Chemistry 2 for dummies pdf

John T. Moore Chemistry II is more like fires and smelly explosions. Chemistry II is more about solving calculations. As a matter of fact, Chemistri IL has a lot more calculations and maths than your Chemistry Class I. In Chemistry II, you need to master several formulas to calculate various mathematical problems ranging from kinetic to different equilibrium states, thermochemistry and electrochemistry. Kinetic testing, the speed of chemical reactions, is essential for the study of chemistry, and is one of the main themes of all Chemistry II classes. Knowing the concepts of kinetics can help you understand why some reactions are fast and others slow, and why some simple reactions are slow and other, more complex reactions are fast. The reaction rate (the reaction rate) is the change in the concentration of the reactant or product according to the time change. You can write it as: Chemist's are usually molarity, M, and time is usually in seconds, s, which means that the reaction rate units are M/s. You can also express the number of units in other ways, such as: The equilibrium constant describes the relationship between the quantity of retant and the quantity of products at a certain temperature. You need to know the equilibrium constant while studying Chemistry II. In the general equilibrium situation, the constant equilibrium expression is as follows: In the expression K is the equilibrium constant, subscript c expresses this constant in a concentration (not pressure, p) in conjunktor (as a rule), parentheses (as a rule) indicate molar (moles/l), uppercase letters are the reactuant and product species, and lowercase letters are the combined balance of the chemical equation. Constant expressions of acidity and base balance describe the relationship between the quantity of reactant and products in aqueous acid base systems. For the following general low-acid equilibrium: the constant equilibrium expression is as follows: In the case of a general weak base balance, the constant equilibrium expression is as follows: The concentration of water (or any clear liquid, solvent or solid) is expressed in the constant equilibrium expression. K is the equilibrium constant, subscript b indicates that this is the equilibrium constant expression of a weak base, and braces represent molar concentrations. The solubility product formula is used for the equilibrium where a not-solubility salt dissolves in water. For general dissociation of sparingly soluble salt: In this equation, x+ and z – the magnitude of positive and negative filling; constant equilibrium expression (solubility product expression) Ksp = [Mx+]a[Xz-]b Gibbs Free Energy is the best indicator of whether the reaction will be spontaneous or non-spontaneous. You need to know that the way Chemistry II. Form: In this equation, ΔG° is Gibbs' free energy for solutions at 1 atm (or 1 bar) and 25°C for gases. ΔH° is the reaction entalpia under standard conditions; T is kelvin temperature; and δS° is the reaction entropy under normal conditions. The spontaneous process is °G < 0 >. If °G = 0, the process is balanced. EducationScienceChemistryChemistry II Beginners Author: John T. MoorePrint, 384 pages, July 2012ISBN: 978-1-118-16490-7 The tools you need to ace the Chemistry II course college's success in almost all sciences, computer science, engineering, and premedical majors depend in part on passing chemistry. Skills acquired in chemistry courses cover a wide range of areas, and chemistry courses are essential for students who learn to be nurses, doctors, pharmacists, clinical technicians, engineers and many more among the fastest growing professions. But if, like a lot of students who are confused about chemistry, it may seem like a daunting task to address the subject. This is where chemistry II can help beginners! Here, you get plain English, an easy-to-understand explanation of everything you encounter in chemistry II class. Whether it's chemistry in your chosen field of study, your degree requirement, or an optional one, you get the skills and confidence to score high and enhance your understanding of this often intimidating topic. So, what are you waiting for? Presenting simple information about complex concepts tracks in a typical Chemistry II course that serves as an excellent complement to classroom learning It helps you understand difficult subject matter with confidence and ease full of approachable information and loads of practical options, Chemistry II Beginners have just what they need to get their degree. John T. Moore, EdD, is a regents 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 The Biochemistry For Dummies and Chemistry for Beginners, 2nd Edition. 