

1: Chemistry: The Central Science, Chapter 1, Section 2

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History[edit] In , iodine was discovered by French chemist Bernard Courtois , [5] [6] who was born to a manufacturer of saltpeter an essential component of gunpowder. At the time of the Napoleonic Wars , saltpeter was in great demand in France. Saltpeter produced from French nitre beds required sodium carbonate , which could be isolated from seaweed collected on the coasts of Normandy and Brittany. To isolate the sodium carbonate, seaweed was burned and the ash washed with water. The remaining waste was destroyed by adding sulfuric acid. Courtois once added excessive sulfuric acid and a cloud of purple vapour rose. He noted that the vapour crystallised on cold surfaces, making dark crystals. They described the substance to a meeting of the Imperial Institute of France. The scarce and fugitive fifth halogen, the radioactive astatine , is not well-studied due to its expense and inaccessibility in large quantities, but appears to show various unusual properties due to relativistic effects. Iodine has an electron configuration of $[\text{Kr}]4d^55p^5$, with the seven electrons in the fifth and outermost shell being its valence electrons. Like the other halogens, it is one electron short of a full octet and is hence a strong oxidising agent, reacting with many elements in order to complete its outer shell, although in keeping with periodic trends , it is the weakest oxidising agent among the stable halogens: Elemental iodine hence forms diatomic molecules with chemical formula I_2 , where two iodine atoms share a pair of electrons in order to each achieve a stable octet for themselves; at high temperatures, these diatomic molecules reversibly dissociate a pair of iodine atoms. This trend occurs because the wavelengths of visible light absorbed by the halogens increase down the group though astatine may not conform to it, depending on how metallic it turns out to be. Iodine is violet when dissolved in carbon tetrachloride and saturated hydrocarbons but deep brown in alcohols and amines , solvents that form charge-transfer adducts. From left to right: Similarly, iodine is the least volatile of the halogens. Most bonds to iodine are weaker than the analogous bonds to the lighter halogens. The $\text{I}-\text{I}$ bond is one of the longest single bonds known. It is even longer Isotopes of iodine Of the thirty-seven known isotopes of iodine , only one occurs in nature, iodine The others are radioactive and have half-lives too short to be primordial. As such, iodine is monoisotopic and its atomic weight is known to great precision, as it is a constant of nature. Its former presence may be determined from an excess of its daughter xenon It also occurs from open-air nuclear testing, and is not hazardous because of its incredibly long half-life, the longest of all fission products. Iodine has a half-life of thirteen hours and decays by electron capture to tellurium , emitting gamma radiation ; it is used in nuclear medicine imaging, including single photon emission computed tomography SPECT and X-ray computed tomography X-Ray CT scans. It is a common fission product and thus is present in high levels in radioactive fallout. It may then be absorbed through contaminated food, and will also accumulate in the thyroid. As it decays, it may cause damage to the thyroid. The primary risk from exposure to high levels of iodine is the chance occurrence of radiogenic thyroid cancer in later life. Other risks include the possibility of non-cancerous growths and thyroiditis.

2: Argon - Element information, properties and uses | Periodic Table

Cyan- is " used as combining form of cyanogen before a vowel, and in names of cyanogen compounds and derivatives, as in cyanamide, cyanate, cyanic, cyanide n., etc. " The ending *-ide* is "a suffix used to form names of simple compounds of an element with another element or a radical.

Oxygen is removed from air by burning phosphorus, to leave a much higher concentration of nitrogen. Liquid nitrogen condenses water vapor from the surrounding air. Click here for larger image. Doug Stewart In the English physician John Mayow demonstrated that air is not a single element, it is made up of different substances. He did this by showing that only a part of air is combustible. Most of it is not. After removing oxygen and carbon dioxide, part of the air remained. Black used burning phosphorus as the final step in oxygen removal. Burning phosphorus has a very high affinity for oxygen and is efficient at removing it completely. Black then assigned further study of the gases in air to his doctoral student, Daniel Rutherford. He showed that, like carbon dioxide, the residual gas could not support combustion or living organisms. Unlike carbon dioxide, however, nitrogen was insoluble in water and alkali solutions. Scheele absorbed oxygen in a number of ways, including using a mixture of sulfur and iron filings and burning phosphorus. After removing the oxygen, he reported a residual gas which would not support combustion and had between two-thirds and three-quarters of the volume of the original air. Scheele published his results in , although it is thought the work was carried out in Interesting Facts about Nitrogen About 2. Many of the molecules of life contain nitrogen. It is the fourth most abundant element in the human body. The nitrogen compound nitroglycerin can be used for relief of angina, a life threatening heart condition. The solid nitrogen allows the feeble light arriving from the sun to pass through it. Nitrogen is the seventh most abundant element in the universe. In , the world learned for the first time that atomic nuclei could be disintegrated. Ernest Rutherford reported that he had bombarded nitrogen gas with alpha-particles helium nuclei and found hydrogen was produced. Further research by Patrick Blackett showed that the alpha particles had transmuted nitrogen to oxygen plus hydrogen. Click here for enlargement. As these stars burned, they synthesized heavier elements, such as carbon. Supernovae then spread the heavier elements out into galaxies where more stars were born. Carbon from supernovae plays a crucial role in the way many second and higher generation stars burn. In stars whose mass is higher than about 1. As you can see on the left, carbon is regenerated at the end of each cycle, the net result of which is that four hydrogen nuclei are consumed and one helium nucleus is produced. This reaction is called the CNO cycle. Over time, each carbon nucleus can take part in a very large number of cycles. A proportion of nitrogen made during the CNO cycle evades further reaction. What will liquid nitrogen do to an air filled balloon? A polycyclic aromatic hydrocarbon with nitrogen. The blue balls are carbon atoms and the yellow balls are hydrogen atoms. The red ball shows the position of a nitrogen atom which fits almost perfectly within the molecule. This molecule was detected in the spiral galaxy M81, some 12 million light years from Earth. Nasa Appearance and Characteristics Nitrogen is non-toxic under normal conditions. Direct skin contact with liquid nitrogen causes severe frostbite. Nitrogen is a colorless, odorless, tasteless, diatomic and generally inert gas at standard temperature and pressure. At atmospheric pressure, nitrogen is liquid between 63 K and 77 K. Liquids colder than this are considerably more expensive to make than liquid nitrogen is. Uses of Nitrogen Nitrogen is used to produce ammonia Haber process and fertilizers, vital for current food production methods. It is also used to manufacture nitric acid Ostwald process. In enhanced oil recovery, high pressure nitrogen is used to force crude oil that would otherwise not be recovered out of oil wells. Liquid nitrogen is used as a refrigerant. Superconductors for practical technologies should ideally have no electrical resistance at temperatures higher than 63 K because this temperature is achievable relatively cheaply using liquid nitrogen. Lower temperatures come with a much higher price tag. Oxides naturally form in steel during welding and these weaken the weld. Nitrogen can be used to exclude oxygen during welding, resulting in better welds. In the natural world, the nitrogen cycle is of crucial importance to living organisms. Nitrogen is taken from the atmosphere and converted to nitrates through lightning storms and nitrogen fixing bacteria. The nitrates fertilize plant growth where the nitrogen becomes bound in amino acids, DNA and

