HISTORICAL DEVELOPMENT OF CHEMISTRY pdf

1: Timeline of the Historical Development of Chemistry by john ross manuel on Prezi

The development of the modern scientific method was slow and arduous, but an early scientific method for chemistry began emerging among early Muslim chemists, beginning with the 9th-century chemist JÄ•bir ibn HayyÄ•n (known as "Geber" in Europe), who is sometimes regarded as "the father of chemistry".

Consequently, a survey of the Nobel Prizes in Chemistry during this century will provide an analysis of important trends in the development of this branch of the Natural Sciences, and this is the aim of the present essay. Chemistry has a position in the center of the sciences, bordering onto physics, which provides its theoretical foundation, on one side, and onto biology on the other, living organisms being the most complex of all chemical systems. Thus, the fact that chemistry flourished during the beginning of the 20th century is intimately connected with fundamental developments in physics. This is instead created by a cloud of electrons circling around the nucleus. Rutherford received the Nobel Prize for Chemistry already in for his work on radioactivity see Section 2. Niels Bohr from Copenhagen understood that an important clue to the solution of this problem could be found in the distinct lines observed in the spectra of atoms, the regularities of which had been discovered in by the physics professor Johannes Janne Rydberg at Lund University. Consequently, Bohr formulated in an alternative atomic model, in which only certain circular orbits of the electrons are allowed. In this model light is emitted or absorbed , when an electron makes a transition from one orbit to another. Bohr received the Nobel Prize for Physics in for his work on the structure of atoms. Another step in the application of the electronic structure of atoms to chemistry was taken in , when Gilbert Newton Lewis suggested that strong covalent bonds between atoms involve a sharing of two electrons between these atoms electron-pair bond. Lewis also contributed fundamental work in chemical thermodynamics, and his brilliant textbook, Thermodynamics , written together with Merle Randall, is counted as one of the masterworks in the chemical literature. Much to the surprise of the chemical community, Lewis never received a Nobel Prize. Fundamental work had, however, also been done in more traditional chemical fields, particularly in organic chemistry and in the chemistry of natural products, which is clearly reflected in the early prizes. Until recently there was no limit other than age on how many times regular members could be re-elected for 3-year terms, so that some members sat on the Committee for a very long period. Only persons that have been properly nominated before 31 January can be considered for the Nobel Prize in a given year. Consequently, the Nobel Committee starts its work by sending out invitations to nominate in the autumn of the preceding year. Recipients of these invitations, for both Physics and Chemistry, are: In the initial years of the Nobel Prize, about invitations to nominate for the Nobel Prize for Chemistry were sent out, but this number has increased over the years and was as high as 2, in The number of nominations received has also increased dramatically from during the first decade to in the s. The number of candidates is usually smaller than the number of nominations, since many candidates receive more than one nomination. During the first few years only about 10 scientists were nominated, but in recent years this number has been in the range of The invitations to nominate are personal, and it is stressed that nominations should not be discussed with the candidate or with colleagues. This is unfortunately not always respected as is obvious from the fact that many identically worded nominations are some years received from the same university. For this reason the Committee does not put much weight on the number of nominations a given candidate receives, unless clearly independent nominations come from different universities in different countries. This attitude was not taken in earlier years however, as is evident from the following statement made by Committee Chairman Arne Westgren, in a survey over the first 60 years of the Nobel Prize for Chemistry [1]: This problem was met already in , when Arrhenius had been nominated both for the Prize for Chemistry and that for Physics, and in its deliberations the Committee for Chemistry suggested that he should be awarded half of each Prize, but this idea was rejected by the Committee for Physics. Because of such borderline problems, the Committee for Chemistry nowadays has joint meetings with those for Physics and for Physiology or Medicine. However, as pronounced by Westgren [1]: It was undoubtedly this rule that excluded Stanislao Cannizzaro from receiving one of the first Nobel Prizes, since his work on drawing up a reliable table of atomic weights, helping to establish the periodic system, was done in the middle of the 19th century. A more recent example is Henry Eyring, whose brilliant theory for the rates of chemical reactions, published in , was apparently not understood by members of the Nobel Committee until much later. The Nobel Prize was, however, awarded for his later work on chemical kinetics and equilibria and on the osmotic pressure in solution, published in and , when he held a professorship in Amsterdam. When he received the prize he had, however, left this for a position at Akademie der Wissenschaften in Berlin in An apparent exception was aqueous solutions of electrolytes acids, bases and their salts , but in the following year Arrhenius showed that this anomaly could be explained, if it is assumed that electrolytes in water dissociate into ions. Arrhenius had already presented the rudiments of his dissociation theory in his doctoral thesis, which was defended in Uppsala in and was not entirely well received by the faculty. It was, however, strongly supported by Ostwald in Riga, who, in fact, travelled to Uppsala to initiate a collaboration with Arrhenius. When Arrhenius was awarded the Nobel Prize for Chemistry in , he was since professor of physics in Stockholm, and he was also nominated for the Prize for Physics see Section 1. The award of the Nobel Prize for Chemistry in to Ostwald was chiefly in recognition of his work on catalysis and the rates of chemical reactions. Ostwald had in his investigations, following up observations in his thesis in , shown that the rate of acid-catalyzed reactions is proportional to the square of the strength of the acid, as measured by titration with base. Three of the Nobel Prizes for Chemistry during the first decade were awarded for pioneering work in organic chemistry. At the award ceremony in the importance of his discoveries for chemical industry was emphasized. Two of the early prizes were given for the discovery of new chemical elements. Sir William Ramsay from London received the Nobel Prize for Chemistry for his discovery of a number of noble gases, a new group of chemically unreactive elements. The following year Ramsay found helium, observed earlier only in the solar spectrum hence its name , in emanations from radium, thus anticipating later prizes for nuclear chemistry see below. The isolation of another element, fluorine, by Henri Moissan in Paris was honored with the Nobel Prize. Ernest Rutherford [Lord Rutherford since], professor of physics in Manchester, was awarded the Nobel Prize for Chemistry in for his investigations of the chemistry of radioactive substances. In his studies of