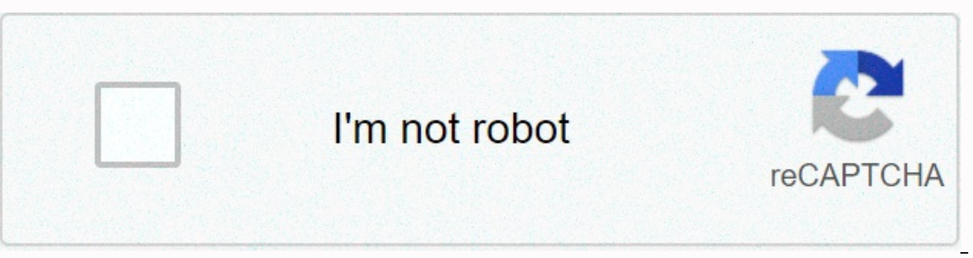


I am not robot!

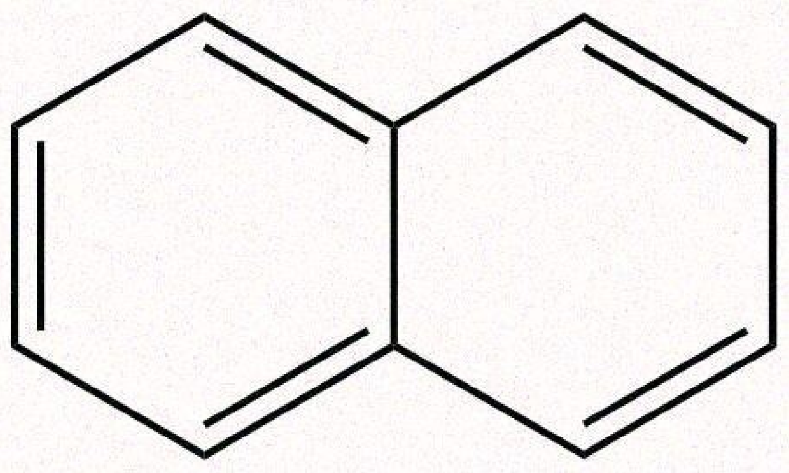
# Naphthalene lewis dot structure

## Nl3 lewis dot structure.  Lewis structure of naphthalene.  What is the structure of naphthalene.

C10H8 napthalene  The naphthalene compound may be called differently depending on the various different situations of industrial applications. Below are the list of the other names (synonyms) of naphthalene including the various registry numbers, if available: BBV-76024228 72931-45-4 Naphthalene solution, certified reference material, 5000 mug/mL in methanol Naphthalene solution, certified reference material, 200 mug/mL in methanol Naphthalene, United States Pharmacopeia (USP) Reference Standard Naphthalene solution, 100 ng/muL in cyclohexane, analytical standard Naphthalene, pharmaceutical secondary standard; traceable to USP Naphthalene, crude or refined [UN1334] [Flammable solid] Naphthalene, crude or refined [UN1334] [Flammable solid] Naphthalene, certified reference material, TraceCERT(R) F0001-2217 SR-01000854997-2 Melting point standard 79-81C, analytical standard I14-6944 Naphthalene, molten [UN2304] [Flammable solid] Naphthalene, molten [UN2304] [Flammable solid] L001166 Naphthalene, suitable for scintillation, >=99% S0672 N0885 N0004 Bicyclo[4.4.0]deca-1,3,5,7,9-pentene Naphthalene, SAJ first grade, >=98.0% S652 68412-25-9 UN 2304 UN 1334 RTR-003288 Naphthalene, for synthesis, 98.5% BDBM50159249 ANW-39567 LTBB002419 HMS3039N15 2166IN72UN Naphthalene, 99.5% 500g BIDD:ER0665 NAPHTHALENE- D8 Naphthalene, di-C5-6-alkyl derivs. Naphthalene, 98% Naphthalene, crude 2-naphthalenyl 1-naphthalenyl Naphthyl Group moth flaker naphthalir naphthalinr mothballr antimitr Di(C5-C6)alkylnaphthalene NPY CAS-91-20-3 Naphthalene-1,2,3,4-13C4 NAPHTHALENE [1-14C] Naphthalene, analytical standard MFCD00001742 Naphthalene, 99% Naphthalene, crude or refined EPA Pesticide Chemical Code 055801 RCRA waste no. U165 Naphthalene (molten) Naphthalene, molten Naphthalene, pure Naphtalene [ISO:French] Naphthalene [BSI:ISO] Mothballs naphthalen naphtaline naftalina Caswell No. 587 Naftalen [Polish] naftaleno Mighty RD1 RCRA waste number U165 Naftalen Mighty 150 Dezodorator naphtalene Tar camphor Moth flakes Moth balls Naphthaline Albocarbon White tar Camphor tar Naphthene Naphthalin 91-20-3 Not to be confused with naphtha, naphthene, or Naphtali. Naphthalene Skeletal formula and numbering system of naphthalene Ball-and-stick model of naphthalene Names IUPAC name Naphthalene[2] Other names white tar, camphor tar, tar camphor, naphthalin, naphthaline, antimite, albocarbon, hexalene, mothballs, moth flakes[1] Identifiers CAS Number 91-20-3 Y 3D model (JSmol) Interactive image Beilstein Reference 1421310 ChEBI CHEBI:16482 Y ChEMBL ChEMBL16293 Y ChemSpider 906 Y ECHA InfoCard 100.001.863 EC Number 214-552-7 Gmelin Reference 3347 KEGG C00829 Y PubChem CID 931 RTECS number QJ0525000 UNII 2166IN72UN N CompTox Dashboard (EPA) DTXSID8020913 InChI InChI=1S/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8H YKey: UFWIBTONFRDIAS-UHFFFAOYSA-N YInChI=1/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8HKey: UFWIBTONFRDIAS-UHFFFAOYAC SMILES c1c2ccccc2ccc1 Properties Chemical formula C10H8 Molar mass 128.174 g·mol−1 Appearance White solid crystals/ flakes Odor Strong odor of coal tar or mothballs Density 1.145 g/cm3 (15.5 °C)[3] 1.0253 g/cm3 (20 °C)[4] 0.9625 g/cm3 (100 °C)[3] Melting point 78.2 °C (172.8 °F; 351.3 K) 80.26 °C (176.47 °F; 353.41 K) at 760 mmHg[4] Boiling point 217.97 °C (424.35 °F; 491.12 K) at 760 mmHg[3][4] Solubility in water 19 mg/L (10 °C) 31.6 mg/L (25 °C) 43.9 mg/L (34.5 °C) 80.9 mg/L (50 °C)[4] 238.1 mg/L (73.4 °C)[5] Solubility Soluble in alcohols, liquid ammonia, Carboxylic acids, C6H6, SO2,[5] CCl4, CS2, toluene, aniline[6] Solubility in ethanol 5 g/100 g (0 °C) 11.3 g/100 g (25 °C) 19.5 g/100 g (40 °C) 179 g/100 g (70 °C)[6] Solubility in acetic acid 6.8 g/100 g (6.75 °C) 13.1 g/100 g (21.5 °C) 31.1 g/100 g (42.5 °C) 111 g/100 g (60 °C)[6] Solubility in chloroform 19.5 g/100 g (0 °C) 35.5 g/100 g (25 °C) 49.5 g/100 g (40 °C) 87.2 g/100 g (70 °C)[6] Solubility in hexane 5.5 g/100 g (0 °C) 17.5 g/100 g (25 °C) 30.8 g/100 g (40 °C) 78.8 g/100 g (70 °C)[6] Solubility in butyric acid 13.6 g/100 g (6.75 °C) 22.1 g/100 g (21.5 °C) 131.6 g/100 g (60 °C)[6] log P 3.34[4] Vapor pressure 8.64 Pa (20 °C) 