proteins. It can then be eaten by animals. Eventually the nitrogen from the plants and animals returns to the soil and atmosphere and the cycle repeats. Commercially, nitrogen is obtained from liquid air by fractional distillation. Nitrogen has 12 isotopes whose half-lives are known, with mass numbers 11 to 15. Naturally occurring nitrogen is a mixture of two isotopes, ^{14}N and ^{15}N with natural abundances of 99.63% and 0.37% respectively. Roberts, Serendipity, Accidental Discoveries in Science. John Wiley and Sons. Cite this Page For online linking, please copy and paste one of the following:

3: Sulfur - Element information, properties and uses | Periodic Table

Homoserine, or its lactone form, is the product of a cyanogen bromide cleavage of a peptide by degradation of methionine. Homoserine is an intermediate in the biosynthesis of three essential amino acids: methionine, threonine (an isomer of homoserine), and isoleucine.

Diamond crystallizes in the cubic system. Amorphous carbon is completely isotropic. Carbon nanotubes are among the most anisotropic materials known. Allotropes Atomic carbon is a very short-lived species and, therefore, carbon is stabilized in various multi-atomic structures with different molecular configurations called allotropes. The three relatively well-known allotropes of carbon are amorphous carbon, graphite, and diamond. Once considered exotic, fullerenes are nowadays commonly synthesized and used in research; they include buckyballs, [32] [33] carbon nanotubes, [34] carbon nanobuds [35] and nanofibers. As of, graphene appears to be the strongest material ever tested. It could also be used to safely store hydrogen for use in a hydrogen based engine in cars. It is present as a powder, and is the main constituent of substances such as charcoal, lampblack soot and activated carbon. At normal pressures, carbon takes the form of graphite, in which each atom is bonded trigonally to three others in a plane composed of fused hexagonal rings, just like those in aromatic hydrocarbons. This gives graphite its softness and its cleaving properties the sheets slip easily past one another. This results in a lower bulk electrical conductivity for carbon than for most metals. The delocalization also accounts for the energetic stability of graphite over diamond at room temperature. Some allotropes of carbon: Here, each atom is bonded tetrahedrally to four others, forming a 3-dimensional network of puckered six-membered rings of atoms. Diamond has the same cubic structure as silicon and germanium, and because of the strength of the carbon-carbon bonds, it is the hardest naturally occurring substance measured by resistance to scratching. The bottom left corner of the phase diagram for carbon has not been scrutinized experimentally. The missing or additional atoms warp the sheets into spheres, ellipses, or cylinders. The properties of fullerenes split into buckyballs, buckytubes, and nanobuds have not yet been fully analyzed and represent an intense area of research in nanomaterials. The names "fullerene" and "buckyball" are given after Richard Buckminster Fuller, popularizer of geodesic domes, which resemble the structure of fullerenes. The buckyballs are fairly large molecules formed completely of carbon bonded trigonally, forming spheroids the best-known and simplest is the soccerball-shaped C₆₀ buckminsterfullerene. It consists of a low-density cluster-assembly of carbon atoms strung together in a loose three-dimensional web, in which the atoms are bonded trigonally in six- and seven-membered rings. Carbon in this modification is linear with sp orbital hybridization, and is a polymer with alternating single and triple bonds. Q-carbon is reported to exhibit ferromagnetism, fluorescence, and a hardness superior to diamonds. Carbon is abundant in the Sun, stars, comets, and in the atmospheres of most planets. PAHs seem to have been formed "a couple of billion years" after the Big Bang, are widespread throughout the universe, and are associated with new stars and exoplanets. This is much more than the amount of carbon in the oceans or atmosphere below. Hydrocarbons such as coal, petroleum, and natural gas contain carbon as well. Various estimates put this carbon between, Gt, [58] or 3, Gt. According to one source, in the period from to about gigatonnes of carbon were released as carbon dioxide to the atmosphere from burning of fossil fuels. Natural diamonds occur in the rock kimberlite, found in ancient volcanic "necks", or "pipes". Diamonds are now also being recovered from the ocean floor off the Cape of Good Hope. These asteroids have not yet been directly sampled by scientists. The asteroids can be used in hypothetical space-based carbon mining, which may be possible in the future, but is currently technologically impossible. Isotopes of carbon Isotopes of carbon are atomic nuclei that contain six protons plus a number of neutrons varying from 2 to Carbon has two stable, naturally occurring isotopes. Carbon 14C is a naturally occurring radioisotope, created in the upper atmosphere lower stratosphere and upper troposphere by interaction of nitrogen with cosmic rays. The amount of 14C in the atmosphere and in living organisms is almost constant, but decreases predictably in their bodies after death.

4: Cyanogen fluoride - WikiVisually

The following reaction represents the decomposition for water: $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ How many molecules of hydrogen are produced from the decomposition of grams of water into its elements? aP Chemistry The net ionic equation for ALL aqueous reac- tion of strong acids and strong soluble bases that form soluble salts is 1. the formation of the.