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Part I of The Basic Review of Chemistry I In this section . . . In this section I give a basic review of these topics often found in the Chem I course that I feel critical of the progression through chem II concepts. I'm going through the 1st. Chapter, I'll give you a quick overview of the chemical calculations. I'll show you how to use the factor label method for calculations, as well as an introduction to the SI (metric) system. In Chapter 3, I give a review of atomic structure, the periodic table, and different types of knitting. I don't cover topics in great depth here, but just enough to jog the memory of energy level configurations, periodicity, and bonding. In Chapter 4, I'll give you a good review of reaction to schiometry, because you'll really need these mole concepts related to Chem II. I'll review the solutions and the solution concentration units in chapter 1. I also touch on the properties of different types of intermolecular forces and fluids. In the final review chapter, I review the properties of the gases, including the gas laws (Boyle's Law, Charles's Law, Gay-Lussac's Law, the Combined Gas Act, the Ideal Gas Act, Avogadro's Law, and so on). That's it - six chapters of review passed throughout the year if you're in high school or a full semester if you're in college full. Chapter 1 I passed Chem I, but what about chem II? In this chapter understanding chemistry Discovering science and technology testing in the general fields of chemistry already knows what chemistry is. You went through your first year of high school or your first semester of college chemistry. You are now ready to take the second year or the second half of the year and want a resource to help explain concepts in plain English. This chapter defines the terrain of the rest of the book by showing the difference between Chem I and Chem II so that they can be more connected to this new material. It is also linked to some of the main areas of chemistry in the topic you will learn chemistry II. If you've been in the middle of a Chem II college or high school course, you might want to lean through this chapter for a quick review of some basic concepts and then go right to the topic in the book, which worries you. If you bought this book just to have fun finding something new and isn't taking a chemistry trick, you may need a little refreshing the really basic chemical themes. I recommend buying a copy of the first book in this series, Chemistry for Beginners. This book, now in its second edition, can give you the basics and make this book more meaningful. Teaching chemistry is very enjoyable. For me, it's more than facts and knowledge. Although I wasn't a chemistry major when I joined college, I quickly became addicted when I took my first chemistry course. The subject seemed so interesting and logical. Looking at chemical changes, figuring out the unknowns, using tools, expanding my senses, and making predictions to figure out why they were right and wrong, everything seems so fascinating. The journey to Chem II begins here. Capturing the nature of chemistry II. You can of course find some transfer between themes; finishes the chapter on gases and only briefly covers these topics again until you reach the final exam. The Chemistry II class is more consistent on these topics. Chem II is much more mathematical than Chem I, which was great for me because I always enjoyed the quantitative aspect of chemistry more than the descriptive part. That's why I'm an analytical chemist, not a biochemist. I like working with numbers. The following sections will give you a quick reminder of the content of a typical Chem I course and then show you what to expect in a typical Chem II class that you are taking or possibly taking. In conclusion general Chemistry I In the first couple of weeks of chemistry II class, you'll probably review the basics of what's covered in chemistry I class. I recommend the chapters in Part I of Chemistry II For beginners to these topics to help you review these important topics. Here are the topics you can find: Problem solving: A metric or SI system is essential for studying chemistry at all levels. You should be able to use the factor-label method for problem solving, also known as unit analysis. This method allows you to manipulate units to create a setting for a specific problem. About this time you will be profied in determining the significant numbers to be reported in the final response. For more information, see Article 2(1) and (2). Atomic structure: A thorough knowledge of subatomy particles (protons, electrons and neutrons), nucleus and electron clouds is important during the chemistry course. Chapter 2 provides an overview of these topics. You can also find information about electron configurations (how different electrons are represented in atoms), average atomic masses and mole concept. For an overview of the topics, see Section 3. The periodic table and periodic table properties: Chemistry gave the basics of electron configurations, ionization energies, size atoms, and many topics related to the periodic table. This knowledge is absolutely necessary when you are studying Chem II. Chapter 2 gives a brief overview. Bonding: Chemical bonding, both ionous and covalent, are an important part of Chem I. Having a solid foundation in these subjects is also an important chem II. See table 3. Molecules, compounds and chemical equations: This is where the chemical nomenclature was first introduced in Chem I class. You may remember discussing chemical formulas, chemical names, and vice versa. It is important to calculate molar masses and determine the empirical formula from the percentage data. You also figured out a way to balance the chemical equations. The chemical nomenclature for the Chemical II. Reaction to schiometry: You probably remember that this topic was the main crux of the Chem I course. You learned how to calculate how much - how much is retant, how much it produces, how many moles, how many grams, and how many