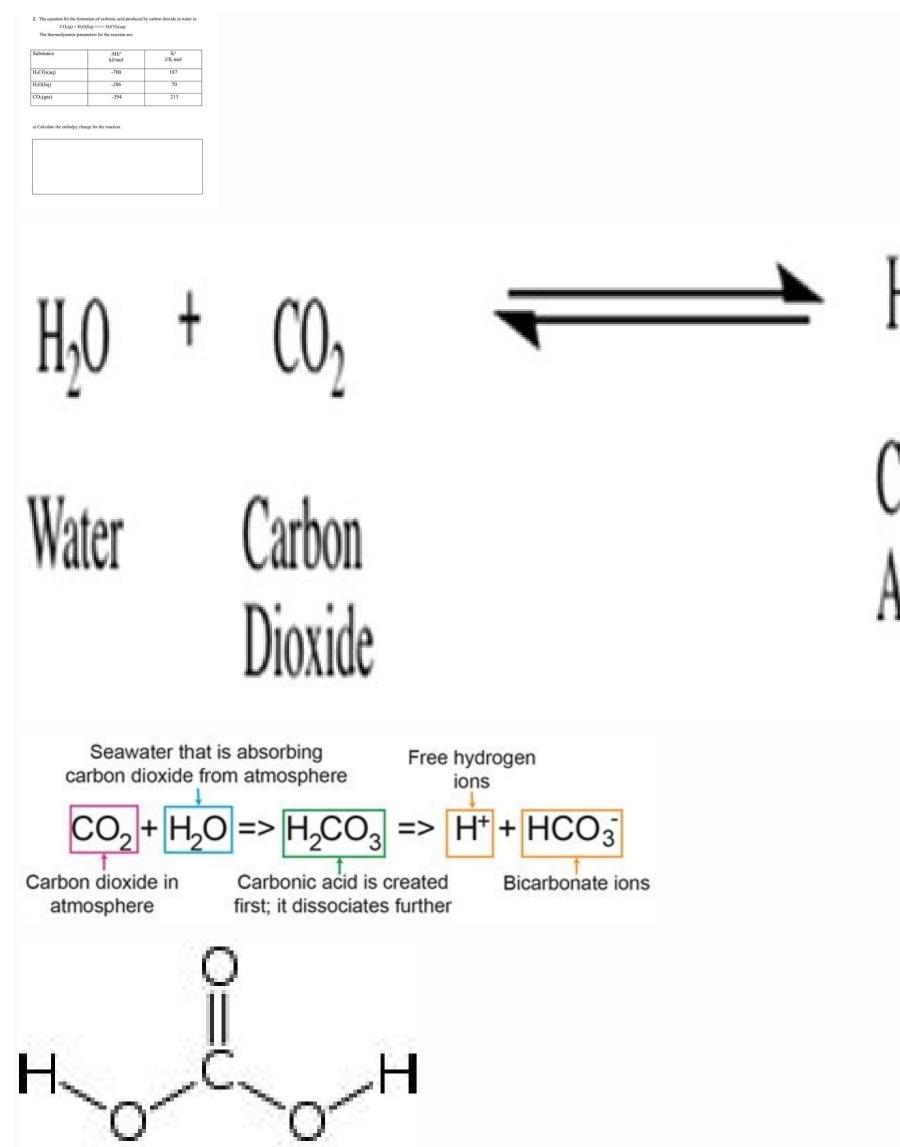
Formation of carbonic acid equation

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Larbonic Acid

## $CO_2 + H_2O <--> H_2CO_3$

Word equation for the formation of carbonic acid. How to find carbonic acid formula

Access through your institutionVolume 287, 15 October 2022, 119245 rights and contentView full text Chemical compound This article is about the molecule. For the group of chemicals that contains a phenol group, see Phenols. "Carbolic acid" redirects here. Not to be confused with carbonic acid. Phenol Names Preferred IUPAC name Phenol[1] Systematic IUPAC name Benzenol Other names Carbolic acidPhenylic acidHydroxybenzenePhenic acid Identifiers CAS Number 108-95-2 Y 3D model (JSmol) Interactive image ChEBI CHEBI:15882 Y ChEMBL 14060 Y ChemSpider 971 Y DrugBank DB03255 Y ECHA InfoCard 100.003.303 KEGG D00033 Y PubChem CID 996 RTECS number SJ3325000 UNII 339NCG44TV Y CompTox Dashboard (EPA) DTXSID5021124 InChI InChI=1S/C6H6O/c7-6-4-2-1-3-5-6/h1-5,7H SMILES Oc1ccccc1 Properties Chemical formula C6H6O Molar mass 94.113 g/mol Appearance Transparent crystalline solid Odor Sweet and tarry Density 1.07 g/cm3 Melting point 40.5 °C (104.9 °F; 313.6 K) Boiling point 181.7 °C (359.1 °F; 454.8 K) Solubility in water 8.3 g/100 mL (20 °C)[3] Acidity (pKa) 9.95 (in water),18.0 (in DMSO),29.1 (in acetonitrile)[4] Conjugate base Phenoxide UV-vis (\lambda max) 270.75 nm[5] Dipole moment 1.224 D Pharmacology ATC code C05BB05 (WHO) D08AE03 (WHO), R01BX03 (WHO), R02AA19 (WHO) Hazards GHS labelling: Pictograms [6] Hazard statements P261, P280, P301+P310, P305+P351+P338, P310[6] NFPA 704 (fire diamond) 3 2 0 Flash point 79 °C (174 °F; 352 K) Explosive limits 1.8-8.6%[3] Lethal dose or concentration (LD, LC): LD50 (median dose) 317 mg/kg (rat, oral)270 mg (Permissible) TWA 5 ppm (19 mg/m3) [skin][3] REL (Recommended) TWA 5 ppm (19 mg/m3)C 15.6 ppm (60 mg/m3) [15-minute] [skin][3] IDLH (Immediate danger) 250 ppm[3] Safety data sheet (SDS) [2] Related compounds Re state (at 25 °C [77 °F], 100 kPa). Y verify (what is YN ?) Infobox references Chemical compound Phenol (also called carbolic acid) is an aromatic organic compound with the molecular formula C6H5OH. It is a white crystalline solid that is volatile. The molecule consists of a phenyl group (-C6H5) bonded to a hydroxy group (-OH). Mildly acidic, it requires careful handling because it can cause chemical burns. Phenol was first extracted from coal tar, but today is produced on a large scale (about 7 billion kg/year) from petroleum-derived feedstocks. It is an important industrial commodity as a precursor to many materials and useful compounds.[8] It is primarily used to synthesize plastics and related materials. Phenol and its chemical derivatives are essential for production of polycarbonates, epoxies, Bakelite, nylon, detergents, herbicides such as phenoxy herbicides, and numerous pharmaceutical drugs. Properties Phenol is an organic compound appreciably soluble in water, with about 84.2 g dissolving in 1000 mL (0.895 M). Homogeneous mixtures of phenol and water at phenol to water mass ratios of ~2.6 and higher are possible. The sodium salt of phenol, sodium phenoxide, is far more water-soluble. Acidity Phenol is a weak acid. In aqueous solution in the pH range ca. 8 - 12 it is in equilibrium with the phenolate anion C6H5OH = (also called phenoxide):[9] C6H5OH C6H5O- + H+ Resonance structures of the phenoxide anion. In this way, the negative charge on oxygen is delocalized on to the ortho and para carbon atoms through the pi system.[10] An alternative explanation involves the sigma framework, postulating that the dominant effect is the induction from the more electronegative sp2 hybridised carbons; the compared to an sp3 system allows for great stabilization of the oxyanion. In support of the second explanation, the pKa of the enol of acetone in water is 10.9, making it only slightly less acidic than phenol (pKa 10.0).