23.6 Pa (30 °C) 0.93 kPa (80 °C)[5] 2.5 kPa (100 °C)[7] Henry's lawconstant (kH) 0.42438 L·atm/mol[4] Magnetic susceptibility (χ) -91.9·10−6 cm3/mol Thermal conductivity 98 kPa: 0.1219 W/m·K (372.22 K) 0.1174 W/m·K (400.22 K) 0.1152 W/m·K (418.37 K) 0.1052 W/m·K (479.72 K)[8] Refractive index (nD) 1.5898[4] Viscosity 0.964 cP (80 °C) 0.761 cP (100 °C) 0.217 cP (150 °C)[9] Structure Crystal structure Monoclinic[10] Space group P21/b[10] Point group C52h[10] Lattice constant a = 8.235 Å, b = 6.003 Å, c = 8.658 Å[10]α = 90°, β = 122.92°, γ = 90° Thermochemistry Heat capacity (C) 165.72 J/mol·K[4] Std molarentropy (S⊖298) 167.39 J/mol·K[4][7] Std enthalpy offormation (ΔfH⊖298) 78.53 kJ/mol[4] Gibbs free energy (ΔfG⊖) 201.585 kJ/mol[4] Std enthalpy ofcombustion (ΔcH⊖298) -5156.3 kJ/mol[4] Hazards Occupational safety and health (OHS/OSH): Main hazards Flammable, sensitizer, possible carcinogen.[12] Dust can form explosive mixtures with air GHS labelling: Pictograms [11] Signal word Danger Hazard statements H228, H302, H351, H410[11] Precautionary statements P210, P273, P281, P501[11] NFPA 704 (fire diamond) 2 2 0 Flash point 80 °C (176 °F; 353 K)[11] Autoignitiontemperature 525 °C (977 °F; 798 K)[11] Explosive limits 5.9%[11] Threshold limit value (TLV) 10 ppm[4] (TWA), 15 ppm[4] (STEL) Lethal dose or concentration (LD, LC): LD50 (median dose) 1800 mg/kg (rat, oral)490 mg/kg (rat, intravenous)1200 mg/kg (guinea pig, oral)533 mg/kg (mouse, oral)[14] NIOSH (US health exposure limits): PEL (Permissible) TWA 10 ppm (50 mg/m3)[13] REL (Recommended) TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)[13] IDLH (Immediate danger) 250 ppm[13] 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 Naphthalene is an organic compound with formula C10H8. It is the simplest polycyclic aromatic hydrocarbon, and is a white crystalline solid with a characteristic odor that is detectable at concentrations as low as 0.08 ppm by mass.[15] As an aromatic hydrocarbon, naphthalene's structure consists of a fused pair of benzene rings. It is the main ingredient of traditional mothballs. History In the early 1820s, two separate reports described a white solid with a pungent odor derived from the distillation of coal tar. In 1821, John Kidd cited these two disclosures and then described many of this substance's properties and the means of its production. He proposed the name naphthaline, as it had been derived from a kind of naphtha (a broad term encompassing any volatile, flammable liquid hydrocarbon mixture, including coal tar).[16] Naphthalene's chemical formula was determined by Michael Faraday in 1826. The structure of two fused benzene rings was proposed by Emil Erlenmeyer in 1866,[17] and confirmed by Carl Gräbe three years later.[18] Physical properties A naphthalene molecule can be viewed as the fusion of a pair of benzene rings. (In organic chemistry, rings are fused if they share two or more atoms.) As such, naphthalene is classified as a benzenoid polycyclic aromatic hydrocarbon (PAH).[19] The eight carbon atoms that are not shared by the two rings carry one hydrogen atom each. For purpose of the standard IUPAC nomenclature of derived compounds, those eight atoms are numbered 1 through 8 in sequence around the perimeter of the molecule, starting with a carbon atom adjacent to a shared one. The shared carbon atoms are labeled 4a (between 4 and 5) and 8a (between 8 and 1).[20] Molecular geometry The molecule is planar, like benzene. Unlike benzene, the carbon–carbon bonds in naphthalene are not of the same length. The bonds C1−C2, C3−C4, C5−C6 and C7−C8 are about 1.37 Å (137 pm) in length, whereas the other carbon–carbon bonds are about 1.42 Å (142 pm) long. This difference, established by X-ray diffraction,[21] is consistent with the valence bond model in naphthalene and in particular, with the theorem of cross-conjugation. This theorem would describe naphthalene as an aromatic benzene unit bonded to a diene but not extensively conjugated to it (at least in the ground state), which is consistent with two of its three resonance structures. Because of this resonance, the molecule has bilateral symmetry across the plane of the shared carbon pair, as well as across the plane that bisects bonds C2-C3 and C6-C7, and across the plane of the carbon atoms. Thus there are two sets of equivalent hydrogen atoms: the alpha positions, numbered 1, 4, 5, and 8, and the beta positions, 2, 3, 6, and 7. Two isomers are then possible for mono-substituted naphthalenes, corresponding to substitution at an alpha or beta position. Azulene Structural isomers of naphthalene that have two fused aromatic rings include azulene, which has a 5–7 fused ring system, and Bicyclo[6.2.0]decapentaene which has a fused 4–8 ring system.