##### General Chemistry II

##### Philosophy:

##### Vision:

*To be a student-centered, dynamic and innovative, world-class and multi-campus college, promoting excellence in teaching and learning, serving diverse communities and producing lifelong learners who can compete globally.*

##### Mission:

*To be the premier educational institution in: providing high quality, affordable and accessible education programmes serving the needs of business, industry and the diverse campus communities and facilitation the personal and professional development of its students, faculty and staff.*

The Institution’s motto “Transforming Lives, Transforming Communities, Transforming the Nation… One Student at a Time.” is embodied in our Core Curriculum as well as Programme Curriculum through ten competencies which students will understand, practice and demonstrate upon successful completion of their programmes of study at the College. These competencies are as follows:

|  |
| --- |
| Programme Curriculum Competencies |
| **KNOWLEDGE** |
| A clear understanding of the principles and concepts of related theories and models of the particular discipline and the relationship to other disciplines through study, education and experience. |
| **EFFECTIVE COMMUNICATION** |
| The ability to accurately transfer thoughts and meaning through interpersonal skills using appropriate registers**.** |
| **ANALYTICAL ABILITY** |
| The ability to systematically gather relevant data and make appropriate deductions, inferences and connections with a view to judiciously solve problems. |
| **TECHNOLOGICAL EXPERTISE** |
| Utilization of current tools and techniques with the view to achieving efficiency and improving functionality. |
| **COLLABORATION** |
| Proficiency in working cohesively with other stakeholders with the view to achieving common goals. |
| **CREATIVITY** |
| The ability to explore issues and generate solutions from an innovative perspective. |
| **PROFESSIONALISM** |
| A life-long engagement in reflective, moral, ethical and best practices in all spheres. |
| **DIVERSITY** |
| The ability to recognize and respect uniqueness, worth and dignity of others whilst developing one’s own belief system. |
| **SOCIAL AND GLOBAL RESPONSIBILITY** |
| A conscientious approach that reflects social and global accountability, commitment, caring and integrity. |
| **ENTREPRENEURSHIP** |
| The ability to recognize and take advantage of legitimate opportunities for innovation and social improvement, whilst accepting the related risks. |

|  |  |
| --- | --- |
| **Course Code:** | **CHEM 132** |
| **Course Title:** | General Chemistry II |
| **Number of Credits:** | 4 |
| **Co-requisites:** |  |
| **Prerequisite:** | A minimum grade of C in CHEM 131 |
| **Prerequisite for:** | All advanced Chemistry courses; A minimum C grade is required. |
| **Number of Contact Hours:** | 90 |
| **Delivery:** | Learning is accomplished through practical experiences with an emphasis on group work, planning and design, manipulation and scientific reporting skills |
| **Instructor:** |  |
| **Office:** |  |
| **Office Hours:** |  |
| **Telephone:** |  |
| **Email:** |  |

##### COURSE DESCRIPTION AND GOAL:

In this course the fundamental principles, theories and laws of physical chemistry are studied. The chemistries of the liquid, solid and aqueous states are also introduced.

The competencies addressed in this course are **Knowledge**, **Analytical Ability**, **Technological Expertise** and **Collaboration** at the **Entry and Immersion Levels**. The specific objectives for this course are listed by Competency:

|  |
| --- |
| **General Objectives** |
| KNOWLEDGE |
| ***Entry Level:*** *Understands the content of various disciplines, the generalizations about content and the methods of inquiry.*  Student should be able to:   1. Discuss the properties of liquids, solids and gases. 2. Explain the dissolution process and the factors that affect it 3. Describe colloids and their properties 4. Discuss the first law of thermodynamics 5. Identify strong electrolytes 6. Describe titration and standardization 7. Describe the shape and species present at various stages of different titration curves   ***Immersion Level:*** *Demonstrates in-depth understanding of the relevant and significant ideas across disciplines.*  Student should be able to:   1. Discuss various kinds of intermolecular attractions and how they influence physical properties 2. Explain the structure and bonding in solids 3. Explain key concepts of chemical kinetics 4. Explain the basic ideas of chemical equilibria 5. Describe the classification and properties of acids, bases and salts. 6. Balance redox equations 7. Describe buffering action and the use of acid-base indicators 8. Draw diagrams and write half-reactions and overall cell reactions of simple voltaic cells |
| ANALYTICAL ABILITY |
| ***Entry Level:*** *observes accurately and draws reasonable inferences from observations*  Student should be able to:   1. Arrange binary and ternary acids in order of increasing strength   ***Immersion level:*** *Analyses structures and organizations and perceives and makes relationships*  Student should be able to:   1. Calculate the heat transfer with or without change of phase. 2. Carry out calculations relating atomic arrangement, density, unit cell size and ionic or atomic radii in simple crystalline arrangements 3. Carry out calculations involving the four colligative properties of solutions 4. Perform thermodynamic calculations 5. Apply the method of initial rates to find the rate-law expression for a reaction 6. Analyze concentration-versus-time data to determine the order of a reaction 7. Perform calculations involving pH, pOH, kw. 8. Carry out titrimetric calculations 9. Use and interpret standard reduction potentials |
| TECHNOLOGICAL EXPERTISE |
| ***Entry Level:*** *uses basic technology proficiently and understands its potential as a learning tool*  Student should be able to:   1. Determine the melting and boiling point of substances 2. Properly use and calibrate a pH meter 3. Construct simple voltaic cells   ***Immersion Level:*** *uses technology to gain knowledge of varipus techniques and demonstrates a sound understanding of the nature and functioning of technology systems in problem solving, gathering, organizing and analyzing information.*  Student should be able to:   1. Show an ability to construct and interpret tables and graphs showing the results of chemical experiments. 2. Use back, double and redox titrations to determine the molarity of a solution, etc. 3. Design a simple experiment for electroplating of metals |
| COLLABORATION |
| ***Entry Level:*** *Engages in collaboration when learning across disciplines.*  Student should be able to:   1. Work in a group to solve calculation types problems   ***Immersion Level:*** *Initiates cooperative learning activities by seeking out other for assistance and for building projects together and acts as an active facilitator.*  Student should be able to:   1. Work in groups to gather, present and explain material pertaining to specific course topics. |