Chemistry in its element: End promo Chris Smith Hello, this week stinky sediments, skunks and the smell of hell. Steve Mylon "How did it smell? The smell of the sediment tells a great deal about the underlying chemistry. Thick black anoxic sediments can be accompanied by a putrid smell which is unique to reduced sulfur. Maybe this is why sulfur has such a bad reputation. In the bible it seems that whenever something bad happens or is about to happen burning sulfur is in the picture: For example, In Genesis we hear, "the lord rained down burning sulfur on Sodom and Gomorrah" And in Revelation we read that the sinners will find their place in a fiery lake of burning sulfur. When sulfur burns in air, it generally forms sulfur dioxide or sulfur trioxide, the latter of which lacks any smell [amended from the podcast audio file, which states that sulfur dioxide does not smell]. These compounds can further oxidize and rain out as sulfuric or sulfurous acid. This is the mechanism for acid rain which has reeked havoc on the forests of the northeastern United States as sulfur rich coals are burned to generate electricity in midwestern states and carried east by prevailing winds where sulfuric acid is rained out causing all sorts of ecological problems. Additionally, the combination of burning coal and fog creates smog in many industrial cities causing respiratory problems among the locals. Here too, sulfur dioxide and sulfuric acid are implicated as the culprits. But again, there is no smell associated with this form of sulfur. But reduce sulfur by giving it a couple of electrons, and its smell is unmistakable. The requirement of sulfur reduction to sulfide has clearly been lost in translation. Hell that smells like hydrogen sulfide or any number of organic-sulfur compound will not be a nice place at all. Skunks take advantage of the foul smell of butyl seleno-mercaptan as a means of defending themselves against their enemies. And for me, personally, the worst chemistry of all occurs when reduced sulfur imparts a bad skunky taste in bottles of wine or beer. So, where does the "smell of hell" come from in anoxic sediments. Interestingly, some bacteria have evolved to make use of oxidized sulfur, sulfate, as an electron acceptor during respiration. Smell is not the only interesting chemistry that accompanies reduced sulfur. The deep black associated with anoxic sediments results from the low solubility of most metal sulfides. Sulfate reduction to sulfide generally accompanies the precipitation of pyrite iron sulfide, cinnabar mercury sulfide, galena lead sulfide and many more minerals. These metal sulfides have become an important industrial source for many of these important metals. Industry is one place you are almost certain to find sulfur or more importantly sulfuric acid which is used in processes ranging from fertilizer production to oil refining. In fact sulfuric acid ranks as the most highly produced chemical in the industrialized world. Imagine that, the element with such a hellish reputation has become one of the most important. And some even suggest that sulfur could save the planet. The biogenic compound dimethylsulfide DMS is produced from the cleavage of dimethylsulfoniopropionate, an osmotic regulatory compound produced by plankton in the ocean. DMS is oxidized to SO_2 and finally to sulfuric acid particles which can act as cloud condensation nuclei forming clouds which have a net cooling effect to the planet. Imagine warmer temperatures followed by greater biological activity resulting in more DMS to the atmosphere. The resulting cloud formation might work to cool a warming planet. From a symbol of damnation to savior Chris Smith Steve Mylon sniffing out the stinky story of Sulfur. John Emsley The story of its discovery started when Rayleigh found that the nitrogen extracted from the air had a higher density than that made by decomposing ammonia. The difference was small but real. Ramsay wrote to Rayleigh suggesting that he should look for a heavier gas in the nitrogen got from air, while Rayleigh should look for a lighter gas in that from ammonia. Ramsay removed all the nitrogen from his sample by repeatedly passing it over heated magnesium. He was left with one percent which would not react and found it was denser than nitrogen. Its atomic spectrum showed new red and green lines, confirming it a new element. End promo Help text not available for this section currently Video.

5: Cyanogen iodide | ICN - PubChem

Cyanogen bromide is formed by the reaction of bromine with salts of hydrocyanic acid; it is a solid that has been used as a fumigant against insects and rodents and as a reagent for the study of the structure of proteins.

Chemistry in its element: They made it by condensing a mixture of argon and hydrogen fluoride on to caesium iodide at 0°C and exposing it to UV light. On warming above just 0°C it reverted right back to argon and hydrogen fluoride. And no other process has ever induced argon to react - [a truly lazy element]. Although argon makes up 0. The story of its discovery started when Rayleigh found that the nitrogen extracted from the air had a higher density than that made by decomposing ammonia. The difference was small but real. Ramsay wrote to Rayleigh suggesting that he should look for a heavier gas in the nitrogen got from air, while Rayleigh should look for a lighter gas in that from ammonia. Ramsay removed all the nitrogen from his sample by repeatedly passing it over heated magnesium, with which nitrogen reacts to form magnesium nitride. He was left with one percent which would not react and found it was denser than nitrogen. Its atomic spectrum showed new red and green lines, confirming it a new element. Although in fact it contained traces of the other noble gases as well. Most argon goes to making steel where it is blown through the molten iron, along with oxygen. Argon does the stirring while the oxygen removes carbon as carbon dioxide. It is also used when air must be excluded to prevent oxidation of hot metals, as in welding aluminium and the production of titanium to exclude air. Welding aluminium is done with an electric arc which requires a flow of argon of at litres per minute. Atomic energy fuel elements are protected with an argon atmosphere during refining and reprocessing. The ultra-fine metal powders needed to make alloys are produced by directing a jet of liquid argon at a jet of the molten metal. Some smelters prevent toxic metal dusts from escaping to the environment by venting them through an argon plasma torch. For a gas that is chemically lazy argon has proved to be eminently employable. Illuminated signs glow blue if they contain argon and bright blue if a little mercury vapour is also present. Double glazing is even more efficient if the gap between the two panes of glass is filled with argon rather than just air because argon is a poorer conductor of heat. Thermal conductivity of argon at room temperature K is For the same reason argon is used to inflate diving suits. Old documents and other things that are susceptible to oxidation can be protected by being stored in an atmosphere of argon. Blue argon lasers are used in surgery to weld arteries, destroy tumors and correct eye defects. The most exotic use of argon is in the tyres of luxury cars. Not only does it protect the rubber from attack by oxygen, but it ensures less tyre noise when the car is moving at speed. Laziness can prove useful in the case of this element. Its high tech uses range from double glazing and laser eye surgery to putting your name in lights. Chris Smith John Emsley unlocking the secrets of the heavier than air noble gas argon. Next week, would you marry this man? That might have something to do with the fact that copper oxide has an annoying habit of dyeing your skin green. But if she only took the time to learn about copper, to get to know it some; maybe then she would be likely to turn her back on the others and wear it with pride. End promo Help text not available for this section currently Video.