uranium disintegration he found two types of radiation, named aâ€” and b-rays, and by their deviation in electric and magnetic fields he could show that a-rays consist of positively charged particles. His demonstration that these particles are helium nuclei came in the same year as he received the Nobel Prize. The vitalistic outlook had been fiercely defended by Louis Pasteur, who maintained that alcoholic fermentation can only occur in the presence of living yeast cells. Buchner was awarded the Nobel Prize for Chemistry in , when he was professor at the agricultural college in Berlin. This confirmed the prediction of his former teacher, Adolf von Baeyer: The Nobel Prizes for Chemistry A survey of the Nobel Prizes for Chemistry awarded during the 20th century, reveals that the development of this field includes breakthroughs in all of its branches, with a certain dominance for progress in physical chemistry and its subcategories chemical thermodynamics and chemical change , in chemical structure, in several areas of organic chemistry as well as in biochemistry. Of course, the borders between different areas are diffuse, therefore many Laureates will be mentioned in more than one place. Most atomic weights in Cannizzaros table see Section 1. In Richards had discovered that the atomic weight of natural lead and of that formed in radioactive decay of uranium minerals differ. This pointed to the existence of isotopes, i. Aston also showed that the atomic weights of pure isotopes are, whithin the resolution of his experiment, integral numbers, with the exception of hydrogen, for which he obtained the atomic weight 1. For his achievements Aston received the Nobel Prize for Chemistry in One branch of physical chemistry deals with chemical events at the interface of two phases, for example, solid and liquid, and phenomena at such interfaces have important applications all the way from technical to physiological processes. Detailed studies of adsorption on surfaces, were carried out by Irving Langmuir at the research laboratory of General Electric Company, and when he was awarded the Nobel Prize for Chemistry in , he was the first industrial scientist to receive this distinction. Two of the Prizes for Chemistry in more recent decades have been given for fundamental work in the application of spectroscopic methods to chemical problems. The most used spectroscopic method in chemistry is undoubtedly NMR nuclear magnetic resonance , and Richard R. Already in Walther Hermann Nernst of Berlin received this award for work in thermochemistry, despite a year opposition to this recognition from Arrhenius [2]. Nernst had shown that it is possible to determine the equilibrium constant for a chemical reaction from thermal data, and in so doing he formulated what he himself called the third law of thermodynamics. This states that the entropy, a thermodynamic quantity, which is a measure of the disorder in the system, approaches zero as the temperature goes towards absolute zero. Willard Gibbs at Yale, who certainly had deserved a Nobel Prize, but his work had been published in an obscure place]. According to the second law, heat of reaction is not an accurate measure of chemical equilibrium, as had been assumed by earlier investigators. But Nernst showed in that it is possible with the aid of the third law, to derive the necessary parameters from the temperature dependence of thermochemical quantities. To prove his heat theorem the third law Nernst carried out thermochemical measurements at very low temperatures, and such studies were extended in the s by G. Lewis see Section 1. With this he managed to reach temperatures a few thousandths of a degree above absolute zero and could thereby provide extremely accurate entropy estimates. He also showed that it is possible to determine entropies from spectroscopic data. Giauque was awarded the Nobel Prize for Chemistry in for his contributions to chemical thermodynamics. The next Nobel Prize given for work in thermodynamics went to Lars Onsager of Yale University in for contributions to the thermodynamics of irreversible processes. Classical thermodynamics deals with systems at equilibrium, in which the chemical reactions are said to be reversible, but many chemical systems, for example, the most complex of all, living organisms, are far from equilibrium and their reactions are said to be irreversible. With the aid of statistical mechanics Onsager developed in his so-called reciprocal relations, describing the flow of matter and energy in such systems, but the importance of his work was not recognized until the end of the s. A further step forward in the development of non-equilibrium thermodynamics was taken by Ilya Prigogine in Bruxelles, whose theory of dissipative structures was awarded the Nobel Prize for Chemistry in Only molecules with sufficient kinetic energy in the collision do, in fact, react, and Arrhenius derived an equation in allowing the calculation of this activation energy from the temperature dependence of the reaction rate. With the advent of quantum mechanics in the s see Section 3. Strangely, Eyring never received a Nobel Prize see Section 1. A limit in investigating reaction rates is set by the speed with which the reaction can be initiated. If this is done by rapid mixing of the reactants, the time limit is about one thousandth of a second millisecond. The methods involve disturbing an equilibrium by rapid changes in temperature or pressure and then follow the passage to a new equilibrium. Another way to initiate some reactions rapidly is flash photolysis, i. Eigen received one-half and Norrish and Porter shared the other half of the Nobel Prize for Chemistry in The milli- to picosecond time scales gave important information on chemical reactions. However, it was not until it was possible to generate femtosecond laser pulses s that it became possible to reveal when chemical bonds are broken and formed. His experiments relate back to when Arrhenius Nobel Prize, made the important prediction that there must exist intermediates transition states in the transformation from reactants to products. The latest prize for work in chemical kinetics was that to Dudley R. Herschbach at Harvard University, Yuan T. Lee of Berkeley and John C. Polanyi from Toronto in Herschbach and his student Lee introduced the use of fluxes of molecules with well-defined direction and energy, molecular beams. By crossing two such beams they could study details of the reaction between molecules at extremely short times. Another important method to investigate such reaction details is infrared chemiluminescence, introduced by Polanyi. The emission of infrared radiation from the reaction products gives information on the energy distribution in the molecules. In Walter Heitler and Fritz London showed that it is possible to solve exactly the relevant equations for the hydrogen molecule ion, i. A few years later he published an extensive non-mathematical treatment in The Nature of the Chemical Bond, a book which is one of the most read and influential in the entire history of chemistry. Pauling was not only a theoretician, but he also carried out extensive investigations of chemical structure by X-ray diffraction see Section 3. On the basis of results with small peptides, which are building blocks of proteins, he suggested the a-helix as an important structural element.

2: Famous Chemists - The Greatest Chemists of All Time

In many ways, the history of civilization is the history of chemistry â€” the study of matter and its properties. Humans have always sought to identify, use and change the materials in our.

