Chemistry 2 for dummies

EducationScienceChemistryChemistry II For Dummies Author: John T. MoorePrint, 384 pages, July 2012ISBN: 978-1-118-16490-7 The tools required to ace your Chemist II College Course success for virtually all sciences, computing, engineering and pre-medical specialties depend in part on passing chemistry. Skills learned in chemistry courses are applicable in a number of fields, and chemistry courses are important for students who are studying to become nurses, doctors, pharmacists, clinical technicians, engineers and many others among the fastest growing professions. But if you like a lot of students who confuse chemistry, this may seem like a daunting task to address the topic. That's where Chemistry II for Dummies can help! Here you get a simple English, easy-to-understand explanation of everything you encounter in your Chemistry II class. So what are you waiting for? Introducing simple information about complex track concepts to typical Chemistry II course serves as a great addition to learning in the classroom Helps you understand a difficult subject with confidence and ease packed with available information and a plethora of practice opportunities, Chemistry II For Dummies is exactly what you need to do a class. John T. Moore, EdD, is a regent professor of chemistry at Stephen F. Austin State University, where he teaches chemistry and is co-director of the Science, Technology, Engineering and Mathematics (STEM) Research Center. He is the author of Biochemistry for Dummies and Chemistry for Dummies, 2nd edition. Introduction 1 Part I: Basic Chemistry Review I 7 Chapter 1: I Passed Chem I, But What About Chem II? 9 Chapter 2: Mathematics for (Chemistry) Mass 15 Chapter 3: Atomic Structure, Periodic Table, and Bonding 27 Chapter 4: Digging the Mole Concept and Stoichiometry 47 Chapter 5: Capture Solutions and Intermolecular Forces 61 Chapter 6: Not Full Hot Air: Gaza and Gas Laws 81 Part II: Diving in Kinetics and Balance 97 Chapter 7: Low on: Turtle or Hare? 99 Chapter 8: All present in the same condition: Homogeneous Balance 125 Chapter 9: Neutralizing Effects: Acid-Base Balance 145 Chapter 10: Taking on Solubility and Complex Ion Balance 179 Part III: Multiple Chemistry II Concept 1 Chapter 11: Getting Hot With Thermodynamics 191 Chapter 12: Causing Flow Electrons: Electrochemistry 207 Chapter 13: Transition of Carbon Route: Organic Chemistry 231 Chapter 14 : Reflecting Polymers 247 Chapter 15 : Bringing Biology in the Laboratory: Biochemistry 261 Part IV: Description of Narrative Chemistry 277 Chapter 16: Exploring All and Away From Oil 279 Chapter 17: Sensing the Power of Nuclear Chemistry 289 Chapter 18: Chemistry in House 309 Part V: Part 327 19: Ten Awesome Tips for Passing Chem II 329 Chapter 20: Ten Must-Know Formula for Chem II 333 Chapter 21: Ten Great Career Chemistry 339 Index 345 Trips. Part I Major Chemistry Review I'm in this part . . . In this piece, I give you a basic overview of those topics commonly found in the Chem I course that I feel are crucial to your progress through Chem II concepts. I look at the really basic concepts of science and chemistry in Chapter 1. In Chapter 2 I give you a quick overview of chemical calculations. I'll show you how to use the method of labeling the factors of calculations, along with the introduction of the SI (metric). In Chapter 3 I give an overview of the atomic structure, periodic table and different types of bonding. I don't cover topics in great depth here, but enough to run around your memory about energy-level configurations, frequency, and communication. In Chapter 4, I give you a good overview of the stoichiometry reaction because you really need these mole-related concepts in Chem II. I will also touch on different types of intermolecular forces and fluid properties. In the last chapter of the review, I examine the properties of gases including the water laws (Boyle's law, Charles's law, the Gay-Lusac Act, the combined gas law, the perfect gas law, the Avogadro law, and more). That's it - six chapters reviewing the course it took you a full year if you're in high school or a full semester if you're in college to complete. Chapter 1 I passed Chem I, but what about Chem II? In this chapter Understanding Chemistry Discovery science and technology Exploring common areas of chemistry you already know what chemistry is. You went through your first year of high school or your first semester of chemistry in college. Now you are ready to take on the second year or second semester and you want a resource that will help you explain the concept in plain English. This chapter lays the groundwork for the rest of the book, showing you what the differences are between Chem I and Chem II, so you can better relate to this new material. It also attributes some of the major areas of chemistry to topics that you will be studying in Chemistry II. If you are already in the midst of a Chem II college or high school course, you can skim over this chapter for a quick review of some basic concepts and then go straight to the subject area in the book that bothers you. If you bought this book just to have fun discovering something new and not taking a chemistry