Stoichiometry color by number answer key fish

Stoichiometry color-by-number! Add art and creativity to your reviewers! Students work ten problems, choose the correct answer and color their masterpieces according to the color next to the correct answer. For early finishes, I let students make it their own by adding a background and coloring parts of the drawing that don't have numbers. This is a great review assignment that will let students review stoichiometry in a whole brain activity. Ideal for keeping students on the task for sub-days. This resource is distinguished to meet your needs – three versions of the problem setVersion #1: basic stoichiometry problems: mole mole moles, mole mass, mass moles, and mass mass version #2: basic stoichiometry plus molar volume @STPVersion #3: basic stoichiometry, molar volume @STP, plus the limitation/excess reactors and percentage yield These concepts: Basic stoichiometry problemsLimiting & Excess ReactorsPercent YieldIncluded in This Product: ✓ (3) Question Sets—with KEYS ✓ Color-by-number handout- Butterfly✓ Color-For-Number complete key (with KEYS ✓ Color-by-number handout- Butterfly✓ Color-by-number complete key (colored)✓ Quick KEY with answers highlighted✓ Complete KEY with all problems worked out✓ Teacher tips and tips for using this resource with your studentPrior Knowledge for Students: Students should be very familiar with nomenclature, calculation of molar mass, balancing chemical equations , stoichiometry, limitation and excess reactors, and percentage yield. Teacher Prep Time: Just press and go! Lesson Duration: 1 class periodJust Print and Go! Everything is ready for immediate use in your classroom. This lesson is suitable for grades 9-12 chemistry Chemistry Corner **Check out these other products you're interested in: Stoichiometry: A full lessonstoichiometry: Limitation and excess reactorsStoichiometry: Percentage YieldHigh School Chemistry: Year curriculum **TPT credit to use on your future purchases! Go to your My Purchases page and click on Provide Feedback button. Your feedback is greatly appreciated! Click here for more information. Become a follower to receive updates on new products as I add them. 9th, 10th, 11th, 12th, Higher Education, Adult Education, Homeschooling, Staff bring a seaship to life in this color through number of activity! Kids use a key to match each number with a matching color — to reveal a friendly sorrow! This activity is ideal for first grade maths and animal enthusiasts. □Thaz to Collect Digitally□Assign DigitallyCommon Core State StandardsTexas Essential Knowledge and Skills (TEXT)Virginia Standards of Learning (CTL)BC Performance StandardsAlberta Program of StudiesThe Australian Curriculum (ACARA)The Victorian Curriculum standards associated with this content. Use Usage worksheet for reviewing or assessing your students' understanding of stoichiometry and stoic calculations from moles to moles, mass to moles and mass to mass. Your students will love to have the activity as a more interactive and engaging alternative to a traditional worksheet. Use it as a n-class or homework command, a quiz, or for early finishes. Check out the preview for a view of the download. Allied versions included. Keywords: science, chemistry, stoichiometry, stoicometric calculations, conversions, mass, moles, grams, molmassa, chemical equation, chemical reaction, reactor, product, review, assessment, quiz, homework, fun stuff, activity, puzzle, maze, group work * You can also work like color by significant number Fishsheet. Color by Significant Number of Giraffe Worksheet. Significant digits Worksheet. Color by significant number robotic worksheet. Significant digits map sorting. Significant digits cut and paste Worksheet. Color by significant number butterfly worksheet. Classification of Matter Graphics Organizer. Phases and changes Worksheet. Phases and matter graphic organizer. Classification of Matter Graphics Organizer. Phases and changes Worksheet. Make case review questions. Periodic Table Bundle Activities and Assessments. Periodic Table Review FAQ. Periodic Table Interactive Cut and Paste Worksheet. Binding and naming batch activities and assessments. Naming Ionic connections puzzle. 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Also, be sure to visit my blogging science from the South for other ideas for your classroom and FREEBIES. Thank you so much for visiting and happy teaching! =) **** I teach Honors Chemistry & AP Chemistry at Benjamin E. Mays High School. Mays High is a Magnet School for Science and Mathematics in school in addition to other smaller learning communities. All together Mays High serves about 1700 to 1800 students. The population at Mays is about 98% African-American and 2% Hispanic. Mays High is a 'Title I' school where more than 50% of students are eligible for free or reduced lunch. Students in the Magnet Program must take a minimum of three Advanced Placement classes, in addition to regular graduation requirements, which include a one year chemistry. These requirements send almost every Magnet Student through my door. Some of my students have a strong background and interest in science, since their goal is to go to college for a science major, while others aren't interested in a science major. I always find my class to contain a heterogeneous mix of science knowledge. It forces me to learn the basic elements, principles of chemistry and math skills in a chemistry class as I prepare it for more advanced classes, which is very challenging. The biggest challenge of students of chemistry does multi-step problems using some basic math skills and chemical concepts. Food is one of the most important basic needs of life and most of us love food. The unit will associate the idea of healthy food habits with an understanding of key chemical concepts. One important concept is stoichiometry, which is an essential tool for chemists - this unit connects food with stoichiometry to drive the student's interest toward chemistry. One particular purpose of the unit is for students to make calculations without using the word stoichiometry. Another goal is to educate students to make the right choices in selecting healthy food, which is good for their body It helps students be physically healthier as they tend to choose the right food and will also be active in chemistry class. Throughout the unit, the activities will involve food and chemistry, highlighting the importance of chemistry in healthy food choices. The activities include math calculations that will lead students to central concepts of chemistry: stoichiometry and limiting reactor. Rationale We eat food for two physiological reasons: energy and chemical building bricks1. Food undergoes several complex reactions in the digestive system before absorbing through the walls of intestine. Some knowledge of chemistry is critical to understanding the metabolism of food in our body. Metabolism is the complete set of chemical reactions that occur within the cells of our bodies. These reactions extract energy from food, and convert them into movement, growth and reproduction. Metabolism of carbohydrates differs from metabolism of protein and fat, and vice verate. Using this knowledge, one can choose healthy food from the abundant varieties that is to satisfy one's palate and live a healthy life. On the other hand, poor food choices lead to being overweight and and Being overweight or obese increases the risk of many diseases and health conditions, including hypertension (high blood pressure), osteoarthritis (a degeneration of cartilage and its underlying bone within a