[22] The point group symmetry of naphthalene is D2h. Electrical conductivity Pure crystalline naphthalene is a moderate insulator at room temperature, with resistivity of about 1012 Ω m. The resistivity drops more than a thousandfold on melting, to about 4 × 108 Ω m. Both in the liquid and in the solid, the resistivity depends on temperature as ρ = ρ0 exp(E/(k T)), where ρ0 (Ω m) and E (eV) are constant parameters, k is Boltzmann's constant (8.617×10−5 eV/K), and T is absolute temperature (K). The parameter E is 0.73 in the solid. However, the solid shows semiconducting character below 100 K.[23][24] Chemical properties Reactions with electrophiles In electrophilic aromatic substitution reactions, naphthalene reacts more readily than benzene. For example, chlorination and bromination of naphthalene proceeds without a catalyst to give 1-chloronaphthalene and 1-bromonaphthalene, respectively. Likewise, whereas both benzene and naphthalene can be alkylated using Friedel–Crafts reaction conditions, naphthalene can also be easily alkylated by reaction with alkenes or alcohols, using sulfuric or phosphoric acid catalysts.[25] In terms of regiochemistry, electrophiles attack at the alpha position. The selectivity for alpha over beta substitution can be rationalized in terms of the resonance structures of the intermediate: for the alpha substitution intermediate, seven resonance structures can be drawn, of which four preserve an aromatic ring. For beta substitution, the intermediate has only six resonance structures, and only two of these are aromatic. Sulfonation gives the "alpha" product naphthalene-1-sulfonic acid as the kinetic product but naphthalene-2-sulfonic acid as the thermodynamic product. The 1-isomer forms predominantly at 25 °C, and the 2-isomer at 160 °C. Sulfonation to give the 1- and 2-sulfonic acid occurs readily: H2SO4 + C10H8 → C10H7SO3H + H2O Further sulfonation give di-, tri-, and tetrasulfonic acids. Lithiation Analogous to the synthesis of phenyllithium is the conversion of 1-bromonaphthalene to 1-lithionaphthalene, by lithium–halogen exchange: C10H7Br + BuLi → C10H7Li + BuBr The resulting lithionaphthalene undergoes a second lithiation, in contrast to the behavior of phenyllithium. These 1,8-dilithio derivatives are precursors to a host of peri-naphthalene derivatives.[26] Reduction and oxidation With alkali metals, naphthalene forms the dark blue-green radical anion salts such as sodium naphthalene, Na+C10H−8. The naphthalene anions are strong reducing agents. Naphthalene can be hydrogenated under high pressure in the presence of metal catalysts to give 1,2,3,4-tetrahydronaphthalene(C10H12), also known as tetralin. Further hydrogenation yields decahydronaphthalene or decalin (C10H18). Oxidation with O2 in the presence of vanadium pentoxide as catalyst gives phthalic anhydride: C10H8 + 4.5 O2 → C6H4(CO)2O + 2 CO2 + 2 H2O This reaction is the basis of the main use of naphthalene. Oxidation can also be effected using conventional stoichiometric chromate or permanganate reagents. Production Naphthalene Most naphthalene is derived from coal tar. From the 1960s until the 1990s, significant amounts of naphthalene were also produced from heavy petroleum fractions during petroleum refining, but present-day production is mainly from coal tar. Approximately 1.3M tons are produced annually. Naphthalene is the most abundant single component of coal tar. The composition of coal tar varies with coal type and processing, but typical coal tar is about 10% naphthalene by weight. In industrial practice, distillation of coal tar yields an oil containing about 50% naphthalene, along with twelve other aromatic compounds. This oil, after being washed with aqueous sodium hydroxide to remove acidic components (chiefly various phenols), and with sulfuric acid to remove basic components, undergoes fractional distillation to isolate naphthalene. The crude naphthalene resulting from this process is about 95% naphthalene by weight. The chief impurities are the sulfur-containing aromatic compound benzothiophene (< 2%), indane (0.2%), indene (< 2%), and methylnaphthalene (< 2%). Petroleum-derived naphthalene is usually purer than that derived from coal tar. Where required, crude naphthalene can be further purified by recrystallization from any of a variety of solvents, resulting in 99% naphthalene by weight, referred to as 80 °C (melting point).