6: Consider the formation of cyanogen C_2N_2 and its subsequent decomposition in

CYANOGEN (Gr. *Kuavos*, blue -*yevvav*, to produce), C_2N_2 , in chemistry, a gas composed of carbon and nitrogen. The name was suggested by Prussian blue, the earliest known compound of cyanogen.

Two of the principal ways of classifying matter are according to its physical state, as a gas, liquid, or solid, and according to its composition, as an element, compound, or mixture. States of Matter A sample of matter can be a gas, a liquid, or a solid. These three forms of matter are called the states of matter. The states of matter differ in some of their simple observable properties. A gas also known as vapor has no fixed volume or shape; rather, it conforms to the volume and shape of its container. A gas can be compressed to occupy a smaller volume, or it can expand to occupy a larger one. A liquid has a distinct volume independent of its container but has no specific shape. It assumes the shape of the portion of the container that it occupies. A solid has both a definite shape and a definite volume; it is rigid. Neither liquids nor solids can be compressed to any appreciable extent. The properties of the states can be understood on the molecular level Figure 1. In a gas the molecules are far apart and are moving at high speeds, colliding repeatedly with each other and with the walls of the container. In a liquid the molecules are packed more closely together, but still move rapidly, allowing them to slide over each other; thus, liquids pour easily. In a solid the molecules are held tightly together, usually in definite arrangements, in which the molecules can wiggle only slightly in their otherwise fixed positions. Thus, solids have rigid shapes. We cannot see water vapor. What we see when we look at steam or clouds is tiny droplets of liquid water dispersed in the atmosphere. The molecular views in this figure show that the molecules in the solid are arranged in a more orderly way than in the liquid. The molecules in the gas are much farther apart than those in the liquid or the solid. Pure Substances and Mixtures Most forms of matter that we encounter—for example, the air we breathe a gas, gasoline for cars a liquid, and the sidewalk on which we walk a solid—are not chemically pure. We can, however, resolve, or separate, these kinds of matter into different pure substances. A pure substance usually referred to simply as a substance is matter that has a fixed composition and distinct properties. For example, water and ordinary table salt sodium chloride, the primary components of seawater, are pure substances. We can classify substances as either elements or compounds. Elements are substances that cannot be decomposed into simpler substances. Each element is composed of only one kind of atom [Figure 1. Compounds, in contrast, are composed of two or more elements, and thus contain two or more kinds of atoms [Figure 1. Elements might consist of individual atoms, as in a, or molecules, as in b. Compounds contain two or more different atoms connected, or bonded together, as in c. A mixture contains the individual units of its components, shown in d as both atoms and molecules. Most of the matter we encounter consists of mixtures of different substances. Mixtures are combinations of two or more substances in which each substance retains its own chemical identity and hence its own properties [Figure 1. Whereas pure substances have fixed compositions, the compositions of mixtures can vary. For example, a cup of sweetened coffee can contain either a little sugar or a lot. The substances making up a mixture such as sugar and water are called components of the mixture. Some mixtures, such as sand, rocks, and wood, do not have the same composition, properties, and appearance throughout the mixture. Such mixtures are heterogeneous [Figure 1. Mixtures that are uniform throughout are homogeneous. Air is a homogeneous mixture of the gaseous substances nitrogen, oxygen, and smaller amounts of other substances. The nitrogen in air has all the properties that pure nitrogen does because both the pure substance and the mixture contain the same nitrogen molecules. Salt, sugar, and many other substances dissolve in water to form homogeneous mixtures [Figure 1. Homogeneous mixtures are also called solutions. Air is a gaseous solution; gasoline is a liquid solution; brass is a solid solution. The distinction between physical and chemical changes is examined in Section 1. At the chemical level all matter is classified ultimately as either elements or compounds. Separation of Mixtures Because each component of a mixture retains its own properties, we can separate a mixture into its components by taking advantage of the differences in their properties. For example, a heterogeneous mixture of iron filings and gold filings could be sorted individually by color into iron and gold. A more clever approach would be to use a magnet to attract the iron filings, leaving the gold ones

behind. We can also take advantage of an important chemical difference between these two metals: Many acids dissolve iron but do not dissolve gold. Thus, if we put our mixture into an appropriate acid, the iron will dissolve and the gold will be left behind. The two could then be separated by filtration, a procedure illustrated in Figure 1. We would have to use other chemical reactions, which we will learn about later, to transform the dissolved iron back into metal. We can separate homogeneous mixtures into their components in similar ways. For example, water has a much lower boiling point than does table salt; it is more volatile. If we boil a solution of salt and water, the more volatile water evaporates and the salt is left behind. The water vapor is converted back to liquid form on the walls of the condenser Figure 1. This process is called distillation. Boiling the solution evaporates the water, which is condensed, then collected in the receiving flask. After all the water has boiled away, pure sodium chloride remains in the boiling flask. The differing abilities of substances to adhere to the surfaces of various solids such as paper and starch can also be used to separate mixtures. This is the basis of chromatography literally "the writing of colors" , a technique that can give beautiful and dramatic results. An example of the chromatographic separation of ink is shown in Figure 1.

Elements At the present time elements are known. In , scientists first reported the production and detection of elements , , and , so this number will likely change! These elements vary widely in their abundance, as shown in Figure 1. In contrast, just three elements oxygen, carbon, and hydrogen account for over 90 percent of the mass of the human body. Some of the more familiar elements are listed in Table 1. All the known elements and their symbols are listed on the front inside cover of the text. The table in which the symbol for each element is enclosed in a box is called the periodic table. In the periodic table the elements are arranged in vertical columns so that closely related elements are grouped together. We describe this important tool in more detail in Section 2. Notice that the symbol for each element consists of one or two letters, with the first letter capitalized. These symbols are often derived from the English name for the element first and second columns in Table 1. You will need to know these symbols and to learn others as we encounter them in the text.