Famous Chemists Chemistry is a study of reactions between chemicals and substances that most people experience in their everday life. All of our medicines and household products are the result of a history of chemical studies and discoveries. Below is a list of some of the most important chemists of all time organized by the significance of their contributions to this field. Marie Curie â€" Famous For: She was able to isolate and study the compounds and nature of radium. Louis Pasteur â€" Famous For: The process of Pasteurization and creation of Vaccines for Rabies and Anthrax In addition to developing the process of Pasteurization, Louis Pasteur discovered the assymetrical molecular structure on certain crytals. He made some of the earliest vaccines for rabies and anthrax, and the reduction of a bacterial infection in what is known as puerperal fever. John Dalton â€" Famous For: Identification and presenting the atomic theory Recognized for his work on the atomic theory and research on color blindness. He successfully identified chemical compounds and reactions affected by interaction of atoms with one another. George Washington Carver â€" Famous For: Promoting alternative crops to cotton, such as peanuts, soybeans, sweet potatoes George Washington Carver found different crops to use instead of cotton. He used peanuts, soybeans, sweet potatoes to keep the land productive. His intention was to keep the poor farmers healthy and productive. Michael Faraday â€" Famous For: In addition he made the earliest type of what we know today as the Bunsen burner. He was the first to identify would known as nanoparticles in mettalic form. Alfred Nobel â€" Famous For: Inventing the dynamite As the inventor of the dynamite, Alfred Nobel is seen as a chemist, innovator, engineer, and arms manufacturer. One of his earliest inventions include the gas meter. At one time, he held nearly patents on various items. Rosalind Franklin â€" Famous For: Discovery of the DNA structure in genetics Rosalind Elsie Franklin and her contributions to science involve the study of the structures of coal, graphite, DNA, RNA, and viruses in understing their molecular structures. Antoine Lavoisier â€" Famous For: He also was able to show the role of oxygen in plant respiration and in animals. It was he who showed that water was made of hydrogen and oxygen, and that air was composed mainly of oxygen and nitrogen in its gaseous state. Robert Boyle â€" Famous For: His book, The Sceptical Chymyst, is considered a foundational source of literature on the field of chemistry. Linus Pauling â€" Famous For: His work in molecular biology and quantum chemistry A recipient of the Nobel Prize in the field of chemistry in His work in the field of chemistry is chronicled in his book The Nature of the Chemical Bond is believed as one of the most foundational books on chemistry. Dmitri Mendeleev â€" Famous For: Creating the table of elements used in chemistry and physics In addition to the creation of the periodic table, Mendeleev work on the spectroscope and the capillarity of liquids, both of which continue to be used to this day. Politics got in the way of Dmitri from receiving the Nobel Prize in Joseph Priestley â€" Famous For: Inventing soda water As a chemist, Joesph Priestly has been credited with the discovery of oxygen. He shares that distinction with Lavoisier and Scheele. Mario Molina Famous For: Discovered the ozone hole in the Antarctic As one of three recipients of the Nobel Prize in Chemistry in , Molina co-discovered the harm that chlorofluorocarbons had on the ozone layer. Humphry Davy â€" Famous For: In addition, people remember for his identifying earth based alkaline metals and alkali itself. Fritz Haber Famous For: Otto Hahn â€" Famous For: Svante Arrhenius Famous For: Ahmed Zewail Famous For: He received a Nobel Prize in for his advancement of the field of femtochemistry. Frederick Sanger Famous For: Successful determination of base sequences in nucleic acids The research work undertaken by Frederick Sanger involved his successful sequencing of DNA, insulin, and RNA. He was awarded the Nobel Prize two times, both for his work in chemistry, in and in The Cannizzaro reaction Cannizzaro worked extensively on organic chemistry in addition to his explanation which on how certain chemical reactions take place certain elements lact the hydrogen atom. This is named aptly as the Cannizaro reaction. Thomas Graham Famous For: His work on the diffusion of gases and the application of dialysis. The discovery of Graham on the use of dialysis has its roots on his study of colloids. He was able to separate crystalloids from colloids using a dialyzer.

3: what are the historical development of chemistry? | Yahoo Answers

The timeline of chemistry lists important works, discoveries, ideas, inventions, and experiments that significantly changed humanity's understanding of the modern science known as chemistry, defined as the scientific study of the composition of matter and of its interactions.

The Act set a precedent of eliminating pollution from its source, and , the Environmental Protection Agency EPA adopted this principle as one of its declared objectives. The groundwork for the movement that became Green Chemistry emerged from these two events and developed further through the efforts and collaboration of several key advocates in the US Government. Hancock died unexpectedly in while attending a conference in Eastern Europe. Hancock Memorial Award provides national recognition to outstanding student contributions to furthering the goals of green chemistry through research or education. Several early advocates of Green Chemistry were instrumental in the founding of the Green Chemistry Institute in Joe Breen, whose twenty-year career at the EPA informed his understanding of the necessity of sustainable chemistry, was a pioneer and relentless early advocate of Green Chemistry. As the co-founder and first Director of the Green Chemistry Institute in , he toured the world talking with students, teachers, and scientists about the urgency of promoting Green Chemistry. Dennis Hjeresen, a subsequent Director of the Green Chemistry Institute and currently at Los Alamos National Laboratory, also worked to make Green Chemistry a known entity in the chemistry world; through his efforts, the American Chemical Society, intending to focus on the role of chemistry in the environment, formed an alliance withâ€”and began to provide core funding forâ€"the Green Chemistry Institute. The Founding of Green Chemistry: Despite the Pollution Prevention Act of and the early work of several tireless advocates, the focus of the US EPA at that time remained on end of pipe regulations, pollution clean-up, rather than preventing pollution. This award increased awareness of Green Chemistry in industry and government by annually acknowledging individuals, groups, and organizations in academia, industry, and the government for their innovations in cleaner, cheaper, smarter chemistry. This remains the only award given by the President of the United States specifically for work in chemistry. Theory and Practice, which gave a precise definition to Green Chemistry and enumerated the Twelve Principles fundamental to the science. The definition and principles have become the generally-accepted guidelines for Green Chemistry. The book has achieved world-wide renown and has been re-printed in several languages. Paul Anastas went on to become the director of the U. He also held the role of Director of the Green Chemistry Institute, where he established twenty-four Green Chemistry chapters in countries around the world. He went on to found a Green Chemistry program at Yale University. The nomination is a decisive achievement for the adoption and advancement of the principles of Green Chemistry. John Warner turned his focus next on the need for educating a new generation of scientists in Green Chemistry principles. In , John Warner returned to industry to develop green technologies, partnering with Jim Babcock to found the first company completely dedicated to developing green chemistry technologies, the Warner Babcock Institute for Green Chemistry. The Institute was created with the mission to develop nontoxic, environmentally benign, and sustainable technological solutions for society. Simultaneously, John Warner founded a non-profit foundation, Beyond Benign, to promote K science education and community outreach. As a result, Green Chemistry is becoming a focus for governments as well as academic institutions around the world. Countries throughout the world are engaging and adopting Green Chemistry as a sustainable and economical development. It was founded with the mission of developing and commercializing early-stage Green Chemistry discoveries generated by academic researchers and industry. An integral component to the growth of Green Chemistry is the proliferation of Green Chemistry education and research. To this end, several universities around the world have created specific departments focused on teaching, studying, and expanding Green Chemistry. Since , the University of Oregon has been developing undergraduate chemistry curricula that incorporates the principles and practices of Green Chemistry into both laboratory and lecture classes. Carnegie Mellon University , in Pittsburg, Pennsylvania, has established the Institute for Green Science, a center focused on research , education and development. In England, the University of York houses the Green Chemistry Centre of Excellence, supporting Green Chemistry research, industrial collaboration, and development of educational materials, including Masters course in Green Chemistry and Sustainable Industrial Technology. Recent Developments in Green Chemistry: California was the first state to pass a comprehensive Green Chemistry policy. The bills set a precedent for Green Chemistry legislation, and states around the nation and countries around the world have been following suit. Other states, including Minnesota, and other countries, including Canada, Spain, and China, have hosted large conferences to discuss the opportunities and applications of green chemistry on local, national, and international scales. With these initiatives and still others announced on almost a daily basis, Green Chemistry continues to grow in importance and impact on both national and international stages.

