with your study material.

E-Tutors and SFP tutors

Unisa offers free online tutorials (e-tutoring) to students registered for this module.

Shortly after registration closes, you will be allocated to a group of students and assigned an e-tutor who will be your tutorial facilitator. Thereafter you will receive an sms informing you about your group, the name of your e-tutor and instructions on how to log onto myUnisa in order to receive further information on the e-tutoring process.

The online tutorials are conducted by qualified e-tutors who are appointed by Unisa and their services are offered free of charge. All you need to be able to participate in e-tutoring is a computer with internet connection. If you live close to a Unisa regional Centre or a Telecentre contracted with Unisa, please feel free to visit any of these to access the internet. E-tutoring takes place on myUnisa where you are expected to connect with other students in your allocated group and on the myUnisa discussion forum. It is the role of the e-tutor to guide you through your study material during this interaction process. For you to get the most out of online tutoring, you need to participate in the online discussions that the e-tutor will be facilitating.

myUNISA

You can quickly access resources and information at the University on the internet. The *myUnisa* system is Unisa's online campus that will help you communicate with other students, your lecturers and the administrative departments of the University.

To go to the *myUnisa* website, start at the main Unisa website, http://www.unisa.ac.za and then click on the 'Login to *myUnisa*' link on the right-hand side of the screen. This should take you to the myUnisa website. You can also go there directly by typing in http://my.unisa.ac.za.Please consult the publication *my Studies @ Unisa* which you received with you study material for more information on *myUnisa*.

The module CHE1501 has an active discussion forum on myUNISA. Many resources are made available throughout the year, and these are not necessarily posted to students. We have found that students who use myUNISA regularly for this module perform much better than those who do not.

We recommend that you check in at myUNISA regularly for discussions, announcements and new resources. myUNISA is where the lecturer talks about the material, drop hints about what is and what is not important for exam purposes, set additional tasks to set you thinking more deeply about the material – the sort of thing you would get in class if this was a contact university.

Discussion classes

If discussion classes are arranged for this module, you will receive a separate tutorial letter with the relevant information soon after registration.

6 STUDY PLAN

First semester

Assignment 1 is a multiple choice assignment and is based on study units 1-6.

Assignment 2 is a multiple choice assignment and is based on study units 7-11.

Assignment 3 is an online assignment to be done on MasteringChemistry. It contains four interactive tasks with immediate feedback and hints and is extremely effective in getting students to understand the content of this module. Task 1 is based on study units 1-2. Task 2 is based on study units 3 and 4. Task 3 is based in study units 5, 6, 7 and 8. Task 4 is based on study units 9, 10 and 11. I would recommend doing the MasteringChemistry Tasks simultaneously with assignments 1, 2 and 4, as they cover the same work, but using a different teaching method. Thus, when you are finished assignments 1, 2 and 4, you should be finishing assignment 3 on MasteringChemistry around the same time.

Assignment 4 is a self-assessment assignment which covers the longer type questions and explanation type questions that cannot be easily covered by multiple choice or MasteringChemistry. It does not count towards your semester mark but the questions covered are vital for your exam preparation, as the longer questions in the exam will be similar to the type found in this assignment.

Assignment	Due date	Remarks
1	19 March	**Compulsory!** Must be in by **19 March in order to gain admission to the examination.** This assignment counts 25% of your semester mark; in other words, 7.5% of your final mark.
2	16 April	This assignment is not compulsory for exam admission but contributes 25% of your semester mark; in other words, 7.5% of your final mark.
3	27 April	This assignment is not compulsory for exam admission but contributes **half of your semester mark**, in other words, 15% of your final mark, and it contains interactive tutorial questions, which will be extremely effective in aiding your understanding of the contents of this module.
4	27 April	**Self-Assessment** **Do not submit this assignment!** This assignment is not compulsory and does not count towards your final semester mark. However, it contains extremely important material and questions which are examinable in the final exam.

Second semester

Assignment 1 is a multiple choice assignment and is based on study units 1-6.

Assignment 2 is a multiple choice assignment and is based on study units 7-11.

Assignment 3 is an online assignment to be done on MasteringChemistry. It contains four interactive tasks with immediate feedback and hints and is extremely effective in getting students to understand the content of this module. Task 1 is based on study units 1-2. Task 2 is based on study units 3 and 4. Task 3 is based in study units 5, 6, 7 and 8. Task 4 is based on study units 9, 10 and 11. I would recommend doing the MasteringChemistry Tasks simultaneously with assignments 1, 2 and 4, as they cover the same work, but using a different teaching method. Thus, when you are finished assignments 1, 2 and 4, you should be finishing assignment 3 on MasteringChemistry around the same time.

Assignment 4 is a self-assessment assignment which covers the longer type questions and explanation type questions that cannot be easily covered by multiple choice or MasteringChemistry. It does not count towards your semester mark but the questions covered are vital for your exam preparation, as the longer questions in the exam will be similar to the type found in this assignment.

Assignment	**Due date**	**Remarks**
1	20 August	**Compulsory!** Must be in by **20 August in order to gain admission to the examination.** This assignment counts 25% of your semester mark; in other words, 7.5% of your final mark.
2	17 September	This assignment is not compulsory for exam admission but contributes 25% of your semester mark; in other words, 7.5% of your final mark.
3	01 October	This assignment is not compulsory for exam admission but contributes **half of your semester mark**, in other words, 15% of your final mark, and it contains interactive tutorial questions, which will be extremely effective in aiding your understanding of the contents of this module.
4	01 October	**Self-Assessment** **Do not submit this assignment!** This assignment is not compulsory and does not count towards your final semester mark. However, it contains extremely important material and questions which are examinable in the final exam.

7 PRACTICAL WORK AND WORK-INTEGRATED LEARNING

There are no practicals for this module. The practical component of first-year chemistry is contained in the module CHE1503.

8 ASSESSMENT

8.1 Assessment criteria

This section contains important information regarding the CHE1501 syllabus and examination:

The following tutorial letter details the complete syllabus for CHE1501 and what you need to do in order to ace the examination.

The text book should be your primary study material. The syllabus which must be studied is detailed below. This tutorial letter will guide you as to what depth you must learn the content in the textbook for the examination. I have developed a comprehensive checklist for each study below. If you understand all your assignment questions and answers, and you can say 'yes' to, and answer all the questions in the checklists below (and learn the given equations), and you should be able to get very high marks in the exam.

To prepare for the exam, you should start with the checklists, and then read in the textbook all that is necessary to answer the questions. i.e. to make sure that you understand the concepts. The tasks that were set for you on Mastering Chemistry will test how well you understand these concepts.

The study guide is not the primary source of study material. It was written mainly to simplify topics in the textbooks which students often have trouble understanding. It is therefore not designed to be a repetition of the textbook and does not cover all the material in the course. The textbook and this tutorial letter should be your primary guide to your studies, and the study guide should be considered an additional helpful resource. Topics in the study guide which are not listed in the checklist below will not be directly examined (although it may be necessary to understand these topics in order to answer questions in other study units). **Use this tutorial letter and the checklist below as the definitive guide as to what is or is not examinable.** If you have trouble with the textbook, then consult the relevant section in the study guide.

I did not give out specific page numbers or textbook sections to study because every student's chemistry background may be different, and for a student with little or no knowledge of chemistry, it may be necessary to read a much larger section of the textbook in order to understand a topic than a student with a solid background.

Finally, you should continually keep an eye on myUNISA for further study material, especially closer to exam time, as I may be posting further material, such as a sample examination paper, or a last-minute exam preparation tutorial letter before the exam.

Study Unit 1 – Review of chemical foundations

Equations you should learn:

$\rho = m/V$ $K = °C + 273.15$

Checklist:

Can you distinguish between atoms, elements and molecules? Can you explain what is meant by pure substances, and distinguish between elements, compounds and mixtures?

Do you know the difference between homogeneous and heterogeneous mixtures?

Do you understand the properties of the three different states of matter (gases, liquids and solids)?

Do you know how to use scientific notation and SI units?

Can you calculate the density of a substance?

Can you explain uncertainty in measurement in terms of accuracy and precision and explain how significant figures are used to report this uncertainty in calculations?

Do you know understand what is meant by the terms atomic number, mass number, isotope, element and ion?

Can you write nuclide symbols for ions, and determine how many protons, neutrons and electrons are in any given element, isotope or ion?

Do you understand the concept of average atomic mass and can you calculate average atomic masses and relative abundance of isotopes?

Can you name and write formulas for simple molecular and ionic compounds?

Study Unit 2 – Quantum mechanics and periodicity

Equations you should learn:

None

Checklist:

Can you draw the orbital diagram of any given atom and determine the number of paired and unpaired electrons from the diagram?

Can you write electron configurations for atoms or ions?

Can you determine whether an atom or ion is diamagnetic or paramagnetic?

Do you understand the term ‘isoelectronic’?

Can you classify elements as metals, non-metals or metalloids based on their position on the periodic table, and explain what is meant by each of these classifications?

Can you predict trends in atomic radii, electronegativity, ionization energy and electron affinity?

Can you distinguish between orbits and orbitals?

Can you name the classes and characteristics of groups on the periodic table (ie. alkali metals, halogens etc.)?

Can you draw and identify the characteristic shapes for s and p orbitals?

Can you define the quantum numbers and relate them to the position of an electron?

Can you determine if a given set of quantum numbers is valid or not?

Do you know what is meant by valence and core electrons?

Do you know the relationship of valence electrons to the position of the elements in the periodic table?

Do you understand what is meant by effective nuclear charge?

Study Unit 3 – Chemical bonding and bonding theories

Equations you should learn:

None

Checklist:

Do you know the difference between ionic, polar-covalent, non-polar covalent, coordination (or dative covalent) bonds and hydrogen bonds? Can you predict when each type will occur in bonding and identify these bond types in any given molecule?

Do you understand valence electrons and the octet rule and can you determine how many valence electrons there are in any given molecule?

Can you explain what is meant by electronegativity?

Can you draw the Lewis structure of a given molecule?

Can you determine the formal charge of an atom?

Do you know the basic molecular shapes? Can you use VSEPR theory to predict the molecular geometry of a molecule?

Can you explain what is meant by bond polarity and dipole moment and identify these in a given molecule?

Do you understand the properties of polar and non-polar solvents and the concept of 'like dissolves like.'

Can you predict the products in simple ionic/covalent reactions and write balanced equations for these reactions?

Do you understand what is meant by hybrid orbitals, and can you predict the hybridization of the orbitals in a given molecule?

Study unit 4 – Types of Chemical Reactions

Equations you should learn:

None

Checklist:

Can you describe the common characteristics of chemical reactions such as combination, combustion, decomposition, displacement, precipitation, neutralization, acid-base and redox reactions? Given a reaction, can you determine the type?

Do you know the rules for determining oxidation numbers, and can you apply them to determine the oxidation number of every atom in an ion or molecule?

Do you understand what is meant by oxidation and reduction?

Can you identify the oxidizing agent and reducing reagent in a redox reaction?

Can you predict the products of oxidation?

Can you balance redox reactions in acidic and basic mediums?

Can you explain what is meant by an endothermic and an exothermic reaction?

Do you know and understand the solubility guidelines for ionic compounds?

Study Unit 5 – Stoichiometry

Equations you should learn:

$$\%\ \text{mass} = \frac{(\text{number of atoms of that element}) \times (\text{atomic weight})}{(\text{formula weight of compound})} \times 100\% \qquad \text{Percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$

$n = m/M$

Checklist:

Can you balance a reaction?

Can you calculate the mass percentage of an element in a compound?

Can you interconvert grams, moles and number of molecules using molar masses and Avogadro's number?

Do you understand empirical and molecular formulae?

Can you calculate the empirical and molecular formula of a compound from percentage composition and molecular mass?

Can you determine the limiting reagent of a reaction?

Can you calculate the amount of reactants or products in a reaction?

Do you know the difference between theoretical yield and actual yield, and can you calculate the percentage yield of a reaction?