joint), dyslipidemia (for example, High total cholesterol or high levels of triglycerides), type 2 diabetes, coronary heart disease, stroke, gallbladder disease, sleep apnea and respiratory problems, and some cancers (endometrial, breast, this unit will focus on food facts, information about the nutritious values of food, and the connection of this information by stoichiometry. In normal mode of teaching stoichiometry, I can ask for a general question of industrial chemistry: How much grams of ammonia can be produced by mixing 2.50 kg of nitrogen with excess hydrogen? To solve this problem, students need chemistry knowledge along with simple arithmetic knowledge and problem-solving skills. I'd like to emphasize my student's answers before discussing the process: 'Once again maths, are we in math class?', 'Involve a lot of steps, I can't do that', 'It's very difficult', 'Too many conversions, I give up.' Probably, these types of responses are common in high school chemistry class. I don't want to blame my students completely because the above question actually involves several steps. Not only that, they can't relate the above question to their day-to-day life. Although the above process is very important to the industry, since 20,000 tons of ammonia are used each year in the United States to make fertilizer,3 it is not interesting to my students. The following steps are involved in solving the above question: Writing correct formulas for nitrogen, hydrogen and ammonia. Writing a chemical equation for the process. Balancing the equation. Conversion of the mass of given substances to moles using moles using mole mass of dust. Using the stoic sociometric coefficients of the balanced equation to convert the moles of given to moles of unknown. Conversion of the mole from unknown to mass unknown. To make sure the mass is unknown in the correct unit with correct significant digits. The unit focuses on achieving the same problem-solving skills using examples related to food. Hopefully, by choosing problems in which students care about the answers, they will be motivated to use math in chemistry. I would like to show an example to achieve this goal. The problem: How much energy did you get from your breakfast/lunch today? Students can relate this question to their life. The question can be changed according to your situation and the time of class. The above question works as is for the first block or the block after lunch. I the question changes as How much energy will you get from your lunch break, today? for the block before lunch. This question seems simple and doable for students because they relate to themselves, although although problem also involves many steps. Since they can relate to their life, they don't care about doing this multi-step math problem. Besides doing maths, they need to list the food items, collect facts, analyze the food for nutritious values, put them together, etc. I think the driving force here is that they're the calories they've gotten from food they've had or are going to have, which will be an immediate connection to their life. The following steps are involved in calculating the total energy of breakfast/lunch: Collecting facts: energy per gram of fat, per gram of carbohydrate, and per gram of protein. List of the food items they had/are going to have. Estimation of the number of servings of each food item. Collect the nutrition labels or nutrition facts from the internet for each food item. Using nutrition facts, calculating the amount (in grams) of fat based on the servings for each food item. Repeat step 5 for carbohydrates and proteins separately. Conversion of grams of fat into energy calories for each item. Repeat step 7 for carbohydrates and proteins separately for each food item. Make sure that if 3 different food items consumed, then there are 9 different calorie amounts. Adding the calorie amounts obtained in step 7 and 8. While this problem is also a multi-step problem and involves mathematics, the students don't care because the end product of the problem relates to them. After the calculations are done, we will have a class discussion and can make a list of good foods they have or will have. Hopefully, students' awareness about healthy foods with addition to analytical and problem-solving skills will increase. Those skills are essential for stoichiometry. After completing this activity, I would like to bring up the synthesis of ammonia problem. Since students are familiar with multi-step problem solving with food analysis, they will do the stoichiometry without problems. Background Study of chemistry involves chemical changes in our body and around us. One major focus is on the structure and characteristics of substances. Chemistry is very important as it serves as an interface for all the other sciences and many areas of human pursuit. Therefore, chemistry is often mentioned as Central Science. The language of chemistry includes symbols for elements, formulas for compounds, and equations for chemical reactions. The shorthand representation of an element is called symbol. These symbols are recognized by the International Union of Pure and Applied Chemistry. Example: carbon is represented by C, sodium is by Na and xenon by Xe. The periodic table is used to catalog the symbols of elements. The chemical formula indicates the relative numbers of atoms of the elements of a substance4. For example: the chemical for baking soda (sodium bicarbonate) is $NaHCO_3$. The formula tells that 1 atom of sodium, 1 atom of hydrogen and 3 atoms atoms oxygen is present in one formula unit of baking soda. Propane, C_3H_8, is a common fuel used for cooking and home heating. In the chemical formula, the numbers 3 and 8 are called the subscripts and they represent the number of atoms/moles of carbon and hydrogen in one molecule/mole of propane. Chemical formulas are of two types. The empirical formula is the simplest formula that gives the correct relative numbers of atoms of each element in a compound, true if the molecular formula specifies the number of atoms of each element in a molecule of that substance. For example, the molecular formula of glucose is $C_6H_{12}O_6$, the ratio of atoms of carbon, hydrogen and oxygen is 6:12:6. The empirical formula of glucose is CH_2O, the atoms carbon, hydrogen and oxygen are in the ratio of 1:2:1. In a chemical reaction, the reactors are converted to products. During a chemical reaction, atoms are not created or destroyed; they are simply reorganized. A chemical equation represents the chemical reaction that reactors on the left side of an arrow and products on the right. N_2+3H_2 -> 2NH_3 The reactors in the above equation are nitrogen (N_2) and hydrogen (H_2) where the product is ammonia (NH_3). Food chemistry The chemistry of food includes water and three essential macro-nutrients - carbohydrates, proteins and fats. There are also many important components of food that contribute to our health, but are only present in small quantities; these components are called micronutrients and include vitamins, minerals such as calcium, potassium, iron and many others. Nutritionists recommend that a healthy adult female consume ~2000 lime of energy per day. Of course, this number can change depending on the level of activity of the female. These total calories should come from a mixture of macro extracts: for example, carbohydrate intake can be ~60% of calories, fat intake ~30%, and protein intake ~10% per day. Experts disagree on the exact percentages that make up a healthy diet, but these percentages are a good starting point. A calorie is the unit of energy, which