4: History of chemistry - Wikipedia

THE History of Chemistry - a great cache of chemical history is contained at this Umea University Chemistry Department site. Biographies of famous scientists, collection of science papers and etc. are found and well-catalogued in this area.

It indicates that early humans had an elementary knowledge of chemistry. History of ferrous metallurgy and History of metallurgy in the Indian subcontinent The earliest recorded metal employed by humans seems to be gold which can be found free or "native". Small amounts of natural gold have been found in Spanish caves used during the late Paleolithic period, c. However, for millennia fire was seen simply as a mystical force that could transform one substance into another burning wood, or boiling water while producing heat and light. Fire affected many aspects of early societies. These ranged from the simplest facets of everyday life, such as cooking and habitat lighting, to more advanced technologies, such as pottery, bricks, and melting of metals to make tools. It was fire that led to the discovery of glass and the purification of metals which in turn gave way to the rise of metallurgy. Bronze Age Certain metals can be recovered from their ores by simply heating the rocks in a fire: However, as often happens with the study of prehistoric times, the ultimate beginnings cannot be clearly defined and new discoveries are ongoing. Mining areas of the ancient Middle East. Yellow area stands for arsenic bronze , while grey area stands for tin bronze. These first metals were single ones or as found. By combining copper and tin, a superior metal could be made, an alloy called bronze , a major technological shift which began the Bronze Age about BC. The Bronze Age was period in human cultural development when the most advanced metalworking at least in systematic and widespread use included techniques for smelting copper and tin from naturally occurring outcroppings of copper ores, and then smelting those ores to cast bronze. These naturally occurring ores typically included arsenic as a common impurity. After the Bronze Age, the history of metallurgy was marked by armies seeking better weaponry. Countries in Eurasia prospered when they made the superior alloys, which, in turn, made better armor and better weapons. Iron Age The extraction of iron from its ore into a workable metal is much more difficult than copper or tin. While iron is not better suited for tools than bronze until steel was discovered , iron ore is much more abundant and common than either copper or tin. So iron was much more often available locally without have to trade for it. The secret of extracting and working iron was a key factor in the success of the Philistines. Historical developments in ferrous metallurgy can be found in a wide variety of past cultures and civilizations. This includes the ancient and medieval kingdoms and empires of the Middle East and Near East, ancient Iran , ancient Egypt , ancient Nubia , and Anatolia Turkey , Ancient Nok , Carthage , the Greeks and Romans of ancient Europe, medieval Europe, ancient and medieval China, ancient and medieval India, ancient and medieval Japan, amongst others. Many applications, practices, and devices associated or involved in metallurgy were established in ancient China, such as the innovation of the blast furnace , cast iron , hydraulic -powered trip hammers , and double acting piston bellows. Atomism Democritus , Greek philosopher of atomistic school. Philosophical attempts to rationalize why different substances have different properties color, density, smell , exist in different states gaseous, liquid, and solid , and react in a different manner when exposed to environments, for example to water or fire or temperature changes, led ancient philosophers to postulate the first theories on nature and chemistry. The history of such philosophical theories that relate to chemistry can probably be traced back to every single ancient civilization. The common aspect in all these theories was the attempt to identify a small number of primary classical element that make up all the various substances in nature. The early theory of atomism can be traced back to ancient Greece and ancient India. Leucippus also declared that atoms were the most indivisible part of matter. This coincided with a similar declaration by Indian philosopher Kanada in his Vaisheshika sutras around the same time period. What Kanada declared by sutra, Democritus declared by philosophical musing. Both suffered from a lack of empirical data. Without scientific proof, the existence of atoms was easy to deny. Aristotle opposed the existence of atoms in BC. Earlier, in BC, a Greek text attributed to Polybus argues that the human body is composed of four humours. Around BC, Epicurus postulated a universe of indestructible atoms in which man himself is responsible for achieving a balanced life. In the work, Lucretius presents the principles of atomism ;