Compounds Most elements can interact with other elements to form compounds. Hydrogen gas, for example, burns in oxygen gas to form water. Conversely, it is possible to decompose water into its component elements by passing an electrical current through the water, as shown in Figure 1. As seen in Table 1. Furthermore, the composition of water is not variable. Pure water, regardless of its source, consists of 11 percent hydrogen and 89 percent oxygen by mass. This macroscopic composition of water corresponds to its molecular composition, which consists of two hydrogen atoms combined with one oxygen atom. The observation that the elemental composition of a pure compound is always the same is known as the law of constant composition or the law of definite proportions. It was first put forth by the French chemist Joseph Louis Proust in about 1795. Although this law has been known for almost 200 years, the general belief persists among some people that a fundamental difference exists between compounds prepared in the laboratory and the corresponding compounds found in nature. However, a pure compound has the same composition and properties regardless of its source. Both chemists and nature must use the same elements and operate under the same natural laws. When two materials differ in composition and properties, we know that they are composed of different compounds or that they differ in purity.

7: Cyanogen - The Full Wiki

Element BINGO Element Word Search In addition to the information contained within the *Periodic Table of Elements*, the following articles may be helpful if you are writing a report about an element or if you are making a model of an atom.

It is a colorless solid that is widely used to modify biopolymers, fragment proteins and peptides cuts the C-terminus of methionine, and synthesize other compounds. The compound is classified as a pseudohalogen. Synthesis, basic properties, and structure The carbon atom in cyanogen bromide is bonded to bromine by a single bond and to nitrogen by a triple bond. The compound is linear and polar, but it does not spontaneously ionize in water. It dissolves in both water and polar organic solvents. Cyanogen bromide can be prepared by oxidation of sodium cyanide with bromine, which proceeds in two steps via the intermediate cyanogen CN: Like some other cyanogen compounds cyanogen bromide undergo an exothermic trimerisation to cyanuric bromide BrCN. This reaction is catalyzed by traces of bromine, metal salts, acids and bases. Cyanogen bromide activation method Protein immobilization Cyanogen bromide is often used to immobilize proteins by coupling them to reagents such as agarose for affinity chromatography. Cyanogen bromide is also often used because it reacts with the hydroxyl groups on agarose to form cyanate esters and imidocarbonates. These groups are reacted with primary amines in order to couple the protein onto the agarose matrix, as shown in the figure. Because cyanate esters are more reactive than are cyclic imidocarbonates, the amine will react mostly with the ester, yielding isourea derivatives, and partially with the less reactive imidocarbonate, yielding substituted imidocarbonates. Also, cyanogen bromide activation involves the attachment of a ligand to agarose by an isourea bond, which is positively charged at neutral pH and thus unstable. Consequently, isourea derivatives may act as weak anion exchangers. This reaction is used to reduce the size of polypeptide segments for identification and sequencing. Mechanism Cyanogen bromide peptide bond cleavage The electron density in cyanogen bromide is shifted away from the carbon atom, making it unusually electrophilic, and towards the more electronegative bromine and nitrogen. This leaves the carbon particularly vulnerable to attack by a nucleophile, and the cleavage reaction begins with a nucleophilic acyl substitution reaction in which bromine is ultimately replaced by the sulfur in methionine. This attack is followed by the formation of a five-membered ring as opposed to a six-membered ring, which would entail the formation of a double bond in the ring between nitrogen and carbon. This double bond would result in a rigid ring conformation, thereby destabilizing the molecule. Thus, the five-membered ring is formed so that the double bond is outside the ring, as shown in the figure. Although the nucleophilic sulfur in methionine is responsible for attacking BrCN, the sulfur in cysteine does not behave similarly. If the sulfur in cysteine attacked cyanogen bromide, the bromide ion would deprotonate the cyanide adduct, leaving the sulfur uncharged and the beta carbon of the cysteine not electrophilic. The strongest electrophile would then be the cyanide nitrogen, which, if attacked by water, would yield cyanic acid and the original cysteine. Reaction conditions Cleaving proteins with BrCN requires using a buffer such as 0. An advantage to HCl is that formic acid causes the formation of formyl esters, which complicates protein characterization. However, formic is still often used because it dissolves most proteins. Also, the oxidation of methionine to methionine sulfoxide, which is inert to BrCN attack, occurs more readily in HCl than in formic acid, possibly because formic acid is a reducing acid. Alternative buffers for cleavage include guanidine or urea in HCl because of their ability to unfold proteins, thereby making methionine more accessible to BrCN. In formic acid, cleavage of Met-Ser and Met-Thr bonds is enhanced with increased water concentration because these conditions favor the addition of water across the imine rather than reaction of the side chain hydroxyl with the imine. Lowered pH tends to increase cleavage rates by inhibiting methionine side chain oxidation. Normally, once the iminolactone is formed refer to figure, water and acid can react with the imine to cleave the peptide bond, forming a homoserine lactone and new C-terminal peptide. However, if the adjacent amino acid to methionine has a hydroxyl or sulfhydryl group, this group can react with the imine to form a homoserine without peptide bond cleavage. Organic synthesis Cyanogen bromide is used in organic synthesis. In the synthesis of cyanamides and dicyanamides, primary and secondary amines react with BrCN to yield mono- and dialkylcyanamides, which can further react with

amines and hydroxylamine to yield guanidines and hydroxyguanidines. In the von Braun reaction, tertiary amines react with BrCN to yield disubstituted cyanamides and an alkyl bromide. Cyanogen bromide can be used to prepare aryl nitriles, nitriles, anhydrides, and cyanates. It can also serve as a cleaving agent. Therefore, toxic exposure may occur by inhalation, physical contact, or ingestion. It is acutely toxic, causing a variety of nonspecific symptoms. Exposure to even small amounts may cause convulsions or death. The cyanide can then be oxidized by sodium or calcium hypochlorite to the less toxic cyanate ion. Note that deactivation is extremely exothermic and may be explosive.

8: Cyanogen bromide | Revolv

Solid compositions containing absorbed cyanogen azide can likewise be used in making blown polymers containing the solid adsorbents as fillers, e.g., by mixing the solid composition in the polymer and heating, and also in the preparation of useful derivatives, e.g., cyanamide.