is defined as the amount of heat needed to raise the temperature of one liter of water from 14.5 ^oC to 15.5 ^oC. This equals the amount of energy a 150 pound person burns every minute while sleeping5. The body converts food into energy. The human body can make four calories of energy for each gram of carbohydrate, nine calories per gram of fat and four grams per gram of protein. Choosing perfect relationships and correct combinations can be easier with knowledge about nutrition and simple arithmetic. Carbohydrates Carbohydrates, commonly known as sugars, are made from carbon, hydrogen and oxygen with a common chemical formula $C_n(H_2O)_n$. This formula hydrate carbon, hence the name was given as carbohydrates. Although it is now known that there are no full water molecules after carbohydrates, the name still remained. Carbohydrates contain multiple hydroxyl (-OH) and >C = O) functional groups. Carbohydrate molecules vary in size from monomers (monosaccads) to polymers (polysaccaeids). Polymer (poly= lots, mer = unity) is large a molecule with many recurring units called monomers. Monosaccads are the simplest carbohydrates and are referred to as simple sugars. The most common monosaccads, glucose, fructose and galactose, have either five or six carbon atoms. The presence of many polar groups makes this monosaccad water soluble. Glucose is a six carbon sugar that has an aldehyde structure. Glucose is often called blood sugar, as it is present in the blood at a high concentration. It serves as an important source of immediate energy. Fructose is a six carbon sugar with ketone structure. Fructose is known as fruit sugar, since it is present in many fruits. Glucose and fructose are structural ismomere, structurally different with the same molecular formula6. Galactose is a stereo isomer of glucose. They differ in special arrangement of hydrogen atoms and hydroxyl group around one of the six carbon atoms. An inaccuracy is formed when two monosaccads are tied together via a condensation response with the release of a water molecule. Sucrose and lactose are common disaccoils. Sucrose is also known as table sugar, since it is mainly used as a sweeteter. Sucrose is formed from glucose and fructose. Lactose is often mentioned as milk sugar, since it is important carbohydrate in milk. Lactose is formed from glucose and galactose is bound together. After intake, disaccharides are too large to be absorbed directly into the bloodstream, allowing the digestive enzymes sucrase and lactase to break sucrose and lactose into their monosaccharide units, respectively. Polysaccades contain 12 or more monosaccade units that are tied together. These are often called complex sugars. Starch, glycotan and cellulose are important digakkagarides. Plants make starch and cellulose: starch is water-soluble true if cellulose is insoluble. The animal counterpart of starch is another poetry butchride called glyogen. It is made by animals to store energy, most often in muscles and liver. Glucose is the monomer for each of these three polymers. Although they have the same monomer unit, they have different characteristics. This is because of the way the glucose monomers bound differs in the three polyaclyaclics. Cellulose has a linear structure that looks like a chain like fence. Starch molecules are either branched out or unbrewed, and glyces are highly branched. Because of the difference in their tape form, people can consume starch and glyceine, but not cellulose. Digestive enzymes cannot fit cellulose into their active sites due to the lock and key fit required for enzyme action. As a result, the cellulose in the fruits, vegetables, and grains we eat eat through the digestive system without being modified or absorbed. Molecules that act like this are called dietary fiber. The main function of carbohydrates is as a source of energy, both immediately and stored. When carbohydrates are oxidized, they release carbon dioxide, water and energy. Foods rich sources of carbohydrates include bread, rice, pasta, potatoes, milk, pie, soft drinks, vegetables, fruits etc. Due to the difference in the composition of the carbohydrates in each of these foods, their short- and long-term effects differ on energy in the body. Eating whole grain products helps the body's sugar control system8. Insulin, produced by pancreatic beta cells, is secreted into the circulatory circulation in response to the rise in blood glucose after meals. Insulin regulates blood glucose levels by suppressing glucose production of the liver and stimulating glucose uptake by cells throughout the body. When glucose (or other simple sugars) are eaten directly, blood sugar rises and therefore insulin dramatically. The fiber in whole grains leads to a slower rise in blood glucose and facilitates the workload for the insulin that makes cells in the pancreas9. Diabetes occurs when the pancreas cannot secrete insulin — or cells in the body stop responding to insulin. Proteins The word protein comes from the Greek root protos, which means first10. Proteins are organic polymers made from amino acids linked together in a specific way. Each amino acid has a carboxyle and an amino group. The amino and carboxyl groups provide convenient bonding sites for connecting amino acids together. The ame mid-band that joins two amino acids is known as a peptide tape. Proteins are not only large molecules, but also randomly arranged chains of amino acids. There are 20 amino acids, which make up the tens of thousands of different proteins in our body. Our body makes some of these amino acids and rest is obtained from food. These amino acids are referred to as essential amino acids, since they are essential in the diet. Proteins are the building tinges of the body. Proteins play many roles in our body. Proteins are involved in the formation of structures, digesting food, catalyzing reactions, transporting substances, regulating cellular processes, recycling waste, and even serving as an energy source when other sources are scarce. For example, insulin is a protein hormone, a small protein with 51 amino acids. The recommended daily allowance of protein is 50 grams per day for a 140 pound person and nearly 65 grams for a 180 pound person11. General sources of protein are meat, milk, nuts, fish, and some fruits and vegetables. Protein is found in the body in high concentrations in muscles, hair, skin, bone and all other tissues. The effects of dietary proteins on health are approximately the same for animal protein and plant protein. Animal proteins tend to be complete, be, they are sources of all essential amino acids. But one should be careful to eat too much of it, since animal protein tends to come with saturated fat. Although vegetable proteins are incomplete, they do not have all essential amino acids, but still they are good source of proteins. Research says that eating a lot of protein does not harm the heart12. Choosing the right protein sources that are low in saturated fat will help you keep in good health. Fats Fats are large, non-polish, biological molecules. Fats are insoluble in water, since they are not polish. Fats have two large functions in living organisms. They store energy efficiently, and they make the most of the structure of cel1 membranes. Fats are convenient source of energy storage. Our dietary fat contains phospholipids, and cholesterol in addition to triglycerides. A triglycerides are formed by condensation of one molecule glycerol with three molecules of fatty acid. Animal and vegetable rafts are complex mixtures of triglycerides. The cell membrane consists of phospholipids that regulate