**Key:** Competency Levels

K= Knowledge E= Entry

A = Analytical Ability Im = Immersion

T= Technological Expertise It = Intermediate

C= Collaboration Ad = Advanced

##### WEEKLY CLASS SCHEDULE AND TEACHING OBJECTIVES

| **Week** | **Content** | **Specific Objectives and Activities** | **Competency** | **Level** |
| --- | --- | --- | --- | --- |
| 1 & 2 | Unit 3 – Chemical Thermodynamics  * The First Law of Thermodynamics * Some thermodynamics terms * Enthalpy changes * Calorimetry * Thermochemical equations * Standard states and standard enthalpy changes * Standard molar enthalpies of formation, ∆Hfº * Hess’s Law | 1. Understand the terminology of thermodynamics, and the meaning of the signs of changes 2. Use the concept of state functions 3. Carry out calculations of calorimetry to determine changes in energy and enthalpy 4. Use Hess’s Law to find the enthalpy change, ∆H, for a reaction by using tabulated values of standard molar enthalpies of formation 5. Use Hess’s Law to find the enthalpy of formation given ∆H for a reaction and the known enthalpies of formation of the other substances in the reaction | K4  K4  A8  A8  A8 | E  E  Im  Im  Im |
| 3/4 | Unit 4 – Chemical Kinetics  * The rate of reaction * Nature of the reactants * The concentrations of reactants: The rate-law expression * Collision Theory of reaction rates * Catalysts | 1. Express the rate of a chemical reaction in terms of changes in concentrations of reactants and products with time 2. Describe the experimental factors that affect the rates of chemical reactions 3. Use the rate-law expression for a reaction – the relationship between concentration and rate 4. Use the concept of order of reaction 5. Apply the method of initial rates to find the rate-law expression for a reaction 6. Analyze concentration-versus-time data to determine the order of a reaction 7. Describe the collision theory of reaction rates 8. Explain how temperature affects rates of reactions | K10  K10  K10  K10  A9, C1  A10, T4, C1  K10  K10 | Im  Im  Im  Im  Im  Im, E  Im  Im |
| 5 | **Unit 5– Chemical Equilibrium**   * The Equilibrium Constant * Variation of Kc with the form of the balanced equation * Disturbing a system at equilibrium: Predictions * The Haber Process: A commercial application of equilibrium | 1. Explain the basic ideas of chemical equilibrium 2. Explain what an equilibrium constant is and what it tells us 3. Use equilibrium constants to describe systems at equilibrium 4. Calculate equilibrium constants 5. Recognize the factors that affect equilibria and predict the resulting effects | K11  K11  K11  A3, C1  K11 | E  E  E  E  E |
| 6,7 | Unit 2 – Solutions  * Spontaneity of the dissolution process * Dissolution of solids in liquids * Dissolution of liquids in liquids (miscibility) * Dissolution of gases in liquids * Rates of dissolution and saturation * Effect of temperature on solubility * Effect of pressure on solubility * Molarity and mole fraction * Lowering of vapour pressure and Raoult’s Law * Fractional distillation * Boiling point elevation * Freezing point depression * Determination of molecular weight by freezing point depression or boiling point elevation * Colligative properties and dissociation of electrolytes * Osmotic pressure * The Tyndall effect * The adsorption phenomenon * Hydrophilic and hydrophobic colloids | 1. Describe the factors that favor the dissolution process 2. Describe the dissolution of solids in liquids, liquids in liquids and gases in liquids 3. Describe how temperature and pressure affect solubility 4. Express concentrations of solutions and some of their applications 5. Carry out calculations involving the four colligative properties of solutions: lowering of vapour pressure (Raoult’s Law), boiling point elevation, freezing point depression, and osmotic pressure 6. Use colligative properties to determine molecular weights of compounds 7. Describe dissociation and ionization of compounds, and the associated effects on colligative properties 8. Recognize and describe colloids: the Tyndall effect, the adsorption phenomenon, hydrophilic and hydrophobic colloids | K2  K2  K2  A7, C1  A7, C1  A7, C1  K2  K3 | E  E  E  Im, E  Im, E  Im, E  E  E |
| 8 | Mid-Term Exam 1 (15%) – Units 4-5, 2 | | | |
| 9 | Unit 6 –Reactions in aqueous solutions I: Acids, Bases and Salts  * Properties of aqueous solutions of acids and bases * The Arrhenius Theory * The Hydronium Ion (Hydrated Hydrogen ion) * The Bronsted – Lowry Theory * The autoionization of water * Amphoterism * Strengths of acids * Acid – base reactions in aqueous solutions * Acidic salts and basic salts * The Lewis theory | 1. Describe the Arrhenius theory of acids and bases 2. Describe hydrated hydrogen ions 3. Describe the Bronsted – Lowry theory of acids and bases 4. List properties of aqueous solutions of acids 5. List properties of aqueous solutions of bases 6. Arrange binary acids in order of increasing strengths 7. Arrange ternary acids in order of increasing strengths 8. Describe the Lewis theory of acids and bases 9. Complete and balance equations for acid – base reactions 10. Define acidic and basic salts 11. Explain amphoterism | K12  K12  K12  K12  K12  A1  A1  K12  K12  K12  K12 | Im  Im  Im  Im  Im  E  E  Im  Im  Im  Im |