course, you may need a bit of retraining on a really fundamental chemical topic. I suggest buying a copy of the first book in this series, Chemistry for Dummies. This book, now in its second edition, can give you the basics and make this book more meaningful. Teaching chemistry is very pleasant. For me, it's more than just a set of facts and a lot of knowledge. Although I wasn't major in chemistry when I went to college, I quickly became when I took my first chemistry course. The topic seemed so interesting and logical. Watching chemical changes occur, figuring out the unknown, using tools, broadening my senses, and making predictions to find out why they were right and wrong everything seems so fascinating. Your journey to Chem II begins here. Capturing the nature of Chemistry II Chem I, in most schools, is a mixture of many different topics. You will naturally find some shift between themes; You will finish the chapter on gases and only briefly cover these topics again until you get to the final exam. Your Grade II chemistry is more consistent in these topics. Chem II is also much more mathematical than Chem I, which was great for me because I have always enjoyed the quantitative aspects of chemistry more than the narrative. That's why I'm an analytical chemist, not an organic chemist. I like working with numbers. The following sections give you a quick reminder of the content in a typical Chem I course, and then show you what to expect in a typical Chem II class that you accept or can accept. Summarize The General Chemistry I In the first couple of weeks in your Chemistry II class, you'll probably consider the basics of what you've covered in your Chemistry I class. Here are the topics you can find: Problem solving: A metric or a SI system is essential for studying chemistry at any level. You should be able to use a factor-label problem-solving method, also called Unit Analysis. This method allows you to manipulate units to create a setting for a particular problem. Around the same time, you become experienced in determining the number of significant numbers that you should report in your final response. For more information, please refer to Chapter 2. Atomic structure: Having a clear understanding of subatomic particles (protons, electrons and neutrons), nuclei and electronic clouds is important when taking a course of chemistry. Chapter 3 gives you an overview of these topics. You can also find information about the configurations of electrons (the way different electrons are presented in an atom), medium atomic masses, and mole concepts. A review of these topics can be seen in chapters 3 and 4. Periodic table and periodic properties: Chemistry I gave you the basics on electron configurations, ionization energies, atom sizes, and hei other topics related to the periodic table. You definitely need this knowledge when learning Chem II. Chapter 3 gives you a quick overview. Link: Chemical communication, both ion and covalent, are an important part of Chem I. Having a solid foundation on these topics is also important in Chem II. See Chapter 3 for review. Molecules, compounds and chemical equations: This is where the chemical nomenclature was first introduced in your Chem I class. names and and Calculating the moly masses and defining an empirical formula based on percentages is also important. You've also figured out how to balance chemical equations. Chemical nomenclature is an absolute necessity of chemistry II, as well as balancing chemical equations and determining moly mass. For a review, please refer to Chapter 4. Stoichiometry Reaction: You probably remember that this topic was the main essence of your Chem I course. Balanced chemical equations go hand in hand to allow you to make these calculations. You also focus on the main types of reaction and sometimes even a little solution of stoichiometry. The reaction of stoihiometry and mole concepts are of paramount importance in Chem II. Turn to Chapter 4 to make sure you have a good understanding of these topics. Solutions: Most likely you have studied unit-concentration solution, especially moly and malleability, in your class Chem I. The concentration of solutions is extremely important in Chem II. Gas Properties: Many Chem I textbooks and instructors cover the properties of gases, including numerous gas laws and kinetic molecular theory. Understanding kinetic molecular theory also facilitates an idea of how different factors influence the kinetic reaction in Chem II. Nuclear Chemistry: Some instructors cover nuclear chemistry as part of the Chem I training programme; some cover it in Chem II. Chapter 17 touches on what you need to know. If you want a more detailed explanation of these topics, you can check out my book, Chemistry for Dummies, 2nd Edition (John Wylie and Sons, Inc.). Looking at where you are now: General Chemistry II in Chem II you can expect to encounter the following topics, but not necessarily in this exact order: Chemical Kinetics: Chemistry II Class usually covers this topic early after completing a review of the themes of Chem I. Kinetics is the study of reaction speed. In addition to the reaction mechanisms of kinetics, a number of steps