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by Heather Hattori and
Richard H. Langley, PhD

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Contents at a Glance

INTRODUCTION 1

PART 1: THE QUESTIONS 5

CHAPTER 1: Units and Unit Conversions 7
CHAPTER 2: Scientific Notation and Significant Figures 13
CHAPTER 3: Matter and Energy 19
CHAPTER 4: The Atom and Nuclear Chemistry 25
CHAPTER 5: Periodicity and the Periodic Table 33
CHAPTER 6: Ionic Bonding 39
CHAPTER 7: Covalent Bonding 47
CHAPTER 8: Molecular Geometry 53
CHAPTER 9: Chemical Reactions 61
CHAPTER 10: Molar Calculations 71
CHAPTER 11: Thermochemistry 83
CHAPTER 12: Gases 97
CHAPTER 13: Solutions (The Chemistry Kind) 107
CHAPTER 14: Acids and Bases 115
CHAPTER 15: Graphing Basics 125

PART 2: THE ANSWERS 131

CHAPTER 16: Answers and Explanations 133

APPENDIX: THE PERIODIC TABLE OF ELEMENTS 425

INDEX 427

Table of Contents

INTRODUCTION 1
What You'll Find 1
Beyond the Book 2
Where to Go for Additional Help 2

PART 1: THE QUESTIONS 5

CHAPTER 1: Units and Unit Conversions 7
The Problems You'll Work On 7
What to Watch Out For 7
Understanding Metric Prefixes and Units 8
Choosing Appropriate Units 8
Doing Metric Conversions 9
Converting between Systems of Measurement 10
Using Dimensional Analysis 11

CHAPTER 2: Scientific Notation and Significant Figures 13
The Problems You'll Work On 13
What to Watch Out For 13
Putting Numbers in Scientific Notation 14
Taking Numbers out of Scientific Notation 14
Calculating with Numbers in Scientific Notation 14
Recognizing Significant Figures 16
Writing Answers with the Right Number of Sig Figs 16

CHAPTER 3: Matter and Energy 19
The Problems You'll Work On 19
What to Watch Out For 19
Phases of Matter and Phase Changes 20
Classifying Substances and Mixtures 20
Properties of Matter 21
Calculating Density 22
Working with Energy 23

CHAPTER 4: The Atom and Nuclear Chemistry 25
The Problems You'll Work On 25
What to Watch Out For 25
Isotopes and Subatomic Particles 26
Electrons and Quantum Mechanics 28
Average Atomic Mass 29
Nuclear Reactions and Nuclear Decay 30
Completing Nuclear Reactions 31
Half-Lives 32

CHAPTER 5: Periodicity and the Periodic Table 33
The Problems You'll Work On 33
What to Watch Out For 33
Element Symbols and Names 34
Structure of the Periodic Table 35
Periodic Trends 36

CHAPTER 6: Ionic Bonding 39
The Problems You'll Work On 39
What to Watch Out For 39
Naming Binary Compounds 40
Naming Compounds with Polyatomic Ions 41
Writing Formulas of Binary Compounds 42
Writing Formulas of Compounds with Polyatomic Ions 43

CHAPTER 7: Covalent Bonding 47
The Problems You'll Work On 47
What to Watch Out For 47
Prefixes in Covalent — Compound Names 48
Naming Covalent Compounds 48
Writing Formulas of Covalent Compounds 50

CHAPTER 8: Molecular Geometry 53
The Problems You'll Work On 53
What to Watch Out For 53
Valence Electrons 54
Predicting Bond Types 55
Basic Molecular Shapes 56
Exceptional Molecular Shapes 58
Polarity of Molecules 59

CHAPTER 9: Chemical Reactions 61
The Problems You'll Work On 61
What to Watch Out For 61
Classifying Reactions from Chemical Equations 62
Classifying Reactions from Word Equations 63
Predicting Reactions 64
Balancing Chemical Reactions 65
Balancing Reactions from Word Equations 66
Predicting Products and Balancing Reactions 67
Redox and Acid-Base Reactions 68