[25] In North America, the coal tar producers are Koppers Inc., Ruetgers Canada Inc. and Recochem Inc., and the primary petroleum producer is Monument Chemical Inc. In Western Europe the well-known producers are Koppers, Ruetgers, and Deza. In Eastern Europe, naphthalene is produced by a variety of integrated metallurgy complexes (Severstal, Evraz, Mechel, MMK) in Russia, dedicated naphthalene and phenol makers INKOR, Yenakievsky Metallurgy plant in Ukraine and ArcelorMittal Temirtau in Kazakhstan. Other sources and occurrences Naphthalene and its alkyl homologs are the major constituents of creosote. Trace amounts of naphthalene are produced by magnolias and some species of deer, as well as the Formosan subterranean termite, possibly produced by the termite as a repellant against "ants, poisonous fungi and nematode worms."[27] Some strains of the endophytic fungus Muscodor albus produce naphthalene among a range of volatile organic compounds, while Muscodor vitigenus produces naphthalene almost exclusively.[28] Uses Naphthalene is used mainly as a precursor to derivative chemicals. The single largest use of naphthalene is the industrial production of phthalic anhydride, although more phthalic anhydride is made from o-xylene. Fumigant Naphthalene has been used as a fumigant. It was once the primary ingredient in mothballs, although its use has largely been replaced in favor of alternatives such as 1,4-dichlorobenzene. In a sealed container containing naphthalene pellets, naphthalene vapors build up to levels toxic to both the adult and larval forms of many moths that attack textiles. Other fumigant uses of naphthalene include use in soil as a fumigant pesticide, in attic spaces to repel insects and animals such as opossums,[29] and in museum storage-drawers and cupboards to protect the contents from attack by insect pests. Solvent Molten naphthalene provides an excellent solubilizing medium for poorly soluble aromatic compounds. In many cases it is more efficient than other high-boiling solvents, such as dichlorobenzene, benzonitrile, nitrobenzene and durene. The reaction of C60 with anthracene is conveniently conducted in refluxing naphthalene to give the 1:1 Diels–Alder adduct.[30] The aromatization of hydroporphyrins has been achieved using a solution of DDQ in naphthalene.[31] Derivative uses The single largest use of naphthalene is the production of phthalic anhydride, which is an intermediate used to make plasticizers for polyvinyl chloride, and to make alkyd resin polymers used in paints and varnishes. Sulfonic acids and sulfonates Many naphthalenesulfonic acids and sulfonates are useful. Naphthalenesulfonic acids are used in the synthesis of 1-naphthol and 2-naphthol, precursors for various dyestuffs, pigments, rubber processing chemicals and other chemicals and pharmaceuticals.[25] They are also used as dispersants in synthetic and natural rubbers, in agricultural pesticides, in dyes, and in lead–acid battery plates. Naphthalenedisulfonic acids such as Armstrong's acid are used as precursors and to form pharmaceutical salts such as CFT. The aminonaphthalenesulfonic acids are precursors for synthesis of many synthetic dyes. Alkyl naphthalene sulfonates (ANS) are used in many industrial applications as nondetergent surfactants (wetting agents) that effectively disperse colloidal systems in aqueous media. The major commercial applications are in the agricultural chemical industry, which uses ANS for wettable powder and wettable granular (dry-flowable) formulations, and in the textile and fabric industry, which uses the wetting and defoaming properties of ANS for bleaching and dyeing operations.

Some naphthalenesulfonate polymers are superplasticizers used for the production of high strength concrete. They are produced by treating naphthalenesulfonic acid with formaldehyde, followed by neutralization with sodium hydroxide or calcium hydroxide.

Other derivative uses Propranolol is a beta blocker. Many azo dyes are produced from naphthalene.