the transport of substances across the cell membrane. Our body requires cholesterol to make estrogen, testosterone and other important compounds. There are four types of fatty acids: monounsaturated, polyunsaturated, saturated and trans. All fatty acids are long chain hydrocarbons. Unsaturated fatty acids contain dual ties between some of the carbon atoms. Depending on the number of double bands, the fatty acid can be mono-saturated (one double tape) or poly saturated (more than one double band). Due to the cis orientation of double effects naturally occur in unsaturated fatty acids, they have a kink or bend that prevents them from effectively packing together. This leads to fewer intermolecular attractions, and lower melting points. Unsaturated fatty acids are in liquid phase at room temperature. These fatty acids are called as good fats because eating these fats instead saturated fats and carbohydrates lowers levels of low-density lipoprotein (bad) cholesterol with from lowering the levels HDL (good or protective) cholesterol. Olive oil, vegetable oil and fish oil are rich in unsaturated fats. Saturated fatty acids do not contain double effects there they are saturated with hydrogen. Saturated fatty acids can pack together because of their straight chain structure. Saturated fatty acids have higher melting points, therefore they are in solid shape at room temperature. Whole milk, red meat and coconut oil are good sources of saturated fats. These fats are called as bad fats as they strongly increase the LDL (bad) cholesterol13. Hydrogen, addition of hydrogen, to unsaturated fatty acids produce saturated fatty acids. For example, oleic acid can be hydrified to form stearic acid. Transv fats are mostly humans made fats. Polysaturated fatty acids on partial trans sure. sure. This process, hydrogen will be added on double bound carbon, but not all, to create single tires. At the same time, some of the remaining double effects al change their orientation, from cis to trans, leading to new physical and chemical properties to fats. Like saturated fats, trans fats increase the LDL cholesterol. They also elevate the triglycerides and lipoproteins. A higher level of this in the bloodstream increases the chances of heart disease. Trans rafts not only increase the LDL levels, but also reduce the HDL (protective form) levels. This does not happen with saturated fats. This suggests that transv fats are more dangerous than saturated fats. Vegetable shortenings, most margarine, deep fried fast food, most commercially baked foods, and partially hydrogenated vegetable oil14 are sources of trans fat. Including the good fats in the diet and keeping the bad fats keeps a person healthy. In the recommended 30% of dietary calories, less than 1/3 should be saturated fats and rest of them should be unsaturated fats15. Most importantly, keep transv fats out of your meal. Balancing comparisons The Prohibition of Mass Act states that 'the mass of the universe is constant'. This means that mass is not created or destroyed. According to the Act of Conservation of Mass, one must balance every chemical equation so that the mass of substances remains the same before and after the chemical change. Another way to declare it, which is more convenient for chemists, is: all atoms present in the reactors must be accounted for under the products. A balanced comparison gives the relative numbers of reactors and product molecules. In a balanced chemical equation, the subscripts tell the number of atoms of each element in a molecule, where if the coefficients tell the number of molecules/moles of reactors and products. As mentioned earlier, in our body several chemical reactions occur during digestion, breathing and other processes. Some examples of biochemical reactions: Sample1: During cellular breathing, our cells make energy from breaking down glucose through oxygen in carbon dioxide and water. The process is an exoermic process, the energy emissions process. $C_6H_{12}O_6$ +6O_2 -> 6 CO_2+ 6H_2O+ Energy Sample 2: The Hydrolysis of Sucrose in Glucose and Fructose $C_{12}H_{22}O_{11}$ + H_2O -> $C_6H_{12}O_6$+$C_6H_{12}O_6$ Example 3: Peptides are synthesized by connecting carboxic group from one amino acid with amino acid to form peptide tape. Example 4: Fermentation of sugars in alcohol: A fraction of chemical reactions found in our body during metabolism, cellular breathing and protein synthesis are mentioned above to show the importance of chemistry to understand the metabolism and our food. Mole Draft We Are All Familiar With The Meting The Quantity by their mass: I have one pound of orange oranges 10 ounces of gold. But there is another way of metling amounts that are convenient for chemists, or anyone interested in substances that can respond. A mole is a unit of extent equal to the number of carbon atoms in exactly 12 grams of pure Carbon -12. A mole of any other substance is the same number of units of that substance. One mole of any substance contains Avogadro's number of units of that substance. Avogadro's number was experimentally determined as 6.022×10^{23}, which is a large number. The molar mass of a compound is the mass in grams of one mole of the compound and is calculated by summary of the average masses of its constituent atoms. As I mentioned in the rationale, a stoichiometry problem requires understanding the mole concept, molar mass, balancing equations and conversions. Since a mole is such a large number, I use Mole Facts16 to fascinate my students. Some of the mole facts are listed here: - 6.02×10^{23} Donut Gate: Would cover the Earth and be 5 miles (8 km) deep. - 6.02×10^{23} Watermelon Seeds: Would be found in a melon slightly larger than the moon. - 6.02×10^{23} Grains of sand: Would be more than all the sand on Miami Beach. - 1 Liter bottle of Water contains 55.5 moles H_2O - 5 Pounds Bag of Sugar contains 6.6 moles of $C_{12}H_{22}O_{11}$ (Sucrose) Stoichiometry Stoichiometry (from the Greek stoicheion, element, and metria, science of measurement)17 deals with the calculation of the quantities of material consumption and produced in chemical reaction It's like chemical arithmetic. Stoichiometry is often used in the industry to determine the amount of materials needed to produce the desired amount of products in a given useful comparison. Stoichiometry calculations help scientists and engineers working in the industry to estimate the amount of products they will obtain from a given procedure: it can also help decide whether or not the product is profitable to produce. Companies make many chemical substances, through chemical reactions, that are useful in our lives. For example, addition of stannous fluoride, SnF_2 , to paste toothpaste to prevent the tooth decay in the toothpaste industry; aspartamine, a sugar substitute, in soda in soda industry; preparation of citroic acid from the fermentation of sugars (sucrose) in the air in food industry; synthesis of aspirin in pharmaceutical industry; use of titanium metal and its alloys in aerospace industry; extraction of titanium from its ore rock, TiO_2, into metalluria; production of the bleach, calcium hypochlorite, of sodium hydroxide, calcium hydroxide and chlorine in detergent industry; manufacturing of polyethylene (found in some milk cartons) in polymer industry; removal of hazardous mercury compounds from industrial waste in environmental chemistry. The list can go on. Each of these products stoichiometry. There would be no of these industries without chemical stoichiometry. Quantities of reactors consumed and products formed can be calculated from the balanced