the nature of the mind and soul ; explanations of sensation and thought; the development of the world and its phenomena; and explains a variety of celestial and terrestrial phenomena. Much of the early development of purification methods is described by Pliny the Elder in his Naturalis Historia. He made attempts to explain those methods, as well as making acute observations of the state of many minerals. Medieval alchemy[edit] See also: Minima naturalia , a medieval Aristotelian concept analogous to atomism Seventeenth-century alchemical emblem showing the four Classical elements in the corners of the image, alongside the tria prima on the central triangle. They were seen by early alchemists as idealized expressions of irreducibile components of the universe [18] and are of larger consideration within philosophical alchemy. The three metallic principles: Paracelsus saw these principles as fundamental and justified them by recourse to the description of how wood burns in fire. Mercury included the cohesive principle, so that when it left in smoke the wood fell apart. Smoke described the volatility the mercurial principle , the heat-giving flames described flammability sulphur , and the remnant ash described solidity salt. Alchemy and chemistry share an interest in the composition and properties of matter, and prior to the eighteenth century were not separated into distinct disciplines. The term chymistry has been used to describe the blend of alchemy and chemistry that existed before this time. The bain-marie, or water bath is named for Mary the Jewess. Her work also gives the first descriptions of the tribikos and kerotakis. During the Renaissance, exoteric alchemy remained popular in the form of Paracelsian iatrochemistry , while spiritual alchemy flourished, realigned to its Platonic , Hermetic, and Gnostic roots. Early modern alchemists who are renowned for their scientific contributions include Jan Baptist van Helmont , Robert Boyle , and Isaac Newton. There was no systematic naming scheme for new compounds, and the language was esoteric and vague to the point that the terminologies meant different things to different people. The language of alchemy soon developed an arcane and secretive technical vocabulary designed to conceal information from the uninitiated. Less than a century earlier, Dante Alighieri also demonstrated an awareness of this fraudulence, causing him to consign all alchemists to the Inferno in his writings. A law was passed in England in which made the "multiplication of metals" punishable by death. Despite these and other apparently extreme measures, alchemy did not die. Indeed, many alchemists included in their methods irrelevant information such as the timing of the tides or the phases of the moon. The esoteric nature and codified vocabulary of alchemy appeared to be more useful in concealing the fact that they could not be sure of very much at all. As early as the 14th century, cracks seemed to grow in the facade of alchemy; and people became sceptical. Alchemy in the Islamic world[edit] Main article: Alchemy and chemistry in medieval Islam In the Islamic World , the Muslims were translating the works of the ancient Greeks and Egyptians into Arabic and were experimenting with scientific ideas. Paracelsus â€" , for example, rejected the 4-elemental theory and with only a vague understanding of his chemicals and medicines, formed a hybrid of alchemy and science in what was to be called iatrochemistry. Paracelsus was not perfect in making his experiments truly scientific. For example, as an extension of his theory that new compounds could be made by combining mercury with sulfur, he once made what he thought was "oil of sulfur". This was actually dimethyl ether , which had neither mercury nor sulfur. Early chemistry[edit] Agricola, author of De re metallica See also: Timeline of chemistry and Corpuscularianism Practical attempts to improve the refining of ores and their extraction to smelt metals was an important source of information for early chemists in the 16th century, among them Georg Agricola â€" , who published his great work De re metallica in His work describes the highly developed and complex processes of mining metal ores, metal extraction and metallurgy of the time. His approach removed the mysticism associated with the subject, creating the practical base upon which others could build. The work describes the many kinds of furnace used to smelt ore, and stimulated interest in minerals and their composition. It is no coincidence that he gives numerous references to the earlier author, Pliny the Elder and his Naturalis Historia. Agricola has been described as the "father of metallurgy". In Jean Beguin published the Tyrocinium Chymicum , an early chemistry textbook, and in it draws the first-ever chemical equation. The book contains the results of numerous experiments and establishes an early version of the law of conservation of mass. Working during the time just after Paracelsus and iatrochemistry , Jan Baptist van Helmont suggested that there are insubstantial substances other than air and coined a name for them - " gas ", from the Greek word chaos. In addition to introducing the word "gas" into the vocabulary of scientists, van Helmont conducted several experiments involving gases. Jan Baptist van Helmont is also remembered today largely for his ideas on spontaneous generation and his 5-year tree experiment , as well as being considered the founder of pneumatic chemistry. Robert Boyle[edit] Robert Boyle , one of the co-founders of modern chemistry through his use of proper experimentation, which further separated chemistry from alchemy Title page from The sceptical chymist, , Chemical Heritage Foundation Anglo-Irish chemist Robert Boyle â€” is considered to have refined the modern scientific method for alchemy and to have separated chemistry further from alchemy. In the work, Boyle presents his hypothesis that every phenomenon was the result of collisions of particles in motion. Boyle appealed to chemists to experiment and asserted that experiments denied the limiting of chemical elements to only the classic four: He also pleaded that chemistry should cease to be subservient to medicine or to alchemy, and rise to the status of a science. Importantly, he advocated a rigorous approach to scientific experiment: The work contains some of the earliest modern ideas of atoms , molecules , and chemical reaction , and marks the beginning of the history of modern chemistry. Boyle also tried to purify chemicals to obtain reproducible reactions. Boyle was an atomist, but favoured the word corpuscle over atoms. He commented that the finest division of matter where the properties are retained is at the level of corpuscles. He also performed numerous investigations with an air pump , and noted that the mercury fell as air was pumped out. He also observed that pumping the air out of a container would extinguish a flame and kill small animals placed inside. Boyle helped to lay the foundations for the Chemical Revolution with his mechanical corpuscular philosophy. Development and dismantling of phlogiston[edit] Joseph Priestley , co-discoverer of the element oxygen, which he called "dephlogisticated air" In , German chemist Georg Stahl coined the name " phlogiston " for the substance believed to be released in the process of burning. Around , Swedish chemist Georg Brandt analyzed a dark blue pigment found in copper ore. Brandt demonstrated that the pigment contained a new element, later named cobalt. Cronstedt is one of the founders of modern mineralogy. In , Scottish chemist Joseph Black isolated carbon dioxide , which he called "fixed air". Cavendish discovered hydrogen as a colorless, odourless gas that burns and can form an explosive mixture with air, and published a paper on the production of water by burning inflammable air that is, hydrogen in dephlogisticated air now known to be oxygen , the latter a constituent of atmospheric air phlogiston theory. In , Swedish chemist Carl Wilhelm Scheele discovered oxygen , which he called "fire air", but did not immediately publish his achievement. Scheele and Torbern Bergman suggested that it might be possible to obtain a new metal by reducing this acid.