[11] Thus, the greater number of resonance structures available to phenoxide compared to acetone enolate seems to contribute very little to its stabilization. However, the situation changes when solvation effects are excluded. A recent in silico comparison of the gas phase acidities of the vinylogues of phenol and cyclohexanol in conformations that allow for or exclude resonance accounting for the remaining difference.[12] Hydrogen bonding In carbon tetrachloride and alkane solvents phenol hydrogen bonds with a wide range of Lewis bases such as pyridine, diethyl ether, and diethyl sulfide. The enthalpies of adduct formation have been studied.[13] Phenol is classified as a hard acid which is compatible with the C/E ratio of the ECW model with EA = 2.27 and CA = 1.07. The relative acceptor strength of phenol toward a series of bases, versus other Lewis acids, can be illustrated by C-B plots.[14][15] Phenoxide anion is a strong nucleophile with a nucle carbon sites as an ambident nucleophile (see HSAB theory). Generally, oxygen attack of phenoxide anions is kinetic reaction control). Mixed oxygen/carbon attack and by this a loss of selectivity is usually observed if the reaction rate reaches diffusion control.[17] Tautomerism Phenol-cyclohexadienone tautomerism Phenol exhibits keto-enol tautomerism with its unstable keto tautomer cyclohexadienone, but only a tiny fraction of phenol exhibits keto-enol tautomerism with its unstable keto tautomer cyclohexadienone tautomerism. any moment.[18] The small amount of stabilisation gained by exchanging a C=C bond for a C=O bond is more than offset by the large destabilisation resulting from the loss of aromaticity. Phenol therefore exists essentially entirely in the enol form.[19] 4, 4' Substituted cyclohexadienone can undergo a dienone-phenol rearrangement in acid conditions and form stable 3,4-disubstituted phenol.[20] Phenoxides are enolates stabilised by aromaticity. Under normal circumstances, phenoxide is more reactive at the oxygen position, but the oxygen position, but the oxygen position is a "hard" nucleophile whereas the alpha-carbon positions tend to be "soft".[21] Reactions Neutral phenol substructure "shape". An image of a computed electrostatic surface of neutral phenol molecule, showing neutral regions in green, electropegative areas in orange-red, and the electropositive phenolic proton in blue. Phenol water can make two solutions in one bottle. Phenol water phase diagram: Certain combinations of phenol and water can make two solutions in one bottle. substitution. The enhance nucleophilicity is attributed to donation pi electron density from O into the ring, via halogenation, acylation, sulfonation, and related processes. Phenol's ring is so strongly activated that bromination and chlorination lead readily to polysubstitution.[22] Phenol reacts with dilute nitric acid at room temperature to give a mixture of 2-nitrophenol and 4-nitrophenol while with concentrated nitric acid, additional nitro groups are introduced, e.g. to give 2,4,6-trinitrophenol. Aqueous solutions of phenol are weakly acidic and turn blue litmus slightly to red. Phenol is neutralized by sodium hydroxide forming sodium phenate or phenolate, but being weaker than carbonic acid, it cannot be neutralized by sodium bicarbonate or sodium carbonate or sodium carbonate or sodium bicarbonate or sodium carbonate or benzoyl chloride are shaken in presence of dilute sodium hydroxide solution, phenyl benzoate is formed. This is an example of the Schotten-Baumann reaction: C6H5COCl + HOC6H5  $\rightarrow$  C6H5CO2C6H5 + HCl Phenol is reduced to benzene when it is distilled