

National Commission for Academic Accreditation & Assessment

Course Specification

Institution	KING KHALID UNIVERSITY
College/Department	College of Science – Department of Chemistry

A Course Identification and General Information

1. Course title and code:	General Chemistry (2) – Chem 102
2. Credit hours:	(theoretical + practical) : 3 (2 + 1)
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)	Bachelor Degree in Chemistry (BSc)
4. Name of faculty member responsible for the course	Dr. Ahmed M. Ramadan
5. Level/year at which this course is offered	Level 3 / 2nd Year
6. Pre-requisites for this course (if any)	General Chemistry (1) – Chem 101
7. Co-requisites for this course (if any)	NO– Co–requisites
8. Location if not on main campus	

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

Chemistry 102 is the second course of the freshman chemistry sequence. The course establishes the foundation of almost all subsequent courses of chemistry. The students are expected to recognize basic structure of atomic and molecular systems and to predict the properties and behaviour of elements based on their position in the periodic table. It offers a comprehensive introduction to the chemical bonding, chemical reactions in aqueous solutions, thermochemistry, kinetics for understanding why chemical reactions happen. Weekly laboratory experiments provides hands-on experience with quantitative techniques used by chemists and complement the lecture material.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

- Problem solving skills, relating to qualitative and quantitative information
- E-Learning System is being introduced.
- Students can download course material which can be helpful for the students learning.
- For the research, use internet such as Wikipedia, Googleetc.
- Interpersonal skills, relating to the ability to interact with other people and to engage in team-working through group discussion.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
List of Topics	No of Weeks	Contact hours
The Periodic Table and Some Atomic Properties: Classifying the Elements: The Periodic Law and the Periodic Table, Electronic Configuration of Atoms and Ions, Metals and Nonmetals, Periodic Trends In The Properties of Atoms, The Sizes of Atoms and Ions, Ionization Energy, Electron Affinity, Electronegativity, Magnetic Properties, General Properties of Groups, Properties of Oxides Across a Period.	2	4
Chemical Bonding II: Molecular Geometry, Applying Valence-Shell Electron-Pair Repulsion Theory (VSEPR) Theory, Valence Bond Theory: Hybridization of Atomic Orbitals, Hybridization in Molecules Containing Double and Triple Bonds, Molecular Orbital Theory: MO of Hydrogen Molecule, Bond order, MO of Diatomic Molecules of First Period, MO Diagram of Heteronuclear Diatomics, Delocalized Electrons: Bonding in the Benzene Molecule.	3	6

Introduction to Reactions in Aqueous Solutions: The Nature of Aqueous Solutions, Precipitation Reactions, Solubility Rules, Oxidation-Reduction: Balancing Redox Reactions. Oxidizing and Reducing Agents. - Midterm Exam 1.	2	4
Acid-Base Equilibria: The Arrhenius Theory, Brønsted-Lowry Theory of Acids and Bases, The pH Scale, Strong Acids and Strong Bases, Weak Acids and Weak Bases, Polyprotic Acids, Ions as Acids and Bases, Molecular Structure and Acid-Base Behavior, Lewis Acids and Bases, The Common-Ion Effect in Acid-Base Equilibria, Buffer Solutions, Acid-Base Indicators, Neutralization Reactions and Titration Curves, Solutions of Salts of Polyprotic Acids, Acid-Base Equilibrium Calculations.	3	6
Thermochemistry and Thermodynamics: Heats of Reaction and Calorimetry, Work, The First Law of Thermodynamics, Hess's Law, Enthalpies of Formation, Spontaneous Change, The Concept of Entropy, Second Law of Thermodynamics, Standard Free Energy Change, Free Energy Change and Equilibrium Constant.	2	4
Chemical Kinetics: The Rate of a Chemical Reaction, Effect of Concentration on Reaction Rates, The Rate Law, Zero-Order Reactions, First-Order Reactions, Second-Order Reactions, Reaction Kinetics: Theoretical Models for Chemical Kinetics, The Effect of Temperature on Reaction Rates, Reaction Mechanisms, Catalysis. - Midterm Exam 2.	2	4
Practical General Chemistry (Chem 102):		
Introduction Safety instructions, Use of balance and the metric system	1	2
Chemical Periodicity and Inorganic Nomenclature - Preparation and collection of Cl ₂ gas - Inorganic nomenclature, physical appearance of elements, oxidation states of polyatomic ions	1	2
Estimation of the number of water molecules of crystallization of a hydrated compound	1	2
Physical properties of the elements Allotropy Phenomenon of Sulphur.	1	2
Preparation of standard solutions	1	2
Acid-base titrations - Standardization of HCl by using Standard solution of Na ₂ CO ₃ - Standardization of NaOH by using HCl	2	4