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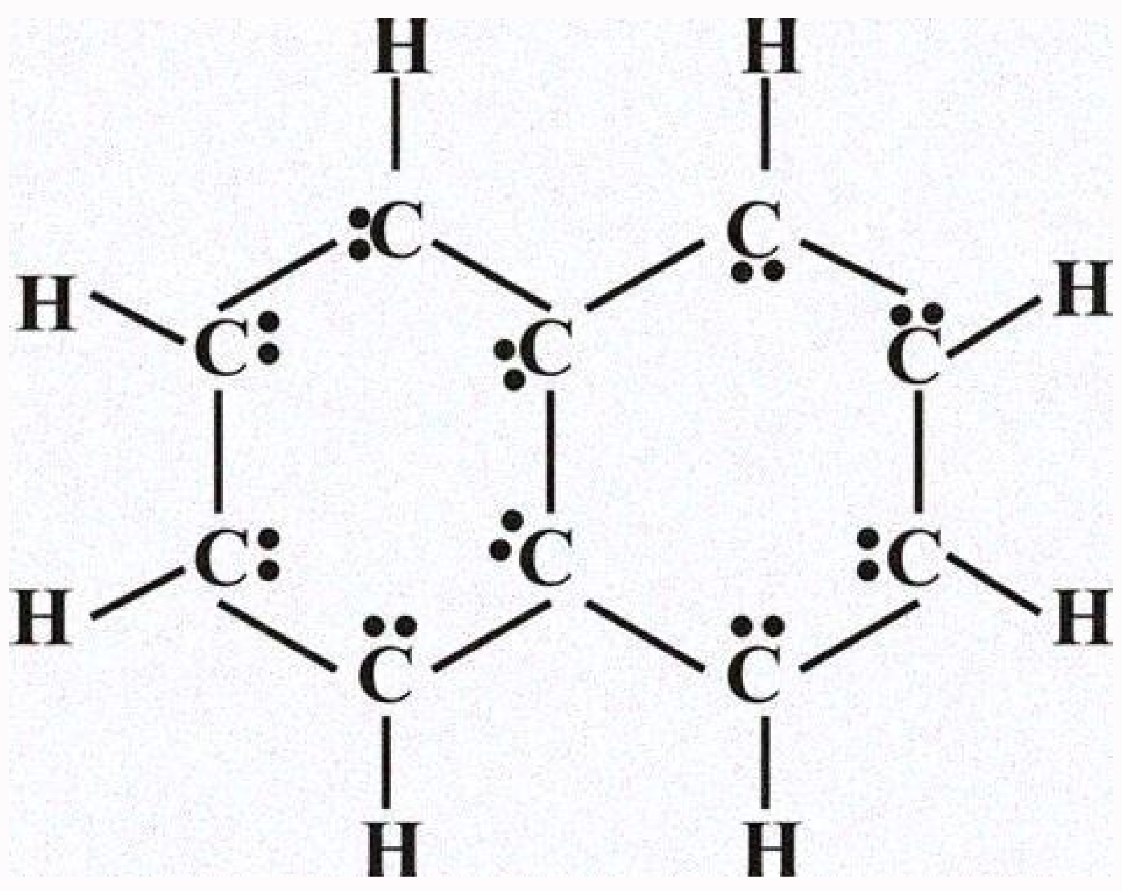

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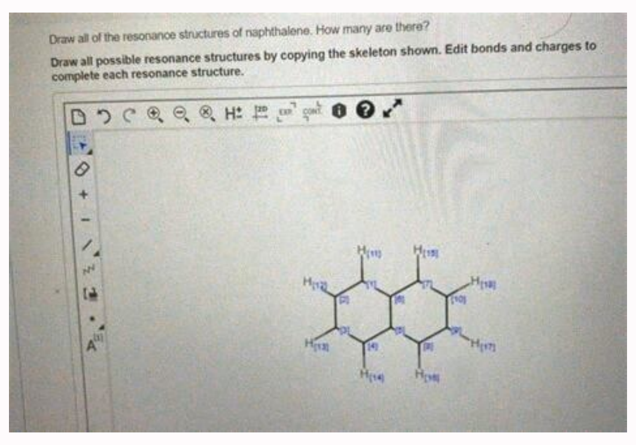
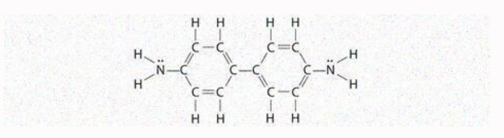


Draw all of the resonance structures of naphthalene. How many are there?

Draw all possible resonance structures by copying the skeleton shown. Edit bonds and charges to complete each resonance structure.