Study Unit 6 – Solutions and expressions of concentrations

Equations you should learn:

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{Liters of solution}} \qquad \text{Molality} = \frac{\text{moles of solute}}{\text{kilograms of solvent}} \qquad X\text{component} = \frac{n_{component}}{n_{total}}$$

$n = m/M$ $C_1V_1 = C_2V_2$

Checklist:

Can you define, calculate and express concentrations in terms of molarity, molality, mole fraction, percentage composition, ppm and ppb and interconvert between them? Do you know when it is appropriate to use each term?

Do you understand the difference between molarity and normality?

Do you understand how to carry out a dilution to achieve a desired solution concentration?

Study Unit 7 – Introductory kinetics Rates

Equations you should learn:

Rate = $-\Delta[A]/\Delta t$ $\quad k = Ae^{-Ea/RT}$ $\quad \ln k = -\frac{E_a}{RT} + \ln A$ $\quad K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$

Checklist:

Do you know which factors affect the rate and the rate constant in chemical reactions?

Can you determine the rate of a chemical reaction given times and concentrations?

Can you interpret the rate law and predict changes to the rate if the concentration of the reagents or other factors are changed?

Do you understand 'orders' of reactions?

Can you explain the action of a catalyst and how it affects the rate? Does the concentration of a catalyst affect the rate?

Can you explain the difference between a heterogeneous and a homogeneous catalyst?

Can you describe the action of an enzyme and how it speeds up a biological reaction?

How does temperature affect the rate of a reaction? Is it different for an endothermic or exothermic reaction?

Do you know and understand the Arrhenius equation? Can you determine the activation energy of a reaction graphically?

Do you understand why rusting occurs and why salt and acid solutions increase the rate of rusting?

Study Unit 8 – Chemical equilibrium

Equations you should learn:

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Checklist:

Do you understand what is meant by chemical equilibrium and how it relates to reaction rates? Can you derive the equilibrium constant expression from the reaction rates?

Can you write the equilibrium constant expression for any reaction?

Do you understand the significance of the value of the equilibrium constant and how it relates to the amounts of reactants and products in the equilibrium mixture?

Can you write the equilibrium constant expression for a heterogeneous equilibrium?

Can you calculate K_c from concentration measurements?

Do you understand how changing the concentrations, volume, pressure or temperature of a system at equilibrium affects the equilibrium position? (Le Chatelier's Principle)

Study unit 9 – Acid-bases equilibria

Equations you should learn:

$pH = -\log[H^+]$ $pOH = -\log[OH^-]$ $K_w = [H^+][OH^-] = 1.0 \times 10^{-14}$ $K_a = \frac{[H^+][A^-]}{[HA]}$

$K_w = K_a \times K_b$ $pK_a + pK_b = 14$ $\%\ \text{Ionization} = \frac{[H^+]_{equilibrium}}{[HA]_{initial}} \times 100\%$

Checklist:

Can you define and identify Arrhenius, Brønsted-Lowry and Lewis acids and bases and identify conjugate acid-base pairs?

Do you understand the autoionization of water and how $[H_3O^+]$ and $[OH^-]$ are related?

Dou you understand the relationships between $[H^+]$, $[OH^-]$, pH and pOH? If you are given any one of $[H^+]$, $[OH^-]$, pH and pOH, can you calculate the other three?

Do you understand the strengths of acids and bases and their conjugates, and are you able to predict how these will react?

Can you calculate the pH or pOH of a strong acid or base given its concentration?

Can you calculate the percentage ionization of a weak acid or base?

Do you understand the relationship between K_a, K_b and K_w?

Do you understand what a titration and an endpoint mean?

Can you write solubility equilibria equations and calculate the solubility of partially soluble substances?

Can you determine the pH of a weak acid or base using ICE tables?

Can you explain how acid rain is formed, including the relevant chemical equations?

Study Unit 10 – Thermochemistry

Equations you should memorize:

$\Delta H = H_{products} - H_{reactants}$ $q = c \times m \times \Delta T$

Exam Checklist:

Do you understand the concept of enthalpy?

What information is contained in a thermochemical equation?

Do you understand fully the guidelines for using thermochemical equations? Can you apply this reasoning to calculations?

Can you calculate the heat transferred in a process, given temperature measurements and heat capacities?

Do you know the difference between 'heat capacity,' 'molar heat capacity' and 'specific heat capacity' and the units for each?

Do you understand 'exothermic' and 'endothermic' reactions? Would you consider the melting of ice to be exothermic of endothermic? What is the sign of ΔH?

Study Unit 11 – Gases

Equations you should learn:

$PV = nRT$ $\quad V \alpha (1/P)$ $\quad V \alpha T$ $\quad V \alpha N$

$\rho=(PM)/(RT)$ $\quad P_x = X_x(P_{Total})$ $\quad P_{Total} = P_1 + P_2 + \ldots$

Checklist:

Do you know the conditions corresponding to STP?

Can you derive relations between sets of initial and final conditions from the ideal gas law?

Can you convert between atm, Torr, kPa and bar; L, mL and dm^3; and °C and K

Can you calculate P, V, n or T using the ideal gas equation? Do you know which units to use in PV=nRT calculations?

Do you know which value of R to use?

Can you calculate the partial pressure of a gas, or the total pressure if you are given the partial pressures?

Do you understand how Partial pressures, Daltons's law and mole fraction are related?

Can you calculate the density or molar mass of a gas?

Do you know what is meant by ideal behaviour? Do you know the difference between ideal and real gases and under which conditions a gas will imitate ideal behaviour?

COMPLETE SYLLABUS

Study unit 1: Review of chemical foundations

1.1 Introduction to chemistry
1.2 Classification and properties of matter
1.3 Significant figures and dimensional analysis
1.4 Atomic theory and atomic structure
1.5 Atomic mass
1.6 Introduction to the periodic table
1.7 Chemical compounds: formulae and nomenclature

Study unit 2: Quantum mechanics and periodicity

2.1 A brief introduction to quantum chemistry
2.2 Quantum numbers and atomic orbitals
2.3 Atomic properties and periodic trends
2.4 Electron configuration
2.5 Ions
2.6 Nobel gas core notation
2.7 Subshell energies in a multi-electron atom
2.8 Effective nuclear charge

Study unit 3: Chemical bonding and bonding theories

3.1 Introduction
3.2 Types of bonds
3.3 Bond formation or breakage in chemical reactions
3.4 Bond polarity and the dipole moment
3.5 Lewis dot notation of atoms
3.6 Lewis structures of molecules and ions
3.7 Formal charges
3.8 The Octet rule and exceptions to the Octet rule
3.9 Valence-shell electron-pair repulsion (VSEPR) theory
3.10 Resonance structures and delocalisation of electrons and pi bonds

Study unit 4: Types of chemical reactions

4.1 Introduction
4.2 Balancing chemical equations
4.3 Synthesis (combination)
4.4 Decomposition
4.5 Combustion
4.6 Displacement: single and double
4.7 Precipitation and solubility
4.8 Acid-base neutralisation
4.9 Redox reactions and oxidation numbers

Study unit 5: Stoichiometry

5.1 Introduction
5.2 Chemical equations and stoichiometry
5.3 Percentage composition of an element in a compound
5.4 The mole concept and Avogadro's number
5.5 The empirical and molecular formulae of compounds
5.6 Limiting reagents and percentage yield

Study unit 6: Solutions and expression of concentrations

6.1 Introduction
6.2 Mass percentage
6.3 Ppm & ppb
6.4 Mole fraction
6.5 Molarity
6.6 Molality
6.7 Normality
6.8 Dilution

Study unit 7: Introductory kinetics

7.1 Introduction
7.2 Collisions
7.3 Factors that affect reaction rates
7.4 Reaction rates
7.5 Rate laws and the rate constant
7.6 Activation energy

Study unit 8: Chemical equilibrium

8.1 Introduction
8.2 The concept of chemical equilibrium
8.3 The equilibrium constant
8.4 Interpreting equilibrium constants
8.5 Heterogeneous equilibria (Kc)
8.6 Le Châtelier's principle

Study unit 9: Acid-base equilibria

9.1 Introduction
9.2 The proton, the hydronium ion and Kw
9.3 Acid-base theories
9.4 The auto-ionisation of water
9.5 The pH scale
9.6 Strong acids and bases
9.7 Weak acids
9.8 Weak bases
9.9 Relationship between Ka and Kb
9.10 Application of acid-base media in balancing redox reactions
9.11 Acid rain
9.12 Heterogeneous equilibrium: solubility products and Ksp

Study unit 10: Introductory thermochemistry

10.1 Introduction
10.2 Endothermic and exothermic processes
10.3 Enthalpy
10.4 Heat capacity and calorimetry

Study unit 11: Gases

11.1 Introduction
11.2 Fundamental properties of gases
11.3 The gas laws
11.4 The ideal-gas equation
11.5 Gas densities and molar mass
11.6 Gas mixtures and partial pressures

8.2 Assessment plan

Criteria for Marking of Multiple Choice Assignments

Each multiple choice assignment has 50 questions. You will be given 1 mark for each correct answer. If you leave a question blank, you will be awarded 0 marks for that question. The assignment is marked negatively, so if you guess and submit incorrect answers, 1 mark will be subtracted for every four wrong answers.

Criteria for Marking of Online Assignments

Assignment 3 will be made up of 4 online tasks (to be done on MasteringChemistry®) which you may complete in your own time, provided that you have completed all four tasks by the due date. The mark for assignment 3 will be determined by the marks that you obtained in the online tasks. The contribution of each task may be weighted, and details will be posted on myUnisa.

Commentaries and feedback on assignments

You will receive the correct answers automatically for multiple-choice questions. Commentaries on compulsory assignments may be sent to all students registered for this module in a follow-up tutorial letter. The tutorial letter number will be 201, 202, etc. We strongly suggest that you scan myUnisa weekly for new tutorial letters.

As soon as you have received the commentaries, please check your answers. The assignments and the commentaries on these assignments constitute an important part of your learning and should help you to be better prepared for the examination.

Semester mark

Assignment 1 and assignment 2 each make up 25% of your final semester mark. Assignment 3 contributes 50% to your semester mark. This semester mark will count for 30 % of the final mark for the examination.

Your exam mark counts 70 % of your final mark.

For example, if you submit assignment 1 and get a mark of 70 %, assignment 2 for which you get 54 %, and assignment 3 for which you get 80%, you will have earned a semester mark of 71 %, calculated as follows:

70 % × 0.25 = 17.5 %
54 % × 0.25 = 13.5 %
80 % × 0.50 = 40.0 %
Total: 71 %

Then let's assume that you write the examination and get 50 %.

Your final mark is calculated as follows

Semester mark: 71 × 30 % = 21 %
Exam mark: 50 × 70 % = 35 %
Final mark: 21 % + 35 % = 56 %

8.3 Assignment numbers

8.3.1 General assignment numbers

There are four assignments for each semester of Module CHE1501.

8.3.2 Unique assignment numbers

In addition to the general assignment number (eg. Assignment 1), assignments each have a unique assignment number which must be entered on your MCQ (multiple choice questions) answer sheet or on your assignment cover. Make sure that you use the correct unique number.

8.4 Assignment due dates

FIRST SEMESTER		SECOND SEMESTER	
Assignment	**Due date**	**Assignment**	**Due date**
1	19 March	**1**	20 August
2	16 April	**2**	17 September
3	27 April	**3**	01 October
4	27 April	**4**	01 October

IMPORTANT: Semester 1 and Semester 2 have different assignment questions. Please make sure that you do the assignments for the correct semester.

The closing dates for assignments 1, 2 and 3 are fixed - no extensions can be granted since these assignments carry a year mark, and the solutions to the assignments are posted immediately after the closing dates. Assignments reaching us after the closing dates will be awarded 0% which will seriously affect your year-mark.

8.5 Submission of assignments

Students may submit written assignments and assignments completed on mark-reading sheets either by post or electronically on *myUnisa*. Assignments may **not** be submitted by fax or e-mail.

Posted assignments should be addressed to:

The Registrar
PO Box 392
UNISA
0003

For detailed information and requirements as far as assignments are concerned, see the brochure *my Studies @ Unisa* that you received with your study material.