equation for a response using the mole ratios relating to the reactors and products. In this unit we will concentrate on understanding and using these mass relations. Limitation of Reactor / Restrictive Rehuns The restrictive reactor is the one first consumed and therefore determines the amount of products that can be formed. The other reactors in the chemical response are called excess reactors. The excess amount of these reactors will be left, without responding, when the response is complete. For example, if you're hungry, the number of grilled cheese sandwiches you can make depends on how many slices of bread and slices of cheese you have. You can make five sandwiches from sixteen bread slices and five cheese slices. You couldn't make eight sandwiches, even though you had sixteen slices of bread because you only had five slices of cheese. In this situation, the restrictive reactor is cheese and excess reactor is bread. Your products are five sandwiches and six slices of bread (which is the unassuming excess substance). Percentage Yield The theoretical yield of a product is the maximum amount that can be produced from a given amount of restrictive reactor. The actual yield, the amount of product actually obtained in a given experiment, is always less than the theoretical yield. The ratio of actual yield to theoretical yield, multiplied by 100%, gives the percentage yield in a given response. In the above example about making sandwiches, if for some reason (say, by accident, a cheese cut came on the floor) you could make four sandwiches instead five, then the percentage yield would be (4/5) 100% = 80%. Percentage yield = (Actual return/theoretical return) 100% Teaching Strategies In my class, students mostly work in groups. I use two different types of grouping based on the requirement: that is, capability grouping and cooperative grouping. Cooperative grouping will work better at the beginning of the concept where as ability grouping works for students to gain mastery in a topic. Nutrition label Analysis How much molecules water is needed to burn a lunchtime meal? This activity focuses on studying the nutritious values in a meal and then determining the number of moles and molecules of water needed for the digestion of that meal. The process involves determining calorie values of carbohydrates, proteins and fats separately. For example: A student chose the following items from the existing lunch options in the school cafeteria on Monday18 - orange chicken (two servings, steamed rice (1 cup), Lo Mein Noodles (1cup), pepperoni pizza (1 French fries (1 serving) along with a piece of chocolate cake. Students will examine and study the nutritious labels to cost calories for each item. This process involves a lot of maths. Therefore, it would be the stepping stone to incorporate math into chemistry, without mentioning stoichiometry. Students identify which item in the meal is healthy and which is not based on the knowledge they gained from Eat, Drink and Healthy Book and their research. After the food cal calorie calculation, students will calculate the volume of water needed to consume the meal from the information that an average person needs about a milliliter (mL) of liquid for each calorie burned 19. The first step in calculating water molecules is the determination of volume liquid. For example, the number of calories obtained from the above meal is 750 calories: therefore, the volume of the liquid needed, with the assumption as water is the only liquid available for our case, is 750 milliliters. Then the volume of water is converted into the mass of water using the density (density of water = 1.00 g /ml). In the third step, mass water is converted into mole water using water-molar mass. The last step is the conversion of the number of moles of water into molecules of water. Burn calories20: The energy in food This activity focuses on calculating energy in food items using a calorie meter. All foods contain energy, but the amount of potential energy stored will vary greatly depending on the type of food. In addition, not all of the stored energy is available to do work. When we eat food, our bodies transform the stored energy, known as calories, to chemical energy, through which we can do work. A calorie is the amount of heat (energy) needed to collect the temperature of 1 gram (g) of water 1 degree Celsius (°C). The density of water is 1 gram per milliliter (1g/ml) therefore 1 g of water equals 1 ml of water. When we talk about calorie values of food, we refer to them as Calories (see the capital C), which is actually kilocalorical. There are 1000 calories in a kilocalory (or diet Calorie). So in fact, a food item listed as 38 Calories has 38,000 calories. Calories are a way to measure the energy you get from the food you eat. Neutralizing ability of stomach acids The focus of this activity is on stoichiometry of acidic soil neutralization between stomach acid and commercially available animations. Students are expected to do research to find information on the chemistry of stomach acid and commercially available hours. At least students with the chemical name of stomach acid, hydrochloride acid and its neutralization will come up with antacids, whether Tums - calcium carbonate or milk of magnesia - magnesium hydroxide. Students then write the balanced chemical equation between the gastric acid and the hour that Is. After students understood the concept of neutralisation of stomach acid with acid (base) to students will get a virtual lab21 as homework. This virtual lab acquates students through the process of acid-base titration. The following class-period students will complete the titration laboratory - neutralizing ability of stomach acids22. At the end of lab students are required to find the post lab questions and write lab report. Approximately the entire activity will be completed in three class periods. Gasstoichiometry and cellular breathing The activity will begin with asking students: if we're locked in the classroom and can't go out the room, how long we can survive? The activity involves: measurement of the dimensions of the classroom, subtracting the volume of the tables, laboratory stations, etc., determining amounts of oxygen and carbon dioxide from the room dimension and composition of air, research to learn about the cellular breathing, inhalation amount of oxygen and exhalation amount of CO_2, hazardous indoors They are supposed to find the inhalation amount of oxygen and exhalation amount of CO_2 per student and multiply by number of students to calculate indoor air quality. I estimate that this activity can take one class period. Baking Cookies This activity will focus on limiting reactors and percent yield. Students are expected to calculate the maximum number of cookies they can make from the given set of ingredients. Students are expected to make a list of ingredients that were redundant. Students are expected to identify the ingredient that will limit the number of cookies they can bake. They are expected to report these amounts in SI units. Finally, they are supposed to write the reason for making such a number of cookies (limiting reactor). After baking cookies, students will count the number of cookies they could actually bake. The use of the estimated number and the actual number of students will calculate the percentage return. This activity will take one ninety-minute class period. Hopefully, by the end of these activities, students will be able to understand healthy food choices, ways to avoid obesity, conversions, stoichiometry ratios, limit reactant and percent return. Activities