Naphthalene Skeletal formula and numbering system of naphthalene Ball-and-stick model of naphthalene Names IUPAC name Naphthalene[2] Other names white tar, camphor tar, tar camphor, naphthalin, naphthaline, antimite, albocarbon, hexalene, mothballs, moth flakes[1] Identifiers CAS Number 91-20-3 Y 3D model (JSmol) Interactive image Beilstein Reference 1421310 ChEBI CHEBI:16482 Y ChEMBL ChEMBL16293 Y ChemSpider 906 Y ECHA InfoCard 100.001.863 EC Number 214-552-7 Gmelin Reference 3347 KEGG C00829 Y PubChem CID 931 RTECS number QJ0525000 UNII 2166IN72UN N CompTox Dashboard (EPA) DTXSID8020913 InChI InChI=1S/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8H YKey: UFWIBTONFRDIAS-UHFFFAOYSA-N YInChI=1/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8HKey: UFWIBTONFRDIAS-UHFFFAOYAC SMILES c1c2ccccc2ccc1 Properties Chemical formula C10H8 Molar mass 128.174 g·mol−1 Appearance White solid crystals/ flakes Odor Strong odor of coal tar or mothballs Density 1.145 g/cm3 (15.5 °C)[3] 1.0253 g/cm3 (20 °C)[4] 0.9625 g/cm3 (100 °C)[3] Melting point 78.2 °C (172.8 °F; 351.3 K) 80.26 °C (176.47 °F; 353.41 K) at 760 mmHg[4] Boiling point 217.97 °C (424.35 °F; 491.12 K) at 760 mmHg[3][4] Solubility in water 19 mg/L (10 °C) 31.6 mg/L (25 °C) 43.9 mg/L (34.5 °C) 80.9 mg/L (50 °C)[4] 238.1 mg/L (73.4 °C)[5] Solubility Soluble in alcohols, liquid ammonia, Carboxylic acids, C6H6, SO2,[5] CCl4, CS2, toluene, aniline[6] Solubility in ethanol 5 g/100 g (0 °C) 11.3 g/100 g (25 °C) 19.5 g/100 g (40 °C) 179 g/100 g (70 °C)[6] Solubility in acetic acid 6.8 g/100 g (6.75 °C) 13.1 g/100 g (21.5 °C) 31.1 g/100 g (42.5 °C) 111 g/100 g (60 °C)[6] Solubility in chloroform 19.5 g/100 g (0 °C) 35.5 g/100 g (25 °C) 49.5 g/100 g (40 °C) 87.2 g/100 g (70 °C)[6] Solubility in hexane 5.5 g/100 g (0 °C) 17.5 g/100 g (25 °C) 30.8 g/100 g (40 °C) 78.8 g/100 g (70 °C)[6] Solubility in butyric acid 13.6 g/100 g (6.75 °C) 22.1 g/100 g (21.5 °C) 131.6 g/100 g (60 °C)[6] log P 3.34[4] Vapor pressure 8.64 Pa (20 °C) 23.6 Pa (30 °C) 0.93 kPa (80 °C)[5] 2.5 kPa (100 °C)[7] Henry's lawconstant (kH) 0.42438 L·atm/mol[4] Magnetic susceptibility (χ) -91.9·10−6 cm3/mol Thermal conductivity 98 kPa: 0.1219 W/m·K (372.22 K) 0.1174 W/m·K (400.22 K) 0.1152 W/m·K (418.37 K) 0.1052 W/m·K (479.72 K)[8] Refractive index (nD) 1.5898[4] Viscosity 0.964 cP (80 °C) 0.761 cP (100 °C) 0.217 cP (150 °C)[9] Structure Crystal structure Monoclinic[10] Space group P21/b[10] Point group C52h[10] Lattice constant a = 8.235 Å, b = 6.003 Å, c = 8.658 Å[10]α = 90°, β = 122.92°, γ = 90° Thermochemistry Heat capacity (C) 165.72 J/mol·K[4] Std molarentropy (S⊖298) 167.39 J/mol·K[4][7] Std enthalpy offormation (ΔfH⊖298) 78.53 kJ/mol[4] Gibbs free energy (ΔfG⊖) 201.585 kJ/mol[4] Std enthalpy ofcombustion (ΔcH⊖298) -5156.3 kJ/mol[4] Hazards Occupational safety and health (OHS/OSH): Main hazards Flammable, sensitizer, possible carcinogen.[12] Dust can form explosive mixtures with air GHS labelling: Pictograms [11] Signal word Danger Hazard statements H228, H302, H351, H410[11] Precautionary statements P210, P273, P281, P501[11] NFPA 704 (fire diamond) 2 2 0 Flash point 80 °C (176 °F; 353 K)[11] Autoignitiontemperature 525 °C (977 °F; 798 K)[11] Explosive limits 5.9%[11] Threshold limit value (TLV) 10 ppm[4] (TWA), 15 ppm[4] (STEL) Lethal dose or concentration (LD, LC): LD50 (median dose) 1800 mg/kg (rat, oral)490 mg/kg (rat, intravenous)1200 mg/kg (guinea pig, oral)533 mg/kg (mouse, oral)[14] NIOSH (US health exposure limits): PEL (Permissible) TWA 10 ppm (50 mg/m3)[13] REL (Recommended) TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)[13] IDLH (Immediate danger) 250 ppm[13] 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 Naphthalene is an organic compound with formula C10H8. It is the simplest polycyclic aromatic hydrocarbon, and is a white crystalline solid with a characteristic odor that is detectable at concentrations as low as 0.08 ppm by mass.[15] As an aromatic hydrocarbon, naphthalene's structure consists of a fused pair of benzene rings. It is the main ingredient of traditional mothballs. History In the early 1820s, two separate reports described a white solid with a pungent odor derived from the distillation of coal tar. In 1821, John Kidd cited these two disclosures and then described many of this substance's properties and the means of its production.