Oxidation-Reduction Reactions - Standardization of KMnO_4 by using Standard solution of Oxalic acid - Titration of Ferrous Sulfate (FeSO_4) by using solution of KMnO_4	2	4
Precipitation Reactions - Determination of Chloride ion by Mohr's Method - Determination of Chloride ion by Vegan's Method	2	4
Determination of the specific heat of metals	1	2
Rates of Chemical Reactions: A Clock Reaction	1	2
Revision	1	2
Final Practical Exam (Quiz + Practical Test)	1	2

2 Course components (total contact hours per semester):				
Lecture: 28	Tutorial: 2	Laboratory 14	Practical/Field work/Internship	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week) - Assignments 4 Hrs - Tutorials 4 Hrs - Blackboard 8 Hrs Total 16 Hrs
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4. Development of Learning Outcomes in Domains of Learning For each of the domains of learning shown below indicate: <ul style="list-style-type: none"> • A brief summary of the knowledge or skill the course is intended to develop; • A description of the teaching strategies to be used in the course to develop that knowledge or skill; • The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.
a. Knowledge
(i) Description of the knowledge to be acquired <ul style="list-style-type: none"> - Describe and compare the properties of gases, liquids and solids. - Know about Quantum Concepts in Chemistry, Electronic Configuration. - Describe the structure and behavior of atoms.

<ul style="list-style-type: none"> - Extract data and information from the periodic table of the elements - Predict the properties and behavior of elements based on their position in the periodic table. - Correctly name chemical substances based on the ratio of the elements in the compound and the type of bonding between the atoms - Understand the process of chemical bonding and predict what type of bonds will form between different substances. - Able to deal with the scientific data in English and solving problems related to qualitative and quantitative information.
<p>(ii) Teaching strategies to be used to develop that knowledge</p> <ul style="list-style-type: none"> - Class room lectures - Power point representations - Introductory lecture gives an overview of the content and significance of the course and of its relationship to students' existing knowledge. Each subsequent lecture begins with a similar overview linking the particular content of the presentation to the general overview. - Meeting individual students during office hours to solve their problems related to language learning, and encourages them to enjoy learning the new language. - Assignments - Individual handwritten assignments require use of library reference material and web sites to identify information required to complete tasks. - E-learning through university website
<p>(iii) Methods of assessment of knowledge acquired</p> <p>Questions may be in the form of: multiple choice, matching, fill in the blank, short answers, and problems</p> <ul style="list-style-type: none"> - First Midterm Exam : 10 % - Second Midterm Exam: 10 % - Assignments: 5 % - Practical 25% - Final examination: 50%
<p>b. Cognitive Skills</p>
<p>(i) Description of cognitive skills to be developed</p> <ul style="list-style-type: none"> - English Language skills, - Symbolic thinking skills, - Reasoning, Perception, and Intuition, - Attention, Memory, Self-regulation, and Motor executive functions - Interpreting, Analysing, Summarizing, and Evaluating the reading materials, - Comparing and contrasting - Storing, manipulating, and retrieving information - The ability to use the Internet for more information specially you tube. - Demonstrate good understanding and retention of basic and advanced chemical principles.
<p>(ii) Teaching strategies to be used to develop these cognitive skills</p>

<ul style="list-style-type: none"> - Making connections between different concepts across the domains. - Using charts and concept maps. - Assigning research questions that can be answered through collecting and analyzing data. - Summarizing the findings of the online research. - Using the instructor's webpage learning activities. - Provide experimental evidence and theoretical interpretations of atoms properties and its appearance. - Demonstrate knowledge and understanding of concepts, principles and theories relating to atomic structure and molecular bonding types
<p>(iii) Methods of assessment of students cognitive skills</p> <ul style="list-style-type: none"> - Discussing and evaluating the topics that students learn from their textbooks and other sources. - Assignments, Midterm Exams and Final examination at the end of semester. - Solving general chemistry problems related to qualitative and quantitative information at the end of each topic. - Individual assignments for developing/solving a task.
<p>c. Interpersonal Skills and Responsibility</p>
<p>(i) Description of the interpersonal skills and capacity to carry responsibility to be developed</p> <ul style="list-style-type: none"> - The essential components of communication skills are based on developing critical skills, observation, and feedback. - Encouraging students to use online resources. - Using the Internet to collect statistical data - Using Microsoft Office (e.g. Excel, Microsoft Access, front page) to analyze data and prepare statistical reports.
<p>(ii) Teaching strategies to be used to develop these skills and abilities</p> <ul style="list-style-type: none"> - Using PowerPoint (it's easy to cover more material quickly). - Provide good quality handouts or copies of slides as appropriate (printed no more than four slides).The slides should be clear, well illustrated, referenced and informative. - Group discussion - Online workshops
<p>(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility</p> <ul style="list-style-type: none"> - Assessment of group assignment includes component for individual contribution. - Providing opportunities for observed practice. - Providing feedback. - Encouraging self-assessment during the learning process.
<p>d. Communication, Information Technology and Numerical Skills</p>
<p>(i) Description of the skills to be developed in this domain.</p> <ul style="list-style-type: none"> - Communicating personal ideas and thoughts. - Responding to class discussions. - Developing teamwork skills. - Collaboration to finish team assignments. - Presenting reports on their reading. - What relation of Data, Information, and Knowledge
<p>(ii) Teaching strategies to be used to develop these skills</p>