To submit an assignment **via *myUnisa*:**

- Go to *myUnisa*.Log in with your student number and password.
- Select the module.
- Click on assignments in the menu on the left-hand side of the screen.
- Click on the assignment number you wish to submit.
- Follow the instructions.

Should you encounter any problems in submitting an assignment on myUnisa, you may phone the following number: (012) 429-3689 or contact the help line at: myUnisaHelp@unisa.ac.za

Assignments 1 and 2 are multiple choice assignments and should be submitted on myUnisa.

Assignment 3 should be done on MasteringChemistry. Shortly after the due date, the marks will be automatically transferred to the myUnisa system. **Please do not submit anything for assignment 3 on myUnisa as this will confuse the system and you may end up with your assignment getting cancelled and receiving a mark of 0%.** Your marks on MasteringChemistry are automatically stored after you save your work. There is no need to submit the assignment after you have completed it.

Assignment 4 is a self-assessment assignment and should not be submitted on myUnisa.

8.6 The assignments

SEMESTER 1

NB: PLEASE MAKE SURE YOU HAVE READ THE STUDY PLAN ON PAGE 8 OF THIS TUTORIAL LETTER BEFORE CONTINUING

Due dates: Assignment 1: 19 March

Assignment 2: 16 April

Assignment 3: 27 April

Assignment 4: 27 April

- Assignment 1 is a multiple choice assignment that consists of 50 questions, and must be completed by the due date in order to gain admission to the exam.
- Assignment 2 is multiple choice assignment that consists of 50 questions, and must be completed by the due date in order to contribute to your semester mark
- Assignment 3 is an online assessment comprised of 4 tasks to be completed on MasteringChemistry®. Details of this assignment can be found on myUnisa. Assignment 3 requires the use of a computer and internet access.
- Assignment 4 is a self-assessment assignment. It must not be submitted. This assignment is not compulsory and does not count towards your final semester mark. However, it contains extremely important material and questions which are examinable in the final exam.

Assignments 1 and 2 have **unique assignment numbers** which must be written on your assignment cover or entered on myUnisa when submitting the assignments. These are tabulated below:

UNIQUE NUMBERS	
Assignment 1	**667821**
Assignment 2	**761916**

ASSIGNMENT 1

Due date: **19 March**

Unique Assignment Number: **667821**

This assignment must be completed on a mark-reading sheet or electronically on myUnisa.

Assignment 1 is based on Study Units 1-6 of the syllabus.

(1) Copper sulphate can be broken down into simpler substances by chemical means. It is therefore

[1] a mixture
[2] an element
[3] an atom
[4] a compound
[5] an electron

(2) Which of the following is a homogeneous mixture?

[1] soil
[2] cake flour mixed with baking powder
[3] air
[4] pizza
[5] none of the above

(3) The mass of a metal cylinder was determined on an analytical balance to be 50.208 g. The volume of a cylinder is measured and determined to be 5.6 mL. What is the density of a cylinder, expressed to the proper number of significant figures?

[1] 0.11 g/mL
[2] 0.11153 g/mL
[3] 8.9657 g/mL
[4] 9.0 g/mL
[5] None of the above

(4) Consider the species ^{72}Zn, ^{75}As and ^{74}Ge. These species have:

[1] the same number of electrons.
[2] the same number of protons.
[3] the same number of neutrons.
[4] the same number of protons and neutrons.
[5] the same mass number.

(5) Which one of the following pairs are isotopes?

[1] O_2 and O_3

[2] $^{35}_{17}Cl$ and $^{37}_{17}Cl$

[3] I_2 (g) and I_2 (s)

[4] Mg^{2+} and Ne

[5] F^+ and F^-

(6) Suppose there is an element consisting of only three naturally occurring isotopes:

	% Abundance	Mass (amu)
1.	35.39	150.9377
2.	35.25	151.9791
3.	29.36	156.9332

What is the atomic mass of the element?

[1] 151.5 amu
[2] 153.1 amu
[3] 153.34 amu
[4] 153.9 amu
[5] 154.5 amu

(7) A bottle containing a greenish substance was labelled ferric chlorate. The material in this bottle is made up of

[1] Fe^{2+} and ClO_3^{2-} ions
[2] Fe^{3+} and ClO_2^- ions
[3] Fe^{3+} and ClO_3^- ions
[4] Fe^{2+} and ClO_4^- ions
[5] F^+ and ClO_2^- ions

(8) Which of the following orbital diagrams is impossible according to the Pauli Exclusion Principle?

	1s	2s	2p		
[1]	↑↓	↑	__	__	__
[2]	↑↓	↑↓	↑↓	↑↑	↓↓
[3]	↑↓	↑↓	__	__	__
[4]	↑↓	↑↓	↑	↑	↑
[5]	↑↓	↑↓	↑↓	↓	↓

(9) Which of the following orbital diagrams represents a paramagnetic atom?

	1s	2s	2p		
[1]	↑↓	↑↓	↑↓	↑	↑
[2]	↑↓	↑↓	↑	↑	↑
[3]	↑↓	↑↓	↑↓	↑↓	↑

[4] All of the above
[5] None of the above

(10) Which of the following ions are isoelectronic?

[1] Ca^{+} and S^{-}
[2] Ca^{+} and Ca^{2+}
[3] Ca^{2+} and Mg^{2+}
[4] Ca^{2+} and S^{2-}
[5] Ca^{2+} and P^{2-}

(11) When combining with nonmetallic atoms, metallic atoms generally will

[1] lose electrons and form positive ions
[2] lose electrons and form negative ions
[3] gain electrons and form positive ions
[4] gain electrons and form negative ions
[5] rust

(12) All of the following properties of the alkaline earth metals increase going down the group **except**

[1] atomic radius
[2] atomic volume
[3] ionic radius
[4] atomic mass
[5] first ionization energy

(13) All of the following statements about different elements are true **except**

[1] Gallium is a transition element.
[2] Potassium is an alkali metal.
[3] Magnesium is an alkaline-earth metal.
[4] Iodine is a halogen.
[5] Xenon is a noble gas.

(14) Which atomic orbital is spherical in shape?

[1] 3s
[2] 2p
[3] 4d
[4] 4f
[5] All of the above.

(15) Which statement about the four quantum numbers which describe electrons in atoms is **incorrect**?

[1] n = principal quantum number, n = 1, 2, 3, ...
[2] l = azimuthal quantum number, l = 1, 2, 3, ... , (n+1)
[3] m_l = magnetic quantum number, m_l = (-l), ... , 0, ... , (+l)
[4] m_s = spin quantum number, m_s = +½ or -½
[5] The magnetic quantum number is related to the orientation of atomic orbitals in space.

(16) Which of the following sets of quantum numbers is not allowed?

[1] n = 1, l = 0, m_l = 0, m_s = + ½
[2] n = 4, l = 0, m_l = 0, m_s = + ½
[3] n = 2, l = 0, m_l = 0, m_s = + ½
[4] n = 2, l = 1, m_l = 1, m_s = - ½
[5] n = 3, l = 3, m_l = -3, m_s = - ½

(17) The outer electronic configuration ns^2np^3 corresponds to which one of the following elements in its ground state?

[1] S
[2] Ca
[3] Cr
[4] Br
[5] As

(18) Which of the following is the best definition of a covalent bond?

[1] electrons simultaneously attracted by more than one nucleus
[2] the overlapping of two electron-filled orbitals having different energies
[3] the overlapping of unoccupied orbitals of two or more atoms
[4] a positive ion attracting negative ions
[5] an interaction between outer electrons

(19) The bonding in HCl is best characterized as:

[1] nonpolar covalent
[2] coordinate covalent
[3] ionic
[4] polar covalent
[5] electrostatic

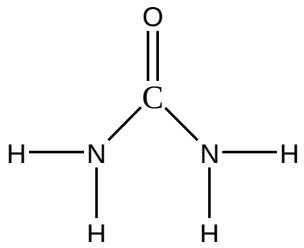
(20) An example of a compound that contains an atom with an expanded octet of electrons is

[1] KBF_4
[2] NH_4Br
[3] SeF_4
[4] $NaIO_4$
[5] BF_3

(21) How many valence electrons are in sulphuric acid?

[1] 12
[2] 20
[3] 24
[4] 28
[5] 32

(22) The following Lewis structure of urea is incomplete because it does not show the lone pairs:



Draw the lone pairs on the diagram. How many lone pairs of electrons should there be in the Lewis structure?

[1] 2
[2] 3
[3] 4
[4] 5
[5] 8

(23) How many lone pairs of electrons are there in the Lewis structure of XeF_4

[1] 2
[2] 4
[3] 6
[4] 12
[5] 14

(24) Draw the Lewis structure of SO_3. The formal charge of the O atoms is

[1] +2
[2] +1
[3] 0
[4] -1
[5] -2

(25) In the AB_4 molecule there are 2 lone pairs of electrons on the A atom. What is the shape of the molecule?

[1] tetrahedral
[2] trigonal pyramidal
[3] bent
[4] square planar
[5] linear

(26) Find a pair that are isoelectronic with one another and hence have the same geometry:

[1] carbonate and phosphate ions
[2] sulphite and chlorate ions
[3] sulphate and sulphite ions
[4] nitrate and chlorate ions
[5] carbonate and chlorate ions

(27) Which of the following has a dipole moment?

[1] IF_5
[2] XeF_4
[3] SF_6
[4] PCl_5
[5] CH_4

(28) From your knowledge of solubility guidelines, state which of the following compounds will precipitate in water?

[1] Cobalt (II) hydroxide.
[2] Barium nitrate.
[3] Ammonium phosphate.
[4] Sodium Chloride.
[5] None of the above.

(29) What is the net ionic equation for the acid-base reaction that occurs when acetic acid and potassium hydroxide solutions are mixed?

[1] $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
[2] $H^+(aq) + KOH(s) \rightarrow K^+(aq) + H_2O(l)$
[3] $CH_3COOH(aq) + KOH(s) \rightarrow KCH_3COO(aq) + H_2O(l)$
[4] $CH_3COO^-(aq) + H^+(aq) + K^+(aq) + OH^-(aq) \rightarrow K^+(aq) + CH_3COO^-(aq) + H_2O(l)$
[5] $CH_3COOH(aq) + OH^-(aq) \rightarrow CH_3COO^-(aq) + H_2O(l)$

(30) Which of the following species would **not** function as an oxidizing agent?

[1] MnO_4^-
[2] Mn^{2+}
[3] H^+
[4] S
[5] Br^-

(31) What type of reagent is required to convert SO_2 to S?

[1] acid
[2] base
[3] reducing agent
[4] oxidizing agent
[5] precipitating agent

(32) Which of the following reactions involves neither oxidation nor reduction?

[1] $2H_2O_2 \rightarrow 2H_2O$
[2] $2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$
[3] $NH_3 + HCl \rightarrow NH_4Cl$
[4] $NH_4NO_3 \rightarrow N_2O + 2H_2O$
[5] All of the above reactions involve both oxidation and reduction.

(33) The oxidation number of the manganese atom in $(NH_4)_2MnO_4$ is

[1] +1
[2] +2
[3] +4
[4] +6
[5] +7

(34) Melting of an ice cube is an example of

[1] an exothermic reaction
[2] an endothermic reaction
[3] a chemical change
[4] a redox reaction
[5] none of the above

(35) How many moles of hydrogen atoms does one mole of $(NH_4)_2SO_4$ contain?

[1] 1
[2] 2
[3] 4
[4] 8
[5] 15

(36) How many moles of NH_3 are present in 100 g of NH_3?

[1] 0.170 mol
[2] 5.87 mol
[3] 17.0 mol
[4] 100 mol
[5] 1703 mol

(37) What is the mass percentage of hydrogen in methane?

[1] 0.062 %
[2] 0.251 %
[3] 6.28 %
[4] 12.6 %
[5] 25.1 %

(38) What is the empirical formula of a compound whose molecular formula is P_4O_{10}?

[1] PO
[2] PO_2
[3] P_2O_5
[4] P_4O_{10}
[5] P_8O_{20}

(39) What is the empirical formula for a compound which contains 0.0130 mol C, 0.390 mol H and 0.065 mol O?