particles. Balanced chemical equations go hand in hand to allow you to make these calculations. You are also focused on the basic reaction types and sometimes even a small solution stochiometry. Reaction schiometry and mole conception are of primary importance in Chem II. Flip Chapter 4 in order to have a good understanding of these topics. Solutions: It is more than likely that in the class I of Chem, you have studied the concentration units of the solution, in particular molarity and molality. The concentration of the solution is extremely important in Chem II. Article 5(2) shall be replaced by the following Gas properties: Many textbooks and Chem I instructors cover gas properties, including a number of gas laws and kinetic molecular theory. Understanding the kinetic molecular theory also makes it easier to see how different factors affect the kinetic nature of the reaction to Chem II. Check out Chapter 6 for more information. Nuclear chemistry: Some educators cover nuclear chemistry as part of the chem I curriculum; some cover it chem II. Chapter 17 concerns what you need to know. If you want a more detailed explanation of these topics, you can check out my book, Chemistry for Beginners, 2nd Edition (John Wiley & Sons, Inc.). Looking to see where you are now: General Chemistry II Chem II you can expect to meet on the following topics, but not necessarily in that order: Chemical Kinetics: The Chemistry II class usually covers this topic early on after you finish reviewing topics from Chem I. Kinetics for the study of the speed of reactions. In addition to kinetic reaction mechanisms, a series of reaction steps are included from reactants to products. Article 7(2) shall be replaced by the following Chemical balance: This is the biggest topic in most Chem II classes. Balance is created when a chemical from reactants to products, and at the same time reacts from the products. These two reactions occur at the same reaction rate (speed). You can explore different types of equilibrium: homogeneous, heterogeneous, acid-base, solubility, and complex-ion. You can also learn how to manipulate the balance system to create as many products as possible. The following shall be replaced by the following: Thermodynamics: Thermodynamics is another important theme of Chemistry II. Thermodynamics is basically a study of energy transmission. It is based on the thermochemical concepts of I. chem, but its purpose is to be able to predict under what circumstances the reaction is spontaneous. Article 11(1) shall be replaced by the following: Electrochemistry: The study of cells and cells also appears in Chem II. You figure out how to balance the redox reaction and then move on to electrochemical cells. You can explore everything about cells and batteries, including car batteries and flashlights. Chapter 12 explains electrochemistry more deeply. Radioactivity: Chemistry II classes sometimes deal with this topic. Sometimes the chemistry i. clocks cover it. Radioactivity is essentially the spontaneous decomposition of an unstable nucleus to a more stable one. It's the stuff of nuclear bombs and nuclear power plants. Chapter 17 discusses radioactive decay, half-life, fission, and fusion. Other topics: Some trainers also cover organic chemistry and biochemistry. These themes shall be discussed in the 13th and 15th EDD. Looking at the branches of chemistry as you go through your Chemistry II course, you can think about what chemist people do all day. Well, some make things (synthesis), others examine the properties of things (analysis), and others explain things (teach). But every chemist has a special area where they have received more training. The general areas of chemistry are described below. Physical chemistry: This branch guesses how and why the chemical system behaves like this. Physical chemists study the physical properties and behavior of matter and try to develop models and theories that describe this behavior. In particular, keep this branch in mind when it comes to the 11th century. Analytical chemistry: This branch is highly involved in determining the properties of the substance (analysis). Chemist in this field of chemistry may be trying to find out what substances are in the mixture (qualitative analysis) or how much of a particular substance is present (quantitative analysis) in something. Analytical chemist is typically employed in the industry in product development or quality control. If a chemical manufacturing process goes wrong and costing 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 instruments in analytical chemistry. Chapter 12, electrochemistry, is a typical topic studied by analytical chemistry. Inorganic chemistry: This branch is involved in the study of inorganic compounds such as salts. This includes the study of the structure and properties of these compounds. It also often involves the study of individual elements of the compounds. Inorganic chemist's probably say that this area of study is everything except coal, which they leave to organic chemist. Inorganic chemists are interested in the descriptive chemistry of the elements. Organic chemistry: This is the area of study of carbon and compounds. This is probably the most organized areas of chemistry - for good reason. There are millions of organic compounds, thousands discovered or created each year. Industries such as polymer, petrochemical