HISTORICAL DEVELOPMENT OF CHEMISTRY pdf

5: History of Chemistry | Famous Chemists

A Brief History of Chemistry. The historical development of the concept of the atom is summarized in Figure "A Summary of the Historical Development of.

Heinrich Geissler creates the first vacuum tube. Crookes created a glass vacuum tube which had a zinc sulfide coating on the inside of one end, a metal cathode imbedded in the other end and a metal anode in the shape of a cross in the middle of the tube. When electricity was run through the apparatus, an image of the cross appeared and the zinc sulfide glowed. Crookes hypothesized that there must have been rays coming from the cathode which caused the zinc sulfide to fluoresce and the cross to create a shadow and these rays were called cathode rays. The positive particle had a charge equal and opposite to the electron. It also had a mass of 1. The positive particle was named the proton. Roentgen performed his research on cathode rays within a dark room and during his research, he noticed that a bottle of barium platinocyanide was glowing on a shelf. He discovered that the rays that were causing the fluorescence could also pass through glass, cardboard and walls. The rays were called x-rays. Pitchblend gave a fluorescent light with or without the aid of sunlight. He found that the cathode rays were negatively charged and that each charge had a mass ratio of 1. He concluded that all atoms have this negative charge through more experiments and he renamed the cathode rays electrons. His model of the atom showed a sphere of positively charged material with negative electrons stuck in it. Thomson received the Nobel Prize in physics. Marie Curie discovered uranium and thorium within pitchblend. She then continued to discover two previously unknown elements: These two new elements were also found in pitchblend. She received two nobel prizes for her discovery; one was in chemistry while the other was in physics. The charge of the electron was found to be 1. Millikan received the Nobel Prize in Physics for this discovery. Some of the radioactivity was deflected to the positive plate; some of it was deflected to the negative plate; and the rest went through the magnetic field without deflection. Thus, there were three types of radioactivity: Rutherford believed that the atom was mostly empty space. It contains an extremely tiny, dense positively charged nucleus full of protons and the nucleus is surrounded by electrons traveling at extremely high speeds. The Thomson model was thrown out after the introduction of the Rutherford model. He was unsuccessful because the neutron had not been discovered yet.

6: Nobel Prizes and Laureates - www.enganchecubano.com

Over the past two centuries chemistry has developed from germinal speculations on the nature of gases and minerals to a highly complex discipline encompassing numerous areas of study. This authoritative and comprehensive volume traces the historical development of chemistry from its roots in ancient.

His theory stated that everything is composed of atoms, with empty space between each atom. He also stated that atoms are indestructible and are constantly in motion. Muslim alchemists were the first to use experimental scientific method, as used in modern chemistry. On the other hand, they did discover the distillation apparatus, purified alchohol, and a variety of acids Jan 1, John Dalton John Dalton was an English chemist, meteorologist and physicist who contributed to the development of the modern atomic theory. He also did research on the topic of colour blidness, which is why colour blindness is sometimes referred to as "Daltonism. He was born in Paris, from a family with four generations of scientists. Becquerel discovered radioactivity by accident, while investigating phosphorescence in uranium salts. J Thompson Joseph John Thompson was a British physicist and Nobel laureate who discovered the electron and isotopes and invented the mass spectrometer. He was awarded the Nobel Prize in Physics in Through the use of cathode rays, Thompson discovered something that weighed times less than the hydrogen atom and contained a negative charge. He named this the electron and recognized it as a fundamental building block of atoms, May 15, Marie and Pierre Curie Marie and Pierre Curie were French physicists who made fundamental discoveries in crystallography, magnetism, piezoelectricity, and radioactivity. They received the Nobel Prize in physics in , along with Henri Becquerel, for their research on radiation. Pierre designed a torsion balance for measuring magnetic coefficients , which he used to study magnetism. Together, they isolated polonium and radium. Essentially, they were the pioneers of radioactivity. The curie is a unit of radioactivity. Aug 30, Ernest Rutherford Ernest Rutherford was a British chemist and physicist who pioneered nuclear physics. He was knighted in and received the Hector Memorial Medal in He discovered radioactive decay and half life and differentiated and named alpha and beta radiation. He also proved that radioactivity involved the transmutation of one chemical to another. He died unexpectedly after an operation for an umbilical hernia. Oct 7, Niels Bohr Niels Henrik David Bohr was a Danish physicist who contributed to the understanding of atomic structure and quantum mechanics. He received the Nobel Prize in physics in Despite working on the top secret project, Bohr believed that his research should be shared with everyone, inlcuding Russia. Oct 20, J. Chadwick James Chadwick was a British physicist who discovered the neutron. His discovery was crucial for the fission of Uranium and therefore, the creation of the atomic bomb. For his findings, he was awarded the Nobel Prize for Physics in W camp, where worked on the ionization of phosphorus and photo-chemical reaction of carbon monoxide and chlorine.

HISTORICAL DEVELOPMENT OF CHEMISTRY pdf

7: The History of Chemistry timeline | Timetoast timelines

history of chemistry tries to doâ€”get to the human side of how the science developed and show just how human it is. That way I could show how chemistry (or any other science).