are included, through which the reaction takes place when moving from reactionary to products. Chapter 7 covers kinetics. Chemical equilibrium: This is the biggest topic in most Chem II classes. Balance is established when the chemical reaction goes from reactionary substances to products and at the same time also comes from products reacting. These two reactions occur at the same reaction rate (speed). You can reveal all different types of equilibrium: homogeneous, heterogeneous, acid-based, solubility, and complex ion. You can also learn about ways to manipulate the equilibrium system to form as much product as possible. I discuss the equilibrium in chapters 8, 9 and 10. Thermodynamics: Thermodynamics is another important topic of Chemistry II. Thermodynamics is basically the study of transmission It is based on thermomimia thermomimi Chem I, but it has the goal of being able to predict under what conditions the reaction is spontaneous. Chapter 11 covers thermodynamics. Electrochemistion: Studying batteries and cells also appears in Chem II. You will figure out how to balance the radox response and then go to electrochemical cells. You discover everything about cells and batteries, including car batteries and flashlight batteries. Chapter 12 explains electrochemography in more detail. Radioactivity: Chemistry II classes sometimes cover this topic. Sometimes the chemistry I classes cover it. Radioactivity is essentially a spontaneous disintegration of an unstable nucleus into a more stable one. It is the material of atomic bombs and nuclear power plants. Chapter 17 refers to radioactive decay, half-seine, division and synthesis. Other topics: Some teachers also cover organic chemistry and biochemistry. I cover these topics in chapters 13 to 15. Learning the chemistry industries as you go through your Chemistry II course, you may actually be starting to wonder what chemists do all day. Well, some do things (synthesis), others study the properties of things (analysis), and others explain things (teach). But all chemists have a specialty in which they have received more training. Here are some general areas of chemistry: Physical Chemistry: This branch figure out how and why the chemical system behaves the way it does. Physical chemists study the physical properties and behaviors of matter and try to develop models and theories describing such behavior. Especially keep in mind this industry when you study thermodynamics in Chapter 11. Analytical Chemistry: This industry is actively involved in determining the properties of matter (analysis). Chemists in this area of chemistry may be trying to figure out which substances are in the mixture (quality analysis) or how much of a particular substance is present (quantitative analysis) in something. Analytical chemists usually work in the industry in product development or quality control. If the chemical manufacturing process goes wrong and costs that industry hundreds of thousands of dollars an hour, that quality control chemist is under a lot of pressure to fix it and fix it quickly. Many devices are used in analytical chemistry. Chapter 12, electrochemicia, is a typical topic studied by analytical chemists. Inorganic chemistry: This industry is involved in the study of inorganic compounds such as salt. It involves studying the structure and properties of these compounds. It also usually involves the study of individual elements of the compounds. Inorganic chemists probably say that this field is a study of everything except carbon, which they leave to organic chemists. Inorganic chemists are interested in the narrative chemistry of the elements. Organic Chemistry: This field is the study of carbon and its compounds. These are perhaps the most organized areas of chemistry - for good reason. millions of organic compounds, with thousands more discovered or created each year. Industries such as polymer, petrochemicals and pharmaceuticals depend on organic chemists. Chapters 13 and 14 describe aspects of organic chemistry. Much more about organic chemistry can be found in Organic Chemistry II for Dummies (John Wylie and Sons, Inc.). Biochemistry: This industry specializes in living organisms and systems. Biochemists study chemical reactions that occur at the molecular level of the body - a level where the elements are so small that people cannot directly see them. Biochemists study processes such as digestion, metabolism, reproduction, breathing and so on. Sometimes distinguishing between a biochemist and a molecular biologist is difficult because they both study living systems at a microscopic level. However, the biochemist really concentrates more on the reactions that occur. Check out Chapter 15 for a taste of biochemistry, but for a full meal see my book Biochemistry for Dummies (John Wylie and Sons, Inc.). Biotechnology: This is a relatively new field of science that is usually found with chemistry. This is the application of biochemistry and biology in the creation or alteration of genetic material or organisms for specific purposes. It is used in areas such as cloning and the creation of disease-resistant crops, and it has the potential to eliminate genetic diseases in