[1] CHO
[2] CH_5O_2
[3] $CH_{30}O_5$
[4] $CH_{39}O_6$
[5] $C_2H_{60}O_{10}$

(40) What is the empirical formula for a compound that contains 17.34 % hydrogen and 82.66 % carbon by mass?

[1] CH
[2] CH_2
[3] CH_3
[4] C_2H_5
[5] C_5H

Consider the following balanced reaction:

$$2Mg + O_2 \rightarrow 2MgO$$

2 moles of Mg and 5 moles of O_2 are allowed to react according to the above reaction. Answer questions 41-44 below for this reaction:

(41) Which reagent is the limiting reagent?

[1] Mg
[2] O_2
[3] MgO
[4] There is no limiting reagent
[5] Both Mg and O_2 are limiting reagents

(42) What is the maximum number of moles of MgO that can be formed?

[1] 1 mol
[2] 2 mol
[3] 5 mol
[4] 40.3 mol
[5] 80.6 mol

(43) How many moles of the excess reagent remain unreacted?

[1] 1 mol
[2] 2 mol
[3] 4 mol
[4] 5 mol
[5] No excess reagent remains unreacted

(44) If the actual mass of MgO produced was 0.5 mol, what is the percentage yield of MgO?

[1] 0.62%
[2] 1.2%
[3] 10%
[4] 25%
[5] 50%

(45) The value of a solution concentration unit that may change with temperature is

[1] molarity.
[2] mole fraction.
[3] molality.
[4] mole percentage.
[5] weight percentage.

A solution is prepared by mixing 25 mL (0.22 mol, 16 g) of pentane (the solute) with 45 mL (0.34 mol, 30 g) of hexane (the solvent). Assuming that the volumes add on mixing, answer questions 46-48 below.

(46) What is the molality of the pentane?

[1] 3.1 mol/kg
[2] 4.8 mol/kg
[3] 7.3 mol/kg
[4] 3.1 mol/L
[5] 7.3 mol/L

(47) What is the molarity of the pentane?

[1] 3.1 mol/kg
[2] 7.3 mol/kg
[3] 3.1 mol/L
[4] 7.3 mol/L
[5] 45.8 mol/L

(48) What is the mole fraction of the pentane?

[1] 0.35
[2] 0.39
[3] 0.64
[4] 39%
[5] 64 %

(49) If I prepare a solution by adding 25 mL of 2.0 M NaOH into a 500 mL volumetric flask, and filling the flask to the mark with water, what will the final concentration of the solution be?

[1] 0.05 M
[2] 0.1 M
[3] 0.5 M
[4] 2.0 M
[5] 40.0 M

(50) 25.00 cm^3 of a 0.7892 $mol.dm^{-3}$ solution of potassium hydroxide is transferred to an empty 350.00 cm^3 volumetric flask. This flask is made up to the mark with distilled water and then shaken well. The concentration of the potassium hydroxide in this second flask is:

[1] 0.01109 $mol.dm^{-3}$
[2] 0.05637 $mol.dm^{-3}$
[3] 0.7892 $mol.dm^{-3}$
[4] 17.74 $mol.dm^{-3}$
[5] None of the above.

ASSIGNMENT 2

Due date: **16 April**

Unique Assignment Number: **761916**

This assignment must be completed on a mark-reading sheet or electronically on myUnisa.

Assignment 1 is based on Study Units 7-11 of the syllabus.

(1) Which of the following statements is false?

[1] A collision between two molecules means a reaction will always occur.
[2] For a reaction to occur, the orientation of the molecules must be right.
[3] If two molecules collide with not enough energy, no reaction will occur.
[4] The reaction rate depends on the frequency of collisions between molecules.
[5] None of the above.

(2) When a catalyst is added to a system at equilibrium, a decrease occurs in the:

[1] activation energy
[2] heat of reaction
[3] potential energy of the reactants
[4] potential energy of the products
[5] All of the above

The experimental rate law for the reaction $2A + B \rightarrow 3C + D$ is: Rate = $k[A][B]^3$
Answer questions 3-4 that follow:

(3) What is the overall reaction of this reaction?

[1] 0
[2] 1
[3] 2
[4] 3
[5] 4

(4) If the concentration of B is doubled, what happens to the reaction rate?

[1] The reaction rate remains the same.
[2] The reaction rate is doubled.
[3] The reaction rate is tripled.
[4] The reaction rate will increase by 8 times.
[5] The reaction rate will decrease.

(5) For the reaction: O_2 (g) + 2NO (g) ⇆ $2NO_2$ (g), the observed rate law is: Rate = $k[O_2][NO]^2$ What are the units of k for this reaction, assuming time in seconds and concentration in mol/L?

[1] s
[2] $L.(mol.s)^{-1}$
[3] $L^2.(mol^2.s)^{-1}$
[4] mol/L
[5] None of the above

(6) Which of the following statements is false?

[1] Increased temperature will increase the rate of an endothermic reaction, but decrease the rate of an exothermic reaction.
[2] Enzymes are catalysts in many biochemical reactions.
[3] The rate of a reaction will decrease as the reactants are used up.
[4] A solid which is ground into a fine powder will react faster with a liquid than one large chunk of the solid.
[5] None of the above.

(7) Which is a property of a reaction that has reached equilibrium?

[1] The amount of products is greater than the amount of reactants.
[2] The amount of products is equal to the amount of reactants.
[3] The rate of the forward reaction is greater than the rate of the reverse reaction.
[4] The rate of the forward reaction is equal to the rate of the reverse reaction.
[5] None of the above.

(8) Consider the reaction:

$$3NO_{(g)} \leftrightarrows N_2O_{(g)} + NO_{2\,(g)}$$

What is the expression for K_c for this reaction?

[1] $K_c = \frac{[N_2O][NO_2]}{[NO]^3}$

[2] $K_c = \frac{[N_2O][NO_2]}{[NO]}$

[3] $K_c = \frac{[N_2O][NO_2]}{3[NO]}$

[4] $K_c = [N_2O][NO_2]$

[5] None of the above.

(9) Consider the reaction:

$$HF_{(aq)} \leftrightarrows H^+_{(aq)} + F^-_{(aq)}$$

If the value of the equilibrium constant is very large, which species will predominate at equilibrium?

[1] HF
[2] H^+
[3] F^-
[4] Both H^+ and F^-
[5] All species will have the same concentration.

(10) Consider the reaction:

$$Ni(CO)_{4\,(g)} \leftrightarrows Ni_{(s)} + 4CO_{(g)}$$

What is the expression for K_c for this reaction?

[1] $K_c = \frac{[Ni][CO]^4}{[Ni(CO)_4]}$

[2] $K_c = \frac{[Ni][CO]}{[Ni(CO)_4]}$

[3] $K_c = \frac{[CO]^4}{[Ni(CO)_4]}$

[4] $K_c = [Ni][CO]^4$

[5] None of the above.

(11) Which of the following will <u>not</u> affect the position of a chemical equilibrium?

[1] Changing the temperature
[2] Adding a catalyst
[3] Changing the volume
[4] Changing the concentration of the products
[5] Changing in pressure

Consider the following exothermic reaction:

$$2HI_{(g)} \leftrightarrows H_{2\,(g)} + I_{2\,(g)}$$

For this reaction, answer questions 12-16 below.

(12) What will happen to the reaction mixture at equilibrium if some $H_{2\,(g)}$ is removed?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(13) What will happen to the reaction mixture at equilibrium if the temperature is increased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(14) What will happen to the reaction mixture at equilibrium if an inert gas is added?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(15) What will happen to the reaction mixture at equilibrium if the volume of the container is increased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(16) What will happen to the reaction mixture at equilibrium if the pressure is increased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(17) Which substance can be classified as an Arrhenius acid?

[1] HCl
[2] NaCl
[3] LiOH
[4] KOH
[5] Mg^{2+}

(18) Which of the following is a conjugate acid-base pair?

[1] F^- and NaF
[2] CH_3COOH and CH_3COO^-
[3] NH_3 and NO_3^-
[4] Cl_2 and Cl^-
[5] HCl and $HClO_4$

(19) Which of the following will give an acidic mixture?

[1] Mixing equal volumes of 1.0 M HCl and 1.0 M NaOH
[2] Mixing equal volumes of 1.0 M H_2SO_4 and 1.0 M NaOH
[3] Mixing equal volumes of 1.0 M NH_3 and water
[4] Mixing 1.0 L of 1.0 M HCl with 2.0 L of 1.0 M NaOH
[5] Mixing 1.0 L of 1.0 M H_2SO_4 with 2.0 L of 1.0 M NaOH

(20) Which of the following is the strongest base?

[1] Cl^-
[2] SO_4^{2-}
[3] F^-
[4] NH_3
[5] PO_4^{3-}

(21) Which of the following is a salt?

[1] KOH
[2] KCl
[3] CH_3OH
[4] CH_3COOH
[5] HF

(22) As the hydrogen ion concentration of an aqueous solution increases, what will happen to the hydroxide ion concentration?

[1] It will decrease.
[2] It will increase.
[3] It will remain the same.
[4] It will shift towards 1×10^{-14} M.
[5] None of the above.

A solution has a pOH of 9.36. For this solution, answer questions 23-26 below.

(23) What is the pH of the solution?

[1] -2.36
[2] -0.97
[3] 4.37×10^{-10}
[4] 2.36
[5] 4.64

(24) What is the $[H^+]$ of the solution?

[1] -0.67 M
[2] 4.37×10^{-10} M
[3] 2.29×10^{-5} M
[4] 4.37×10^{-4} M
[5] 0.67 M

(25) What is the $[OH^-]$ of the solution?

[1] -0.67 M
[2] 4.37×10^{-10} M
[3] 2.29×10^{-5} M
[4] 4.37×10^{-4} M
[5] 0.67 M

(26) Which of the following is true for this solution?

[1] The solution is acidic.
[2] The solution is basic.
[3] The solution is neutral.
[4] $[OH^-] > [H^+]$.
[5] Both 2 and 4.

(27) What is the pH of a 0.25 M HCl solution?

[1] -1.30
[2] -0.60
[3] 0.60
[4] 1.30
[5] 7.00

(28) What is the pH of a 0.50 mol/L NaOH solution?

[1] -0.30
[2] 0.30
[3] 0.32
[4] 3.16
[5] 13.7

(29) What is the concentration of an aqueous solution of NaOH (a strong base) which has a pH of 11.50?

[1] 3.162×10^{-12} M
[2] 3.162×10^{-3} M
[3] 3.162×10^{11} M
[4] 316.2 M
[5] None of the above

(30) What is the concentration of an aqueous solution of $Ca(OH)_2$ (a strong base) which has a pH of 12.05?

[1] -1.08 M
[2] 2.244×10^{-3} M
[3] 5.610×10^{-3} M
[4] 1.122×10^{-2} M
[5] 1.08 M

(31) Acetic acid, CH_3COOH, is a weak acid. A 1.0 M solution of this acid has a pH of 2.38. What is the K_a value of this acid?

[1] -4.1
[2] 6.3×10^{-14}
[3] 1.7×10^{-5}
[4] 4.2×10^{-3}
[5] 6.4×10^{-2}

(32) Lactic acid has one acidic proton. What is the pH of a 0.10 M solution of this acid? ($K_a = 1.4 \times 10^{-4}$ for lactic acid.)

[1] 1.6
[2] 2.4
[3] 3.7
[4] 9.1
[5] 12.6

(33) Which of the following is false?

[1] $K_w = [OH^-][H^+]$
[2] $K_w = K_a \times K_b$
[3] $pK_w = pK_a + pK_b$
[4] $pK_a + pK_b = 14$
[5] None of the above

(34) Which of the following statements about acid rain is false?

[1] Normal rainwater is usually slightly acidic due to dissolved carbon dioxide.
[2] Acid rain is usually caused by dissolved sulphur dioxide and nitrogen oxides in the atmosphere.
[3] Burning coal for fuel is one of the primary causes of acid rain.
[4] Acid rain usually contains sulphuric acid.
[5] None of the above.