CHAPTER 10: Molar Calculations 71
The Problems You'll Work On 71
What to Watch Out For 71
Calculating Molar Mass 72
Finding Mass Percent 73
Empirical Formulas 74

Molecular Formulas . . . 75
Mole Calculations . . . 75
Percent Yield . . . 80
Limiting Reactants . . . 81

CHAPTER 11: Thermochemistry . . . 83
The Problems You'll Work On . . . 83
What to Watch Out For . . . 83
Converting Temperatures . . . 84
Phase Changes and Energy . . . 85
Specific Heat and Calorimetry . . . 90
Heats of Formation . . . 91
Enthalpy Changes with Hess's Law . . . 92

CHAPTER 12: Gases . . . 97
The Problems You'll Work On . . . 97
What to Watch Out For . . . 97
Converting Pressure Units . . . 98
Boyle's Law . . . 98
Charles's Law . . . 99
Gay-Lussac's Law . . . 100
The Combined Gas Law . . . 101
Avogadro's Law . . . 103
The Ideal Gas Law . . . 103
Dalton's Law of Partial Pressures . . . 104
Graham's Law . . . 105
Gas Stoichiometry . . . 106

CHAPTER 13: Solutions (The Chemistry Kind) . . . 107
The Problems You'll Work On . . . 107
What to Watch Out For . . . 107
Solutions, Solvents, and Solutes . . . 108
Concentration Calculations . . . 109
Dilution . . . 110
Molality . . . 110
Colligative Properties . . . 111

CHAPTER 14: Acids and Bases . . . 115
The Problems You'll Work On . . . 115
What to Watch Out For . . . 115
Identifying Acids and Bases . . . 116
Conjugate Acids and Bases . . . 116
Finding pH and pOH of Strong Acids and Bases . . . 117
Finding pH and pOH of Weak Acids and Bases . . . 118
Stoichiometry of Titrations . . . 119
Buffer Solutions . . . 120
Titrations and pH Changes . . . 121

CHAPTER 15: Graphing Basics 125
The Problems You'll Work On 125
What to Watch Out For 125
Graphing 126

PART 2: THE ANSWERS 131

CHAPTER 16: Answers and Explanations 133

APPENDIX: THE PERIODIC TABLE OF ELEMENTS 425

INDEX 427

Introduction

Whether you're taking your first chemistry course, you're taking your last chemistry course, or you just need a little practice before taking a test that contains chemistry questions (like a nursing, pre-med, or teacher certification test), doing problems is a fine way to prepare.

The 1,001 practice questions in this book cover topics that you might encounter in a high school chemistry course, an introductory college chemistry course, the first semester of a general chemistry course for science majors, or a general science test for entry into a pre-professional program. The types of questions found here are similar to the ones you may see on homework assignments, quizzes, practice tests, or actual tests.

You can start at Question 1 or Question 121 or skip around. You may find that your instructor (or textbook) covers topics in a different order from this book. That's okay; just go to the table of contents, find the topic you need, and start there.

Completing 1,001 chemistry practice questions is no small undertaking, but the time you spend practicing valuable science, math, and chemistry skills can improve your scores and help you "know what you know."

What You'll Find

The 1,001 chemistry practice questions in this book are divided among 15 chapters, each one representing a few major subject areas in chemistry. Within each chapter, questions are grouped by topic and arranged from easy to hard, allowing you to answer beginner questions as well as multi-step and more difficult questions. Some questions are accompanied by an image or diagram that you need in order to answer the question correctly.

After you answer the questions for one chapter or subcategory — or even after you answer just one question — you can flip to the last chapter of the book and check your answers. There, you find thorough answer explanations for each problem, often covering processes, formulas, and definitions. In many cases, studying an answer explanation can help you better understand a difficult subject, so spend as much time as you need reviewing the explanations.

Beyond the Book

In addition to what you're reading right now, this book comes with a free, access-anywhere Cheat Sheet that includes tips and other goodies you may want to have at your fingertips. To get this Cheat Sheet, simply go to www.dummies.com and type **Chemistry: 1001 Dummies Cheat Sheet** into the Search box.