the future. I also suggest you check out my book Biochemistry for Dummies (John Wylie and Sons, Inc.) for more information. By comparing macroscopic and microscopic perspectives as you go through your chemistry course, pay attention to how your instructor moves from talking about matter to terms of atoms and molecules, and then shifts very naturally into a specific world of grams and kilograms. These two points of view are called microscopic point of view and macroscopic point of view. Almost all chemists, no matter what area they study, study the world around them in two ways: macroscopic view: This opinion is what you see, feel and touch. It's a world of dirty lab coats - mixing solutions and weighing the elements. This view is the world of experimentation, or what some unscientific call the real world. Microscopic view: This view focuses on working with models and theories. Chemists can describe a chemical reaction, such as Haber's reaction to ammonia production, from the perspective of individual atoms and molecules. It's a microscopic world. Scientists are often so used to going back and forth between two views that they don't even realize they're doing it. The emergence or observation in the macroscopic world generates the idea of a microscopic world, and vice versa. You may find this stream of ideas disconcerting at first glance. You may have noticed this back and forth some in your chemistry I You'll notice it more in your Chemistry II studies. becomes second nature to you. Contrasting pure and applied chemistry in pure chemistry, chemists are free to conduct any research on their interests - or any research they can obtain funding for. At the moment there are no real expectations of practical application. The researcher just wants to know for the sake of knowledge. This type of research (often called basic research) is most commonly conducted in colleges and universities. The chemist uses undergraduate and graduate students to help conduct the study. Work becomes part of the training of students. The researcher publishes his findings in professional journals for other chemists to study and try to disprove. Funding is almost always a problem because experiments, chemicals and equipment are quite expensive. In applied chemistry, chemists usually work in private corporations. Their research focuses on a very specific short-term goal set by the company - improving the product or developing a new plastic or medicine, for example. Typically, more money is available on equipment and appliances with applied chemistry, but chemists also have pressure to view the company's goals. These two types of chemistry, pure and applied, have the same basic differences as science and technology. In science, the goal is simply basic knowledge acquisition. There should be no visible practical application. Science is simply knowledge for the sake of knowledge. Technology is the application of science to a very specific goal. Society has a place for science and technology - also for two types of chemistry. A pure chemist generates data and information that is then used by an applied chemist. Both types of chemists have their own sets of strengths, problems and pressures. In fact, because of the reduction in federal research dollars, many universities are becoming much more involved in obtaining patents, and they are paying for the transfer of technology to the private sector. Chapter 2 Mathematics for (Chemistry) Masses In this chapter Feeling from the SI Measurement System Working with numbers like a really large or small use of the square equation to solve the problems of figuring out the conversion unit Getting comfortable with significant numbers. You did it through Chemistry I. You probably remember that chemistry has a lot of calculations. Guess what? Chemistry II has a lot more calculation than Chemistry I. Good news: I'm sure you can handle these calculations, which include more arithmetic and simple algebra. You should also be able to use the square equation and be able to do a few more calculator functions. Since you rely heavily on the SI system, exponential notation, and the method of converting units, I focus on considering these concepts in this chapter. I also touch a quick review of significant numbers and rounding. Most of these concepts follow Reading this chapter or or This chapter that you need to consider can lead you up to speed for Chemistry II. Dig through the SI System SI Decimal System. It has base units for mass, length, volume and so on. You use the SI system in almost all the calculations that you make in chemistry. You've probably used it a lot in your Chemistry I class, and you'll use it probably even more in your Chemistry II class. This section lists the most common SI prefixes, the base units for physical quantities in the SI system and some useful SI English conversions. The British used the English system of weights and measures. The American colonies and then the United States accepted it. The U.S. system uses pounds and ounces, gallons and quarts, and miles and yards with all sorts of strange transformations in between. The metric system (SI system) is much easier to use, so much actually that the