and pharmaceutical industries depend on organic chemistry. in Article 13(1), the following shall be Much more about organic chemistry can be found in Organic Chemistry II for Beginners (John Wiley & Sons, Inc.). Biochemistry: This branch specializes in living organisms and systems. Biochemist is studying chemical reactions that occur at the molecular level of an organism - the level at which objects are so small that people can't see them directly. Biochemist studies processes such as digestion, metabolism, reproduction, breathing, and more. Sometimes it's hard to distinguish between a biochemist and a molecular biologist because they both study living systems at a microscopic level. However, the biochemist is actually more focused 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 Wiley & Sons, Inc.). Biotechnology: This is a relatively new field of science that is often placed with chemistry. This is the use of biochemistry and biology when genetic material or organisms are created or modified for specific purposes. It is used in areas such as cloning and the creation of disease-resistant plants, and in the future it is capable of eliminating genetic diseases. I also encourage you to check out my book Biochemistry For Dummies (John Wiley & Sons, Inc.) for more information. Comparison of macroscopic and microscopic viewpoints during the Achemistry course, pay attention to the way the instructor talks about matter in terms of atoms and molecules, and then, of course, very naturally it is pushed into the concrete world of grams and kilograms. These two points of view are called microscopic and macroscopic viewpoints. Almost every chemist, no matter what field they study, study the world around them in two ways: Macroscopic view: This is the view you see, feel and touch. This is the world of dirty lab coats - blending solutions and Items. This point of view is a world of experiments, or what some non-scientists call the real world. Microscopic view: This view focuses on working with models and theories. Chemist can describe a chemical reaction, such as the Haber reaction to the production of ammonia, in terms of individual atoms and molecules. This is the microscopic world. Scientists are often so used to going back and forth between the two views that they don't even realize they're doing so. An event or observation in the macroscopic world creates an idea connected to the microscopic world, and vice versa. You may find this flow of ideas unsettling at first. You may have noticed this back and forth in some of the Chemistry I studies; You'll notice that you prefer chemistry II studies. You may need to make some adjustments before moving back and forth to become the second nature for you. Unlike pure and applied chemistry in pure chemistry, chemist's are free to carry out any research interests in them – or whatever research they can finance. There is currently no real expectation of practical application. The researcher simply wants to know for the sake of knowledge. This type of research (often referred to as basic research) is most commonly conducted in colleges and universities. The chemist uses university and graduate students to help carry out the research. The work will be part of students' professional training. The researcher publishes his findings in professional journals for other chemist to examine and try to disprove. Funding is almost always a problem because experimentation, chemicals, and equipment are quite expensive. In applied chemistry, chemistry usually works in private companies. Their research aims to achieve the very specific short-term goal set by the company – for example, product development or the development of a new plastic or pharmaceutical product. Normally more money is available for equipment and instruments applied to chemistry, but chemist's can be under pressure to meet the company's goals. These two types of chemistry, pure and applied, have the same fundamental differences as science and technology. In science, the goal is simply to acquire knowledge fundamentally. You don't need any obvious practical application. Science is simply knowledge for the sake of knowledge. Technology is the application of science towards a very specific goal. Society has a place for science and technology – as well as for two types of chemistry. A clean chemist creates data and information that is then used by the chemist employed. Both types of chemist have their own strengths, problems, and pressure. In fact, due to declining federal research dollars, many universities are becoming much more involved in getting patents, and they're being paid for technology transfers to the private sector. 