The online practice that comes free with this book offers you the same 1,001 questions and answers that are available here, but presented in a multiple-choice format. The beauty of the online problems is that you can customize your online practice to focus on the topic areas that give you trouble. If you're short on time and want to maximize your study, you can specify the quantity of problems you want to practice, pick your topics, and go. You can practice a few hundred problems in one sitting or just a couple dozen, and you can focus on a few types of problems or a mix of several types. Regardless of the combination you create, the online program keeps track of the questions you get right and wrong so you can monitor your progress and spend time studying exactly what you need to.

To gain access to the online practice, you simply have to register. Just follow these steps:

1. **Register your book or ebook at Dummies.com to get your PIN. Go to** www.dummies.com/go/getaccess.
2. **Select your product from the drop-down list on that page.**
3. **Follow the prompts to validate your product, and then check your email for a confirmation message that includes your PIN and instructions for logging in.**

If you don't receive this email within two hours, please check your spam folder before contacting us through our Technical Support website at http://support.wiley.com or by phone at 877-762-2974.

Now you're ready to go! You can come back to the practice material as often as you want — simply log in with the username and password you created during your initial login. No need to enter the access code a second time.

Your registration is good for one year from the day you activate your PIN.

Where to Go for Additional Help

It's easy to get overwhelmed when trying to study a subject as multifaceted as chemistry. But don't despair. This book is designed to break everything into less complex categories so you can concentrate on one topic at a time. Practicing in smaller areas within each topic helps you identify your strong points and your weak points.

After you use this book and identify the areas you feel need extra effort, you can start studying on your own and then come back here to answer the questions again to measure your improvement. For example, if your knowledge of molarity is a little hazy (or nonexistent), try reviewing the molar calculations in Chapter 10. Check your answers and jot down notes or questions

you may have. Then research, say, how solution concentration is expressed using molarity or which biology applications might use molarity. You can look for resources at your local library or online, or you can ask a friend, coworker, or professor to coach you if they seem to spend a lot of time in the lab. You can also check out the *For Dummies* series for books about many of the topics covered in chemistry. Head to `www.dummies.com` to see the many books and articles that can help you in your studies.

Chemistry: 1001 Practice Problems For Dummies gives you just that — 1,001 practice questions and answers in order for you to practice your chemistry skills. If you need more in-depth study and direction for your chemistry courses, you may want to try out the following *For Dummies* products.

- ***Chemistry Essentials For Dummies:*** This book is a quick-reference resource that outlines key topics found in a first-year high school chemistry course or a first-semester college chemistry course.
- ***Chemistry For Dummies:*** This book provides content parallel to the 1,001 chemistry practice problems found in this book.
- ***Chemistry II For Dummies:*** This book provides content similar to what you may encounter in a second-year high school chemistry course or a second-semester college chemistry course.
- ***AP Chemistry For Dummies:*** This book prepares the Advanced Placement chemistry student to take the College Board's AP Chemistry exam. It also includes tools for organizing and planning your study time.
- ***Chemistry Workbook For Dummies:*** This book includes basic instruction, chemistry problems with step-by-step solutions, shortcuts, and more practice problems.

Several *For Dummies* chemistry titles are also available for download to your electronic devices.

1 The Questions

IN THIS PART . . .

One thousand one chemistry problems — that's a lot of chemistry practice. Hundreds of our former students have persevered through what we're sure they felt was even more than that. Here are the general types of questions you'll be dealing with:

- The basics of chemistry (Chapters 1–5)
- Chemical bonding (Chapters 6–8)
- Chemical reactions (Chapters 9–11)
- Gases, acids, bases, and liquids (Chapters 12–14)
- Graphing (Chapter 15)

Chapter 1

Units and Unit Conversions

Many aspects of chemistry are quantitative, and you use units to measure these quantities. In many cases, you have to convert from one unit to another. Most people in the United States initially learn the English system of units, but most chemists use the *Système international d'unités* (the SI system), derived from the older metric system. Unit conversions relate these two systems. Dimensional analysis provides a systematic means to not only perform these conversions but also to work many of the other problems in this book. Dimensional analysis lets the units solve the problem for you.