(35) What is the solubility of PbI_2 in moles per liter? ($K_{sp} = 1.4 \times 10^{-8}$)

[1] 3.5×10^{-9} mol.L^{-1}
[2] 1.4×10^{-8} mol.L^{-1}
[3] 1.2×10^{-4} mol.L^{-1}
[4] 1.5×10^{-3} mol.L^{-1}
[5] None of the above

(36) Which of the following acids are polyprotic?

[1] H_3PO_4
[2] HCl
[3] CH_3COOH
[4] HNO_3
[5] BF_3

(37) If $\Delta H = +32$ kJ for a certain reaction, which of the following is true for that reaction?

[1] The reaction is exothermic.
[2] The reaction is endothermic.
[3] The reaction cannot occur.
[4] The reaction requires a catalyst to occur.
[5] None of the above.

(38) The amount of heat needed to raise the temperature of 1.00 g of copper 1°C is called its

[1] Enthalpy
[2] Specific heat
[3] Molar heat
[4] Molar heat capacity
[5] Potential energy

(39) The specific heat of nickel is 0.444 J/g.°C. If 85.0 J of heat are added to a 50.0 g piece of nickel at 22°C, what is the final temperature of the nickel?

[1] 18.2 °C
[2] 25.8 °C
[3] 29.1 °C
[4] 31.8 °C
[5] 78.3 °C

(40) Consider the thermochemical equation:

$CH_{4(g)} + H_2O_{(g)} \leftrightarrows CO_{(g)} + 3H_{2(g)}$ $\Delta H = +879.35$ kJ at 750°C

For this equation, which of the following statements is true?

[1] Heat is given off by the system to the surroundings.
[2] The reaction conditions are standard.
[3] ΔH is proportional to the amount of reactants in the balanced equation.
[4] All of the above.
[5] None of the above

(41) Consider the following specific heats of metals:

Metal	**Specific Heat**
Copper	0.385 J/(g.°C)
Cobalt	0.418 J/(g.°C)
Chromium	0.447 J/(g.°C)
Gold	0.129 J/(g.°C)
Silver	0.237 J/(g.°C)

If the same amount of heat is added to 100 g samples of each of the metals which are all at the same temperature, which metal will reach the highest temperature?

[1] Copper
[2] Cobalt
[3] Gold
[4] Silver
[5] They will all reach the same temperature

(42) When concentrated sulphuric acid is diluted with water, the solution becomes warm. Therefore,

[1] The reaction is exothermic.
[2] The reaction is endothermic
[3] The energy of both the system and the surroundings is decreased
[4] All of the above
[5] None of the above

(43) What is the total number of joules of heat energy absorbed by 15 grams of water when it is heated from 30 °C to 40 °C? ($C_{(water)}$ = 4.18 J/g.°C)

[1] 10 J
[2] 62 J
[3] 149 J
[4] 627 J
[5] 1327 J

(44) A gas sample occupies a volume of 400 mL at a pressure of 2.00 atm. If the pressure is changed to 20.0 atm while the temperature remains constant, the volume will be

[1] 0.5 mL
[2] 20 mL
[3] 40 mL
[4] 800 mL
[5] 4000 mL

(45) For a gas, which two variables are inversely proportional to each other (if all other conditions remain constant)?

[1] Pressure and temperature
[2] Pressure and volume
[3] Volume and temperature
[4] Amount (number of moles) and volume
[5] Pressure, temperature and volume

(46) A 3.20 mol sample of a gas occupies a volume of 350 mL at 300.0 K. What is its pressure?

[1] 1.32 atm
[2] 67.0 atm
[3] 184 atm
[4] 225 atm
[5] 312 atm

(47) The density of N_2 gas at 0°C and 2.00 atm is

[1] 0.625 g/L
[2] 1.25 g/L
[3] 2.50 g/L
[4] 4.00 g/L
[5] 28 g/L

(48) What is the partial pressure of oxygen in a container that contains 2.0 mol of oxygen, 3.0 mol of nitrogen, and 1.0 mol of carbon dioxide when the total pressure is 900 Torr?

[1] 100 Torr
[2] 200 Torr
[3] 300 Torr
[4] 400 Torr
[5] None of the above

(49) A flask of 1.00 L contains a mixture of 1.00 g of hydrogen gas and 1.00 g of helium gas at 27°C. What is the total pressure in the flask?

[1] 6.15 atm
[2] 12.2 atm
[3] 18.4 atm
[4] 22.1 atm
[5] None of the above

(50) The properties of a real gas are most likely to deviate from those properties predicted for an ideal gas when

[1] the pressure is low
[2] the temperature is high
[3] the pressure is high and the temperature is low
[4] the pressure is low and the temperature is high
[5] it is a diatomic gas

ASSIGNMENT 3

Due date: **27 April**

This assignment must be completed online on MasteringChemistry®.

Assignment 3 consists of 4 online tasks which cover the whole syllabus.

IMPORTANT:

You will need two codes to access to MasteringChemistry and to do the assignment. The first code is the **access code**, which you got when you bought the textbook, and the second is the **course code**, which is given below:

To access MasteringChemistry, you must use the **access code** that came with the textbook that you bought.

Once you have the access code and have finished registering for MasteringChemistry and already have access to MasteringChemistry, then, you need to locate the course by entering the **course code**:

CHE1501S1Y2018

Any changes to the above will be announced on myUnisa, so it is important to check for announcements regularly.

Once the due date for assignment 3 has passed, your mark on MasteringChemistry® will be automatically transferred to the Unisa assignment system.

You may complete the 4 online tasks at your own pace, provided that you have completed all four tasks by the due date. Your final mark for assignment 3 will be determined by your performance on the four tasks that you have done on MasteringChemistry®.

MORE DETAILS OF THIS ASSIGNMENT CAN BE FOUND ON myUnisa:

- **Go to the CHE1501 announcements**
- **Read the FAQs on myUnisa**
- **Check the myUnisa Discussion forum**

If you have any questions regarding this assignment, please post your questions on the myUnisa CHE1501 discussion forum in the forum called ASSIGNMENT 2.

ASSIGNMENT 4

(Self – Assessment Assignment)

Recommended Completion date: 27 April

Note: This assignment covers very important material and topics which are examinable in the final exam.

(1) (a) What is the difference between a hypothesis and a theory?

(b) Explain the difference between a theory and a scientific law. Which addresses how matter behaves, and which addresses why it behaves that way?

(2) Write the correct symbol, with both superscript and subscript for each the following:

(a) The isotope of silver that contains 108 neutrons.

(b) The isotope of rubidium with mass number 86.

(c) The isotope of sodium that has an equal number of protons and neutrons.

(3) Why is SnF_2 named using a Roman numeral, tin (II) oxide, whereas MgO is named without a Roman numeral, magnesium oxide?

(4) What is the difference between an *orbit* in the Bohr model of the hydrogen atom and an *orbital* in the quantum mechanical model?

(5) Explain, referring to sodium levels in the body, how drinking too much water can kill you. Explain how electrolytes in sports drinks solve the problem when consuming large amounts of liquid.

(6) Effective nuclear charge generally increases when you move down a column of the periodic table, whereas the 'size' of an orbital increases as the principal quantum number n increases. With respect to atomic radii, do these trends work together or against each other? Which effect is larger?

(7) Ionizing an H_2 molecule to H_2^+ changes the strength of the bond. Do you expect the H─H bond in H_2^+ to be weaker or stronger than the H─H bond in H_2?

(8) The rhodopsin molecule is the chemical basis of vision. Briefly explain how the rotation around a carbon-carbon bond allows us to see.

(9) Write Lewis structures that obey the octet rule for each of the following, and assign oxidation numbers and formal charges to each atom:

(a) OCS

(b) BrO_3^-

(c) NF_3

(10) (a) Draw the Lewis structure of:

(i) A chlorine atom.

(ii) A fluorine ion.

(iii) A bromine molecule.

(b) Draw the Lewis Structure Phosphoric Acid.
Show how you arrived at your answer.

(11) (a) Explain why BrF_4^- is square planar, whereas BF_4^- is tetrahedral.

(b) How would you expect the H—X—H bond angle to vary in the series H_2O, H_2S and H_2Se? Explain your answer

(12) Is water vapour more or less dense than N_2 under the same conditions of temperature and pressure.

(13) Determine the oxidation number of the underlined atom in each of the following species:

(a) $\underline{Ni}(OH)_2^-$
(b) $\underline{Na}_2O_2$
(c) $\underline{Fe}Cl_6^{3-}$
(d) $\underline{Br}_2$
(e) $\underline{Br}F_4^+$

(14) Balance the following redox reactions by using the half-reaction method:

(a) $BrO_3 + Br^- \rightarrow Br_2$ (acid medium)

(b) $MnO_4^- + S_2O_3^{2-} \rightarrow SO_4^{2-} + MnO_2$ (basic medium)

(15) Rusting occurs faster in salt solution than in pure water.

(a) Write an ion-electron equation for the rusting of iron

(b) Why does rusting occur faster in salt solution than pure water?

(c) Suggest why rusting also occurs faster in acid solution than in pure water

(16) What two ions are central to the Arrhenius definitions of acids and bases?

(17) Given that $HClO_4$ is a strong acid, how would you classify the basicity of ClO_4^-?

(18) Briefly explain the chemistry behind the formation of smog in urban environments.

(19) (a) Calculate the pH of a 0.100 M aqueous solution of hypochlorous acid, HOCl. ($K_a = 3.5 \times 10^{-8}$)

(b) Calculate the pH of a 1.0 M solution of methylamine, CH_3NH_2. ($K_b = 4.38 \times 10^{-4}$)

(c) The K_{sp} value for copper (II) iodate, $Cu(IO_3)$, is $K_{sp} = 1.4 \times 10^{-7}$ at 25°C. Calculate its solubility at 25°C.

SEMESTER 2

NB: PLEASE MAKE SURE YOU HAVE READ THE STUDY PLAN ON PAGE 9 OF THIS TUTORIAL LETTER BEFORE CONTINUING

Due dates: Assignment 1: 20 August

Assignment 2: 17 September

Assignment 3: 01 October

Assignment 4: 01 October

- Assignment 1 is a multiple choice assignment that consists of 50 questions, and must be completed by the due date in order to gain admission to the exam.
- Assignment 2 is multiple choice assignment that consists of 50 questions, and must be completed by the due date in order to contribute to your semester mark
- Assignment 3 is an online assessment comprised of 4 tasks to be completed on MasteringChemistry®. Details of this assignment can be found on myUnisa. Assignment 3 requires the use of a computer and internet access.
- Assignment 4 is a self-assessment assignment. It must not be submitted. This assignment is not compulsory and does not count towards your final semester mark. However, it contains extremely important material and questions which are examinable in the final exam.

Assignments 1 and 2 have **unique assignment numbers** which must be written on your assignment cover or entered on myUnisa when submitting the assignments. These are tabulated below:

UNIQUE NUMBERS	
Assignment 1	**874594**
Assignment 2	**693909**

ASSIGNMENT 1

Due date: **20 August**

Unique Assignment Number: **874594**

This assignment must be completed on a mark-reading sheet or electronically on myUnisa.

Assignment 1 is based on Study Units 1-6 of the syllabus.

(1) Which one of the following statements about mixtures is correct.

[1] The different substances in a mixture are always in a definite proportion to each other.
[2] A mixture is made up of elements that are chemically combined.
[3] It is extremely difficult to separate a mixture into different substances.
[4] A mixture must contain at least two different substances.
[5] A mixture is always homogeneous.

(2) Which of the following is a heterogeneous mixture?

[1] Cola
[2] Brass
[3] Air
[4] Coffee with sugar stirred in
[5] Soil

(3) 5.2 cm^3 of a metal is found to weigh 46.6 g on a three decimal balance. What is the density of the metal, expressed to the proper number of significant figures?

[1] 9 g/cm^3
[2] 9.0 g/cm^3
[3] 8.96 g/cm^3
[4] 0.11 g/cm^3
[5] 0.112 g/cm^3

(4) How many protons, neutrons, and electrons are there in $^{75}_{33}As^{3-}$?