Problem: How many molecules of water should a meal burn? Goal: To understand the nutritious values in the given meal. Background research: Students should examine and obtain the information on macroutrics from our diet such as carbohydrates, proteins and fats and their calorie values. They need to find the information about the types of fluids and the amount of fluids necessary for the important metabolic reactions in our body. Students make an effort to practice the conversions. Hypothesis: Student will make an educated guess. Procedure: the food items from your meal (this could be your lunch or combination of items from the school lunch menu) Go to the website get the nutrition labels for each food item from your list. Identifies the number of grams of carbohydrates, proteins and fats for each food item from the nourishing label. Calculate the calorie value for carbohydrates, proteins and fats for each food item using this information - four calories per each gram of carbohydrates, nine calories per each gram of fat, and four calories per each gram of protein. Add the calories obtained in step 4 to get total calories for the meal. Determine the volume of liquid (assuming water is the only liquid available). Too: An average person requires one ml of fluid per each calorie. Convert the volume of water to mass water through density water (1gm/ml) Convert the mass of water into mole water using the mole water (18.016 g/moles) Convert the mole water into molecules of water using mole concept and Avogadro's number (6.022×10^{23} particles per mole of a dust) Data Calculations: In this section, students must show all the calculations with proper units and correct significant figures. Results and analysis: Students need to report their answer and will list good food items from the meal. Burning Calories -The energy in food objective to determine the number of calories in food. Introduction Why are marathon runners advised to eat a large plate of pasta the night before a competition? Because pasta is a good source of energy, or fuel, for the body. Just as pasta can offer a runner energy to perform a marathon, a small peanut contains stored energy that can be used to heat a container of water. For this lab exercise, you will indirectly measure the amount of Calories in some food items using a calorie meter. A californian (calorie = Latin for heat) is a device that measures the heat generated by a chemical reaction, change of state, or formation of a solution. There are several types of calorie meters, but the main clampdown of all calorie meters is to isolate the response to prevent heat loss. We will be modelled using a homemade calorie meter after a constant volume of calorimeters. A specific food item will be ignited, the homemade calorie meter will capture the heat of the burning food, and the water above will absorb the heat, thereby causing the temperature (T) of the water to increase. By measuring the change in temperature (ΔT for a known volume of water, you will be able to calculate the amount of energy tested in the food tested because the heat produced by the water will equal the heat lost by the food item: $Q_{lost\ by\ food} = Q_{gained\ by\ watr}$ The energy supplied by the water can be calculated as follows: $Q_{water} = (m(c)(\Delta T)$ where Q the heat is sustained in calories (cal); m is the mass of water in grams (g); c is the specific of water (1 calorie/g °C); and ΔT is the change in temperature in degrees Celsius (°C). Note: Energy can also be used in Joules (J) or Thermal unit (Btu). There are 4.184 J in 1 calorie. A btu is the amount of heat needed to increase the temperature of one pound of water by one degree Fahrenheit and 1 Btu is equivalent to 252 Calories. Material per pair of Graduate Cylinder, Water Bottle with Distilled Water, Homemade Calorie Meter, Coffee Can, Small Metal Tin (2), Glasstaaf, Cork with Wire Attached, Thermometer (in°C), Lighter, Safety Glasses, Forceps. Materials in lab roast cashew nuts, Popcorn, Weighing Boats, Scale, Distilled Water, Gloves CAREFULLy!!! Flames will be used and items can be hot! All long hair should be tied back. Procedure of the 2 food items you will test, hypothesis which ones will have more calories (energy). Record your forecast in the Laboratory Report. Acquire a weighing boat and determine its weight. Record your data. Acquire a cashew nut and using the same weighing boat, determine the weight of the cashew (wi). Record your data. Use the graduate cylinder, measure 100 ml of distilled water from the water bottle and pour it into the small metal tin. Measure the initial temperature of the water (Ti). Record your data. Slide the glass rod through the holes into the top of the small tin. Gently wrap the wire attached to the cork around the cashew. It is better to have the cashew at a slight angle. If the cashew breaks, use another; however, you will have to retwehear the new cashew. Place the cork with the cashew on a non-flammable surface. Put on your safety glasses and light up the peanut. It may take a while for the cashew to ignite. Once the cashew catches fire, immediately place the large can around the nut. Then balance the small tin, using the glass rod, top the large can and over the burning cashew (see figure above). . Let the cashew burn until it goes out. If possible, try keeping an eye on it and if it goes out quickly (less than a minute), ease the cashew. Once the cashew has finished burning, carefully remove the small tin by holding the glass rod and place it on the lab bench. Then remove the glass rod. Weight (Mass) of Food (g)A Temperature of Water (oC) Food Item Initial Weight (wi)A Final Weight (wf)A Mass of Sample Burn (Δw = wi - wf) Initial Temperature (Ti) Final Temperature (Tf) Change in Temperature (ΔT = Tf - Ti) Cashew Popcorn ution! The cans and water will be hot! Use the thermometer, carefully stir the water and then measure the temperature again (T f). You may need to leave the thermometer in the water for a while to get the highest reading. Record your data. After the burnt cashew has cooled, transfer it to the original weighing boat (use the forces if necessary) and weigh the remains (w f). Record your data Repeat steps 2 - 11 with the popcorn. Make sure you use a new small tin and fresh ter. Wire. Record all your data. on not forgetting to pull the weight off the weighing boat. Lab report Which food item do you predict to contain more energy? Weight of weighing boat: You can ______________________g_ ______________________g_ on data. Determine the Calories of the food: Be sure to show all your calculations and you include all proper units. able > Food Energy or calories (cal) Calories (Cal) or kilocalories (kcal) Cal/g Cashew calculations answer Popcorn calculations answering no more than that the density of water is 1g/ml therefore 1 g water = 1 m How many calories are in 1 whole cashew? In1 popcorn? Were you able to determine the entire Calorie content of the food item? Why? Do you think the number of Calories you've calculated is likely to be lower or higher than it really is? Explain why. What is the original source of energy tested in all the food? The Neutralizing Ability of Stomach Anteceration Reading Command: Section 4.5 and 4.6 in Chemistry: The Central Science 9th Ed. I. Pre-Lab Preparation (This section must be completed before student comes to lab, it replaces the intro in lab notebook). Returns the formula and the name of two common active ingredients found in commercial hour. Why is it important to rinse off the reed with the solution you will dissolve from it? After going the anticipation in