**Ankara Üniversitesi  
Kütüphane ve Dokümantasyon Daire Başkanlığı**

**Açık Ders Malzemeleri**

Ders izlence Formu

|  |  |
| --- | --- |
| Dersin Kodu ve İsmi | CHM101 |
| Dersin Sorumlusu | PROF.DR. MERAL KARAKIŞLA ŞAHİN |
| Dersin Düzeyi | LİSANS |
| Dersin Kredisi | Kredi: 3, AKTS . 5 |
| Dersin Türü | ZORUNLU |
| Dersin İçeriği | Chemical Basic Definitions, Fundamental Chemical Laws, Dalton’s Atomic Theory, The law of conservation of mass, The Law of Definite Prportions, The Law of Multiple Proportions  Stoichiometry and Chemical Calculations, Determining Empirical and Molecular Formulas  Chemical Equations  Atomic Structure and Periodicity  Bonding: General Concepts, Chemical Bonding and Molecular Geometry |
| Dersin Amacı | It is purpose to explain results and laws in general chemistry, To learn knowledge about the different properties of matter, to investigate chemical equations and product calculations of what may be occurring in chemstry technology by scientific ways, to determine of molcular structure by using relating models. |
| Dersin Süresi | 4 saat/hafta |
| Eğitim Dili | İNGİLİZCE |
| Ön Koşul | --- |
| Önerilen Kaynaklar | 1-Chang, Raymond. "Hybridization of Atomic Orbitals." Physical Chemistry for the Biosciences. Sansalito, CA: University Science, 2005. 450-55..  2-Petrucci, Ralph H. "Hybridization of Atomic Orbitals." General Chemistry: Principles and Modern Applications. 9th ed. Upper Saddle River, NJ: Pearson/Prentice Hall, 2007. |
| Dersin Kredisi | 5 |
| Laboratuvar | -- |
| Diğer-1 |  |

**2.3.4. Hafta**

**Stoichiometry and Chemical Calculations**

Counting by Weighing

Atomic Masses

The Mole

Molar Mass

Percent Composition of Compounds

Determining the Formula of a Compound

Formula Mass and the Mole Concept . . . . . . . . . . . . . . . . . . . . . . . . . . 130

Determining Empirical and Molecular Formulas

Chemical Equations

Balancing Chemical Equations

Stoichiometry of Chemical Reactions . . . . . . . . . . . . . . . . . . . . . . . . . 175

Writing and Balancing Chemical Equations

Stoichiometric Calculations: Amounts of Reactants and

Calculations Involving a Limiting Reactant

Classifying Chemical Reactions . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1

Reaction Stoichiometry . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Reaction Yields . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**5.6.7. Hafta**

Early Ideas about Atom

Early Experiments to Characterize the Atom

The Modern View of Atomic Structure:

Evolution of Atomic Theory . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Atomic Structure and Symbolism

Electromagnetic Radiation 275

The Atomic Spectrum of Hydrogen 284

The Bohr Model . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Electronic Structure of Atoms

Quantum Numbers 293

Orbital Shapes and Energies 295

Electron Spin and the Pauli Principle 296

Introduction to the Periodic Table

Periodic Trends in Atomic Properties 309

The Properties of a Group

**8.9.10.11.Hafta**

**Bonding: General Concepts** 328

**8.1** Types of Chemical Bonds 330

Chapter 7: Chemical Bonding and Molecular Geometry . . . . . . . . . . . . . . . . . . . .

Ionic Bonding . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Covalent Bonding . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Lewis Symbols and Structures . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Formal Charges and Resonance . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 365

Strengths of Ionic and Covalent Bonds . . . . . . . . . . . . . . . . . . . . . . . . . .

Molecular Structure and Polarity . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**8.2** Electronegativity 333

**8.3** Bond Polarity and Dipole Moments 335

**8.4** Ions: Electron Configurations and Sizes 338

**8.5** Energy Effects in Binary Ionic Compounds 342

**8.6** Partial Ionic Character of Covalent Bonds 346

**8.7** The Covalent Chemical Bond: A Model 347

**8.8** Covalent Bond Energies and Chemical Reactions 350

**8.9** The Localized Electron Bonding Model 353

**8.10** Lewis Structures 354

**8.11** Exceptions to the Octet Rule 358

**8.12** Resonance 362

**8.13** Molecular Structure: The VSEPR Model 367

**Covalent Bonding: Orbitals** 390

**9.1** Hybridization and the Localized Electron Model 391

**9.2** The Molecular Orbital Model 403

**9.3** Bonding in Homonuclear Diatomic Molecules 406

**9.4** Bonding in Heteronuclear Diatomic Molecules 412

**9.5** Combining the Localized Electron and Molecular

Orbital Models 413

Chapter 8: Advanced Theories of Covalent Bonding . . . . . . . . . . . . . . . . . . . . . . . . 413

8.1 Valence Bond Theory . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 414

8.2 Hybrid Atomic Orbitals . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 418

8.3 Multiple Bonds . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 430

8.4 Molecular Orbital Theory . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 433

---------------------------------------------------------------------------------------------------------------------------

**The Nucleus: A Chemist’s View**

**18.1** Nuclear Stability and Radioactive Decay 841

**18.2** The Kinetics of Radioactive Decay 846

**18.3** Nuclear Transformations 849

**18.4** Detection and Uses of Radioactivity 852

**18.5** Thermodynamic Stability of the Nucleus 856

**18.6** Nuclear Fission and Nuclear Fusion 859

**18.7** Effects of Radiation 863

Chapter 21: Nuclear Chemistry . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1175