The Problems You'll Work On

In this chapter, you work with units and unit conversions in the following ways:

- Choosing appropriate units
- Interpreting metric prefixes
- Converting metric and English units
- Solving problems with dimensional analysis

What to Watch Out For

Don't let common mistakes trip you up; remember the following when working on units and unit conversions:

- Always include your units when setting up equations and answering questions.
- Set up your problem so that units cancel to leave the desired units.
- Make sure your answer looks reasonable and the final units match what they describe. For example, s^{-1} represents 1/seconds, which is frequency, not time.
- When rounding your answer for significant figures, remember that many, but not all, conversions are exact numbers and therefore don't affect the number of significant figures in the answer.

Understanding Metric Prefixes and Units

1–10 *Answer the questions on metric prefixes and metric units used in the laboratory.*

1. What is a common metric unit of mass used in the laboratory?

2. What is a common metric unit of length used for measuring small objects in the laboratory?

3. What is a common metric unit of volume used in the laboratory?

4. What is a common metric unit of pressure used in the laboratory?

5. What is a common metric unit of energy?

6. What is the metric prefix that represents 1,000?

7. What is the metric prefix that represents $\frac{1}{1{,}000}$?

8. What is the metric prefix that represents $\frac{1}{100}$?

9. What is the metric prefix that represents 10^{-9}?

10. What is the metric prefix that represents 10^{6}?

Choosing Appropriate Units

11–20 *Choose appropriate metric or English units for measuring everyday objects.*

11. Which metric unit is most appropriate for expressing the mass of an adult human?

12. Which metric unit is most appropriate for recording the volume of a child's wooden block?

13. Which metric unit would a scientist use to measure the temperature on a warm autumn day?

14. Which metric unit is most often used for small doses of solid medications?

15. Which SI base unit is named after a person?

16. Which English unit is most similar in volume to a liter?

17. Which English unit is most similar in length to a meter?

18. How many fluid ounces are in a cup?

19. An Olympic swimmer competes in the 100-meter freestyle. What is the comparable English unit?

20. If a wooden board's width is 6 in., what is an appropriate metric unit to express this width?

Doing Metric Conversions

21–32 Complete the conversion between metric units.

21. How many milligrams are in 1 dg?

22. How many deciliters are in 1 L?

23. How many kilometers are in 1 m?

24. How many centimeters are in 1 m?

25. How many grams are in 1 hg?

26. How many milliliters are in 2.5 daL?

27. How many centigrams are in 49 kg?

28. How many gigawatts are in 370,000 W?

29. How many micrograms are in 0.126 Mg?

30. How many kilometers are in 80 pm?

31. How many cubic meters are in 2 L?

32. How many milliliters are in 0.64 m^3?

Converting between Systems of Measurement

33–59 *Convert between metric and English units.*

33. How many miles are in 35 km?

34. How many inches are in 0.20 cm?

35. How many yards are in 202 m?

36. How many pounds are in 58 kg?

37. How many quarts are in 7.54 L?

38. How many centimeters are in 0.087 in.?

39. How many kilometers are in 463 mi.?

40. How many grams are in 91 lb.?

41. How many liters are in 525 gal.?

42. How many atmospheres are in 44 psi?

43. How many cups are in 2.00 L?

44. How many pounds are in 164 hg?

45. How many gallons are in 587 mL?

46. How many centimeters are in 6.02 mi.?

47. How many decigrams are in 225 lb.?

48. How many milliliters are in 6.8 qt.?

49. How many centimeters are in 15.3 ft.?

50. How many liters are in 99 pt.?

51. How many kilograms are in 1.00 short ton? (1 short ton = 2,000 lb.)

52. How many centimeters are in 6.04 yd.?

53. How many cups are in 15 cc?

54. How many millimeters are in 1,760 yd.?

55. How many pints are in 250 hL?

56. How many grams are in 0.35 slugs? (1 slug = 32.2 lb.)

57. How many kilometers are in 9,999 in.?

58. How many ounces are in 0.734 kg?

59. How many microliters are in 55 oz.?

Using Dimensional Analysis

60–75 Solve the word problem using a setup similar to those used in unit conversions.