2 Math of (Chemistry) Masses In this chapter Feeling out of the SI measurement system Working on numbers, both really big or small Use the quadratic equation to solve problems Figure out unit conversions Getting the significant numbers Congratulations. You made it through Chemistry I. You probably remember that chemistry has a lot of calculations. You know what? Chemistri II has a lot more calculations than Chemistry I. The good news: I'm sure you can handle these calculations, which include arithmetic and simple algebra. You also need to be able to use the quadratic equation and be able to get some more calculator features. Since I rely heavily on the SI system, exponential marking, and unit conversion method, I focus on reviewing these concepts in this chapter. I can tap into a quick review of significant numbers and rounding it down. Most of these concepts need to be revised. Read this chapter or sections that need to be reviewed to bring you to speed up your Chemistry II. Digging through the SI measuring system The SI system is a decimal system. It is the basic units of weight, length, volume, and so on. He uses the SI system in almost every calculation he does in chemistry. You probably used it a lot in your Chemistry I class, and probably even more so in your Chemistry I class. This section describes the most common SI prefixes, the basic units of physical quantities in the SI system, and some useful SI-English conversions. The English used a system of English weights and measures. It was adopted by the American colonies and then by the United States. The U.S. system uses pounds and ounces, gallons and quartz, and miles and yards of all sorts of strange conversions between them. The metric system (SI system) is much easier to use, so much so that the English have abandoned their own system and are now using the metric system. The so-called English system is now called the American usual system because the United States is just about the only country that still uses it. The decimal-based SI system is much easier for scientists and understandable worldwide. To guess what SI prefixes mean, prefixes modify base units and tell you how much of an element is in question. For example, kilo-1000; one kilogram is 1000 grams and one kilometre is 1000 metres. Use table 2-1 for abbreviations and meanings of the most commonly used SI prefixes. Table 2-1 Length of selected SI prefixEs The base unit of the length of the SI system is the meter. The exact definition of meter has changed over the years, but it is now defined as the distance that light travels from a vacuum of 1/299,792,458 to the second. The most common SI longitude units are: millimeters (mm) centimeters (cm) meters (m) kilometres (km) Some common conversion from The English system SI system 1 mile (we) = 1.61 km (km) 1 yard (yd) = 0.914 meters (m) 1 inch (in) = 2.54 cm (cm) I find the inch/cm conversion to be the most useful because many of the problems I deal with fall into that length range. I suggest you find the one that works best for you. Weight In the SI system, the basic unit of mass is kilograms. That's the weight of the standard platinum iridium bar found at the International Bureau of Weights and Measures. Here are the most common SI unit weight you'll encounter: milligram (mg) grams (g) kilograms (kg) Some common English SI system bulk conversions are 1 pound (lb) = 453.6 grams (g) 1 ounce (oz) = 28.4 grams (g) I find the lb/g conversion to be the most useful because a lot of the problem I work with falls into this range. Volume The basic unit of the volume of the SI system is the cubic meter; however, chemist's usually use liters. They do this because graduate glass jars used in chemistry are in millilitres or litres, unlike medical instruments such as cc (cm^3). One litre is 0,001 m^3. Here are the most common SI volume units: 1 milliliter (mL) = 1 cubic centimeter (cm^3 or cc) 1 liter (L) = 1000 ml (mL) Some common Anglo-SI system volume conversions of 1 liter (qt) = 0.946 liters (L) 1 liquid ounce (fl oz) = 29.6 ml (mL) 1 gallon (gal) = 3.79 liters (L) I find the qt/L conversion to be the most useful, because again it fits better with most metric English conversion, That I am. Temperature The base unit is the temperature of the SI system Kelvin. Here are the three main temperature conversion formulas: Celsius-Fahrenheit: °F = (9/5)°C + 32 Fahrenheit-Celsius: °C = (5/9) (°F-32) Celsius-Kelvin: K = °C + 273 Pressure of the SI unit is the pressure of the pascal, where 1 pascal equals 1 newton per square meter. But the pressure can be expressed in many different ways, so here are the most common pressure conversions: 1 millimeter mercury (Hgmm) = 1 torr 1 atmosphere (atm) = 760 millimeters mercury (Hgmm) = 760 torr 1 atmosphere (atm) = 101 kilopascal (kPa) 1 barr = 105 Pa Energy The SI unit energy (such as heat) in the joule, but many chemist and chemistry professors still use the metric unit heat, as 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 kilocalorie (kcal) = 4,184 joules (J) dealing with numbers, both large or small chemists work in very large and very small numbers per day. For example, when chemist talk about the number of ones in a gram of table salt, they talk about a very, very large number. But when they talk about the diameter of a single sodium cation, it's a very, small number. As you found in Chem I, chemist can represent these large or small numbers with exponential or scientific indications. These sections review how to handle very large and small numbers, so you are ready for them in Chem II. The use of exponential and scientific marking for Exponential marking displays a number as a value raised to power by ten. The decimal point can be placed anywhere within the number as long as the performance of the decimal is correct. In the scientific indication, the decimal point is always between the first and second digits and the first digit must be a number other than zero. For example, 328,000 is 3.28 x 10 5, and 0.0054 is 5.4 x 10-3. Use addition and subtraction To add or subtract numbers with exponential or