with zinc dust or when its vapour is passed over granules of zinc at 400 °C:[23] C6H5OH + Zn  $\rightarrow$  C6H6 + ZnO When phenol is treated with diazomethane in the presence of boron trifluoride (BF3), anisole is obtained as the main product and nitrogen gas as a byproduct. C6H5OH + CH2N2  $\rightarrow$  C6H5OCH3 + N2 When phenol reacts with iron(III) chloride solution, an intense violet-purple solution, an intense violet-purple solution, an intense violet-purple solution is formed. Production Because of phenol's commercial importance, many methods have been developed for its product. process Accounting for 95% of production (2003) is the cumene process, also called Hock process. It involves the partial oxidation of cumene (isopropylbenzene) via the Hock rearrangement:[8] Compared to most other processes, the cumene process uses relatively mild conditions and relatively inexpensive raw materials. For the process to be economical, both phenol and the acetone by-product must be in demand. [24][25] In 2010, worldwide demand for acetone process. A route analogous to the cumene process begins with cyclohexylbenzene. It is oxidized to a hydroperoxide, akin to the production of cumene hydroperoxide. Via the Hock rearrangement, cyclohexanone is an important precursor to some nylons.[26] Oxidation of benzene and toluene The direct oxidation of benzene to phenol is theoretically possible and of great interest, but it has not been commercialized: C6H6 + O  $\rightarrow$  C6H5OH Nitrous oxide is a potentially "green" oxidant that is a more potent oxidant that O2. Routes for the generation of nitrous oxide however remain uncompetitive.[27][24][26] An electrosynthesis employing alternating current gives phenol from benzene.[28] The oxidation of toluene, as developed by Dow Chemical, involves copper-catalyzed reaction of molten sodium benzoate with air: C6H5CH3 + 2 O2  $\rightarrow$  C6H5OH + CO2 + H2O The reaction of phenol from coal derivatives or the hydrolysis of benzene derivatives. Hydrolysis of benzenesulfonic acid An early commercial route, developed by Bayer and Monsanto in the early 1900s, begins with the reaction of a strong base with benzenesulfonic acid. The conversion is represented by this idealized equation: [29] C6H5SO3H + 2 NaOH → C6H5OH + Na2SO3 + H2O Hydrolysis of chlorobenzene chlorobenzene can be hydrolyzed to phenol using base (Dow process) or steam (Raschig-Hooker process): [25][26][30] C6H5Cl + NaCl  $\rightarrow$  C6H5OH + HCl These methods suffer from the cost of the chlorobenzene and the need to dispose of the Lummus Process, the oxidation of toluene to benzoic acid is conducted separately. Miscellaneous methods Amine to phenol. [31] Phenyldiazonium salts hydrolyze to phenol. [31] Uses The major uses of phenol, consuming two thirds of its production, involve its conversion to precursors for plastics. Condensation of phenol, alkylphenols, or diphenols, or diphenols, or diphenol, alkylphenols, or diphenol, alkylphenols, or diphenol alkylphenols, or diphenol, alkylphenol, alkylph Bakelite. Partial hydrogenation of phenol gives cyclohexanone, a precursor to nylon. Nonionic detergents are produced by alkylation.[8] Phenol is also a versatile precursor to a large collection of drugs, most notably aspirin but also many herbicides and pharmaceutical drugs. Phenol is a component in liquid-liquid phenol-chloroform extraction technique used in molecular biology for obtaining nucleic acids from tissues or cell culture samples. Depending on the pH of the solution either DNA or RNA can be extracted. Medical Phenol is widely used as an antiseptic. Its use was pioneered by Joseph Lister (see History section). From the early 1900s to the 1970s it was used in the production of carbolic soap. Concentrated phenol liquids are commonly used for