C10H8 napthalene  The naphthalene compound may be called differently depending on the various different situations of industrial applications. Below are the list of the other names (synonyms) of naphthalene including the various registry numbers, if available: BBV-76024228 72931-45-4 Naphthalene solution, certified reference material, 5000 mug/mL in methanol Naphthalene solution, certified reference material, 200 mug/mL in methanol Naphthalene, United States Pharmacopeia (USP) Reference Standard Naphthalene solution, 100 ng/muL in cyclohexane, analytical standard Naphthalene, pharmaceutical secondary standard; traceable to USP Naphthalene, crude or refined [UN1334] [Flammable solid] Naphthalene, crude or refined [UN1334] [Flammable solid] Naphthalene, certified reference material, TraceCERT(R) F0001-2217 SR-01000854997-2 Melting point standard 79-81C, analytical standard I14-6944 Naphthalene, molten [UN2304] [Flammable solid] Naphthalene, molten [UN2304] [Flammable solid] L001166 Naphthalene, suitable for scintillation, >=99% S0672 N0885 N0004 Bicyclo[4.4.0]deca-1,3,5,7,9-pentene Naphthalene, SAJ first grade, >=98.0% S652 68412-25-9 UN 2304 UN 1334 RTR-003288 Naphthalene, for synthesis, 98.5% BDBM50159249 ANW-39567 LTBB002419 HMS3039N15 2166IN72UN Naphthalene, 99.5% 500g BIDD:ER0665 NAPHTHALENE- D8 Naphthalene, di-C5-6-alkyl derivs. Naphthalene, 98% Naphthalene, crude 2-naphthalenyl 1-naphthalenyl Naphthyl Group moth flaker naphthalir naphthalinr mothballr antimitr Di(C5-C6)alkylnaphthalene NPY CAS-91-20-3 Naphthalene-1,2,3,4-13C4 NAPHTHALENE [1-14C] Naphthalene, analytical standard MFCD00001742 Naphthalene, 99% Naphthalene, crude or refined EPA Pesticide Chemical Code 055801 RCRA waste no. U165 Naphthalene (molten) Naphthalene, molten Naphthalene, pure Naphthalene [ISO:French] Naphthalene [BSI:ISO] Mothballs naphthalen naphtaline naftalina Caswell No. 587 Naftalen [Polish] naftaleno Mighty RD1 RCRA waste number U165 Naftalen Mighty 150 Dezodorator naphtalene Tar camphor Moth flakes Moth balls Naphthaline Albocarbon White tar Camphor tar Naphthene Naphthalin 91-20-3 Not to be confused with naphtha, naphthene, or Naphtali. Naphthalene Skeletal formula and numbering system of naphthalene Ball-and-stick model of naphthalene Names IUPAC name Naphthalene[2] Other names white tar, camphor tar, tar camphor, naphthalin, naphthaline, antimite, albocarbon, hexalene, mothballs, moth flakes[1] Identifiers CAS Number 91-20-3 Y 3D model (JSmol) Interactive image Beilstein Reference 1421310 ChEBI CHEBI:16482 Y ChEMBL ChEMBL16293 Y ChemSpider 906 Y ECHA InfoCard 100.001.863 EC Number 214-552-7 Gmelin Reference 3347 KEGG C00829 Y PubChem CID 931 RTECS number QJ0525000 UNII 2166IN72UN N CompTox Dashboard (EPA) DTXSID8020913 InChI InChI=1S/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8H YKey: UFWIBTONFRDIAS-UHFFFAOYSA-N YInChI=1/C10H8/c1-2-6-10-8-4-3-7-9(10)5-1/h1-8HKey: UFWIBTONFRDIAS-UHFFFAOYAC SMILES c1c2ccccc2ccc1 Properties Chemical formula C10H8 Molar mass 128.174 g·mol−1 Appearance White solid crystals/ flakes Odor Strong odor of coal tar or mothballs Density 1.145 g/cm3 (15.5 °C)[3] 1.0253 g/cm3 (20 °C)[4] 0.9625 g/cm3 (100 °C)[3] Melting point 78.2 °C (172.8 °F; 351.3 K) 80.26 °C (176.47 °F; 353.41 K) at 760 mmHg[4] Boiling point 217.97 °C (424.35 °F; 491.12 K) at 760 mmHg[3][4] Solubility in water 19 mg/L (10 °C) 31.6 mg/L (25 °C) 43.9 mg/L (34.5 °C) 80.9 mg/L (50 °C)[4] 238.1 mg/L (73.4 °C)[5] Solubility Soluble in alcohols, liquid ammonia, Carboxylic acids, C6H6, SO2,[5] CCl4, CS2, toluene, aniline[6] Solubility in ethanol 5 g/100 g (0 °C) 11.3 g/100 g (25 °C) 19.5 g/100 g (40 °C) 179 g/100 g (70 °C)[6] Solubility in acetic acid 6.8 g/100 g (6.75 °C) 13.1 g/100 g (21.5 °C) 31.1 g/100 g (42.5 °C) 111 g/100 g (60 °C)[6] Solubility in chloroform 19.5 g/100 g (0 °C) 35.5 g/100 g (25 °C) 49.5 g/100 g (40 °C) 87.2 g/100 g (70 °C)[6] Solubility in hexane 5.5 g/100 g (0 °C) 17.5 g/100 g (25 °C) 30.8 g/100 g (40 °C) 78.8 g/100 g (70 °C)[6] Solubility in butyric acid 13.6 g/100 g (6.75 °C) 22.1 g/100 g (21.5 °C) 131.6 g/100 g (60 °C)[6] log P 3.34[4] Vapor pressure 8.64 Pa (20 °C) 23.6 Pa (30 °C) 0.93 kPa (80 °C)[5] 2.5 kPa (100 °C)[7] Henry's lawconstant (kH) 0.42438 L·atm/mol[4] Magnetic susceptibility (χ) -91.9·10−6 cm3/mol Thermal conductivity 98 kPa: 0.1219 W/m·K (372.22 K) 0.1174 W/m·K (400.22 K) 0.1152 W/m·K (418.37 K) 0.1052 W/m·K (479.72 K)[8] Refractive index (nD) 1.5898[4] Viscosity 0.964 cP (80 °C) 0.761 cP (100 °C) 0.217 cP (150 °C)[9] Structure Crystal structure Monoclinic[10] Space group P21/b[10] Point group C52h[10] Lattice constant a = 8.235 Å, b = 6.003 Å, c = 8.658 Å[10]α = 90°, β = 122.92°, γ = 90° Thermochemistry Heat capacity (C) 165.72 J/mol·K[4] Std molarentropy (S⊖298) 167.39 J/mol·K[4][7] Std enthalpy offormation (ΔfH⊖298) 78.53 kJ/mol[4] Gibbs free energy (ΔfG⊖) 201.585 kJ/mol[4] Std enthalpy ofcombustion (ΔcH⊖298) -5156.3 kJ/mol[4] Hazards Occupational safety and health (OHS/OSH): Main hazards Flammable, sensitizer, possible carcinogen.