this experiment at the HCl, do you expect the solution to be acidic, basic or neutral? Explain briefly. Why is it necessary to titrate the NaOH first with KHP then with HCL? Background A general laboratory procedure is a titration, which determines the concentration of a solution of acid. The volume of the basis of known concentration required to respond completely with a known volume of acid is used to determine the acid concentration. Have you ever found yourself wondering why did I eat the whole thing? and respond by popping an hour? What does an anocity do to alleviate discomfort? The parietal cells in the stomach secrete hydrochloride acid at a concentration of about 0.155 M (pH normally between 2 and 3). The amount of HCl secreted increases when food enters the stomach. When eating or drinking too much, your digestive system can generate too much acidity. You may develop a condition called heartburn or neediness. Animations are swallowed to neutralize the excess acid and return the pH to normal. In this experiment, you test different counter-acid brands to compare their effectiveness. The basis in hour varies with the brand. The table below lists the active ingredients in various brands. Brand Active Ingredient (Base) Pepto-Bismol BiO (HOC_6H_4COO) Milk from Magnesia $Mg(OH)_2$ Rolaids $CaCO_3$ and $Mg(OH)_2$ Tums $CaCO_3$ Alka-Seltzer $NaHCO_3$ Gaviscon $Al(OH)_3$ is neutralized by these bases as illustrated below. 1. 2. 3. 4. In addition to the active ingredient, tablets can also be flavors, sweeteners, binders, fillers, antifoam agents, pain relief (aspirin), etc. In this experiment, the tablets will only be analyzed for their ability to neutralize acids. We will dissolve the anticid with excess acidity and then titrate the unresolved acid with a standard NaOH solution. Since you know how much acid you started and how much of it is left and are redacted with NaOH, you'll be able to determine how much responded with the antick. This experiment is divided into two parts. 1. Titration of a solution of sodium hydroxide at the primary standard KHP (potassium hydrogen phalatate, $KC_8H_5O_4$). 2. Titration of an aneopic tablet with the standardized NAOH solution. From these results it is possible to calculate the concentration of the sodium hydroxide and then of the hydrochloride acid solution. The chemical reactions are: The acid and base solutions are colorless, how one will know when sufficient base solution is added to respond with all the acidity (this is known as the equivalence point)? An indicator will be used that changes colors when the equivalence point is reached. A number of different indicators are available for acid-base titrations. Hydrochloride acid is a strong acid while KHP is weak. We will use two indicators: Phenolphthalein and thymol blue. Procedure A. Preparation of a greeting and pipette. Acquire a 50mL greeting and a 10mL pipette. Fill the neighbors with water and look for proper drainage. A clean reed should drain smoothly, and no drops should be left behind to stick to the walls of the drained label. Obtain about 200 ml of the 0.2M NaOH in a mug Fill the pipette with deionized water and check it for proper drainage in similar fashion. nse the reed with several small portions (3-6 ml each) of the NaOH solution. This is done by adding the NaOH, and then tipping the buret so that it's almost horizontal (open end over a sink!) And turn the reed so that the solution can wash over the walls. After this, let the solution drain through the tip to flush out that part of the purse. The goal of all this is to leave a solution recess that will be exactly the same concentration as that of the final fill with your NaOH. Finally, fill the neighboring, and let the filling flush out the point a little, and look to be sure there are no air bubbles trapped in the tip. Clean the pipette in a similar way. Use the pressure bulb to blow out most of the liquid inside the pipette and dry from the outside. Put about 20mL of HCl in a clean dry beak. Then pull a little HCl solution into the pipette (parting direction up into the fat part of the pipette). Put your index finger over the top of the pipette to stop outflows, remove the partially filled pipe from the solution, and turn it almost horizontally again and flip it over a sink to down the walls Repeat these coil 2-3 additional times, and after final drainage, put the pipe on a horizontal horizontal where it will not roll off the table. Spill out the remaining HCl solution. B. Titration of KHP with NaOH Weighs two individual 0.7- to 0.8-g samples (up to the nearest mg) of KHP on weighing paper. Be sure to record all digits on the right side of the decimal point for each weigh. (If the last digit is 0, log it.) Use the same balance for each pair weighing. Dissolve each of the KHP samples in 50 to 75 ml of deionized water in separate Erlenmeyer jars. Add 2 drops of phenoolphthalein and tytrate with NaOH. Perform titrations of the samples as follows: First allow the fluid level in the wallet to drain into a waste probe somewhere between 0 and 15 ml. Do not try to adjust the volume exactly to a specific line. Carefully read the position of the liquid level and record it in your notebook. You should estimate the reading to 0.01 ml. To do this accurately, it is imperative that your eye is at a level with the liquid level. Slowly add NaOH out of the stud with regular swirling of the jar and look for the first signs of gradual color change from colorless to pink. With experience, the amount of local pink color where the NaOH solution walks in will offer an idea about how close you are to the endpoint. If you think you're near the end point, stop and rinse the edges off the jar with deionized water from your wash bottle. Add the NaOH a few drops at a time, thoroughly rotate to each addition and watch the color change. Continue adding until the pink color of the indicator persists for 30 seconds. Read the retention volume and record it in your notebook. (If you accidentally add too much solution and overshoe the endpoint, simply record the volume and add a note of explanation next to the reading and then go to the next sample.) Refill the buret and continue in the same way to titrate the second sample of KHP. C. Titration of HCl with NaOH Gets about 120 ml of 0.5M HCl solution (in the mug you only use for the pipette preparation. Pipe two 50 ml samples of this solution carefully into two clean 250-ml titration jar, marked 1 and 2, respectively. To do this properly, fill the pipette above the mark using a rubber bulb, keep your finger over the top and with the mark at eye level let the solution drain meniscus slowly down to the mark. It takes practice! If a drop gets sticked to the tip of the pipette, touch the tip on the side of the beak to remove it, and then quickly transfer the pipe to one of the titration jars. Let the solution drain freely and when drained downstairs, touch the tip of the pipette on the side of the jar to remove the final drop. Do not shake or blow out the remaining liquid. These pipettes were calibrated to deliver 50.00 ml with this procedure, and that would be changed the pipette has been shaken or blown out. Obtain two acid tablets from the same brand. Each group group analyse another hour and the class results will be pooled for comparison at the end. Be sure to get a copy of the class results before you exit lab. Draw the exact mass of each tablet. Add one tablet to each titration jar that HCl. Covers each jar with a watch glass and brings to a soft boil for 5 minutes on a hot plate. It helps the tablet to fix and dispel any CO_2 provided