permanent treatment of ingrown toe and finger nails, a procedure known as a chemical matrixectomy. The procedure known as a chemical matrixectomy. the chemical of choice for chemical matrixectomies performed by podiatrists. Concentrated liquid phenol can be used topically as a local anesthetic for otology procedures, such as myringotomy and tympanotomy tube placement, as an alternative to general anesthetic for otology procedures. It also has hemostatic and antiseptic qualities that make it ideal for this use. Phenol spray, usually at 1.4% phenol as an active ingredient, is used medically to treat sore throat.[33] It is the active ingredient in some oral analgesics such as Chloraseptic spray, TCP and Carmex.[34] Niche uses Phenol is so inexpensive that it attracts many small-scale uses. It is a component of industrial paint strippers used in the aviation industry for the removal of epoxy, polyurethane and other chemically resistant coatings, [35] Phenol derivatives have been used in the preparations. [37] However, due to safety concerns, phenol is banned from use in cosmetic products in the European Union[38][39] and Canada.[40][41] History Phenol was discovered in 1834 by Friedlieb Ferdinand Runge, who extracted it (in impure form) from coal tar.[42] Runge called phenol "Karbolsäure" (coal-oil-acid, carbolic acid). Coal tar remained the primary source until the development of the petrochemical industry. In 1841, the French chemist Auguste Laurent obtained phenol in pure form.[43] In 1836, Auguste Laurent coined the name "phénol".[45] The antiseptic properties of phenol were used by Sir Joseph Lister (1827-1912) in his pioneering technique of antiseptic surgery. Lister decided that the wounds with a piece of rag or lint[46] covered in phenol, or carbolic acid as he called it. The skin irritation caused by continual exposure to phenol eventually led to the introduction of aseptic (germ-free) techniques in surgery. Joseph Lister was a student at University College London under Robert Liston, later rising to the rank of Surgeon at Glasgow Royal Infirmary. Lister experiments of his contemporary, Louis Pasteur in sterilizing various biological media. Lister was inspired to try to find a way to sterilize living wounds, which could not be done with the heat required by Pasteur's experiments. In examining Pasteur's research. Lister began to piece together his theory: that patients were being killed by germs. He theorized that if germs could be killed or prevented, no infection would occur. Lister reasoned that a chemical could be used to destroy the micro-organisms that cause infection.[47] Meanwhile, in Carlisle, England, officials were experimenting with a sewage treatment, using carbolic acid to reduce the smell of sewage cess pools. Having heard of these developments and having himself previously experimented with other chemicals for antiseptic purposes without much success, Lister decided to try carbolic acid as a wound antiseptic. He had his first chance on August 12, 1865, when he received a patient: an eleven-year-old boy with a tibia bone fracture which pierced the skin of his lower leg. Ordinarily, amputation would be the only solution. However, Lister decided to try carbolic acid. After setting the bone and supporting the leg with splints, Lister soaked clean cotton towels in undiluted carbolic acid and applied them to the wound, covered with a layer of tin foil, leaving them for four days. When he checked the wound, covered with a layer of tin foil, leaving them for four days. acid. Reapplying fresh bandages with diluted carbolic acid, the boy was able to walk home after about six weeks of treatment.