

Contents

สมุดของหนังสือ
โครงการศึกษาเคมีพื้นฐาน

Part One Introduction

1



Chemistry: A Look into the Past

3

Chemistry: Some Accomplishments; Some Concerns 4

A Look into the Past 7

Theories of Combustion 11

Matter, Mass, Physical and Chemical Properties, and Substances 13

Chemical Reaction 15

Physical versus Chemical Change 18

Elements; Compounds 18

Mixtures 19

More Chemical Language 21

Review Questions 23



Chemical Reactions: What Happens?

25

Dalton's Atomic Theory: The Dawn of Modern Thought 26

Explanations for the Law of Conservation of Mass and the Law of Definite Proportions 26

Symbols, Formulas, and Equations 27

Molecules 28

Atomic Mass 30

Molecular Mass 30

Review Questions 31

Part Two Atoms: Structure and Interaction 33



The Divisible Atom 35

Atoms and Electricity: The Connection	36
Discovery of the Electron	38
Electrons and Ions in Solution	39
Radioactivity: Goodbye to Dalton's Atom	41
If You Cannot See It, How Do You Know What It Looks Like?	43
The Bohr Theory: Still More Progress	47
Quantum Numbers	49
Review Questions	52



The Periodic Table: Past to Present 54

Mendeleev's Periodic Table	55
The Modern Periodic Table	57
A Quick Look Back at Those Electrons	62
Review Questions	63



Nuclear Chemistry and Nuclear Energy 64

Radioactivity: Straight from the Nucleus	65
Half-Life and Background Radiation: We Have to Live with Them	67
Man-Made Isotopes: Nonradioactive and Radioactive	68
Some Nuclei Can Become Violent: Nuclear Fission	69
Harnessing Fission with Nuclear Reactors: Benefits and Problems	71
Radioactivity in the Service of People	77
Review Questions	84



Bonding and Chemical Reactions 85

Ionization Energy	86
Metals	87
Nonmetals	89
The Rare or Inert Gases	91
Types of Bonds	92
Review Questions	98



7 Acids, Bases, and Chemical Reactions 100

The Solvent Capacities of Water 101
 Solutions of Acids and Bases 102
 Salts 105
 Chemical Reactions in Solution: Two Types 106
 Rate of Reaction: How Can It be Increased? 107
 Reversible Reactions and Equilibrium 110
 Energy and Entropy: Some Thermodynamics 113
 Review Questions 116

Part Three Metals: Treasures of the Earth 119



8 Metals I: Metals and Metallurgy 121

The Properties of Metals 122
 Metals in Nature 127
 Metallurgical Operations 128
 Review Questions 136



9 Metals II: Iron, Aluminum, and Copper 137

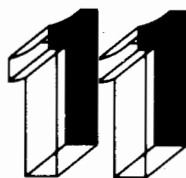
Iron 138
 Aluminum 148
 Copper 154
 Review Questions 160



10 Metals III: Lead, Sodium, and Uranium 161

Lead 162
 Sodium and Sodium Hydroxide 169
 Uranium 176
 Review Questions 181

Part Four Carbon Compounds: Small and Large 183



11 Organic Chemistry 185

Bonding in Carbon Compounds 186
 Hydrocarbons: Saturated and Unsaturated 189
 Families of Organic Chemicals 193
 Hydrocarbons and Organic Halogens 196

Alcohols	197
Ethers, Aldehydes, and Ketones	202
Acids and Esters	203
Organic Ring Compounds	206
Families with Two Functional Groups	207
Naming Organic Compounds	210
Review Questions	212

12

Biopolymers

214

Biopolymers: The Molecular Basis of Life	215
More Biopolymers	226
The Geometry of Molecules	232
In the Beginning . . .	234
Review Questions	235

13

Oil: What Do We Get From It?