60. How many dozen eggs are in 17,981 eggs?

61. How many years are in 6,250 days? (1 yr. = 365.25 days)

62. How many weeks are in 2.5 centuries? (1 yr. = 52 weeks)

63. If the average penny has a mass of 3.16 g, what is the dollar value of 1.00 short ton of pennies? (1 short ton = 2,000 lb.)

64. If an athlete runs the 100-yard dash in 10.0 s, how long will it take for the athlete to run 400 m?

65. You're planning a party and need enough soda for 60 guests. How many liters will you need, assuming each guest drinks 10 fl. oz. of soda?

66. You plan to serve sub sandwiches at a party. How many 6.0-foot subs will you need to feed the 60 guests if each person eats a 25.4-cm length of sandwich?

67. A textbook measures 230 mm long, 274 mm wide, and 60.0 mm thick. What is the volume in cubic centimeters?

68. A textbook measures 230 mm long, 274 mm wide, and 60.0 mm thick. What is the surface area of the front cover in square meters?

69. A hallway measures 10.0 ft. by 5.0 ft. How many square tiles, measuring 10.0 in. on each side, are necessary to cover the floor?

70. If a car is going 20 mph through a school zone, how many centimeters per minute is it traveling?

71. A solid sphere made of pure gold has a volume of 2.0 L. What is the mass of the sphere, in pounds, if 1.00 cm^3 of gold has a mass of 19.3 g?

72. How many minutes does it take a horse to run 12 furlongs at 35.3 mph?
(1 furlong = 40 rods, and 1 rod = 5.5 yd.)

73. If a pitcher throws a 96-mph fastball, how many seconds will it take to travel the 60.5 ft. from the pitcher's mound to home plate?

74. Pure gold can be made into extremely thin sheets called gold leaf. Suppose that 25 kg of gold is made into gold leaf having a surface area of 1,810 m^2. How thick is the gold leaf in millimeters? The density of gold is 19.3 g/cm^3.

75. Radio waves travel at 300,000,000 m/s. If you asked a question of someone who was on the moon, 239,000 mi. from the Earth, what is the minimum time that you would have to wait for a reply?

Chapter 2

Scientific Notation and Significant Figures

Scientific notation allows you to write very large and very small numbers, which are common in chemistry, in a simplified manner. Many chemical experiments involve very precise measurements. The significant figures are an indication of the precision of these measurements. In calculations involving more than one measurement, you need to maintain the precision inherent in the significant figures.

The Problems You'll Work On

In this chapter, you work with scientific notation and significant figures in the following ways:

- Expressing numbers in standard and scientific notation
- Doing calculations with numbers in scientific notation
- Determining significant figures
- Combining math operations with significant figures

What to Watch Out For

Remember the following when working on scientific notation and significant figures:

- All nonzero digits and zeros between nonzero digits are significant. Zeros to the left in the number (leading zeros) are never significant. Zeros to the right are significant only if they aren't just indicating the power of ten.
- Don't confuse the addition/subtraction rule with the multiplication/division rule. Be extra careful when solving mixed-operation problems.
- Most calculators convert to and from scientific notation, but double-check the answer. Calculators are complete idiots concerning the rules for significant figures.

Putting Numbers in Scientific Notation

76–80 Express the given number in scientific notation.

76. 876

77. 4,000,001

78. 0.000510

79. 900×10^4

80. 10

Taking Numbers out of Scientific Notation

81–85 Convert the given number to nonscientific notation (regular decimal form).