Cyanogen azide can be used as a blowing agent or to prepare cyanamide. Details of the invention Cyanogen azide, NCN has now been prepared in readily usable form in nonaqueous media by reaction of a cyanogen halide with an azide salt, i. The reaction can be represented by the equation wherein X is halogen fluorine, chlorine, bromine or iodine, M is a metal or an ammonium, including organoammonium, group, n is the valence of M, and N is the. The compound has also been isolated in essentially pure form and stored adsorbed on solid adsorbents. Cyanogen azide is a colorless, unstable liquid. Since it is explosively sensitive to heat or shock it cannot be isolated and purified by distillation or by other conventional means with safety. It can, however, be isolated in essentially pure form with some danger as shown in Example I below. On the other hand, solutions of cyanogen azide are not explosive. Solutions of NCN are part of this invention and afford useful means of safely storing, analyzing and processing the product. As noted above, the compound can also be stored adsorbed on a solid adsorbent such as diatomaceous earth, alumina, charcoal, silica gel, and the like and the resultant compositions are not explosive. Cyanogen azide is chemically reactive with olefinically unsaturated compounds, and this reactivity provides a method for its analytical determination in solution, e. Any metal azide salt can be used to prepare cyanogen azide from any of the cyanogen halides according to the equation given above. The more practical metal azides are preferred, such as the azides of the alkali and alkaline earth metals the metals of Groups IA and II-A in the periodic table. The preferred metal azides include the azides of lithium, sodium, potassium, cesium, magnesium, calcium and barium. Likewise, any ammonium azide, including organoammonium azides free of reactive substituents, can be used. Among the preferred ammonium azides are ammonium azide and hydrocarbon ammonium azides of up to 18 carbons, e. The reaction of a cyanogen halide, e. Although the reaction also proceeds at temperatures above room temperature, it is preferred not to exceed about 40 or 50 C. Although the reaction is conveniently carried out at atmospheric pressure, higher or lower pressures can be used if desired. The reaction is readily accomplished by admixing the reactants, preferably at a controlled rate in a suitable medium with agitation and temperature control. The cyanogen halide can be added to an excess of the azide salt or vice versa. The mixing can also be accomplished by simultaneous addition of both reactants in near equivalent proportions. Since cyanogen azide is miscible with any of the cyanogen halides in the liquid state, it is especially convenient to carry out the preparation in an excess of liquefied cyanogen halide, which then acts also as the reaction medium. Solutions thus obtained of cyanogen azide in liquid cyanogen halides are convenient for its safe storage, for its further use in chemical reactions, and for its transfer into other solvents. If it is desired to obtain solvent-free or highly concentrated cyanogen azide, it is convenient to use liquefied cyanogen fluoride or cyanogen chloride in the dual role of reactant and reaction medium. Excess of these cyanogen halides can be removed to any extent desired by evaporation or low temperature distillation. The insoluble metal halide by-product is preferably removed before-hand by filtration from the reaction mixture, but the metal halide is frequently not separated when its presence is harmless to subsequent reactions of the cyanogen azide. In variations of the procedure wherein excess cyanogen halide serves as the reaction medium, measured quantities of other solvents can be added to produce solutions of any desired concentration. Organic solvents can be used as reaction media in the preparation of cyanogen azide. However, compounds having aliphatic unsaturation react readily with cyanogen azide and normally are not suitable as reaction media; and the presence of water in the synthesis process allows rapid formation of dicyandiazide Hart, loc. It is unnecessary that the medium be a solvent for the azide salt, since the reaction can proceed in a medium, such as pentane, in which metal azides are essentially insoluble; but it is important that cyanogen azide be soluble in the medium. The exothermic reaction is generally slow in a medium in which the metal azides have poor solubility, e. In a medium wherein the metal azides have appreciable solubility, e. For safety in operations under ordinary conditions, it is usually

preferred that the solvent medium be a liquid having a boiling point above that of the cyanogen halide reactant, more preferably above room temperature, so that evaporation of both the unreacted halide and the solvent will not occur and leave residual cyanogen azide in such high concentration that it is an explosion hazard. The presence of water in a reaction mixture containing a cyanogen halide and an azide salt prevents formation of a cyanogen azide, since the product termed dicyandiazide is formed instead. However, cyanogen azide is relatively stable toward water in the absence of an azide salt, and the presence of water is therefore not precluded in mere solutions of cyanogen azide see Example XVI, below. Since cyanogen azide has limited solubility in water along, dilute aqueous solutions only can be handled with safety. In general, any of the common organic solvents free of aliphatic unsaturation can be employed as media in the preparation of cyanogen azide, or as solvents in its storing and handling. Such solvents include aromatic and saturated aliphatic hydrocarbons and halohydrocarbons, alcohols, ethers, esters including carboxylates, carbonates, sulfates, sulfonates, phosphates, phosphonates, borates, and silicates, carboxylic acids, aldehydes, ketones, acetals, ketals, nitriles, nitrohydrocarbons, amides particularly N,N-dialkyl-substituted amides, sulfides, sulfoxides, sulfones and silicones. Solutions of cyanogen azide are conveniently obtained directly in the synthesis process when using a solvent as the reaction medium, or they can be prepared by taking up solvent-free or highly concentrated cyanogen azide in the solvent. Cyanogen azide is miscible with all common organic solvents under ordinary conditions of temperature and pressure. In fact, on the basis of experience with a variety of uncommon solvents, e. Accordingly, solutions containing cyanogen azide in the widest range of concentrations, e. For practical purposes, however, and especially for safety, solutions having concentrations in the range of to 50 percent are recommended. Such solutions can be used in carrying out reactions of cyanogen azide. They are stable for several days at room temperature, and can be stored indefinitely at low temperature, i. The temperature of storage should not be so low as to cause the solvent to solidify or otherwise reduce the solubility of cyanogen azide so that it separates as a substantially solvent-free, shocksensitive second phase. Preferred storage temperatures are to 0 C. Solvents that react rapidly with cyanogen azide, e. If it is intended to prepare the secondary product it is convenient to use the secondary reactant as the solvent medium in which the metal azide and the cyanogen halide react to form cyanogen azide in situ. Although many solvents other than those having aliphatic unsaturation are completely unreactive with cyanogen azide under all practical conditions, i. But generally speaking, such slow reactive solvents are essentially inert toward cyanogen azide in the presence of a vigorous reactant, such as bicyclo[2. All of these solvents can be used within the practical range of temperatures that are suitable for the preparation of cyanogen azide, i. Many, though not all, of these solvents can be used without reservation throughout this whole temperature range; and all are essentially nonreactive with cyanogen azide in the preferred storage temperature range of 30 to 0 C. Embodiments of the invention The invention is illustrated in greater detail in the following nonlimiting examples. In these examples, all pressures are atmospheric unless otherwise indicated. The flask was then placed in an acetone-solid carbon dioxide bath and charged with cyanogen chloride 34 g. The mixture was stirred for 40 hours under nitrogen at room temperature and excess cyanogen chloride was evaporated. The resultant slurry was filtered under nitrogen and the filter cake washed with a little acetone. Sodium azide was completely converted to sodium chloride, as indicated by a negative test for azide ion and a positive test for chloride ion on the solid product. Distillation of the combined filtrate and acetone washings at less than 1 mm. Removal of excess acetone and pentane from this distillate at room temperature and atmospheric pressure by means of flowing nitrogen as a carrier gave a colorless residual oil, which was essentially solvent-free cyanogen azide and which detonated sharply when tested in a flame. Analysis for CN mol. Infrared analysis of this product showed absorption in the 4. Reduction of an ether solution of this oil with hydrogen sulfide gave sulfur and cyanamide, the latter being identified by comparison of its infrared spectrum with that of a known sample. The flask was then placed in an acetone-solid carbon dioxide cooling bath and cyanogen chloride 20 mi, After the mixture was stirred for 21 hrs. The flask was cooled in ice water and excess cyanogen chloride was removed from the solution under reduced pressure mm. The residual semi-solid product, which contained by-product sodium chloride, was diluted with 50 ml. The ether solution was then filtered and the filtrate evaporated to dryness under reduced pressure. The crystalline