[1]	protons=33,	neutrons=42,	electrons=33
[2]	protons=42,	neutrons=44,	electrons=30
[3]	protons=75,	neutrons=75,	electrons=34
[4]	protons=45,	neutrons=75,	electrons=30
[5]	protons=33,	neutrons=42,	electrons=36

(5) The nuclear symbol of a species that is an *isotope* of $^{19}_{9}\mathrm{F}$ is

[1] $^{20}_{9}\mathrm{F}$

[2] $^{20}_{10}\mathrm{Ne}^{+}$

[3] $^{20}_{10}\mathrm{Ne}$

[4] $^{19}_{9}\mathrm{F}^{-}$

[5] $^{19}_{9}\mathrm{F}^{+}$

(6) Only two gallium isotopes are naturally occurring, $^{69}\mathrm{Ga}$ (mass = 68.9256 amu) and $^{71}\mathrm{Ga}$ (mass = 70.9247 amu). The atomic mass of gallium is 69.72. What percent of the gallium atoms (% abundance) is the heavier isotope?

[1] 36 %
[2] 38 %
[3] 40 %
[4] 59 %
[5] 61 %

(7) The oxyanions IO_2^- and ClO_4^- are respectively called:

[1] Iodide and chlorite ions.
[2] Iodite and perchlorate ions.
[3] Iodate and hypochlorite ions.
[4] Hypoiodite and chloride ions.
[5] None of the above.

(8) Which of the following electron configurations is not possible?

[1] $1s^2\ 2s^3\ 2p^3$
[2] $1s^2\ 2s^2\ 2p^6$
[3] $1s^2\ 2s^2\ 2p^2$
[4] $1s^2\ 2s^1$
[5] $1s^2\ 2s^2\ 2p^6\ 3s^1$

(9) Which of the following orbital diagrams represents a diamagnetic atom?

	1s	2s	2p		
[1]	↑↓	↑↓	↑↓	↑↓	↑↓
[2]	↑↓	↑↓	__	__	__
[3]	↑↓	↑↓	↑↓	↑_	↑_

[4] [1] and [2] only
[5] [1], [2] and [3]

(10) Which of the following ions are isoelectronic?

[1] Si^{3-} and S^{-}
[2] Si^{3-} and Si^{2-}
[3] Si^{3-} and P^{3-}
[4] Si^{3-} and Si^{+}
[5] Si^{3-} and S^{2-}

(11) Which set of elements contains a metalloid?

[1] K, Mn, As, Ar
[2] Li, Mg, Ca, Kr
[3] Ba, Ag, Sn, Xe
[4] Fr, F, O, Rn
[5] All of the above

(12) Which statement is **wrong**?

[1] The atomic weight of carbon is about 12.
[2] The most stable ion of lithium is Li^{+}.
[3] A phosphorus atom is larger than an antimony atom.
[4] The radius of a sodium atom is larger than that of a sodium cation.
[5] Oxygen has a less negative electron affinity than fluorine.

(13) All of the following statements about different elements are true **except**

[1] Sodium is an alkali metal.
[2] Aluminium is a transition element.
[3] Calcium is an alkaline-earth metal.
[4] Bromine is a halogen.
[5] Neon is a noble gas.

(14) Which atomic orbital is spherical in shape?

[1] 2s
[2] 3p
[3] 3d
[4] 4f
[5] All of the above.

(15) All of the following statements about the quantum numbers are true **except**

[1] n has integral values from 1 to ∞.
[2] l has values from 1 to ∞.
[3] m_l has $2l + 1$ possible values
[4] m_l has values of $-l$ to $+l$ including zero.
[5] m_s has values of +½ and -½.

(16) Which of the following sets of quantum numbers is not allowed?

[1] n = 3, l = 1, m_l = -1, m_s = + ½
[2] n = 2, l = l, m_l = 0, m_s = + ½
[3] n = 3, l = 0, m_l = 0, m_s = + ½
[4] n = 2, l = 2, m_l = -1, m_s = - ½
[5] n = 2, l = 1, m_l = -1, m_s = - ½

(17) The outer electronic configuration ns^2np^4 corresponds to which one of the following elements in its ground state?

[1] As
[2] Ca
[3] Cr
[4] Br
[5] S

(18) A bond in which an electron pair is equally shared by two atoms is

[1] ionic
[2] polar covalent
[3] nonpolar covalent
[4] coordinate covalent
[5] bipolar

(19) Which of the following compounds contains both ionic and covalent bonds?

[1] ClF
[2] SO_2
[3] NaCl
[4] SO_3
[5] NaCN

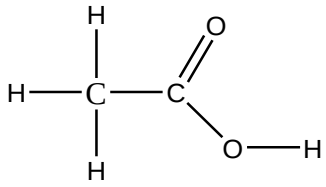
(20) An example of a compound that contains an atom with an expanded octet of electrons is

[1] $NaBF_4$
[2] NH_4Cl
[3] SF_4
[4] $NaClO_4$
[5] BF_3

(21) How many valence electrons are in the sulphite ion?

[1] 8
[2] 24
[3] 26
[4] 30
[5] 32

(22) The following Lewis structure of acetic acid is incomplete because it does not show the lone pairs:



Draw the lone pairs on the diagram. How many lone pairs of electrons should there be in the Lewis structure?

[1] 2
[2] 3
[3] 4
[4] 5
[5] 8

(23) The central atom in the iodite ion, IO_2^-, is surrounded by

[1] 1 single bond, 1 double bond and 2 lone pairs of electrons.
[2] 3 bonding pairs and 1 unshared pair of electrons.
[3] 1 bonding pair and 3 unshared pairs of electrons.
[4] 2 double bonds and no unshared pairs of electrons.
[5] 4 bonding pairs and 4 lone pairs of electrons.

(24) Draw the Lewis structure of SO_3. The formal charge of S is

[1] +2
[2] +1
[3] 0
[4] -1
[5] -2

(25) The shape of a molecule is square planar. How many lone pairs of electrons are there on the central atom?

[1] 1
[2] 2
[3] 3
[4] 4
[5] 5

(26) A species that is isoelectronic with the nitrate ion and hence would have the same shape is

[1] sulphur trioxide
[2] sulphite ion
[3] phosphine, PH_3
[4] water
[5] chlorite ion

(27) Which of the following has a dipole moment?

[1] SF_6
[2] PCl_5
[3] BF_3
[4] SF_4
[5] CCl_4

(28) From your knowledge of solubility guidelines, state which of the following compounds will precipitate in water?

[1] Cobalt (II) hydroxide.
[2] Sodium nitrate.
[3] Ammonium phosphate.
[4] Potassium Chloride.
[5] None of the above.

(29) What is the net ionic equation for the acid-base reaction that occurs when nitric acid is added to copper(II) hydroxide?

(a) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
(b) $2H^+(aq) + Cu(OH)_2(s) \rightarrow Cu^{2+}(aq) + 2H_2O(l)$
(c) $2HNO_3(aq) + Cu(OH)_2(s) \rightarrow Cu(NO_3)_2(s) + 2H_2O(l)$
(d) $2H^+(aq) + 2NO_3^-(aq) + Cu^{2+}(aq) + 2OH^-(aq) \rightarrow Cu(NO_3)_2(s) + 2H_2O(l)$
(e) $2H^+(aq) + 2NO_3^-(aq) + Cu^{2+}(aq) + 2OH^-(aq) \rightarrow Cu^{2+}(aq) + 2NO_3^-(aq) + 2H_2O(l)$

(30) During a certain reaction, element X was converted to X^{2-}. In the reaction, X acts as

[1] the precipitating agent
[2] the acid
[3] the base
[4] the reducing agent
[5] the oxidizing agent

(31) What type of reagent is required to convert N_2H_4 to N_2?

[1] acid
[2] base
[3] reducing agent
[4] oxidizing agent
[5] precipitating agent

(32) Which of the following reactions involves neither oxidation nor reduction?

[1] $Cl_2 + H_2O \rightarrow HCl + HOCl$
[2] $2Na + 2H_2O \rightarrow 2NaOH + H_2$
[3] $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$
[4] $POCl_3 + 3H_2O \rightarrow H_3PO_4 + 3HCl$
[5] $2H_2O \rightarrow 2H_2 + O_2$

(33) What is the oxidation number of phosphorus in KH_2PO_4?

[1] -6
[2] -2
[3] 0
[4] +5
[5] +6

(34) Reactions which cannot occur spontaneously are

[1] exothermic
[2] endothermic
[3] all reactions can occur spontaneously
[4] no reactions can occur spontaneously
[5] both [1] and [2]

(35) Avogadro's number is 6.02×10^{23}. Arrange the following samples in order of increasing number of carbon atoms:

$12g\ ^{12}C$; $1\ mol\ C_2H_2$; 9×10^{23} molecules

[1] $12g\ ^{12}C < 1\ mol\ C_2H_2 < 9 \times 10^{23}$ molecules
[2] $12g\ ^{12}C < 9 \times 10^{23}$ molecules $< 1\ mol\ C_2H_2$
[3] $1\ mol\ C_2H_2 < 12g\ ^{12}C < 9 \times 10^{23}$ molecules
[4] $1\ mol\ C_2H_2 < 9 \times 10^{23}$ molecules $< 12g\ ^{12}C$
[5] 9×10^{23} molecules $< 12g\ ^{12}C < 1\ mol\ C_2H_2$

(36) How many moles of hydrogen atoms does one mole of $CuSO_4 \cdot 5H_2O$ contain?

[1] 1
[2] 2
[3] 5
[4] 10
[5] 20

(37) How many moles of CH_4 are present in 200 g of CH_4?

[1] 0.0802 mol
[2] 12.4 mol
[3] 16.0 mol
[4] 100 mol
[5] 3208 mol

(38) Consider the balanced equation:

$$N_{2\,(g)} + 3H_{2\,(g)} \leftrightarrows 2NH_{3\,(g)}$$

What is the sum of the stoichiometric coefficients?

[1] 5
[2] 6
[3] 7
[4] 8
[5] 13

(39) What is the mass percentage of hydrogen in ammonia?

[1] 1.01 %
[2] 5.9 %
[3] 16.8 %
[4] 17.0 %
[5] 17.8 %

(40) What is the empirical formula of a compound whose molecular formula is S_6O_9?

[1] SO
[2] $SO_{1.5}$
[3] S_2O_3
[4] S_6O_9
[5] $S_{12}O_{18}$

(41) What is the empirical formula for a compound which contains 0.104 mol K, 0.052 mol C and 0.156 mol O?

[1] KCO
[2] KCO_2
[3] K_2CO_3
[4] $K_4C_2O_6$
[5] $K_{104}C_{52}O_{156}$

(42) What is the empirical formula for a compound that contains 87.5 % nitrogen and 12.5 % hydrogen by mass?

[1] $N_{87}H_{12}$
[2] NH_4
[3] NH_3
[4] NH_2
[5] NH

Consider the following balanced reaction:

$$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O.$$

3 moles of NaOH and 4 moles of CO_2 are allowed to react according to the above reaction. Answer questions 43-46 below for this reaction:

(43) Which reagent is the limiting reagent?

[1] NaOH
[2] CO_2
[3] Na_2CO_3
[4] There is no limiting reagent
[5] Both NaOH and CO_2 are limiting reagents

(44) What is the maximum number of moles of Na_2CO_3 that can be formed?

[1] 1 mol
[2] 1.5 mol
[3] 2 mol
[4] 4 mol
[5] 6 mol

(45) How many moles of the excess reagent remain unreacted?

[1] 1 mol
[2] 1.5 mol
[2] 2 mol
[4] 2.5 mol
[5] No excess reagent remains unreacted

(46) If the actual mass of Na_2CO_3 produced was 0.5 mol, what is the percentage yield of Na_2CO_3?

[1] 0.62%
[2] 25 %
[3] 33.3 %
[4] 50 %
[5] 100 %

A solution is prepared by dissolving 50.0 g (0.297 mol) of cesium chloride (CsCl) in 50.0g (2.77 mol) of water. The volume of the solution is 63.3 mL. For this solution, answer questions 47-49 below.

(47) What is the molality of the cesium chloride?