81. 2.00×10^2

82. 9×10^{-2}

83. 4.7952×10^3

84. 1.64×10^{-5}

85. 0.83×10^{-1}

Calculating with Numbers in Scientific Notation

***86–105** Complete the calculations and record your answer in scientific notation. (If you use a calculator, choose a mode that doesn't put the numbers in scientific notation for you.)*

86. $\left(1.26 \times 10^3\right) + \left(4.71 \times 10^3\right) =$

87. $\left(3.9 \times 10^{-1}\right) + \left(2.1 \times 10^{-1}\right) =$

88. $\left(8.9 \times 10^2\right) - \left(3.3 \times 10^1\right) =$

89. $\left(7.4\times10^{-1}\right)-\left(5.2\times10^{1}\right)=$

90. $\left(8.240\times10^{2}\right)+\left(3.791\times10^{2}\right)=$

91. $\left(1.00\times10^{7}\right)-\left(5.2\times10^{5}\right)=$

92. $\left(5.42\times10^{-3}\right)+\left(6.19\times10^{-4}\right)=$

93. $\left(8.20\times10^{6}\right)-\left(7.31\times10^{4}\right)+\left(2.846\times10^{5}\right)=$

94. $\left(1.0\times10^{-7}\right)\times\left(4.5\times10^{5}\right)=$

95. $\left(1.0\times10^{-3}\right)\div\left(1.0\times10^{-4}\right)=$

96. $\left(3.15\times10^{12}\right)\times\left(2.0\times10^{3}\right)=$

97. $\left(4.7\times10^{-2}\right)\div\left(9.6\times10^{-7}\right)=$

98. $\left(8.40\times10^{15}\right)\times\left(2.00\times10^{-5}\right)=$

99. $\left(1.0\times10^{8}\right)\div\left(3.2\times10^{2}\right)=$

100. $\left(9.76\times10^{-9}\right)\times\left(3.55\times10^{-3}\right)\div\left(1.8\times10^{-5}\right)=$

101. $\left(2.48\times10^{3}\right)\times\left(4.756\times10^{-4}\right)\times\left(9.1\times10^{-2}\right)=$

102. $\left(1.8\times10^{-4}\right)+\left(6.27\times10^{-2}\right)\times\left(2.9\times10^{-3}\right)=$

103. $\left(9.189\times10^{-19}\right)\div\left(0.6021\times10^{-13}\right)+\left(4.5\times10^{-11}\right)=$

104. $\left(4.115\times10^{2}\right)+\left(1.1\times10^{1}\right)\div\left(3.68\times10^{-6}\right)\div\left(8.2\times10^{4}\right)=$

105. $\dfrac{\left(4.6\times10^{2}\right)+\left(6.97\times10^{9}\right)\times\left(3\times10^{-7}\right)}{\left(5.18\times10^{4}\right)-\left(2.00\times10^{3}\right)}=$

Recognizing Significant Figures

106–115 *Indicate how many significant figures (significant digits) are in the given number.*

106. 343

107. 0.4592

108. 705,204

109. 0.0075

110. 248,000

111. 9,400,300

112. 1.0070

113. 3,000,000.0

114. 0.0040800

115. 0.870

Writing Answers with the Right Number of Sig Figs

116–135 *Complete the calculation and express your answer using the correct number of significant figures.*

116. $5{,}379+100=$

117. $12.4 + 0.59 =$

118. $61.035 - 33.48 =$

119. $71 + 24.87 + 0.0003 =$

120. $0.387 - 467 =$

121. $0.005689 + 0.0410 =$

122. $60.0080 - 128.35429 + 7.941 =$

123. $130 + 4{,}600 + 395.2 =$

124. $0.0074 \div 0.000035 =$

125. $75 \times 349 =$

126. $7.98 \times 5.21 =$

127. $5.00 \div 0.0025 =$

128. $7.0\ \text{cm} \times 7\ \text{cm} =$

129. $6.48 \div 194.21 =$

130. $0.000000029 \times 0.00000745 =$

131. $\dfrac{0.0034 \times 518.27}{9.00} =$

132. $2{,}300.00 \times 0.854 + 110 =$

133. $\dfrac{10.78\ \text{g}}{25.0\ \text{mL} - 23.8\ \text{mL}} =$

134. $\dfrac{8.1 + 2.32 + 0.741}{2.54} =$

135. $\dfrac{250 + 12}{2.0} \times \dfrac{1.0}{3.57 - 1.2} =$