



# **King Saud University**

Department of Chemistry



## **CHEM 101 & 103 General Chemistry**

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### **First Semester 2013/2014**

**Credit Hours:** 4 hours (1+3).

**Time:** Section 23291: Sun, Tue and Thu 01:00–01:50.

Section 23275: Sun, Tue and Thu 02:00–02:50.

**Lecture Theater:** Section 23291: building No. 5 (B 047).

Section 23275: building No. 5 (A 078).

**Course Coordinator:** Prof. Abdulaziz Alwasil.

**Instructor:** Dr. Ahmad Aqel.

**Web Site:** [fac.ksu.edu.sa/aifseisi](http://fac.ksu.edu.sa/aifseisi)

**Office No.:** AA53.

**Office Hours:** Sun, Tue and Thu: 10:00–11:00, Mon and Wed: 11:00–12:00.

**E-mail:** [aifseisi@ksu.edu.sa](mailto:aifseisi@ksu.edu.sa)

**Textbook:** Chemistry, The Central Science, 11<sup>th</sup> Ed., By T. Brown, H. LeMay, B. Bursten and C. Murphy.

## **Course contents**

### **I. Introduction (7 Lectures)**

#### **1.4** Units of measurement

### **II. Stoichiometry**

#### **3.1** Chemical equations

#### **3.2** Some simple patterns of chemical reactivity

#### **3.3** Formula weights

#### **3.4** Avogadro's number and the mole

#### **3.5** Empirical formulas from analyses

#### **3.6** Quantitative information from balanced equations

#### **3.7** Limiting reactants and theoretical yields

#### **4.5** Concentrations of solutions

#### **13.4** Ways of expressing concentration

### **III. Gases (6 Lectures)**

#### **10.1** Characteristics of gases

#### **10.2** Pressure

#### **10.3** The gas laws

#### **10.4** The ideal gas equation

#### **10.5** Further applications of the ideal gas equation

#### **10.6** Gas mixtures and partial pressures

#### **10.7** Kinetics molecular theory

#### **10.8** Molecular effusion and diffusion

#### **10.9** Real gases deviations from ideal behavior

### **First Exam (15%)**

### **IV. Thermochemistry and Thermodynamics (6 Lectures)**

#### **5.1** The nature of energy

#### **5.2** The first law of thermodynamics

#### **5.3** Enthalpy

#### **5.4** Enthalpies of reaction

#### **5.5** Calorimetry (heat capacity, specific heat)

#### **5.6** Hess's law

#### **5.7** Enthalpies of formation

### **V. Properties of Solutions (6 Lectures)**

#### **13.1** The solution process

#### **13.3** Factors affecting solubility (pressure, temp)

#### **13.5** Colligative properties (van't Hoff factor)

### **VI. Chemical Kinetics (5 Lectures)**

#### **14.1** Factors that affect reaction rates

#### **14.2** Reaction rates

#### **14.3** The rate law: the effect of concentration on rate

#### **14.4** The change of concentration with time, the half-life (first order reactions only)

#### **14.5** Temperature and rate

### **Second Exam (15%)**

### **VII. Chemical Equilibrium (5 Lectures)**

#### **15.1** The concept of equilibrium

#### **15.2** The equilibrium constant

#### **15.3** Interpreting and working with equilibrium constants

#### **15.4** Heterogeneous equilibria

#### **15.5** Calculating equilibrium constants

#### **15.6** Applications of equilibrium constants

#### **15.7** Le Chatelier's principle and its applications on equilibria

### **VIII. Acid Base Equilibria (7 Lectures)**

#### **16.1** Acids and bases

#### **16.2** Bronsted-Lory acids and bases

#### **16.3** The auto-ionization of water

#### **16.4** The pH scale

#### **16.5** Strong acids and bases

#### **16.6** Weak acids

#### **16.7** Weak bases

#### **16.8** Relationship between $K_a$ and $K_b$

#### **16.9** Acid-base properties of salt solutions

#### **17.1** The common ion effect

#### **17.2** Buffered solutions

#### **17.4** Solubility equilibria, the solubility product $K_{sp}$

### **Final Exam (40%)**

#### **All contents**