residue was dissolved in water, and the solution was warmed in a steam bath and filtered to remove traces of sulfur. Evaporation of the filtrate to dryness at about 0. Sublimation of an aliquot of this material gave product melting at C. The melting point was not depressed when the sublimate was mixed with an authentic sample of cyan-amide. Analysis for CH N Calcd.: The flask was cooled under nitrogen to 4 C. When addition was complete the mixture was allowed to warm to room temperature, and stirring was continued for hours. Excess cyanogen chloride was removed under reduced pressure mm. Activated sodium azide is prepared as follows: Hydrazine hydrate 10 ml. The mixture is stirred 15 minutes at room temperature, and is then filtered into 3 liters of acetone with stirring. The acetone slurry is filtered in an atmosphere of nitrogen, and the powdery sodium azide thus separated is dried for hours at C. The flask was cooled in an acetone-solid carbon dioxide bath and cyanogen chloride 80 ml. The residue was diluted with 50 ml. Removal from the filtrate of acetone: Distillation of this material in a short path still gave The infrared spectrum of the above-described isomeric mixture was identical with that of an analytical sample prepared in another experiment B. The analytical sample contained about of the azatricyclooctane isomer. The flask was placed in an ice-salt bath, and cyanogen chloride 5 ml. After completion of the cyanogen chloride addition stirring was continued, and the mixture was allowed to warm to room temperature and remain there for one hour. After standing overnight, during which nitrogen was evolved, the reaction mixture was. The residual light straw-colored oil weighted 6. Data for additional examples of the preparation of cyanogen azide from various cyanogen halides and azide salts in a number of representative reaction media are presented in Table I. The procedure in these examples is like that of Example V, the cyanogen azide being identified and assayed by isolation of its bicyclo [2. The filtrate was mixed with ml. The final mixture, which was stirred for a total of 17 hours at room temperature, was not homogeneous, indicating limited solubility of cyanogen azide in water, i. The aqueous mixture was extracted with ether, and the extract was dried over anhydrous magnesium sulfate. The dried solution was cooled in an ice bath, and 9. The stirred mixture was allowed to warm slowly to room temperature, and was held an additional hour at room temperature.

9: Phase for all the elements in the Periodic Table

Sulfur was mined near Mount Etna in Sicily and used for bleaching cloth and preserving wine, both of which involved burning it to form sulfur dioxide, and allowing this to be absorbed by wet clothes or the grape juice.

Fluorine – Fluorine is a chemical element with symbol F and atomic number 9. It is the lightest halogen and exists as a highly toxic pale yellow diatomic gas at standard conditions, as the most electronegative element, it is extremely reactive, almost all other elements, including some noble gases, form compounds with fluorine. Among the elements, fluorine ranks 24th in universal abundance and 13th in terrestrial abundance, proposed as an element in , fluorine proved difficult and dangerous to separate from its compounds, and several early experimenters died or sustained injuries from their attempts. Only in did French chemist Henri Moissan isolate elemental fluorine using low-temperature electrolysis, industrial production of fluorine gas for uranium enrichment, its largest application, began during the Manhattan Project in World War II. Owing to the expense of refining pure fluorine, most commercial applications use fluorine compounds, the rest of the fluorite is converted into corrosive hydrogen fluoride en route to various organic fluorides, or into cryolite which plays a key role in aluminium refining. Organic fluorides have very high chemical and thermal stability, their uses are as refrigerants, electrical insulation and cookware. Fluorocarbon gases are generally greenhouse gases with global-warming potentials to 20, times that of carbon dioxide, organofluorine compounds persist in the environment due to the strength of the carbon–fluorine bond. Fluorine has no metabolic role in mammals, a few plants synthesize organofluorine poisons that deter herbivores. Fluorines first ionization energy is third-highest among all elements, behind helium and neon and it also has a high electron affinity, second only to chlorine, and tends to capture an electron to become isoelectronic with the noble gas neon, it has the highest electronegativity of any element. Fluorine atoms have a small covalent radius of around 60 picometers, similar to those of its period neighbors oxygen, conversely, bonds to other atoms are very strong because of fluorines high electronegativity. Unreactive substances like powdered steel, glass fragments, and asbestos fibers react quickly with cold fluorine gas, wood, reactions of elemental fluorine with metals require varying conditions. Some solid nonmetals react vigorously in liquid air temperature fluorine, hydrogen sulfide and sulfur dioxide combine readily with fluorine, the latter sometimes explosively, sulfuric acid exhibits much less activity, requiring elevated temperatures. Hydrogen, like some of the metals, reacts explosively with fluorine. Carbon, as black, reacts at room temperature to yield fluoromethane. At room temperature, fluorine is a gas of diatomic molecules and it has a characteristic pungent odor detectable at 20 ppb 2. Carbon – Carbon is a chemical element with symbol C and atomic number 6. It is nonmetallic and tetravalent—making four electrons available to form covalent chemical bonds, three isotopes occur naturally, ¹²C and ¹³C being stable, while ¹⁴C is a radioactive isotope, decaying with a half-life of about 5, years. Carbon is one of the few elements known since antiquity, Carbon is the 15th most abundant element in the Earths crust, and the fourth most abundant element in the universe by mass after hydrogen, helium, and oxygen. It is the second most abundant element in the body by mass after oxygen. The atoms of carbon can bond together in different ways, termed allotropes of carbon, the best known are graphite, diamond, and amorphous carbon. The physical properties of carbon vary widely with the allotropic form, for example, graphite is opaque and black while diamond is highly transparent. Graphite is soft enough to form a streak on paper, while diamond is the hardest naturally occurring material known, graphite is a good electrical conductor while diamond has a low electrical conductivity. Under normal conditions, diamond, carbon nanotubes, and graphene have the highest thermal conductivities of all known materials, all carbon allotropes are solids under normal conditions, with graphite being the most thermodynamically stable form. The largest sources of carbon are limestones, dolomites and carbon dioxide, but significant quantities occur in organic deposits of coal, peat, oil. For this reason, carbon has often referred to as the king of the elements. The allotropes of carbon graphite, one of the softest known substances, and diamond. It bonds readily with other small atoms including other carbon atoms, Carbon is known to form almost ten million different compounds, a large majority of all chemical compounds. Carbon also has the highest sublimation point of all elements, although thermodynamically prone to oxidation, carbon