[48] By 16 March 1867, when the first results of Lister's work were published in the Lancet, he had treated a total of eleven patients using his new antiseptic method. Of those, only one had died, and that was through a complication that was nothing to do with Lister's wound-dressing technique. Now, for the first time, patients with compound fractures were likely to leave the hospital with all their limbs intact — Richard Hollingham, Blood and Guts: A History of Surgery, p. 62[48] Before antiseptic operations were introduced at the hospital, there were sixteen deaths in thirty-five surgical cases. Almost one in every two patients died. After antiseptic surgery was introduced in the summer of 1865, there were only six deaths in forty cases. The mortality rate had dropped from almost 50 per cent. It was a remarkable achievement — Richard Hollingham, Blood and Guts: A History of Surgery, p. 63[49] Phenol was the main ingredient of the Carbolic Smoke Ball, an ineffective device marketed in London in the 19th century as protection against influenza and other ailments, and the subject of the famous law case Carlill v Carbolic Smoke Ball Company. Second World War The toxic effect of phenol on the central nervous system, discussed below, causes sudden collapse and loss of consciousness in both humans and animals; a state of cramping precedes these symptoms because of the motor activity controlled by the central nervous system.[50] Injections of phenol were used as a means of individual execution by Nazi Germany during the Second World War.[51] It was originally used by the Nazis in 1939 as part of the Aktion T4 euthanasia program.[52] The Germans learned that extermination of smaller groups was more economical by injection after surviving two weeks of dehydration and starvation in Auschwitz when he volunteered to die in place of a stranger. Approximately one gram is sufficient to cause death.[53] Occurrences Phenol is a normal metabolic product, excreted in quantities up to 40 mg/L in human urine.[50] The temporal gland secretion of male elephants showed the presence of phenol and 4-methylphenol during musth. [54] [55] It is also one of the chemical compounds found in castoreum. This compound is ingested from the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the plants the beaver eats. [56] Occurrence in whisky [57] generally ~30 ppm, but it can be over 160ppm in the malted barley used to produce the beaver eats. [56] Occurrence in which [56] Occurrence in [56] whisky.[58] This amount is different from and presumably higher than the amount in the distillate.[57] Biodegradation Cryptanaerobacter phenolicus is a bacterium species that produces benzoate from phenol via 4-hydroxybenzoate.[59] Rhodococcus phenolicus is a bacterium species that produces benzoate from phenol via 4-hydroxybenzoate.[59] Rhodococcus phenolicus is a bacterium species able to degrade phenol as sole carbon source.[60] Toxicity Phenol and its vapors are corrosive to the eyes, the skin, and the respiratory tract.[61] Its corrosive effect on skin and mucous membranes is due to a protein-degenerating effect.[50] Repeated or prolonged skin contact with phenol may cause lung edema.[61] The substance may cause harmful effects on the central nervous system and heart, resulting in dysrhythmia, seizures, and coma.[63] The kidneys may be affected as well. Long-term or repeated exposure of the substance may have harmful effects on the liver and kidneys.[64] There is no evidence that phenol causes cancer in humans.[65] Besides its hydrophobic effects, another mechanism for the toxicity of phenol may be the formation of phenoxyl radicals.[66] Since phenol is absorbed through the skin relatively quickly, systemic poisoning by a large quantity of phenol can occur even with only a small area of skin, rapidly leading to paralysis of the central nervous system and a severe drop in body temperature. The LD50 for oral toxicity is less than 500 mg/kg for dogs, rabbits, or mice; the minimum lethal human dose was cited as 140 mg/kg.