Course Specification
(Bachelor)

Course Title:	General Chemistry (1)
Course Code:	CHM 1101
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	1
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 4 (2,2, 2)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 1/ First year					
4. Course general Description:					
This introductory and general chemistry course covers fundamental observations, laws, and theories of chemistry at the basic level. Topics include atoms/molecules, stoichiometry, acids/bases, solutions, equilibrium, gases, solids, liquids, thermodynamics, the periodic table, and chemical bonding. The chemistry lab is taken in parallel with the course and covers the following basic experiments: density, mass-mass relationship, limiting reactant, acid-base titrations, solubility product, reactions in aqueous solution, Calorimetry and redox reactions.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
By the end of this course the student able to: • Recognize atoms, molecules and ions, atomic theory, structure of the atom, isotopes, chemical formulas, naming compounds, stoichiometry, Avogadro's number, mass spectrometer, empirical formulas, chemical equations, limiting reagents and changes taking place. • Describe chemical reactions in aqueous solutions and their general proprieties. • Recall types of chemical reactions (precipitation, acid-base, oxidation-reduction). • Solve ideal gas equation, stoichiometric data, partial pressures and the kinetic molecular theory of gases,					

- Identify quantum theory, electronic structure, Bohr's theory, dual nature of electron, quantum mechanics, and electron configuration, periodic classification periodic variation in physical properties, ionization energy, and electron affinity.
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2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	88	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	60
2.	**Laboratory/Studio**	28
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		88

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	To recognize the atomic theory and structure of the atom.	K1, K3	Lecturing	Short quizzes
1.2	To describe different phenomena related to	K1	Solving problems, Homework and assignment	Homework and assignment marks and written exams

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	chemical reactions and its stoichiometry.			
1.3	To list gases laws and their physical properties.	K1, K3	Discussions, Laboratory classes	Quizzes and MCQs, laboratory report
1.4	To define the principles of safety, list of emergency responses and outline the routes of exposures to hazards, the minimization, and controlling and laboratory management.	K4	Discussions, Laboratory classes	Quizzes and MCQs, laboratory report
2.0	Skills			
2.1	To differentiate between protons, neutrons and electrons.	S1	Lecturing and oral discussion	Short quizzes and Multiples Choice Questions
2.2	To calculate and balance chemical equations.	S1	Lectures supported by laboratory experiments	Homework assignment, Examination and laboratory sheet
2.3	To interpret the ideal gas laws and illustrate chemical calculations.	S1,S3	Lecturing and oral discussion supported by laboratory experiments	Examination and laboratory report
2.4	To demonstrate ability to do oral communication and technical writing skills through writing and oral presentation of mini reports, operate electronic mail and Network in communicating with others.	S1, S2, S3	• Oral participation • Group discussions and lab experiment and reports • Encourage students to use electronic mail to submit homework and assignments.	• Oral tests and lab performance, reports and sheets Marks Assignments and homework marks
3.0	Values, autonomy, and responsibility			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	To illustrate contribution in teamwork and raise Knowledge during various evaluations, initiatives, and Lab-reports to uphold scientific integrity.	V1;V2	• Group discussion, assignments and homework • Lab-reports Virtual labs and demonstrations	• Oral tests, lab performance, Lab-reports and sheets Marks • Assignments and homework marks
3.2	To appraise teamwork, and adapt to the work environment culture as well as link theoretical study with practical reality.	V2	• Group discussion, assignments and homework • Lab-reports • Virtual labs and demonstrations	• Oral tests, lab performance, Lab-reports and sheets Marks • Assignments and homework marks

C. Course Content

No	List of Topics	Contact Hours
1.	The Study of Change: Science for the twenty-first century, the study of chemistry, the scientific method and hypothesis, a law and theory, matter and substance, mixture, physical means, elements and compounds, classification of matter, The three state of matter, Types of changes, Physical and chemical properties of matter, Extensive and Intensive properties, Measurement, handling numbers, Accuracy and precision	8
2.	Atoms, Molecules and Ions: The atomic theory, Dalton's atomic theory, Cathode ray tube, Millikan's experiment, Types of radioactivity, Thomson's model, Rutherford's experiment, The structure of the atom, Atomic number, Masse number, Isotopes, The periodic table, Molecules and ions, Formulas and models, Chemical formulas, molecular formula, empirical formula, Formula of Ionic compounds, Chemical nomenclature, Naming compounds, Organic chemistry.	10
3	Masse Relationships in chemical reactions (Stoichiometry): The mole, Avogadro's number, Molar mass, Molecular mass, Formula mass, the mass spectrometer, Percent composition and empirical formula, Experimental determination of empirical formulas, Chemical reaction, Chemical equations, Balancing chemical equations, Amounts of reaction and reactants and products, Reaction Yield, Limiting reagents.	10
4	Reaction in aqueous solutions: General proprieties of aqueous solutions, Solution, solute, solvent, An electrolyte and nonelectrolyte, Precipitation reactions, Solubility, Properties of acids, Properties of bases, Arrhenius acid and base, Brønsted acid and base, Neutralization reaction. Oxidation-reduction reactions,	8