| 10 | Unit 7 – Reactions in aqueous solutions II: Calculations  * Calculations involving molarity * Titrations: Include back and double titration. * The mole method and molarity * Equivalent weights and normality * The half – reaction method * Adding H+, OH- or H2O to balance Oxygen or Hydrogen * Stoichiometry of redox reactions | 1. Solve acid – base stoichiometry calculations 2. Describe titration and standardization 3. Use the mole method and molarity in acid – base titration reactions 4. Perform calculations involving back and double titration 5. Perform calculations involving equivalent weights and normality of acid and base solutions 6. Balance oxidation – reduction equations 7. Perform calculations associated with redox reactions. | A11  K6  A11  A11  A11  K13  A11 | Im  E  Im  Im  Im  Im  Im |
| 11 | **Unit 8 – Ionic Equilibria 1: Acids & Bases**   * A Review of Strong Electrolytes * The Autoionization of water * The pH and pOH scales | 1. Identify strong electrolytes and calculate concentrations of their ions 2. Understand the autoionization of water 3. Understand the pH and pOH scales 4. Perform calculations involving pH, pOH, kw. | K5  K5  K5  A4 | E  E  E  E |
| 12 | **Unit 9 – Ionic Equilibria II: Buffers & Titration Curves**   * Buffering action * Acid-Base indicators * Strong Acid/Strong Base Titration curves * Weak Acid/Strong Base Titration curves * Weak Acid/Weak Base Titration curves | 1. Recognize buffer solutions and describe their chemistry 2. Explain what acid-base indicators are and how they function 3. Describe the shape and species present at various stages of titration curves for:   (a) strong acids and strong bases,  (b) weak acids and strong bases,  (c) weak acids and weak bases,  (d) strong acids and weak bases. | K14  K14  K7 | Im  Im  E |
| 13 | **Mid-Term Exam 1 (15%) – Units 6-9** | | | |
| 14 | **Unit 10 – Electrochemistry**   * The construction of simple voltaic cells * The Zinc-copper cell * The copper-silver cell * The standard hydrogen electrode * The zinc-SHE cell * The copper-SHE cell * The standard Electrode potentials * Uses of standard electrode potentials * Standard electrode potentials for other half-reactions | 1. Describe the construction of simple voltaic cells from half-cells and a salt bridge, and understand the function of each component 2. Write half-reactions and overall cell reactions for voltaic cells 3. Write and interpret the shorthand notation for voltaic cells 4. Compare various voltaic cells to determine the relative strengths of oxidizing and reducing agents 5. Interpret standard reduction potentials 6. Use standard reduction potentials, Eº, to calculate the potential of a standard voltaic cell, Eºcell 7. Use standard reduction potentials to identify the cathode and the anode in a standard cell 8. Use standard reduction potentials to predict the spontaneity of a redox reaction 9. Use standard reduction potentials to identify oxidizing and reducing agents in a cell or in a redox reaction | K15  K15  K15  K15  A12  A12  A12  A12  A12 | Im  Im  Im  Im  Im  Im  Im  Im  Im |
| 15 | Unit 1 – Liquids and Solid  * Kinetic-Molecular description of liquids and solids * Intermolecular attractions and phase changes * Viscosity * Surface tension * Capillary action * Evaporation * Vapour pressure * Boiling points and distillation * Heat transfer involving liquids * Melting point * Heat transfer involving solids * Sublimation and vapor pressure of solids * Phase diagrams * Amorphous solids and crystalline solids * Structures of crystals * Bonding in solids * Band theory of metals | 1. Describe the properties of liquids and solids and how they differ from gases 2. Understand the kinetic-molecular description of liquids and solids, and show how this description differs from that for gases 3. Use the terminology of phase changes 4. Understand various kinds of intermolecular attractions and how they are related to physical properties such as vapor pressure, viscosity, melting point and boiling point 5. Describe evaporation, condensation, and boiling in molecular terms 6. Calculate the hear transfer involved in warming or cooling without change of phase 7. Calculate the heat transfer involved in phase changes 8. Describe melting, solidification, sublimation, and deposition in molecular terms 9. Interpret P versus T phase diagrams 10. Describe the regular structure of crystalline solids 11. Describe various types of solids 12. Relate the properties of different types of solids to bonding or interactions among particles in these solids 13. Visualize some common simple arrangements of atoms in solids 14. Carry out calculations relating atomic arrangement, density, unit cell size and ionic or atomic radii in simple crystalline arrangements 15. Describe the bonding in metals 16. Explain why some substances are conductors, some are insulators, and others are semiconductors | K1  K1  K1  K8  K8  A5, C1  A5, C1  K8  A2, T4  K9  K9  K9  K9  A6  K9  K9 | E  E  E  Im  Im  Im  Im  Im  E  Im  Im  Im  Im  Im  Im  Im |