[50] The Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Department of Health and Human Services states the fatal dose for ingestion of phenol is from 1 to 32 g.[67] Chemical burns from skin exposures can be decontaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[69] or perhaps even copious amounts of water.[70] Removal of contaminated by washing with polyethylene glycol,[68] isopropyl alcohol,[68] isopro important if the phenol is mixed with chloroform (a commonly used mixture in molecular biology for DNA and RNA purification). Phenol is also a reproductive toxin causing increased risk of miscarriage and low birth weight indicating retarded development in utero.[71] Phenols Main article: Phenols The word phenol is also used to refer to any compound that contains a six-membered aromatic ring, bonded directly to a hydroxyl group (-OH). Thus, phenols are a class of organic compounds of which the phenol discussed in this article is the simplest member. See also Bamberger rearrangement Claisen rearrangement Cresol Fries rearrangement Polyphenol References ^ "Front Matter". Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013 (Blue Book). Cambridge: The Royal Society of Chemistry. 2014. p. 690. doi:10.1039/9781849733069-FP001. ISBN 978-0-85404-182-4. Only one name is retained, phenol, for C6H5-OH, both as a preferred name and for general nomenclature. ^ "Phenol msds" ^ a b c d e NIOSH Pocket Guide to Chemical Hazards. "#0493". 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International Chemical Safety Card 0070 Phenol Material Safety Data Sheet National Pollutant Inventory: Phenol Fact Sheet NIOSH Pocket Guide to Chemical Hazards CDC - Phenol - NIOSH Workplace Safety and Health Topic IARC Monograph: "Phenol" Arcane Radio Trivia outlines competing uses for Phenol circa 1915 Retrieved from " 2Primary alcohol compound Propan-1-ol Names Preferred IUPAC name Propan-1-ol[1] Other names n-Propyl alcoholPropylol Identifiers CAS Number 71-23-8 Y 3D model (JSmol) Interactive image 3DMet B00883 Beilstein Reference 1098242 ChEBI CHEBI:28831 Y ChEMBL 14687 Y ChemSpider 1004 Y DrugBank DB03175 Y ECHA InfoCard 100.000.679 EC Number 200-746-9 Gmelin Reference 25616 KEGG C05979 Y MeSH 1-Propanol PubChem CID 1031 RTECS number 1274 CompTox Dashboard (EPA) DTXSID2021739 InChI InChI=1S/C3H7OH/c1-2-3-4/h4H,2-3H2,1H3 YKey: BDERNNFJNOPAEC-UHFFFAOYSA-N Y SMILES CCCO Properties Chemical formula C3H8O Molar mass 60.096 g·mol-1 Appearance Colorless liquid Odor mild, alcohol-like[2] Density 0.803 g/mL Melting point -126 °C; -195 °F; 147 K Boiling point 97 to 98 °C; 206 to 208 °F; 370 to 371 K Solubility in water miscible log P 0.329 Vapor pressure 1.99 kPa (at 20 °C) Acidity (pKa) 16 Basicity (pKb) -2 Magnetic susceptibility ( $\chi$ )  $-45.176\cdot10-6$  cm3/mol Refractive index (nD) 1.387 Viscosity 1.959 mPa·s (at 25 °C) [3] Dipole moment 1.68 D Thermochemistry Heat capacity (C) 143.96 J/(K·mol) Std molarentropy (So298) 192.8 J/(K·mol) Std enthalpy offormation ( $\Delta$ fH298) -302.79. -302.29 kJ/mol Std enthalpy of combustion ( $\Delta$ cH298) -2.02156...-2.02106 MJ/mol Pharmacology ATC code D08AX03 (WHO) Hazards Flammable liquid GHS labelling: Pictograms Signal word Danger Hazard statements H225, H302, H318, H336 Precautionary statements P210, P261, P280,