British have abandoned their own system and use the metric system now. The so-called English system is now called the usual U.S. system, because the United States is almost the only country that still uses it. The decimal system of SI is much easier for scientists to use and is understood all over the world. Finding out what SI prefixes mean that prefixes change the base units and tell you how much of the item is in question. For example, a kilogram means 1000; kilogram is 1000 grams, and a kilometer - 1000 meters. Use table 2-1 as a handy reference to the abbreviations and values of some of the most commonly used SI prefixes. Table 2-1 Selected SI PrefixEs The length of the base block for length in the SI system is a meter. The exact definition of a meter has changed over the years, but it is now defined as the distance that light travels in a vacuum of 1/299,792,458 seconds. The most common SI units of length that you will encounter are: millimeter (mm) centimeter (cm) meter (m) kilometer (km) Some common length conversions from the English system to the SI system are 1 mile (mi) 1.61 km (km) 1 yard (yd) 0.914 meters (m) 1 inch (in) 2.54 centimeters (cm) I find the conversion of inches/cm to be most useful because many of the problems I deal with drop into that range of length. I suggest you find one that works best for you. The mass base unit for mass in the SI system is a kilogram. This is the weight of a standard platinum-iridium bar found in the International Bureau of Weights and Measures. Here are the most common units of SI mass you will encounter: milligrams (mg) gram (g) kilogram (kg) Some common English SI mass conversion systems are 1 pound (pound) 453.6 grams (g) 1 ounce (ounce) 28.4 grams (g) I believe a pound/g conversion to be most useful because many of the problems I'm working with fall into this range. The volume of the base unit for volume in the SI system is cubic meter; However, chemists use a liter. They do this because it is customable for graduated glassware used in chemistry to be in milliliters or litres, as opposed to medical instruments such as syringes that are cc's (cm3). Litre 0.001 m3. Here are the most common SI volume units: 1 milliliter (ml) 1 cubic centimeter (cm3 or cc) 1 liter (L) 1000 milliliters (ml) Some common English SI system convert volume 1 quart (qt) 0.946 litres (L L) 1 liquid ounce (fl oz) - 29.6 milliliters (ml) 1 gallon (gal) 3.79 litres (L) I believe qt/L conversion, to be most useful, because again it fits better with most metric English conversions that I do. The temperature is the base unit for temperature in the SI Kelvin system. Here are three main formulas for temperature conversion: Celsius to Fahrenheit: F (9/5) Celsius - 32 Fahrenheit to Celsius: C (5/9) (F-32) Celsius to Kelvin: K and C 273 Pressure SI unit for Pascal pressure, where 1 Pascal equals 1 newton per square meter. But pressure can also be expressed in a variety of ways, so here are the most common pressure conversions: 1 millimeter of mercury column (mm Hg) - 1 torr 1 atmosphere (am) - 760 millimeters of mercury (mm Hg). St.) - 760 torr 1 atmosphere (am) - 101 kilopascal (kPa) 1 barrel 10^5 Pa Energy SI-block for energy (e.g. heat) - is a jul, but many chemists and chemistry professors still use a metric unit of heat, calories, because it is still widely used in popular and chemical literature. Here are some common energy conversions: 1 calorie (cal) 4,184 joules (J) 1 Nutritional (food) Calories (Cal) - 1 kilocalories (kcal) 4184 joules (J) Working with numbers like really large or small chemists work with very large and very small numbers on a daily basis. For example, when chemists talk about the amount of ions in a gram of table salt, they talk about very, very large quantities. But when they talk about the diameter of one sodium cations, they talk about very, very small amounts. As you found in Chem I, chemists can use exponential or scientific notation to represent these large or small numbers. These sections explore ways to handle very large and small numbers so you can be ready for them in Chem II. Using exponential and scientific notation in exponential notation, the number is presented as a value raised to ten. The decimal point can be located anywhere within the number as long as the power of ten is correct. In scientific notations, the decimal point is always between the first and second digits, and the first digit should be a number not zero. For example, the number 328,000 can be represented 3.28 x 10^5 while 0.0054 will be 5.4 x 10-3. Using the addition and subtraction To add or subtract numbers in an exponential or scientific notation, both numbers should have the same effect in ten. If they don't, you have to convert them into the same force. Here is an example of subtraction: (2.5 × 10^5 cm) - (2.2 × 10^4 cm) - (25 × 10^4 cm) - (2.. 