**Laboratory Exercises**

There are 10 compulsory laboratory sessions associated with this course. The specific dates for these lab sessions would be given by your class lecturer in the first week of class or posted on E-classroom.

|  |  |  |  |
| --- | --- | --- | --- |
| Lab # | Lab Title | Competency | Level |
|  | Calorimetry | C2, A5 | Im |
|  | Rate of Reactions | C2, T4, A | Im |
|  | Rate law determination of the Crystal Violet reaction | C2, T4, A | Im |
|  | Equilibrium constant for the formation of Ethyl Ethanoate | C2, A3 | Im ,E |
|  | Investigating the properties of solutions | C2, A7 | Im |
|  | pH/Acid-Base Titrimetry | C2, T5 | Im |
|  | Back titration | C2, T5 | Im |
|  | pH/Acid-Base indicators/buffers | C2, T5, T2 | Im, E |
|  | Electroplating of metals | C2, T3, T6, K15 | Im, E |
|  | Melting and boiling points | C2, T1 | Im, E |

For this course, the following grading scheme will be used:

|  |  |  |  |
| --- | --- | --- | --- |
| **Grading system used in AAS for Chemistry** | | | |
| **Mark Range** | **Definitions** | **Grade** | **GPA** |
| 90 – 100 | Excellent | A | 4.0 |
| 85 - 89 | Very good | B+ | 3.5 |
| 80 - 84 | Good | B | 3.0 |
| 75 – 79 | Satisfactory | C+ | 2.5 |
| 70 - 74 | Average | C | 2.0 |
| 65 - 69 | Below average | D+ | 1.5 |
| 60 - 64 | Minimum passing grade | D | 1.0 |
| 0 - 59 | Fail | F | 0.0 |

The mark allocation for this course will be broken down as follows:

|  |
| --- |
| **Mark Allocation system used for AAS in Chemistry** |
| 2 In-course exams at 15% each 30 % |
| These two examinations will consist of multiple choice and/ or structured short- answer questions. You will be informed by your lecturer about the topics to be covered in each test before the exam |
| Assignments 10 % |
| The class assignment/s chosen to be graded for CHEM132 may differ by semester in terms of their number and type as directed by the lecturer. The mark schemes for these assignments will be made available upon distribution of the assignments. |
| Laboratory performance and Reporting 20 % |
| An 80% attendance of Labs is expected for all Science courses. Students are expected to adhere to safety precautions outlined in the Laboratory manual, with special attention to appropriate lab wear (Lab coats and covered shoes.) Students are further expected to be cognizant of the mark penalty for late submission of lab reports and exercises, wheretwo (2) marks per day will be deducted for late assignments. Students are required to submit an explanatory letter and a medical certificate should illness prevent timely completion of an assignment.  Please refer to lab manual for Rubric. |
| Final Examination 40 % |
| See Appendix I for Table of Specification |

Please note: Any late assignments that are not delivered directly to the lecturer must be deposited with the Programme Assistant and signed for in the register. Assignments that are not submitted in the format designated by the lecturer will not be graded.

##### Statement on Academic Dishonesty

“Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the College’s educational mission and the student’s personal and intellectual growth. COSTATT students are expected to bear individual responsibility for their work and to uphold the ideal of academic Integrity. Anu Student who attempts to compromise the academic process will be sanctioned.”

– COSTAATT Academic, Integrity and Honesty Policies and Procedures Handbook.

##### A Quick Note on Citation

***Plagiarism*** is the representation of someone else’s ideas or words as one’s own. It is a serious academic offence that includes:

* Presenting another person’s paper or ideas as original, submitting borrowed, purchased, ghost-written papers and documents downloaded from internet sites.
* Extensive paraphrasing
* Flagrant failure to properly cite sources. This includes uncited ideas, quotations and/ or words.