P305+P351+P338 NFPA 704 (fire diamond) 1 3 0 Flash point 22 °C (72 °F; 295 K) Autoignitiontemperature 371 °C (700 °F; 644 K) Explosive limits): PEL (Permissible) TWA 200 ppm (500 mg/m3)[2] REL (Recommended) TWA 200 ppm (500 mg/m3) ST 250 ppm (625 mg/m3) [skin][2] IDLH (Immediate danger) 800 ppm[2] Related compounds Related compounds Related compounds PropaneIsopropyl alcoholPropanamineEthanolButanol Supplementary data page 1-Propanol (data page) Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa). N verify (what is YN ?) Infobox references Chemical compound Propanol. It is a colorless liquid and an isomer of 2-propanol. It is formed naturally in small amounts during many fermentation processes and used as a solvent in the pharmaceutical industry, mainly for resins and cellulose esters, and, sometimes, as a disinfecting agent. Chemical properties Some example reactions of a primary alcohol. Thus it can be converted to alkyl halides; for example red phosphorus and iodine produce n-propyl iodide in 80% yield, while PC13 with catalytic ZnCl2 gives n-propyl chloride. Reaction with acetic acid in the presence of an H2SO4 catalyst under Fischer esterification conditions gives propyl acetate, while refluxing propanol overnight with formic acid alone can produce propyl formate in 65% yield. Oxidation of propan-1-ol with Na2Cr2O7 and H2SO4 gives a 36% yield of propionaldehyde, and therefore for this type of reaction higher yielding methods using PCC or the Swern oxidation are recommended. Oxidation of ol involves treating n-propyl iodide with moist Ag2O. Safety Propan-1-ol is thought to be similar to ethanol in its effects on the human body, but 2-4 times more potent. Oral LD50 in rats is 1870 mg/kg (compared to 7060 mg/kg for ethanol). It is metabolized into propionic acid. Effects include alcoholic intoxication and high anion gap metabolic acidosis. As of 2011, one case of lethal propan-1-ol poisoning was reported. [7] Propan-1-ol as fuel Propan-1-ol has high octane number and is suitable for engine fuel usage. However, propanol is too expensive to use as a motor fuel. The research octane number (RON) of propanol is 118, and anti-knock index (AKI) is 108.[8] References ^ Favre HA. Powell WH (2014). Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013 (Blue Book). Cambridge: The Royal Society of Chemistry. p. 61. doi:10.1039/9781849733069. ISBN 9780854041824. ^ a b c d e NIOSH Pocket Guide to Chemical Hazards. "#0533". National Institute for Occupational Safety and Health (NIOSH). ^ Pal A, Gaba R (2008). "Volumetric, acoustic, and viscometric studies of molecular interactions in binary mixtures of dipropylene glycol dimethyl ether with 1-alkanols at 298.15 K". J. Chem. Thermodyn. 40 (5): 818-828. doi:10.1016/j.jct.2008.01.008. ^ Propan-1-ol toxicity ^ "n-Propyl alcohol". Immediately Dangerous to Life or Health Concentrations (IDLH). National Institute for Occupational Safety and Health (NIOSH). ^ Papa AJ (2011). "Propanols". Ullmann's Encyclopedia of Industrial Chemistry. Weinheim: Wiley-VCH. doi:10.1002/14356007.a22 173.pub2. ISBN 9783527303854. ^ Unmack JL (2011). "N-PROPANOL Health-Base Assessment and Recommendation for HEAC" (PDF). ^ "Bioalcohols". Biofuel.org.uk. 2010. Retrieved 16 Apr 2014. Further reading Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A. R. (1989), Vogel's Textbook of Practical Organic Chemistry (5th ed.), Harlow: Longman, ISBN 0-582-46236-3 Lide DR, ed. (2006). CRC Handbook of Chemistry and Physics (87th ed.). TF-CRC. ISBN 0849304873. O'Neil MJ, ed. (2006). The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals (14th ed.). Merck. ISBN 091191000X. Perkin WH, Kipping FS (1922). Organic Chemistry. London: W. & R. Chambers. ISBN 0080223540. External links International Chemical Safety Card 0553 NIOSH Pocket Guide to Chemical Hazards Retrieved from " is a process used by plants and other organisms to convert light energy into chemical energy is stored in carbohydrate molecules, such as sugars and starches, which are synthesized from carbon dioxide and water hence the name ... 1) CO 2 + H 2 O  $\leftarrow$  Carbonic anhydrase H 2 CO 3 {\displaystyle {\ce {CO2{} + H2O }

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