It was not until the era of the ancient Greeks that we have any record of how people tried to explain the chemical changes they observed and used. At that time, natural objects were thought to consist of only four basic elements: Then, in the fourth century BC, two Greek philosophers, Democritus and Leucippus, suggested that matter was not infinitely divisible into smaller particles but instead consisted of fundamental, indivisible particles called atoms The fundamental, individual particles of which matter is composed.. Unfortunately, these early philosophers did not have the technology to test their hypothesis. They would have been unlikely to do so in any case because the ancient Greeks did not conduct experiments or use the scientific method. They believed that the nature of the universe could be discovered by rational thought alone. Over the next two millennia, alchemists, who engaged in a form of chemistry and speculative philosophy during the Middle Ages and Renaissance, achieved many advances in chemistry. Their major goal was to convert certain elements into others by a process they called transmutation The process of converting one element to another. In particular, alchemists wanted to find a way to transform cheaper metals into gold. Although most alchemists did not approach chemistry systematically and many appear to have been outright frauds, alchemists in China, the Arab kingdoms, and medieval Europe made major contributions, including the discovery of elements such as quicksilver mercury and the preparation of several strong acids. Although some alchemists were frauds, others made major contributions, including the discovery of several elements and the preparation of strong acids. Modern Chemistry The 16th and 17th centuries saw the beginnings of what we now recognize as modern chemistry. During this period, great advances were made in metallurgy, the extraction of metals from ores, and the first systematic quantitative experiments were carried out. In , the Englishman Robert Boyle â€”91 published The Sceptical Chymist, which described the relationship between the pressure and the volume of air. More important, Boyle defined an element as a substance that cannot be broken down into two or more simpler substances by chemical means. This led to the identification of a large number of elements, many of which were metals. Ironically, Boyle himself never thought that metals were elements. In the 18th century, the English clergyman Joseph Priestley â€” discovered oxygen gas and found that many carbon-containing materials burn vigorously in an oxygen atmosphere, a process called combustion The burning of a material in an oxygen atmosphere.. Priestley also discovered that the gas produced by fermenting beer, which we now know to be carbon dioxide, is the same as one of the gaseous products of combustion. After he fell into a vat of fermenting beer, brewers prohibited him from working in their factories. Although Priestley did not understand its identity, he found that carbon dioxide dissolved in water to produce seltzer water. In essence, he may be considered the founder of the multibillion-dollar carbonated soft drink industry. Joseph Priestley â€” Priestley was a political theorist and a leading Unitarian minister. He was appointed to Warrington Academy in Lancashire, England, where he developed new courses on history, science, and the arts. He and his wife emigrated to the United States in to join their three sons, who had previously emigrated to Pennsylvania. Priestley never returned to England and died in his new home in Pennsylvania. Despite the pioneering studies of Priestley and others, a clear understanding of combustion remained elusive. In the late 18th century, however, the French scientist Antoine Lavoisier â€”94 showed that combustion is the reaction of a carbon-containing substance with oxygen to form carbon dioxide and water and that life depends on a similar reaction, which today we call respiration. Lavoisier also wrote the first modern chemistry text and is widely regarded as the father of modern chemistry. His most important contribution was the law of conservation of mass In any chemical reaction, the mass of the substances that react equals the mass of the products that are formed. That is, in a chemical reaction, mass is neither lost nor destroyed. Unfortunately, Lavoisier invested in a private corporation that collected taxes for the Crown, and royal tax collectors were not popular during the French Revolution. He was executed on the guillotine at age 51, prematurely terminating his contributions to chemistry. All matter is composed of tiny indivisible particles called atoms. All atoms of an element are identical in mass and chemical properties, whereas atoms of different elements differ in mass and fundamental chemical properties. A chemical compound is a substance that always contains the same atoms in the same ratio. In chemical reactions, atoms from one or more compounds or elements redistribute or rearrange in relation to other atoms to form one or more new compounds. Atoms themselves do not undergo a change of identity in chemical reactions. Not all atoms of an element must have precisely the same mass. Atoms of one element can be transformed into another through nuclear reactions. The compositions of many solid compounds are somewhat variable. Under certain circumstances, some atoms can be divided split into smaller particles. The Law of Multiple Proportions Despite the clarity of his thinking, Dalton could not use his theory to determine the elemental compositions of chemical compounds because he had no reliable scale of atomic masses; that is, he did not know the relative masses of elements such as carbon and oxygen. For example, he knew that the gas we now call carbon monoxide contained carbon and oxygen in the ratio 1: But what was the correct formula for each compound? If the first compound consisted of particles that contain one carbon atom and one oxygen atom, the second must consist of particles that contain one carbon atom and two oxygen atoms. If the first compound had two carbon atoms and one oxygen atom, the second must have two carbon atoms and two oxygen atoms. If the first had one carbon atom and two oxygen atoms, the second would have one carbon atom and four oxygen atoms, and so forth. Dalton had no way to distinguish among these or more complicated alternatives. However, these data led to a general statement that is now known as the law of multiple proportions When two elements form a series of compounds, the ratios of the masses of the second element that are present per gram of the first element can almost always be expressed as the ratios of integers. The same law holds for the mass ratios of compounds forming a series that contains more than two elements. The same law holds for mass ratios of compounds forming a series that contains more than two elements. Example 4 shows how the law of multiple proportions can be applied to determine the identity of a compound. Example 4 A chemist is studying a series of simple compounds of carbon and hydrogen. The following table lists the masses of hydrogen that combine with 1 g of carbon to form each compound.

HISTORICAL DEVELOPMENT OF CHEMISTRY pdf

8: A Brief History of Chemistry

Later Earlier Democritu s Alchemists Joseph John Thomson Timeline of the Historical Development of Chemistry Aristotle Antoine Lavoisier John Dalton Eugen Goldstein.