Students are expected to implement the methods taught in COMM117, COMM118 and LIBS130and should be cognizant of the fact that credit will not be given for work found to be plagiarized. Repeated incidents of plagiarism will result in a failing grade and/or academic sanction.

COSTAATT requires students to adhere to the APA (American Psychology Association) citation standards that require in text citation and a reference list. Details of these requirements are as follows:

* In text citation (Quotes/Paraphrasing)
  + Direct quotation
    - Use quotation marks and include page numbers (when quoting books, journals and periodicals) or paragraph number (para. when quoting online sources.
    - A quotation of 40 or more words should be formatted as a freestanding, indented block of text without quotation marks.
  + Indirect quotation/paraphrasing
  + Citations from a secondary source
* References list
  + - At the end of an assignment, the full bibliographic information for each source cited in text should be provided. *Do not use footnotes*
    - References must be listed in alphabetical order by author and should use the hanging indent format.
  + Books / Reports / DVDs
    - Each reference should include four elements:
      * Author/Editor/Producer
      * Date
      * Title
      * Publication Information
* Periodicals -Serials or periodicals are resources published on a regular basis, such as journals, magazines and newspapers. The elements to be included are:
  + - * Author(s)
      * Date
      * Title of article
      * Title of Periodical
      * Volume, Issue and Page numbers
* Webpages (unpublished and informally published work) Reference to web page should include the following elements :
  + - * Author
      * Date
      * Title
      * Retrieval statement (URL)

##### The Teaching Team for this Course:

In addition to the lecturer, several people are responsible for the smooth and efficient running of this course. From time to time, a student will interact with one of the following people:

* **The Programme Assistants:** Students may leave messages for their lecturer with the Programme Assistant, including late lab submissions. The Programme Assistant also sets up appointments should a student wish to see the Department Chair.
* **Lab Lecturer:** In some courses, team teaching is performed where one lecturer is in charge of the theory component of the course and another, highly qualified lecturer teaches the laboratory component. This lecturer is additionally responsible for collecting and grading lab reports.
* **Lab Technicians:** The Lab Technicians are highly capable individuals who are responsible for setting up labs, assisting with handling samples and equipment during labs and responsible for lab safety procedures and protocols. In case of an emergency, the Lab Technician and Lab Lecturer are responsible for your safety in the lab.
* **IT Support:** Should you experience issues with access, please contact the IT Helpdesk

##### Essential Supplies

* Text books – students should walk with their text books to class and to labs.
* Lab manual – to be provided at the start of the lab component of each course.
* Appropriate Lab wear – slippers, flip-flops and open toed footwear are strictly prohibited in the Labs. Students are also expected to wear protective clothing in labs, for example a lab coat. For the safety of all concerned, the Lab Technician has the responsibility to deny a student access to the lab if they are improperly attired.
* Appropriate Field equipment – Students should keep a separate, hardbound notebook for making field notes in potentially uncomfortable circumstances e.g. pouring rain. Depending on the nature of the field trip, students are expected to dress for safety and comfort by wearing sneakers or hiking boots and walking with a change of clothing.

**TEXTBOOKS:**

Recommended Text:

**Chemistry (Latest Edition)** by Kenneth W. Whitten, Raymond E. Davis, M. Larry Peck, George G. Stanley

ISBN- 10: 049539172-7

ISBN- 13: 978049539172-2

Reference Text:

**Chemistry Principles & Practice (2nd Edition)** by Reger, Goode & Mercer

ISBN-13: [9780030733338](http://www.alibris.com/search/books/isbn/9780030733338)

**AUDIO-VISUAL RESOURCES:**

Multimedia Projector, Laptop with Microsoft Office Word, PowerPoint, Excel, Multimedia Player DVD drive, USB ports and Speakers, Biological Models, Specimens and Charts.