2 × 10^4 cm) 22.7 × 10^4 cm (exponential note) - 2.27 × 103 cm (scientific note You're adding the same thing. Multiplying and dividing to numbers expressed in exponential notation, multiply the coefficients (the numbers) and add the exponents (powers of ten): (2.25 × 10–2 cm) × (3.37 × 10–5 cm) = (2.25 × 3.37) × 10(–2 + –5) cm^2 = 7.58 × 10–7 cm^2 To divide numbers expressed in exponential notation, divide the coefficients and subtract the exponent of the denominator from the exponent of the numerator: (6.27 × 10^5 g) ÷ (1.25 × 10^3 mL) = (6.27 ÷ 1.25) × $10^{5–3}$ g/mL = 5.02 × 10^2 g/mL Raising a number to a power To raise a number in exponential notation to a certain power, raise the coefficient to the power and then multiply the exponent by the power: (2.33 × 10–5cm)^3 = $(2.33)^3$ × 10–5 × ^{3} cm^3 = 12.6 × 10–15 cm^3 = 1.26 × 10–14 cm^3 Using a calculator Scientific calculators make doing calculations much easier. You don't have to focus so much time on actual calculations and can spend more time on the problem itself. You can use the calculator to add and subtract the numbers in exponential notation without one converting them into the same ten power. Just be careful that you correctly enter exponential numbers. For example, let's say your calculator has a EXP key. EXP means ×10. Once you press the EXP key, you enter into force. For example, to enter the number 6.25 × 103, you type 6.25, press the EXP, and then enter 3. What about the negative exponent? If you want to enter number 6.05 × 10-12, you enter 6.05, press the EXP, type 12, and then press q/- If you use a scientific calculator, don't enter the × 10th of your exponential number. Click the EXP key to enter this part of the number. Solving the square equation When you fall into the balance section, you may need to solve the square equation. The square equation is a way to solve the second-degree equations of the shape of ax2 and bx s q 0. If you are not familiar with it from your algebra class, you can do some review using a tutorial or the Internet. Here I give you some tips so that you can minimize this experience, but you won't be able to avoid it completely. If it's been a while since you've been working with this equation, use the following example as a retraining to refresh this mathematical decision process. The square equation is useful in solving such problems: 2x2 and 5x 52 can be rebuilt in 2x2 and 5x - 52 - 0 Square equation has a form: where in this case a No. 2, b No. 5, and c q -52. Replacing values in an equation gives: only one value will have any value in the real world. Many times x is concentration and you can't have a negative concentration. Concentrations can be small, but not less than zero. Mastering the unit conversion method you have probably found that actually creating chemical problems to solve them is sometimes vague or unclear. A scientific calculator can help you in processing math, but the calculator can't tell you which the operations you need to perform. That's where unit conversion sometimes called the factor shortcut method, comes into play. This method can help you adjust your chemistry problems and calculate them correctly. Hopefully you got familiar with it in Chem I, but a brief review shouldn't hurt. Two basic rules are related to the one-unit conversion method: Rule 1: Always write a unit and a number associated with a unit. Rarely in chemistry you will have a number without a unit. Pi is the main exception that comes to mind. Rule 2: Perform mathematical operations with units, canceling them until you end up with the unit you want in the final answer. At every turn you have to have the correct mathematical statement. This example can encourage a recall of the unit conversion method. Firkin is a little-known unit of volume in the ordinary U.S. system. Firkin is 9.0 gallons. How many litres in 1 firkin? You have to settle for litres/firkin, so follow these steps: 1. Write down what you start with: Note that in the rule of #1, the equation shows the unit and the number associated with it. 2. Converting gallons into quarts, abolishing a unit of gallons on the #2 rule: 3. Convert quarts into litres: 4. Now that you have a unit of litres per firkin, do the math to get the answer: 34 L/firkin 5. Stop and ask yourself if the answer is reasonable. Nine gallons will contain 36 quarts and a liter is about a liter, so the answer should be about 36 liters. Note that the answer has been rounded to the correct number of significant numbers. If you're a little rusty with significant numbers, the following section gives you details on how to do it. Note that while the setting of the previous example is correct, it is certainly not the only correct setting. Depending on what conversion factors you know and use, there can be many correct ways to create a problem and get the right answer. With a little practice, you can really appreciate and as a method of converting a unit. It made me take an introductory physics course. Working with significant numbers Of significant numbers (no, I'm not talking about Donald Trump's net worth) are the number of numbers you report in the final answer to the mathematical task you calculate. The number of significant indicators is limited by the accuracy of the measurement. The following sections explain how to determine the number of significant indicators chemistry 2 for dummies pdf. organic chemistry 2 for dummies. organic chemistry 2 for dummies pdf. general chemistry 2 for dummies

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