[1] 4.71 mol/kg
[2] 5.94 mol/kg
[3] 55.4 mol/kg
[4] 4.71 mol/L
[5] 5.94 mol/L

(48) What is the molarity of the cesium chloride?

[1] 4.71 mol/kg
[2] 5.94 mol/kg
[3] 55.4 mol/kg
[4] 4.71 mol/L
[5] 5.94 mol/L

(49) What is the mole fraction of the cesium chloride?

[1] 0.0968
[2] 0.107
[3] 0.790
[4] 9.68 %
[5] 10.7%

(50) If I prepare a solution by adding 75 mL of 1.25 M HCl into a 250 mL volumetric flask, and filling the flask to the mark with water, what will the final concentration of the solution be?

[1] 0.10 M
[2] 0.30 M
[3] 0.38 M
[4] 1.3 M
[5] 4.2 M

ASSIGNMENT 2

Due date: **17 September**

Unique Assignment Number: **693909**

This assignment must be completed on a mark-reading sheet or electronically on myUnisa.

Assignment 1 is based on Study Units 7-11 of the syllabus.

(1) Which statement explains why the speed of some chemical reactions is increased when the surface area of the reactant is increased?

[1] This change increases the density of the reactant particles.
[2] This change increases the concentration of the reactant.
[3] This change exposes more reactant particles to a possible collision.
[4] This change alters the electrical conductivity of the reactant particles.
[5] None of the above.

(2) The experimental rate law for the reaction A + 2B → 3C + 2D is:

$$\text{Rate} = k[A][B]^2$$

What is the overall order of this reaction?

[1] 0
[2] 1
[3] 2
[4] 3
[5] 4

(3) The experimental rate law for the reaction A + 2B → 3C + 2D is:

$$\text{Rate} = k[A][B]^2$$

If the concentration of B is doubled, what happens to the reaction rate?

[1] The reaction rate remains the same.
[2] The reaction rate is doubled.
[3] The reaction rate is tripled.
[4] The reaction rate will increase by 4 times.
[5] The reaction rate will decrease.

(4) The rate law for a second order reaction can be written as:

$$\text{Rate} = k[A]^2.$$

What are the units of k for a second order reaction, assuming time in seconds and concentration in mol/L?

[1] s
[2] $L.(mol.s)^{-1}$
[3] $L^2.(mol^2.s)^{-1}$
[4] mol/L
[5] None of the above

(5) Which of the following factors will affect the rate of a reaction?

[1] The physical state of the reactant
[2] The temperature of the reaction
[3] The concentration of the reactants
[4] All of the above
[5] None of the above

(6) Which of the following statements is false?

[1] The minimum amount of energy needed for a reaction to occur is called the activation energy.
[2] The rate of a reaction depends on the magnitude of the activation energy.
[3] A catalyst increases the rate constant in a reaction.
[4] The frequency of collisions is ultimately the only factor which affects the rate of a reaction.
[5] None of the above.

(7) Which is a property of a reaction that has reached equilibrium?

[1] The amount of products is greater than the amount of reactants.
[2] The amount of products is equal to the amount of reactants.
[3] The rate of the forward reaction is greater than the rate of the reverse reaction.
[4] The rate of the forward reaction is equal to the rate of the reverse reaction.
[5] None of the above.

(8) Consider the reaction: $H_{2\,(g)} + Br_{2\,(g)} \leftrightarrows 2HBr_{(g)}$
What is the expression for K_c for this reaction?

[1] $K_c = \frac{[H_2][Br_2]}{[HBr]^2}$

[2] $K_c = \frac{[H_2][Br_2]}{[HBr]}$

[3] $K_c = \frac{[HBr]^2}{[H_2][Br_2]}$

[4] $K_c = \frac{2[HBr]}{[H_2][Br_2]}$

[5] $K_c = \frac{[HBr]}{[H_2][Br_2]}$

(9) Consider the reaction: $H_{2\,(g)} + Br_{2\,(g)} \leftrightarrows 2HBr_{(g)}$
If the value of the equilibrium constant is very large, which species will predominate at equilibrium?

[1] H_2
[2] Br_2
[3] HBr
[4] Both H_2 and Br_2
[5] All species will have the same concentration.

(10) Consider the reaction: $Ti_{(s)} + 2Cl_{2\,(g)} \leftrightarrows TiCl_{4\,(l)}$
What is the expression for K_c for this reaction?

[1] $K_c = \frac{[Cl_2]^2}{[TiCl_4]}$

[2] $K_c = \frac{[TiCl_4]}{[Ti][Cl_2]^2}$

[3] $K_c = \frac{[TiCl_4]}{[Cl_2]^2}$

[4] $K_c = \frac{[TiCl_4]}{[Cl_2]}$

[5] None of the above.

(11) Which of the following will not affect the position of a chemical equilibrium?

[1] Changing the temperature
[2] Adding a catalyst
[3] Changing the volume
[4] Changing the concentration of the products
[5] None of the above

Consider the following exothermic reaction: $N_{2\,(g)} + 3H_{2\,(g)} \leftrightarrows 2NH_{3\,(g)}$

For this reaction, answer questions 12-16 below.

(12) What will happen to the reaction mixture at equilibrium if some more $N_{2\,(g)}$ is added?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(13) What will happen to the reaction mixture at equilibrium if the temperature is decreased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(14) What will happen to the reaction mixture at equilibrium if some helium gas is added?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(15) What will happen to the reaction mixture at equilibrium if the volume of the container is increased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(16) What will happen to the reaction mixture at equilibrium if the pressure is increased?

[1] The equilibrium will shift to the left.
[2] The equilibrium will shift to the right.
[3] There is no effect on the equilibrium.
[4] The reaction will stop.
[5] None of the above.

(17) Which substance can be classified as a Lewis base?

[1] HCl
[2] BF_3
[3] Ca^{2+}
[4] HF
[5] NH_3

(18) Which of the following is a conjugate acid-base pair?

[1] F^- and NaF
[2] H_2SO_4 and HSO_4^-
[3] PH_3 and PF_3
[4] Br_2 and Br^-
[5] HCl and $HClO_4$

(19) Which of the following will give an acidic mixture?

[1] Mixing equal volumes of 1.0 M HCl and 1.0 M KOH
[2] Mixing equal volumes of 1.0 M H_3PO_4 and 1.0 M NaOH
[3] Mixing equal volumes of 1.0 M KOH and water
[4] Mixing 1.0 L of 1.0 M HCl with 2.0 L of 1.0 M KOH
[5] Mixing 2.0 L of 1.0 M H_2SO_4 with 4.0 L of 1.0 M KOH

(20) Which of the following is the strongest acid?

[1] HNO_3
[2] HF
[3] H_2S
[4] CH_3COOH
[5] HPO_4^{2-}

(21) Which of the following is a salt?

[1] KOH
[2] HBr
[3] BF_3
[4] NaBr
[5] NH_3

(22) As the hydrogen ion concentration of an aqueous solution increases, what will happen to the hydroxide ion concentration?

[1] It will decrease.
[2] It will increase.
[3] It will remain the same.
[4] It will shift towards $1x\ 10^{-14}$ M.
[5] None of the above.

A solution has a pOH of 3.71. For this solution, answer questions 23-26 below.

(23) What is the pH of the solution?

[1] 3.71×10^{-14}
[2] 0.569
[3] 3.29
[4] 10.29
[5] 10.71

(24) What is the $[H^+]$ of the solution?

[1] -1.01 M
[2] 5.13×10^{-11} M
[3] 1.95×10^{-4} M
[4] 1.01 M
[5] 1.95×10^{10} M

(25) What is the $[OH^-]$ of the solution?

[1] -1.01 M
[2] 5.13×10^{-11} M
[3] 1.95×10^{-4} M
[4] 1.01 M
[5] 5.13×10^{3} M

(26) Which of the following is true for this solution?

[1] The solution is acidic.
[2] The solution is basic.
[3] The solution is neutral.
[4] $[OH^-] > [H^+]$.
[5] Both 2 and 4.

(27) What is the pH of a 1.32 M HNO_3 solution?

[1] -0.121
[2] 0.121
[3] 1.32
[4] 7.00
[5] None of the above

(28) What is the pH of a 0.16 mol/L OH^- solution?

[1] -0.80
[2] 0.80
[3] 11.16
[4] 13.2
[5] None of the above

(29) What is the concentration of an aqueous solution of NaOH (a strong base) which has a pH of 10.1?

[1] 126 M
[2] 1.26×10^{-3} M
[3] 1.26×10^{-4} M
[4] 7.94×10^{-11} M
[5] None of the above

(30) What is the concentration of an aqueous solution of $Ca(OH)_2$ (a strong base) which has a pH of 12.05?

[1] 1.08 M
[2] 1.122×10^{-2} M
[3] 5.610×10^{-3} M
[4] 2.244×10^{-3} M
[5] -1.08 M

(31) Lactic acid is a weak acid with one acidic proton. A 0.10 M solution of this acid has a pH of 2.44. What is the K_a value of this acid?

[1] 275.4
[2] 2.44
[3] 3.6×10^{-3}
[4] 1.4×10^{-4}
[5] 1.4×10^{-5}

(32) Hydroflouric acid, HF, is a weak acid with one acidic proton. What is the pH of a 0.20 M solution of this acid? ($K_a = 6.8 \times 10^{-4}$ for HF.)

[1] 0.42
[2] 1.9
[3] 2.6
[4] 5.3
[5] 12.1

(33) Which of the following is false?

[1] $K_w = [OH^-][H^+]$
[2] $K_w = K_a \times K_b$
[3] $pK_w = pK_a \times pK_b$
[4] $pK_a + pK_b = 14$
[5] None of the above

(34) Which of the following statements about acid rain is false?

[1] Normal rainwater is usually slightly acidic due to dissolved carbon dioxide.
[2] Acid rain is usually caused by dissolved sulphur dioxide and nitrogen oxides in the atmosphere.
[3] Burning coal for fuel is one of the primary causes of acid rain.
[4] Acid rain usually contains sulphuric acid.
[5] None of the above.

(35) What is the solubility of $CaCO_3$ in moles per liter? ($K_{sp} = 8.7 \times 10^{-9}$)

[1] 1.3×10^{-4} mol.L^{-1}
[2] 9.3×10^{-5} mol.L^{-1}
[3] 8.7×10^{-9} mol.L^{-1}
[4] 7.6×10^{-17} mol.L^{-1}
[5] None of the above

(36) Which of the following acids are polyprotic?

[1] HI
[2] Mg^{2+}
[3] H_2CO_3
[4] HNO_3
[5] BF_3

(37) If $\Delta H = -512$ kJ for a certain reaction, which of the following is true for that reaction?

[1] The reaction is exothermic.
[2] The reaction is endothermic.
[3] The reaction cannot occur.
[4] The reaction requires a catalyst to occur.
[5] None of the above.

(38) The quantity of heat needed to raise the temperature of a substance by 1°C is called its:

[1] Heat capacity.
[2] Specific heat.
[3] Enthalpy.
[4] Work.
[5] Potential energy.

(39) What is the specific heat of ethyl alcohol if 700.0 J of heat are required to raise the temperature of an 80.0 g sample from 30.0°C to 45.0°C?

[1] 0.004 J/(g.°C)
[2] 0.194 J/(g.°C)
[3] 0.292 J/(g.°C)
[4] 0.583 J/(g.°C)
[5] 131 J/(g.°C)

(40) Consider the thermochemical equation:

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ $\Delta H° = -571.7$ kJ

For this equation, which of the following statements is true?

[1] Heat is given off by the system to the surroundings.
[2] The thermochemical equation gives $\Delta H°$, not ΔH. This means that the reaction conditions are standard.
[3] If liquid oxygen, rather than oxygen gas, reacted with hydrogen, the ΔH value would be different.
[4] All of the above.
[5] None of the above.

(41) How much heat is required to raise the temperature of 30.0 g of silver from 18.2°C to 35.6°C? The specific heat of silver is 0.226 J/(g.°C)

[1] 2.31 J
[2] 118 J
[3] 123 J
[4] 241 J
[5] None of the above

(42) Which of the following statements is false?