21.1 Nuclear Structure and Stability . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1176

21.2 Nuclear Equations . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1183

21.3 Radioactive Decay . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1186

21.4 Transmutation and Nuclear Energy . . . . . . . . . . . . . . . . . . . . . . . . . . 1198

21.5 Uses of Radioisotopes . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1213

21.6 Biological Effects of Radiation . . . . . . .

**Liquids and Solids** 424

**10.1** Intermolecular Forces 426

**10.2** The Liquid State 429

**10.3** An Introduction to Structures and Types of

Solids 430

**10.4** Structure and Bonding in Metals 436

**10.5** Carbon and Silicon: Network Atomic Solids 444

**10.6** Molecular Solids 454

**10.7** Ionic Solids 456

**10.8** Vapor Pressure and Changes of State 459

**10.9** Phase Diagrams 467

Chapter 10: Liquids and Solids . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 525

10.1 Intermolecular Forces . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 526

10.2 Properties of Liquids . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 539

10.3 Phase Transitions . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 545

10.4 Phase Diagrams . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 556

10.5 The Solid State of Matter . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 564

10.6 Lattice Structures in Crystalline Solids . . . . . . . . . . . . . . . . . . . . . . . . . 570

**11 Properties of Solutions** 484

**11.1** Solution Composition 485

■ **CHEMICAL IMPACT** Electronic Ink 488

**11.2** The Energies of Solution Formation 488

**11.3** Factors Affecting Solubility 492

■ **CHEMICAL IMPACT** Ionic Liquids? 494

■ **CHEMICAL IMPACT** The Lake Nyos Tragedy 497

**11.4** The Vapor Pressures of Solutions 497

■ **CHEMICAL IMPACT** Spray Power 500

**11.5** Boiling-Point Elevation and Freezing-Point

Depression 504

**11.6** Osmotic Pressure 508

**11.7** Colligative Properties of Electrolyte Solutions 512

**12 Chemical Kinetics** 526

**12.1** Reaction Rates 527

**12.2** Rate Laws: An Introduction 532

**12.3** Determining the Form of the Rate Law 534

**12.4** The Integrated Rate Law 538

**12.5** Rate Laws: A Summary 548

**12.6** Reaction Mechanisms 549

**12.7** A Model for Chemical Kinetics 552

**12.8** Catalysis 557

**13 Chemical Equilibrium** 578

**13.1** The Equilibrium Condition 579

**13.2** The Equilibrium Constant 582

**13.3** Equilibrium Expressions Involving Pressures 586

**13.4** Heterogeneous Equilibria 588

**13.5** Applications of the Equilibrium Constant 591

**13.6** Solving Equilibrium Problems 600

**13.7** Le Chatelier’s Principle 604

For Review 610 • Key Terms 610 • Questions and

Exercises 613

**Acids and Bases** 622

**14.1** The Nature of Acids and Bases 623

**14.2** Acid Strength 626

**14.3** The pH Scale 631

**14.4** Calculating the pH of Strong Acid

Solutions 634

**14.5** Calculating the pH of Weak Acid

Solutions 635

**14.6** Bases 644

**14.7** Polyprotic Acids 650

**14.8** Acid–Base Properties of Salts 655

**14.9** The Effect of Structure on Acid–Base

Properties 661

**14.10** Acid–Base Properties of Oxides 662

**14.11** The Lewis Acid–Base Model 663

**14.12** Strategy for Solving Acid–Base Problems:

**15 Applications of Aqueous Equilibria** 680

**Acid–Base Equilibria 681**

**15.1** Solutions of Acids or Bases Containing

a Common Ion 681

**15.2** Buffered Solutions 684

**15.3** Buffering Capacity 693

**15.4** Titrations and pH Curves 696

**15.5** Acid–Base Indicators 711

**Solubility Equilibria 717**

**15.6** Solubility Equilibria and the Solubility

**15.7** Precipitation and Qualitative Analysis 724

**Complex Ion Equilibria 731**

**15.8** Equilibria Involving Complex Ions 731

For Review 736 • Key Terms 736 • Questions and

Exercises 739

**16 Spontaneity, Entropy, and Free**

**Energy** 748

**16.1** Spontaneous Processes and Entropy 749

**16.2** Entropy and the Second Law of

Thermodynamics 755

**16.3** The Effect of Temperature on Spontaneity 756

**16.4** Free Energy 759

**16.5** Entropy Changes in Chemical Reactions 762

**16.6** Free Energy and Chemical Reactions 766

**16.7** The Dependence of Free Energy on Pressure 770

**16.8** Free Energy and Equilibrium 774

**16.9** Free Energy and Work 778

**4 Types of Chemical Reactions and**

**Solution Stoichiometry** 126

**4.1** Water, the Common Solvent 127

**4.2** The Nature of Aqueous Solutions: Strong and Weak

Electrolytes 129

**4.3** The Composition of Solutions 133

**4.4** Types of Chemical Reactions 140

**4.5** Precipitation Reactions 140

**4.6** Describing Reactions in Solution 145

**4.7** Stoichiometry of Precipitation Reactions 147

**4.8** Acid–Base Reactions 149

**4.9** Oxidation–Reduction Reactions 154

Oxidation? 160

**4.10** Balancing Oxidation–Reduction

**Gases** 178

**5.1** Pressure 179

**5.2** The Gas Laws of Boyle, Charles, and Avogadro 181

**5.3** The Ideal Gas Law 186

**5.4** Gas Stoichiometry 190

**5.5** Dalton’s Law of Partial Pressures 194

**5.6** The Kinetic Molecular Theory of Gases 199

**5.7** Effusion and Diffusion 206

**5.8** Real Gases 208

**5.9** Characteristics of Several Real Gases 210

**5.10** Chemistry in the Atmosphere 211