<ul style="list-style-type: none"> - Debates - Group working. - Student assignments for writing and presenting skills for general chemistry concepts.
<p>(iii) Methods of assessment of students numerical and communication skills</p> <ul style="list-style-type: none"> - Instructor's feedback - Test questions require solving of simple and advanced general chemistry problems. - Assessments of student's assignments.
<p>e. Psychomotor Skills (if applicable)</p>
<p>(i) Description of the psychomotor skills to be developed and the level of performance required</p>
<p>(ii) Teaching strategies to be used to develop these skills</p>
<p>(iii) Methods of assessment of students psychomotor skills</p>

5. Schedule of Assessment Tasks for Students During the Semester			
Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm Examination – I	7	10%
2	Midterm Examination – II	14	10%
3	Assignments and HWs	6 & 13	5%
4	Practical		25%
5	Final Examination	16	50%

D. Student Support

<p>1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)</p> <p>The faculty member has 2 hours per week for these cases.</p>
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E Learning Resources

<p>1. Required Text(s)</p> <p>Ralph H. Petrucci, William S. Harwood, and F. Geoffrey Herring, "General Chemistry, Principles and Modern Applications", 10th Edition, Prentice Hall, 2009.</p>
<p>2. Essential References</p>

<ol style="list-style-type: none"> 1. Raymond Chang, Jason Overby, "General Chemistry: The Essential Concepts", 6th Ed., McGraw Hill, 2010. 2. Julia Burdge, "Chemistry", 2nd Ed., McGraw Hill, 2011.
<p>3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)----- For <u>Practical (required Text)</u>:</p> <ol style="list-style-type: none"> 1. Brown, Theodore E., John H. Nelson, Kenneth C. Kemp, Matthew Stoltzfus. Laboratory Experiments for Chemistry: The Central Science, 12th Edition. Prentice Hall, 2012. <p><u>Essential References:</u></p> <ol style="list-style-type: none"> 2. Jo A. Beran, "Laboratory Manual for Fundamentals of Chemistry ", 2nd Edition, John Wiley & Sons, 1984.
<p>4-.Electronic Materials, Web Sites etc</p> <p style="text-align: center;">http://antoine.frostburg.edu/chem/senese/101/index.shtml</p>
<p>5- Other learning material such as computer-based programs/CD, professional standards/regulations</p> <p style="text-align: center;">Cases and handouts will be distributed to students</p>

F. Facilities Required

<p>Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)</p>
<p>1. Accommodation (Lecture rooms, laboratories, etc.)</p> <p>Air-conditioned rooms (45 seats)</p>
<p>2. Computing resources</p> <p>MS-Office Software and Internet connection</p>
<p>3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)</p> <p>Overhead projector Computer for individual students Internet access</p>

G Course Evaluation and Improvement Processes

<p>1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching</p> <ul style="list-style-type: none"> - Confidential completion of standard course evaluation questionnaire. - Focus group discussion with small groups of students.
<p>2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department</p>

<ul style="list-style-type: none"> - Observations and assistance from colleagues, independent assessment of standards achieved by students, - Independent advice on assignment tasks, etc.
<p>3 Processes for Improvement of Teaching</p> <p style="text-align: center;">Developing the lectures periodically</p>
<p>4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)</p> <p style="text-align: center;">Meetings are conducting with teachers for checking the grading of the exams.</p>
<p>5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.</p> <ul style="list-style-type: none"> - Teachers' survey - Students' survey