**COURSE COORDINATOR:**

Ms. Risha Kalloo

Natural & Life Sciences Department

COSTAATT

Email: [rkalloo121@gmail.com](mailto:rkalloo121@gmail.com)

**CHAIR:**

Ms. Delamae Wilson

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COSTAATT

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**Appendix I-**

**Tables of Specification for CHEM132 Midterms and Final Examinations**

**Table of Specification for CHEM132 Midterm I- 15%**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item type** | **Competency tested** | **Level** | **Percentage Weighting** |
| MCQ/ T&F/Matching | Knowledge | Im | 30% |
| Analytical Ability | Im | 20% |
| Short answer/ data analysis/ calculations | Knowledge | Im | 30% |
| Analytical Ability | Im | 20% |

**Table of Specification for CHEM132 Midterm II- 15%**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item type** | **Competency tested** | **Level** | **Percentage Weighting** |
| MCQ/ T&F/Matching | Knowledge | Im | 20% |
| Analytical Ability | Im | 20% |
| Short answer/ data analysis/ calculations | Knowledge | Im | 30% |
| Analytical Ability | Im | 20% |
| Essay | Knowledge | Im | 5% |
| Analytical Ability | Im | 5% |

**Table of Specification for CHEM132 Final Examination- 40%**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section** | **Item Type** | **Competency** | **% Weighting** | **Comments** |
| A | MCQ, True/False, Diagram labeling, Matching, Short Answer | Knowledge | 30 |  |
| B | MCQ, T/F, Diagram labeling, Matching, Short Answer | Analysis | 40 |  |
| C | Essay | Analysis | 10 | A rubric is provided in the course outline to guide marking in this section. |
| Effective Communication | 10 |
| D | Diagram labeling, short answer, matching | Technical Expertise | 10 | This question must test, at the appropriate level, topics related to those covered in the laboratory aspect of the course. |

**Appendix II-**

**Rubric for grading Class Assignments**

**Assignment Description:**

The class assignment/s chosen to be graded for CHEM132 may differ by semester in terms of their number and type as directed by the lecturer. The following rubric, however, should be used to guide grading.

**Rubric for CHEM 132 Class Assignments**

|  |  |  |  |
| --- | --- | --- | --- |
| **COMPETENCY** | **PERFORMANCE RANKING** | | |
| **EXCELLENT**  **(8-10)** | **AVERAGE**  **(5-7)** | **POOR**  **(0-4)** |
| **KNOWLEDGE (70%)** | Students display a high level of knowledge as evidenced by accurate answers to most questions. | Students display a moderate level of knowledge as evidenced by accurate answers to some questions. | Students display a low level of knowledge as evidenced by accurate answers to few questions. |
| **COLLABORATION (30%)** | The student is an active part of the class group and participates fully in class discussions and activities as directed by the lecturer. | The student is a fairly active part of the class group and participates in class discussions and activities as directed by the lecturer. | The student is not an active part of the class group and does not participate in class discussions and activities as directed by the lecturer. |

**Appendix III –**

**Rubric for Grading of the Final Examination Essay (20%)**

|  |  |  |  |
| --- | --- | --- | --- |
| **COMPETENCY** | **PERFORMANCE RANKING** | | |
| **EXCELLENT**  **(8-10)** | **AVERAGE**  **(5-7)** | **POOR**  **(0-4)** |
| **EFFECTIVE COMMUNICATION**  **(10%)**  *Sentence*  *Structure,*  *Grammar,*  *Mechanics, &*  *Spelling* | The essay contains the following elements:   1. Sentences which are all well constructed, with variation in structure and length. 2. No grammatical and/or spelling errors 3. Legible handwriting 4. Correct use of paragraphs 5. Correct use of relevant jargon | The essay contains three - four of the required elements. | The essay contains less than three of the required elements. |
| **ANALYTICAL ABILITY**  **(10%)**  *Interpretation of question and use of scientific jargon* | The essay contains the following elements:   1. The question is accurately interpreted. 2. Main ideas are appropriately emphasized, and are well supported by detailed and accurate information and appropriate jargon. 3. The introduction is inviting, states the main topic, and provides an overview of the paper. 4. Information is relevant and presented in a logical order. 5. The conclusion is strong and supported by the main points of the essay. | The essay contains three - four of the required elements. | The essay contains less than three of the required elements. |