resists oxidation more effectively than elements such as iron and copper that are weaker reducing agents at room temperature. Carbon is the element, with a ground-state electron configuration of $1s^2 2s^2 2p^2$. Its first four ionisation energies, Carbons covalent radii are normally taken as Carbon compounds form the basis of all life on Earth 3. Nitrogen

Nitrogen is a chemical element with symbol N and atomic number 7. It was first discovered and isolated by Scottish physician Daniel Rutherford in 1772, although Carl Wilhelm Scheele and Henry Cavendish had independently done so at about the same time, Rutherford is generally accorded the credit because his work was published first. It is an element in the universe, estimated at about seventh in total abundance in the Milky Way. The nitrogen cycle describes movement of the element from the air, into the biosphere and organic compounds, many industrially important compounds, such as ammonia, nitric acid, organic nitrates, and cyanides, contain nitrogen. The extremely strong bond in elemental nitrogen, the second strongest bond in any diatomic molecule. Synthetically produced ammonia and nitrates are key industrial fertilisers, and fertiliser nitrates are key pollutants in the eutrophication of water systems. Apart from its use in fertilisers and energy-stores, nitrogen is a constituent of organic compounds as diverse as Kevlar used in high-strength fabric, Nitrogen is a constituent of every major pharmacological drug class, including antibiotics. Many notable nitrogen-containing drugs, such as the caffeine and morphine or the synthetic amphetamines. Nitrogen compounds have a long history, ammonium chloride having been known to Herodotus. They were well known by the Middle Ages, alchemists knew nitric acid as aqua fortis, as well as other nitrogen compounds such as ammonium salts and nitrate salts. The mixture of nitric and hydrochloric acids was known as aqua regia, celebrated for its ability to dissolve gold, the discovery of nitrogen is attributed to the Scottish physician Daniel Rutherford in 1772, who called it noxious air. Though he did not recognise it as a different chemical substance, he clearly distinguished it from Joseph Black's fixed air. The fact that there was a component of air that does not support combustion was clear to Rutherford, Nitrogen was also studied at about the same time by Carl Wilhelm Scheele, Henry Cavendish, and Joseph Priestley, who referred to it as burnt air or phlogisticated air. In an atmosphere of nitrogen, animals died and flames were extinguished 4. Jmol

Jmol is computer software for molecular modelling chemical structures in 3-dimensions. Jmol returns a 3D representation of a molecule that may be used as a teaching tool and it is written in the programming language Java, so it can run on the operating systems Windows, macOS, Linux, and Unix, if Java is installed. A popular feature is an applet that can be integrated into web pages to display molecules in a variety of ways, for example, molecules can be displayed as ball-and-stick models, space-filling models, ribbon diagrams, etc. There is also a JavaScript-only version, JSmol, that can be used on computers with no Java, the Jmol applet, among other abilities, offers an alternative to the Chime plug-in, which is no longer under active development. While Jmol has many features that Chime lacks, it does not claim to reproduce all Chime functions, most notably, Chime requires plug-in installation and Internet Explorer 6. Jmol requires Java installation and operates on a variety of platforms.

Where to harrowing halls Conservation of decorated surfaces on earthen architecture Pastoral call and expatriation not connected The Freeport register, 1904, comp. American literature in Spain. What is an 3 file Mec portable air conditioner manual Pt. 11-12. Detroit Bankers Company. Jan. 24-Feb. 9, 1934. 2 v. Blanco portales reimagining language learning Reasoning Phil Johnson-Laird Management of electrical burns 5 dysfutions of a team book Sammy Keyes and the Runaway Elf Somebody to love glee sheet music Saddleback Mountain-Arizona Settlement Act of 1995 Country life in classical times The Hindu tradition Instantaneous Power Theory and Applications to Power Conditioning (IEEE Press Series on Power Engineering Phocas (Remy de Gourmont) Epa membrane filtration guidance manual Fung kingdom of Sennar Mountain Biking Virginia, 3rd Feeding the world in the nineties Lester R. Brown and John E. Young Introducing global issues sixth edition version Day in the life of the United States Armed Forces Game programming gems 7 Get Off Your Hamster Wheel Barchester Towers Code of Federal Regulations, Title 40, Protection of Environment, Pt. 87-99, Revised as of July 1, 2007 Cruise, Pershing, and SS-20 Behind the Harvard gates Employment and people with mental illness Geoff Waghorn and Chris Lloyd XVII The Great Plague Bringing in talent competence aggregators Exam 70 487 developing windows azure and web services On-farm IPM of chickpea in Nepal Matlab price list euro Glauben Und Wissen Im Zeitalter Der Reformation Columbia point peninsula: a proposal for the revitalization of columbia point peninsula. 2 The phantom falcon Anne Schraff