

TABLE OF CONTENTS

PERIODIC TABLE	INSIDE FRONT COVER
CONVERSIONS AND CONSTANTS	LAST PAGE
LIST OF ELEMENTS	INSIDE BACK COVER
1. BACKGROUND AND BASICS	1
1.1 <i>The Grand Puzzle</i> 1.2 <i>One REALLY BIG item</i> 1.3 <i>Survival Guide</i>	
1.4 <i>Measurement</i> 1.5 <i>Can we ever be sure about uncertainty?</i> 1.6 <i>Sigfigs</i>	
1.7 <i>Problem solving</i>	
2. CHEMICAL UNITS AND THEIR IDENTITIES, Part 1	13
2.1 <i>Atoms</i> 2.2 <i>Identity</i> 2.3 <i>Mass</i> 2.4 <i>The elements and the Periodic Table</i>	
2.5 <i>Group tours</i> 2.6 <i>Monatomic versus polyatomic: one versus many</i>	
3. CHEMICAL UNITS AND THEIR IDENTITIES, Part 2	25
3.1 <i>Ions and ionic compounds</i> 3.2 <i>Covalent compounds</i> 3.3 <i>What to do about polyatomic ions</i>	
3.4 <i>Wrap up</i>	
4. CHEMICAL UNITS AND THEIR IDENTITIES, Part 3	31
4.1 <i>What's in a name?</i> 4.2 <i>We start with ionics.</i> 4.3 <i>We're ready to name an ionic compound.</i>	
4.4 <i>Binary covalent compounds</i> 4.5 <i>We're done. Almost.</i> 4.6 <i>Other systems</i>	
5. CHEMICAL UNITS AND MASS	48
5.1 <i>Still stuck on u.</i> 5.2 <i>We jump to the real world.</i> 5.3 <i>Percent composition</i>	
5.4 <i>An empirical approach</i>	
6. CHEMICAL REACTIONS	58
6.1 <i>Reactions and equations</i> 6.2 <i>Getting into details</i> 6.3 <i>Kinds of reactions: combustion</i>	
6.4 <i>Handling multi-step processes</i>	
7. STOICHIOMETRY, Part 1	69
7.1 <i>We begin stoichiometry with mass.</i> 7.2 <i>Using dimensional analysis</i>	
7.3 <i>General approach</i>	
8. STOICHIOMETRY, Part 2	78
8.1 <i>What do we do with the leftovers???</i> 8.2 <i>Excess and limiting</i> 8.3 <i>The real world versus the ideal world</i>	
9. STOICHIOMETRY, Part 3	85
9.1 <i>Liquid reagents</i> 9.2 <i>The solution to solutions</i> 9.3 <i>Now we're ready for solution stoichiometry.</i>	
9.4 <i>Recapitulate</i>	
10. AQUEOUS SOLUTIONS AND REACTIONS: Background	93
10.1 <i>Water basics</i> 10.2 <i>Why is water weird?</i> 10.3 <i>Balance</i> 10.4 <i>Technical aside</i>	
11. AQUEOUS REACTIONS, Part 1	102
11.1 <i>Independent ions</i> 11.2 <i>Precipitation: background</i> 11.3 <i>Precipitation: putting it together</i>	
11.4 <i>Acids and bases</i>	
12. AQUEOUS REACTIONS, Part 2	114
12.1 <i>Names and formulas for acids</i> 12.2 <i>Neutralizations</i> 12.3 <i>It's a gas!</i> 12.4 <i>Back to balance</i>	
12.5 <i>To diss or not to diss, that is the question.</i>	
13. AQUEOUS REACTIONS, Part 3	126
13.1 <i>Redox</i> 13.2 <i>Oxnos</i> 13.3 <i>Uses of oxnos</i>	