Public domain In many ways, the history of civilization is the history of chemistry â€” the study of matter and its properties. Humans have always sought to identify, use and change the materials in our environment. Early potters found beautiful glazes to decorate and preserve their wares. Herdsmen, brewers and vintners used fermentation techniques to make cheese, beer and wine. Housewives leached the lye from wood ash to make soap. Smiths learned to combine copper and tin to make bronze. Crafters learned to make glass; leatherworkers tanned hides. In the eighth century A. Also known by his Latinized name, Geber, he is known as the "father of chemistry. He invented the alembic, a device used to distill and study acids. He also developed an early chemical classification system using the properties of the materials he studied. Non-malleable substances â€” materials that could be made into powders, such as stone. Although these goals were never achieved, there were some important discoveries made in the attempt. Robert Boyle studied the behavior of gases and discovered the inverse relationship between volume and pressure of a gas. By the s, the Age of Enlightenment had taken root all over Europe. Joseph Priestley disproved the idea that air was an indivisible element. He showed that it was, instead, a combination of gases when he isolated oxygen and went on to discover seven other discreet gases. In , Joseph Proust studied pure chemical compounds and stated the Law of Definite Proportions â€” a chemical compound will always have its own characteristic ratio of elemental components. Water, for instance, always has a two-to-one ratio of hydrogen to oxygen. Portrait of Antoine and Marie-Anne Lavoisier, who helped develop the metric system and a system for naming chemical compounds. Public domain Antoine Lavoisier was a French chemist who made important contributions to the science. While working as a tax collector, Lavoisier helped to develop the metric system in order to insure uniform weights and measures. He was admitted to the French Academy of Sciences in Two years later, at age 28, he married the year-old daughter of a colleague. Marie-Anne Lavoisier is known to have assisted her husband in his scientific studies by translating English papers and doing numerous drawings to illustrate his experiments. In , Lavoisier published "Methods of Chemical Nomenclature," which included the rules for naming chemical compounds that are still in use today. His "Elementary Treatise of Chemistry" was the first modern chemistry textbook. It clearly defined a chemical element as a substance that cannot be reduced in weight by a chemical reaction and listed oxygen , iron , carbon , sulfur and nearly 30 other elements then known to exist. The book did have a few errors though; it listed light and heat as elements. Amedeo Avogadro was an Italian lawyer who began to study science and mathematics in Expanding on the work of Boyle and Charles, he clarified the difference between atoms and molecules. He went on to state that equal volumes of gas at the same temperature and pressure have the same number of molecules. It has been experimentally determined to be 6. In , an English meteorologist began to speculate on the phenomenon of water vapor. John Dalton was aware that water vapor is part of the atmosphere, but experiments showed that water vapor would not form in certain other gases. He speculated that this had something to do with the number of particles present in those gases. Perhaps there was no room in those gases for particles of water vapor to penetrate. Using his own data and the Law of Definite Proportions, he determined the relative masses of particles for six of the known elements: Dalton explained his findings by stating the principles of the first atomic theory of matter. Elements are composed of extremely small particles called atoms. Atoms of the same element are identical in size, mass and other properties. Atoms of different elements have different properties. Atoms cannot be created, subdivided or destroyed. Atoms of different elements combine in simple whole number ratios to form chemical compounds. In chemical reactions atoms are combined, separated or rearranged to form new compounds. Dmitri Mendeleev was a Russian chemist known for developing the first Periodic Table of the Elements. He listed the 63 known elements and their properties on cards. When he arranged the elements in order of increasing atomic mass, he could group elements with similar properties. With a few exceptions, every seventh element had similar properties The eighth chemical group â€” the Noble Gases â€”

had not been discovered yet. Mendeleev realized that if he left spaces for the places where no known element fit into the pattern that it was even more exact. Using the blank spaces in his table, he was able to predict the properties of elements that had yet to be discovered. Describing the atom In , Henri Becquerel discovered radiation. Along with Pierre and Marie Curie , he showed that certain elements emit energy at fixed rates. In , Becquerel shared a Nobel Prize with the Curies for the discovery of radioactivity. It appeared that atoms were made up of still smaller particles, some of which could move away. In , Ernst Rutherford demonstrated that atoms consisted of a tiny dense positively charged region surrounded by relatively large areas of empty space in which still smaller, negatively charged particles electrons move. Rutherford assumed that the electrons orbit the nucleus in separate neat orbits, just as the planets orbit the sun. However, because the nucleus is larger and denser than the electrons, he could not explain why the electrons were not simply pulled into the nucleus thus destroying the atom. Niels Bohr in Photons are emitted from an electrically stimulated atom only at certain frequencies. Electrons in the first energy level, closest to the nucleus, are tightly bound to the nucleus and have relatively low energy. In levels more distant from the nucleus the electrons have increasing energy. Electrons in the energy level furthest from the nucleus are not bound as tightly and are the electrons involved when atoms bond together to form compounds. The periodic nature of the elemental properties is a result of the number of electrons in the outer energy level that can be involved in chemical bonds. Although Bohr models have been replaced by more accurate atomic models, the underlying principles are sound and Bohr models are still used as simplified diagrams to show chemical bonding. Our understanding of the atom has continued to be refined. In , James Chadwick was awarded the Nobel Prize for his discovery that there are an equal number of electrically neutral particles in the nucleus of an atom. Since neutrons are electrically neutral, they are not deflected by either electrons or protons. Furthermore, neutrons have more mass than protons. These facts combine to make it possible for neutrons to penetrate atoms and break apart the nucleus, releasing vast amounts of energy. In recent years, it is increasingly obvious that the protons, neutrons and electrons of classical chemistry are made up of still smaller subatomic particles. The sciences of chemistry and physics are becoming increasingly intertwined and theories overlap and conflict as we continue to probe the materials out of which our universe is made.

9: Chemistry History

Timeline of major events in chemistry history: Democritus (BC) First to propose that matter exists in the form of particles. Coined the term 'atoms'. "by convention bitter, by convention sweet, but in reality atoms and void" Alchemists (~) Among other things, the alchemists sought a.

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The postulates and refutation of idealism Biodiversity Of Fungi Chronicles of Carter barracks, by H. W. Closson. Internal trade project for class 11 Hopes and Fears for Art (Large Print Edition) Strategy, policy, and central management Nomination of Sylvia M. Mathews Human aging research Some thoughts on the teaching of history in Nigeria The inside-outside book of libraries Rick Steves Europe Planning Map Andrews bright blue T-shirt The Parables of the Judgement The life of the self Nationalism and revolution in Indonesia Snowboarding tricks Do We Really Live in a Racist Society? National security and international stability The dock to heaven L.E. Modesitt, Jr. European revolution Basic Field Manual V10, Military Intelligence Steven alter information systems English Dictionary/English Greek Greek English Dinosaurs (Focus on) Open source form creator Operational safety of nuclear power plants Review on application of hplc in food analysis in Introduction: study purpose and approach, limitations of the study, organization of the report Wbchse question paper 2017 class 12 The polar areas are big reservoirs of our cold and pure drinking water Katie Johnstones cross Race, war and nationalism The effects of an educational planning unit on eighth-grade students Because She Can (Replay Edition) Amazon of the north International marriage Last Rights, A Catholic Perspective on End-of-Life Decisions Sacbrood G.F. White Variability and invariability in learner language : a corpus-based approach Yukio Tono The impact of coeliac disease and vulnerable groups