by reaction with HCl. puts it aside to cool. Add several drops (4-5) of the indicator, bromothymol blue, to the cooled solution of anticipated tablet containing the intreate acid. The solution will be yellow. Now take the first jar, slowly adding NaOH out of the receptive with regular swirling of the jar. As you add NaOH, the solution in the beak will change from yellow to blue. The endpoint is reached when the blue color persists for 15 seconds or more. Since it gets harder to get rid of the blue color when you turn the jar, add smaller quantities. Read and record the final volume. Refill the call if necessary and continue in the same manner to titrate the second sample of HCl. Once you know how much it takes for a tablet, you can add slightly less in the next trial and add the last milliliter or so drop wise and you won't go past the endpoint. When finished with experimental work, rinse the reed and leave it filled with pure water. II. Data and calculations 1 Standardization of NaOH with Potassium Hydrogen Stops (KHP) Route 1 Route 2 mass of KHP (g) Initial call reading (mL NaOH) Final purse reading (mL NaOH) Volume of NaOH (m) Mobility of NaOH (mole/L) 2- Titration of HCl with NaOH Brand name of hour usage: __ Active ingredient: __1 Route 2 mass analoxic use (g) Volume of HCl added Molity from HCl millimoles of HCl added to initial wallet reading (mL NaOH) Final wallet reading (mL NaOH) Net Volume of NaOH (mL) millimoles from NaOH needed to neutralize excess millimoles of HCl by The analic acids (mmol) HCl (mmol) millimoles of HCl per gram hour III- Questions In an early TV commercial for Rolaids anticor acid tablets, the manufacturer claims that the tablet would neutralize 47 times its own weight of stomach acid. A tablet weighed 1.4g and contained 0.334 g of the active ingredient, Needle $(OH)_2CO_3$. Assume that the active ingredient responds with HCl according to the response: a) How much moles of HCl would one Rolaids tablet neutralize? b) Gastric acid is about 0.155 M HCl and has approximately the same density as water. Has the Rolaids tablet neutralized 47 times its own weight of HCl solution? Gas stoichiometry and cellular breathing concepts: Measurement techniques, quantities and units, SI system of units, conversion, significant digits, precision and accuracy, cellular breathing, gas Inquiry question: What is the relationship between air quality and volume of air in living space? Pre lab FAQ: Where do you spend most of the time during the day? Estimate the percentage of time you spend at home, school, driving, field etc. Fill and label the pie chart with this information. Do you know any air pollution that can make you sick? Procedure and calculations: 1. Measure indoor air volumes: Collect measurements of the room (in m) and determine the volume of the room. Length: ____ Width: __ Height : __ Volume of the Room = __ ——(1) The unavailable space in the room occupied by objects should be about 4 times the volume of one of the lab tables if it was solid. Measurements of Lab Table: Length: Width: Height : Volume = __ Volume Unavailable = ___——_ Total Volume Air in the Room in L = __ 2. Calculation of human ventilation rates: Count the number of breaths you take per minute using a stop watch. Ventilation rate = _________breaths per minute Assume that you inhale 0.5 L of air for each breath. Volume air inhaled per minute = tidal volume (L/breath) x ventilation rate (breath/minute) Volume air inhaled every minute = Volume air inhaled every hour = 3. Comparison of volumes Total volume air in the room (L) Ventilation rate of a single person (L/hr) Ventilation rate of whole class (L/hr) 4. Determine the use of the total volume of air in the room and the number of persons in the room, the amount of air available to you. Is there enough air for you and everyone else in the classroom? 5. If the room were to be sealed (no outdoor air coming into the room) how long you and your classmates would survive at your current breathing rates. (Assume you don't inhale the same air more than once) The fresh air supply is from the air channels in the classroom. Measure the total area of the air channels in the classroom. What should be the speed of airflow from the channels if it is to replace the air used per hour? Check the units and do appropriate conversion before replacing. oath of airflow (m/s) x area of the channels (m^2) = volume air required per hour by the entire class (m^3/s) If your ventilation rate is 600 L per hour, how long will it take for you to breathe all the air into a small space capsule with 1800 L space that does not inhale you more than once? (show your work) How do you think astronauts get fresh air on the International Space Station? 6. If the average density of air at the room temperature today is ____ kg/m3, calculate the mass of the air in the room. Mass (in kg) = density (kg/ m^3) x volume (m^3) How does the of the air in the room compare to your weight? (1 kg = 2.2 pounds) 7. The density of air changes with temperature. Determine the heavier the air in this room on a cold day in winter would be compared to a very hot day in summer. Temperature Density Volume Mass Hot Day 40 C Cold Day 4 C 8. Fresh outdoor air contains about 21% O_2 and 0.03 per cent CO_2 on a volume basis23 (the rest is mainly nitrogen). Significant variations in these relationships can make it unsuitable for human con use. For prolonged exposure, a minimum concentration of 16 percent O_2 and a maximum concentration of 0.5 percent CO_2 (sometimes extended to 1 1/2 percent) becomes generally accepted standards. 9. A person, when seated, usually inhales about 510 L of air per hour. The exhaled air contains about 16 percent O_2 and about 4 percent CO_2. Thus, if only 1510 L per hour of fresh air were provided for each person in a continuously occupied space, the concentrations of O_2 and CO_2 would approach these levels. Exposure for even a short time to a CO_2 level of 4 percent will result in a temporary loss of vitality and ability. However, if this amount of fresh air was provided ten times (5100 L per hour or 85 L per minute), the ultimate CO_2 level would be only 0.4 percent and the O_2 deficit would be only 0.5 percent, instead of 5 percent. 10. Calculate the amount of fresh air your class needs per hour for the levels of oxygen and carbon dioxide to be maintained. Baking cookies Purpose To understand the concept of limiting reactant and percent yield Background The recipe for baking cookies calls for one cookie mix, one egg and a stick of butter to make 24 cookies. First group students received 3 packs of cookie mix, 12 eggs and 2 butter sticks. Second group students received 2 packs of cookie mix, 1 egg and 3 butter sticks. Third group students received 3 packs of cookie mix, 5 eggs and 2 butter sticks. Fourth group received 5 packs of cookie mix, 12 eggs and 3 butter sticks. Each group must calculate the maximum number of cookies they can make from the given ingredients. They need to justify their answer and show their calculations. Materials required for each group of Cookie mix packs, eggs, butter, oven for baking, baking-ready Procedure Each group will follow the recipe for baking cookies. Results and discussion Expected number cookies___________________ Actual number of cookies baked__________________ Percent yield = __ Bibliography 1. Willett, Walter C. Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating: First Edition. Free Press: New York 2005- pg 45. Best Science-based book on Nutrition for General Public. 2. 3. Zumdahl, Steven S. & Zumdahl Susan A. 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