scientific notation, both numbers must use the same power of ten. If not, you'll have to convert them to the same power. Here's an example extraction: (2.5 × 105 cm) – (2.2 × 10 cm) = (25 × 10cm) – (2.2 × 10 cm) = 22,7 × 10 cm (exponential marking) = 2,27 × 10 cm (scientific indication) Performs the addition in exactly the same way. Szorzás és osztás Az exponenciális jelölésben kifejezett számok szorzata, szorozzuk meg az együtthatókat (a számokat) és adjuk hozzá a kitevőket (tíz) aknadeit (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 Az exponenciális jelölésben kifejezett osztásszámokhoz, osszuk el az együtthatókat, és vonjuk ki a nevező kitevőt a számláló kitevőjéből: (6,27 × 10^5 g) ÷ (1,25 × 103 mL) = (6 .27 ÷ 1,25) × 10^5–3 g/mL = 5,02 × 102 g/mL Szám emelése egy adott teljesítményre, emelje fel az együtthatót a teljesítményre, majd szorozza meg a kitevőt a teljesítménnyel: $(2,33 \times 10–5\ cm)^3 = (2,33)^3 \times 10–5 \times {}^3\ cm^3$ = 12,6 × 10–15 cm^3 = 1,26 × 10–14 cm^3 A tudományos számológépek segítségével a számítások sokkal könnyebb. You don't have to spend as much time on actual calculations and spend more time on the problem itself. You can use the calculator to add and subtract numbers with an exponential notation without first converting them into ten identical power. Be sure to enter the exponential numbers correctly. For example, suppose the calculator has a key labeled EXP. EXP stands for ×10. After you press the EXP button, enter the power. For example, to enter 6.25 × 10^3, type 6.25, press EXP, and then type 3. What about the negative exponent? To enter 6.05 from 10 to 12 ×, type 6.05, press EXP, type 12, and then press +/. If you are using a scientific calculator, do not × the exponential number 10 of the computer. To enter this part of the number, press EXP. The quadratic equation When you enter the equilibrium stages, you may need to solve the quadratic equation. The quadratic equation is one way to solve second-degree equations in the form $ax^2 + bx + c = 0$. If you are not familiar with the algebra class, you may want to do some review using the textbook or the internet. Here I will give you some tips to minimize this experience, but you will not be able to completely avoid it. If you have been working with this equation for some time, use the following example as an updater to refresh the mathematical solution process. The quadratic equation is useful in solving similar problems: $2x^2 + 5x = 52$ rearrangable $2x^2 + 5x – 52 = 0$ The form of the quadratic equation: where in this case a = 2, b = 5 and c = -52. Substituting values by equation gives: Only one value will be relevant in the real world. Many times x is a concentration and there can be no negative concentration. Concentration may be small, but not less than zero. Mastering the unit conversion method you're probably finding is actually setting up a chemical to solve problems sometimes vague or vague. A scientific calculator can help you with mathematical treatment, but the calculator can't tell you what mathematical operations you need to perform. This is where the unit conversion method, also known as the factor label method, comes into play. This method will help you to adjust and correctly calculate chemical problems. Hopefully you got to know Chem I, but a short review wouldn't hurt. There are two basic rules associated with the unit conversion method: 1. Rarely will chemistry be a unit without a number. Pi is the main exception that comes to mind. Rule 2: Perform mathematical operations with units and cancel them until you find the unit you want in the final response. You must have an accurate mathematical instruction for each step. This example can encourage the recall of the unit conversion method. The firkin is a little-known unit of this quantity in the U.S. usual system. The firkin is equal to 9.0 gallons. How many liters is in a firkin? You need to solve the liter / firkin, so follow the steps below: 1. Describe what you are getting: Note that the rule #1, the equation shows the unit and its associated number. 2. Convert gallons of quartz, invalidating the unit gallon to a rule #2: 3. Convert the quartz to liters: 4. Now that you have the units liter per firkin, do the math to the answer: 34 L/firkin 5. Stop and ask yourself if the answer is reasonable. Nine gallons would contain 36 liters, and a liter would be about a liter, so that the answer would be about 36 L. The answer is reasonable and has the right units. Note that the rounded to a sufficient number of significant numbers. If you're a little rusty with significant numbers, the next section gives you details on how to do it. Note that while the previous example is set correctly, this is certainly not the only correct setting. Depending on what conversion factors you know and use, there are several good ways to set up the problem and set the right answer. With a little practice, you can really appreciate it and as a unit conversion method. It took me through my introductory physics course. Working with significant numbers of significant numbers (no, I'm not talking about Donald Trump's net worth) is the number of digits that report the final answer to the math problem calculation. The number of significant numbers is limited by the accuracy of the measurement. The following sections show how to determine the number of significant figures