[1] The reaction vessel cools when an endothermic reaction occurs.
[2] An exothermic reaction is characterized by a negative value of ΔH.
[3] Heat is evolved when an exothermic reaction occurs
[4] An endothermic reaction causes the surroundings to absorb heat.
[5] None of the above

(43) What is the total number of kilojoules of heat energy absorbed by 50 grams of solid iron when it is heated from 20°C to 700°C? ($C_{(water)}$ = 0.45 J/g°C)

[1] 10 kJ
[2] 15 kJ
[3] 165 kJ
[4] 927 kJ
[5] None of the above

(44) A balloon contains 1.0 L of gas at sea level, where the pressure is 1.0 atm. What will the volume be when the pressure is 0.80 atm, if the temperature remains constant?

[1] 0.20 L
[2] 0.80 L
[3] 1.0 L
[4] 1.3 L
[5] None of the above

(45) The pressure of 4.0 L of nitrogen in a flexible container is decreased to one third of its original pressure, and its absolute temperature is decreased by one half. The volume is now

[1] 1.0 L
[2] 4.0 L
[3] 6.0 L
[4] 24 L
[5] None of the above

(46) How many moles of gas are there in a sample occupying 1.74 L at 0.136 atm and 25°C?

[1] 0.00967 mol
[2] 0.0463 mol
[3] 0.0926 mol
[4] 7.36 mol
[5] None of the above

(47) What is the density of CO_2 at 25°C and 750 Torr?

[1] 0.472 g/L
[2] 1.78 g/L
[3] 1.82 g/L
[4] 2.12 g/L
[5] None of the above

(48) A flask of 7L contains a mixture of 6g of O_2 and 15g of N_2 at 30°C.What is the partial pressure of the oxygen gas?

[1] 0.67 atm
[2] 1.9 atm
[3] 2.59 atm
[4] 22.1 atm
[5] None of the above

(49) A 1.00 L flask contains 2.073 g O_2 and 20.13 g N_2 at 25.0°C What is the total pressure?

[1] 0.856 atm
[2] 1.09 atm
[3] 19.2 atm
[4] 22.2 atm
[5] None of the above

(50) Under which set of conditions does $NH_{3\,(g)}$ best follow the ideal gas law?

[1] High temperature and low pressure
[2] Low temperature and high pressure
[3] High temperature and high pressure
[4] Low temperature and low pressure
[5] In a closed cylinder

ASSIGNMENT 3

Due date: **01 October**

This assignment must be completed online on MasteringChemistry®.

Assignment 3 consists of 4 online tasks which cover the whole syllabus.

IMPORTANT:

You will need two codes to access to MasteringChemistry and to do the assignment. The first code is the **access code**, which you got when you bought the textbook, and the second is the **course code**, which is given below:

To access MasteringChemistry, you must use the **access code** that came with the textbook that you bought.

Once you have the access code and have finished registering for MasteringChemistry and already have access to MasteringChemistry, then, you need to locate the course by entering the **course code**:

CHE1501S2Y2018

Any changes to the above will be announced on myUnisa, so it is important to check for announcements regularly.

Once the due date for assignment 3 has passed, your mark on MasteringChemistry® will be automatically transferred to the Unisa assignment system.

You may complete the 4 online tasks at your own pace, provided that you have completed all four tasks by the due date. Your final mark for assignment 3 will be determined by your performance on the four tasks that you have done on MasteringChemistry®.

MORE DETAILS OF THIS ASSIGNMENT CAN BE FOUND ON myUnisa:

- **Go to the CHE1501 announcements**
- **Read the FAQs on myUnisa**
- **Check the myUnisa Discussion forum**

If you have any questions regarding this assignment, please post your questions on the myUnisa CHE1501 discussion forum in the forum called ASSIGNMENT 2.

ASSIGNMENT 4

(Self – Assessment Assignment)

Recommended Completion date: 01 October

Note: This assignment covers very important material and topics which are examinable in the final exam.

(1) Which of these changes are physical and which are chemical? Explain.

(a) Plants make sugar from carbon dioxide and water.

(b) Water vapour in the air forms frost

(c) A goldsmith melts a nugget of gold and pulls it into a wire.

(2) Bromine is a halogen. Locate this element in the periodic table. What is its symbol? In which period and in which group is the element located? What is its atomic number? Is it a metal or a non-metal?

(3) Describe the electron transfers that occur in the formation of magnesium bromide from elemental magnesium and elemental bromine.

(4) (a) What is a hydrocarbon?

(b) What is meant by the term isomer?

(c) What is a functional group?

(5) Which element forms a 3+ ion that has the electron configuration $[Kr]4d^6$?

(6) Based on differences in electronegativity, how would you characterize the bonding in sulphur dioxide, SO_2? Do you expect the bonds between S and O to be nonpolar, polar covalent or ionic?

(7) Nitroglycerin is a highly explosive chemical which can explode merely by shaking the liquid. Write the decomposition reaction for the explosion of nitroglycerin. Also explain what Alfred Nobel did to make this substance safer to form which we now call dynamite.

(8) (a) Draw the Lewis structure of:

(i) A fluorine atom.

(ii) A bromine ion.

(iii) An iodine molecule.

(b) Draw the Lewis Structure of Sulphuric Acid.
Show how you arrived at your answer.

(9) Write Lewis structures that obey the octet rule for each of the following, and assign oxidation numbers and formal charges to each atom:

(a) $SOCl_2$

(b) $HClO_2$

(c) TeO_3

(9) (a) The molecule O=C=S is linear and has a Lewis structure analogous to that of CO_2. Would you expect this molecule to have a dipole moment?

(b) Use the VSEPR model to predict the molecular geometry for SF_4 and IF_5.

(10) Antacids are often used to relieve heartburn and promote healing in the treatment of mild ulcers. Write balanced net ionic equations for the reactions between the HCl(aq) in the stomach and the following substances used in the various antacids:

(a) $Mg(OH)_2(s)$

(b) $CaCO_3(s)$

(11) Determine the oxidation number of the underlined atom in each of the following species:

(a) $\underline{Ca}Cl_2$
(b) $\underline{Fe}(NO_3)_3$
(c) $\underline{Ni}(OH)_2^-$
(d) $H_2\underline{O}_2$
(e) $\underline{Br}F_4^+$

(12) Consider the following redox reaction:

$$MnO_4^- + S_2O_3^{2-} \rightarrow SO_4^{2-} + MnO_2$$

(a) Identify the reducing agent. Motivate your answer.

(b) Identify the oxidising agent. Motivate your answer.

(c) Balance the redox reaction in basic solution using the half-reaction method.

(13) What happens to the pressure of a gas if you halve the volume while its temperature is held constant?

(14) In the forward reaction of this equilibrium, which substance acts as the Brønsted-Lowry base?

$$H_2S(aq) + CH_3NH_2(aq) \leftrightarrows NH_4^+(aq) + OH^-(aq)$$

(15) The CH_3^- ion is the conjugate base of CH_4, and CH_4 shows no evidence of being an acid in water. What happens when CH_3^- is added to water?

(16) Briefly explain the chemistry behind the formation of acid rain.

(17) (a) Formic acid (HCO_2H) is secreted by ants. Calculate the pH of a 0.0025 M solution of formic acid. ($K_a = 3.5 \times 10^{-8}$)

(b) Calculate the pH of a 15.0 M aqueous solution of NH_3. ($K_b = 1.8 \times 10^{-5}$)

(c) The K_{sp} value for lead (II) iodide, PbI_2, is $K_{sp} = 1.4 \times 10^{-8}$ at 25°C. Calculate its solubility at
25°C.

8.7 Other assessment methods

There are no other assessment methods for this module.

8.8 The examination

How the Examination System works

For general examination guidelines and examination preparation guidelines, see the brochure *my Studies @ Unisa* which you received with your study material.

Examination admission

Submission of the first assignment before 19 March (Semester 1) or 20 August (Semester 2) will confirm your registration for that semester and you will be noted as an "active student". (This is so that Unisa will receive subsidy from the Department of Education for you as a student).

NB: Please note that if you do not submit assignment 1 on time, you will NOT be allowed to write the examination.

There will be NO extensions given and NO exceptions made.

A sub-minimum of 40%

Because you can earn a semester mark which will contribute to the final mark, the university requires that a sub-minimum of 40% must be achieved in the examination to pass the module.

Examination period

This module is offered in a semester period of fifteen weeks. This means that if you are registered for the first semester, you will write the examination in May / June 2018 and the supplementary examination will be written in October / November 2018. If you are registered for the second semester you will write the examination in October / November 2018 and the supplementary examination will be written in May / June 2019.

During the semester, the Examination Section will provide you with information regarding the examination in general, examination venues, examination dates and examination times. If your final mark (taking the semester mark into account) is between 40% and 49%, you will be given an opportunity to rewrite the examination in the next examination period. This examination will count out of 100% and the semester mark will not be brought into account. However, if you write an aegrotat examination the semester mark will count towards the final mark.

Duration of the examination

The examination will be of **two hours** duration.

Previous examination papers

Previous examination papers are available to students. You may check on the myUnisa website where old examination papers will be loaded. We advise you, however, not to focus on old examination papers only as the content of modules and therefore examination papers changes from year to year. Solutions will **not** be provided for past examination papers.

9 FREQUENTLY ASKED QUESTIONS

Question: How do I access MasteringChemistry?

Answer:

1) Go to www.MasteringChemistry.com and click on the button to register as a student.

2) Firstly, you will need the valid **access code** that you will receive with your textbook. Register on MasteringChemistry using your access code.

3) *Only after* you have registered on MasteringChemistry, you will need the **Course ID.** Enter the CourseID. Enter your student number when prompted and you are ready to go!

Question: What happens if I do not have an access code?

Answer: If you do not have a valid access code, you will not be able to do assignment 3.

The prescribed book and access code are prescribed material and it is expected that you will obtain them.

If you have a second-hand copy of the textbook or a textbook without MasteringChemistry access, you can also purchase a valid access code (plus e-book) directly from Pearson by contacting them at pearson-za.ebooksupport@pearson.com at a much cheaper price than the hard copy of the textbook.

Question: What happens if I don't do assignment 3?

Answer: Assignment 3 count 15% towards your final mark. If you don't do assignment 3, you will have a lower semester mark and will have to do well in the exam to pass (at least 55-60 percent for the exam depending on your assignment 1 and 2 marks).

However, the MasteringChemistry assignment is extremely good in teaching the concepts as it is interactive and provides immediate feedback and tutorials. Our statistics show that doing the MasteringChemistry assignment drastically improves the pass rate for this module for those who do it.

Question: **Can I reuse my previously used access code?**

Answer: Yes, a MasteringChemistry access code can be used for up to three semesters (18 months) before it expires.

Question: **I don't have internet access. What can I do?**

Answer: You can access the internet at any of the Unisa regional centers and they will give you free internet access to do your MasteringChemistry assignment online. Because the format of assignment 3 is an interactive web based tutorial, it can only be completed online.

Question: **Can I do Assignment 3 as a printed assignment?**

Answer: No, assignment 3 consists of a number of tasks (mini-assignments) that involve interactive tutorials. The whole purpose of MasteringChemistry is that the interactive tutorials explain the concepts you need to learn in a live, interactive way. It is not a standard "Answer the Questions" type assignment.

10 SOURCES CONSULTED

None.

11 IN CLOSING

Good luck with your studies!

12 ADDENDUM

A periodic table is attached on the following page.

Periodic Table of Elements

Key: 1 / **H** / 1.008 = Atomic number / **Symbol** / Atomic weight

1 1A	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 **H** 1.008																	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La*** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.8	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (210)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 **Ac**** (227)	104 **Unq** (257)	105 **Unp** (260)	106 **Unh** (263)	107 **Uns** (262)	108 **Uno** (265)	109 **Une** (266)									

*Lanthanides	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (147)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
**Actinides	90 **Th** 232.0	91 **Pa** (231)	92 **U** 238.0	93 **Np** (237)	94 **Pu** (242)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (249)	99 **Es** (254)	100 **Fm** (253)	101 **Md** (256)	102 **No** (254)	103 **Lw** (257)