	Oxidation number, Types of oxidation-reduction reactions, Solution Stoichiometry, Concentration, dilution, indicators, Equivalence point, Gravimetric analysis, Acid base titrations, Redox titrations.	
5	Gases: Physical characteristics of gases, Units of pressure, Boyle's law, Charles' & Gay-Lussac's Law, Avogadro's law, and The gas laws. The ideal gas equation, Gas stoichiometry, Dalton's law of partial pressures, The kinetic molecular theory of gases, Molecular Speed Distribution, Gas diffusion, Gas effusion, Deviations from ideal behavior.	8
6	Quantum Theory and the Electronic Structure of Atoms: Properties of waves, Line emission spectrum, Bohr's model of the atom, The dual nature of the electron, Schrodinger Wave Equation, Quantum numbers, Atomic Orbitals, Aufbau principle, Hund's rule, Electron Configuration.	8
7	The Periodic Table: Development of the periodic table, ground state electron configurations of the elements, classification of the elements, electron configurations of cations and anions, isoelectronic, effective nuclear charge, atomic radii, ionization energy, electron affinity, diagonal relationships on the periodic table, properties of oxides across a period.	8
Total		60

No	List of Experiments	Contact hours
1	Safety and precautioins in the chemistry laboratory.	2
2	Density of liquids ,water , alcohol, oil	2
3	Density of regular and irregular solids	2
4	Preparation of primary standard solutions.	2
5	Standardization of a secondary standard solution.	2
6	The chemical composition by mass percentage	2
7	Stoichiometry: Mass-mass relationship	2
8	Determination of the empirical formula	2
9	Strong acid-strong base titration	2
10	Vinegar Analysis, Mass %	2
11	Reactions in Aqueous Solutions & Precipitation reaction & Limiting reactant	2
12	Redox titration of Fe^{2+}	2
13	Determination of the specific heat of metal	2
14	Revision	2
Total		28

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation, Homework	All the semester	10 %
2.	Laboratory	All the semester	30 %
3.	Midterm Exam 1	Around 6th & 7th week	10 %
4.	Midterm Exam 2	Around 11th & 12th week	10%
5.	Final Exam	Around 16-17th week	40 %
6.	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Chemistry***, Raymond CHANG, Mc Graw Hill, 10thEducation, 2010, ISBN 9780073511092.
Supportive References	• Chemistry, Steven S. Zumdahl and Susan A. Zumdahl, Houghton Mifflin, 7thEdition, 2006, ISBN: 061852844X • Laboratory Manual for Principles of General Chemistry, J. A. Beran,, 7th Edition, John Wiley & Sons Inc., 2004.
Electronic Materials	•Blackboard •http://highered.mcgrawhill.com/classware/ala.do?isbn=0073048518&alaid=ala_1136810&protected=true&showSelfStudyTree=true •http://www.chem1.com/acad/webtext/virtualtextbook.html •http://www.shodor.org/UNChem/index.html
Other Learning Materials	**Internal server: www. Elesevier.com**

2. Required Facilities and equipment

Items	Resources
facilities	• **Each classroom is equipped with PC and retro projector with a maximum of 25 students.**

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each Laboratory should be equipped with maximum 25 seats** • **In each laboratory, a list of safety and precautions are provided.** • **In each lab has proper ventilation, and well equipped with instruments.** • **In each lab, containers for solid waste, liquid waste, and crushed glasses.** • **Each lab has a small pharmacy for first aid in case of an accident** • **In each lab, the rules, conditions, and safety mechanism as well list of Risk, Safety precautions according to Merck Catalogue are hanging in the labs.**
Technology equipment (projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (depending on the nature of the specialty)	• **Appropriate Glasswares for carrying the requested experiments (burrete, pipets, conical flasks, beakers, measuring cyliders, curecibles, dishes, funnels, buchner, buchner flasks)** • **Appropriate chemicals and solvents (Sodium hydroxide, Barium Chloride, Hydrochloric acid, Sulphuric acid, phenolphthalein, methyl orange, ferric sulphate, ferrous sulphate, potassium permanganate, lead acetate)** • **Furnace Oven, Analytical balance (3 digits), Drying oven** • **Filter papers , clamps, stands**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	Students	**Indirect:** Second examiner checklist-Course report.

Assessment Areas/Issues	Assessor	Assessment Methods
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Lab Performance	Students	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.
	Course Responsible	

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**7 (NO. 2/3)**
DATE	**29/3/1446 - 2/10/2024**