237

Way Back and Not So Way Back	238
Origin and Varieties of Oil	243
Fractional Distillation of Oil: Separating Groups of Molecules	247
Does Your Car Engine Knock?	253
Petrochemicals	256
Review Questions	259

14

From Oil to Plastics

261

What Are Plastics?	263
Addition Polymerization	264
Condensation Polymerization	267
Some Thermosetting Plastics	269
Thermoplastics	276
A Final Thought	280
Review Questions	280

Part Five And Still More Chemicals: Drugs 281**15****Drugs I: Anesthetics 283**

- Anesthetics and the Nervous System: Some Basics 284
- A History of Anesthesia 285
- Preparation and Properties of Some Anesthetics 287
- Mechanism of Action: Do We Know Why Anesthetics Work? 292
- Some More Anesthetics: Take the Local 292
- Review Questions 295

16**Drugs II: Barbiturates, Narcotics, Mood-Changing Drugs, and More 296**

- Barbiturates 297
- Narcotics 301
- Review Questions 319

17**Drugs III: Stimulants and Other Mood-Changing Drugs 309**

- Stimulants 310
- Cocaine 311
- Cannabis (Marijuana) 313
- Mescaline and LSD: Hallucinogenic Drugs 315
- Development, Evaluation, and Regulation of Drugs 317
- Review Questions 319

18**Drugs IV: Chemotherapy and Bacteria 321**

- Sulfa Drugs 322
- Antibiotics 326
- Review Questions 337

Part Six Chemicals: Food and Nutrition **339**

19

Food Processing and Food Additives I **341**

Natural Foods 342
Additives in Food: Why? 344
Chemical Preservation of Foods 345
Nonchemical Preservation of Food 349
Other Kinds of Additives 355
Review Questions 364

20

Food Processing and Food Additives II **366**

Antioxidants 367
Additional Additives 371
Fortified Foods 376
Textured Protein: Beef Up That Hamburger 377
Review Questions 381

21

Chemical Nutrients **382**

Function of Nutrients 383
Carbohydrates 385
Fats and Oils 388
Proteins 391
Minerals 394
Vitamins 397
Water 403
Review Questions 405

**Part Seven Chemistry: At Work in Home
and Industry** **407**

22

**The Chemistry of Detergents/The
Preparation of Pulp for Paper** **409**

**Natural and Synthetic Detergents: And
the Dirt Goes Down the Drain** 410
Soaps 410
Synthetic Detergents 418
From Cellulose to Paper 421

Debarking	421
Chemical Pulping	422
Bleaching of Cellulose Fibers	427
Review Questions	430

23

The Chemistry of Fertilizers / The Chemistry of Paint / Sulfuric Acid / Synthetic Rubber **431**

Fertilizers 432

Nutrient Requirements	432
Nitrogen Fertilizers	433
Phosphorus Fertilizers	439
Mixed Fertilizers	440
Potassium Fertilizers (Potash)	442
Organic Fertilizers	442

The Chemistry of Paint 443

Components of Paints	444
Pigments	446

Sulfuric Acid: Many, Many Uses 452

Synthesis of Sulfuric Acid	452
Physical and Chemical Properties of Sulfuric Acid	456

Synthetic Rubbers 457

Some Synthetic Rubbers	458
Review Questions	462

24

Chemistry and the Environment: Air Pollution **465**

The Atmosphere	466
Source of Pollutants	468
Burning of Coal and Oil: SO ₂ and CO	471
Review Questions	485
And Still More Chemicals into the Air	477
Pollution from Moving Sources: Photochemical Reactions and Smog	479
Review Questions	485

**Water and Water Quality** **487**

The Hydrologic Cycle 488

Pollution of Water 490

Wastewater Treatment: How Are Pollutants Removed
from Water? 494

Review Questions 505

Appendix A Metric Units **507**

Metric Units of Length, Volume, and Mass 508

**Appendix B Some Mathematical
Operations** **510**

Proportions 511

Exponents 511

**Appendix C Naming Nonorganic
Compounds** **513**

Binary Compounds 514

Ternary and Higher Compounds 514

Naming Acids 515

Glossary **516****Index** **528**