14. AQUEOUS REACTIONS, Part 4	133
14.1 <i>Some preliminaries</i> 14.2 <i>Oxnos method</i> 14.3 <i>It's your turn.</i>	
15. AQUEOUS REACTIONS, Part 5	142
15.1 <i>Examples</i> 15.2 <i>Titration</i>	
16. GASES, Part 1	148
16.1 <i>The gas phase</i> 16.2 <i>Can you feel the pressure?</i> 16.3 <i>The math of gas</i>	
16.4 <i>STP and d</i> 16.5 <i>Mixtures</i>	
17. GASES, Part 2	161
17.1 <i>Stoichiometry with gases</i> 17.2 <i>Molecules in motion</i> 17.3 <i>The need for speed</i>	
17.4 <i>Diffusion, effusion, deflation and inflation</i> 17.5 <i>Reality check</i>	
18. ENERGY, Part 1	174
18.1 <i>Economics</i> 18.2 <i>Joule</i> 18.3 <i>Terminology and such</i> 18.4 <i>Thermochemical examples</i>	
18.5 <i>Can you take the heat?</i>	
19. ENERGY, Part 2	186
19.1 <i>Four important aspects: one you knew and three are new.</i> 19.2 <i>How good are your standards?</i>	
19.3 <i>We are finally getting to where we want to be.</i> 19.4 <i>Stoichiometry</i>	
19.5 <i>Calories from the Sun</i>	
20. THE ATOM	200
20.1 <i>Welcome</i> 20.2 <i>Basics and background</i> 20.3 <i>Stand and wave.</i> 20.4 <i>Duality</i>	
20.5 <i>Orbits</i> 20.6 <i>Relax, don't get too excited.</i> 20.7 <i>Obit for orbits</i>	
21. LIGHT, MATTER AND WAVES	213
21.1 <i>Here and now</i> 21.2 <i>Light and matter</i> 21.3 <i>Electron duality</i> 21.4 <i>Quantum numbers</i>	
21.5 <i>Orbitals</i> 21.6 <i>Shapes of orbitals</i>	
22. MANY-ELECTRON ATOMS	225
22.1 <i>Spin</i> 22.2 <i>Splitting subshells</i> 22.3 <i>Configurations</i> 22.4 <i>The general fill sequence in table format</i>	
23. CONFIGURATIONS AND CONSEQUENCES, Part 1	237
23.1 <i>Reading the Periodic Table</i> 23.2 <i>Ions</i> 23.3 <i>Consequences and trends</i>	
23.4 <i>Some important conclusions</i>	
24. CONFIGURATIONS AND CONSEQUENCES, Part 2	251
24.1 <i>Ion charge</i> 24.2 <i>Sizing up an ion</i> 24.3 <i>Taking a spin on magnetism</i>	
25. BONDING RELATIONSHIPS	259
25.1 <i>-•• --- - •••</i> 25.2 <i>More ionics</i> 25.3 <i>Covalent bonds</i> 25.4 <i>Order! Order!</i>	
25.5 <i>Greed</i> 25.6 <i>Extending the gamut</i> 25.7 <i>Applying to compounds</i>	
26. THE POLYATOMIC UNIT, Part 1	273
26.1 <i>Duets, oddities, deficiencies, and excesses</i> 26.2 <i>Lewis</i> 26.3 <i>Examples</i>	
27. THE POLYATOMIC UNIT, Part 2	284
27.1 <i>Delocalization</i> 27.2 <i>More food for thought</i> 27.3 <i>Return to oxnos</i> 27.4 <i>Formal charge</i>	
27.5 <i>Formal applications</i> 27.6 <i>Wrap up</i>	
28. SHAPE, Part 1	297
28.1 <i>VSEPR</i> 28.2 <i>How repulsive!</i> 28.3 <i>What shape are we in?</i>	
29. SHAPE, Part 2 and POLARITY	306
29.1 <i>More examples</i> 29.2 <i>Three summaries</i> 29.3 <i>More than one central atom</i>	
29.4 <i>Another angle on VSEPR</i> 29.5 <i>Molecular polarity</i> 29.6 <i>Stage 3</i>	

30. ORBITALS, Part 1	317
30.1 Basics 30.2 The Valence Bond Approach 30.3 Hybridization sets 30.4 How to use the Valence Bond Approach 30.5 A closing comment	
31. ORBITALS, Part 2	328
31.1 Bond orbital type 31.2 Serving up some pi 31.3 Another point for emphasis 31.4 Stage 4	
32. ORBITALS, Part 3	335
32.1 The Molecular Orbital Approach 32.2 More orbitals and notation 32.3 The relative energies of molecular orbitals 32.4 Configurations and consequences	
33. ORBITALS, Part 4 and METALLIC BONDING	343
33.1 More configurations 33.2 Further aspects 33.3 Bands and conductors	
Appendix A: THERMOCHEMICAL TABLES	A-1
Appendix D: ANSWERS TO END-OF-CHAPTER PROBLEMS	D-1