[12] Dust can form explosive mixtures with air GHS labelling: Pictograms [11] Signal word Danger Hazard statements H228, H302, H351, H410[11] Precautionary statements P210, P273, P281, P501[11] NFPA 704 (fire diamond) 2 2 0 Flash point 80 °C (176 °F; 353 K)[11] Autoignitiontemperature 525 °C (977 °F; 798 K)[11] Explosive limits 5.9%[11] Threshold limit value (TLV) 10 ppm[4] (TWA), 15 ppm[4] (STEL) Lethal dose or concentration (LD, LC): LD50 (median dose) 1800 mg/kg (rat, oral)490 mg/kg (rat, intravenous)1200 mg/kg (guinea pig, oral)533 mg/kg (mouse, oral)[14] NIOSH (US health exposure limits): PEL (Permissible) TWA 10 ppm (50 mg/m3)[13] REL (Recommended) TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)[13] IDLH (Immediate danger) 250 ppm[13] 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 Naphthalene is an organic compound with formula C10H8. It is the simplest polycyclic aromatic hydrocarbon, and is a white crystalline solid with a characteristic odor that is detectable at concentrations as low as 0.08 ppm by mass.[15] As an aromatic hydrocarbon, naphthalene's structure consists of a fused pair of benzene rings. It is the main ingredient of traditional mothballs. History In the early 1820s, two separate reports described a white solid with a pungent odor derived from the distillation of coal tar.

In 1821, John Kidd cited these two disclosures and then described many of this substance's properties and the means of its production. He proposed the name naphthaline, as it had been derived from a kind of naphtha (a broad term encompassing any volatile, flammable liquid hydrocarbon mixture, including coal tar).[16] Naphthalene's chemical formula was determined by Michael Faraday in 1826. The structure of two fused benzene rings was proposed by Emil Erlenmeyer in 1866,[17] and confirmed by Carl Gräbe three years later.[18] Physical properties A naphthalene molecule can be viewed as the fusion of a pair of benzene rings. (In organic chemistry, rings are fused if they share two or more atoms.) As such, naphthalene is classified as a benzenoid polycyclic aromatic hydrocarbon (PAH).[19] The eight carbon atoms that are not shared by the two rings carry one hydrogen atom each. For purpose of the standard IUPAC nomenclature of derived compounds, those eight atoms are numbered 1 through 8 in sequence around the perimeter of the molecule, starting with a carbon atom adjacent to a shared one. The shared carbon atoms are labeled 4a (between 4 and 5) and 8a (between 8 and 1).[20] Molecular geometry The molecule is planar, like benzene. Unlike benzene, the carbon–carbon bonds in naphthalene are not of the same length. The bonds C1−C2, C3−C4, C5−C6 and C7−C8 are about 1.37 Å (137 pm) in length, whereas the other carbon–carbon bonds are about 1.42 Å (142 pm) long. This difference, established by X-ray diffraction,[21] is consistent with the valence bond model in naphthalene and in particular, with the theorem of cross-conjugation. This theorem would describe naphthalene as an aromatic benzene unit bonded to a diene but not extensively conjugated to it (at least in the ground state), which is consistent with two of its three resonance structures. Because of this resonance, the molecule has bilateral symmetry across the plane of the shared carbon pair, as well as across the plane that bisects bonds C2-C3 and C6-C7, and across the plane of the carbon atoms.

Thus there are two sets of equivalent hydrogen atoms: the alpha positions, numbered 1, 4, 5, and 8, and the beta positions, 2, 3, 6, and 7. Two isomers are then possible for mono-substituted naphthalenes, corresponding to substitution at an alpha or beta position. Azulene Structural isomers of naphthalene that have two fused aromatic rings include azulene, which has a 5–7 fused ring system, and Bicyclo[6.2.0]decapentaene which has a fused 4–8 ring system.[22] The point group symmetry of naphthalene is D2h. Electrical conductivity Pure crystalline naphthalene is a moderate insulator at room temperature, with resistivity of about 1012 Ω m. The resistivity drops more than a thousandfold on melting, to about 4 × 108 Ω m. Both in the liquid and in the solid, the resistivity depends on temperature as ρ = ρ0 exp(E/(k T)), where ρ0 (Ω m) and E (eV) are constant parameters, k is Boltzmann's constant (8.617×10−5 eV/K), and T is absolute temperature (K). The parameter E is 0.73 in the solid. However, the solid shows semiconducting character below 100 K.[23][24] Chemical properties Reactions with electrophiles In electrophilic aromatic substitution reactions, naphthalene reacts more readily than benzene. For example, chlorination and bromination of naphthalene proceeds without a catalyst to give 1-chloronaphthalene and 1-bromonaphthalene, respectively. Likewise, whereas both benzene and naphthalene can be alkylated using Friedel–Crafts reaction conditions, naphthalene can also be easily alkylated by reaction with alkenes or alcohols, using sulfuric or phosphoric acid catalysts.[25] In terms of regiochemistry, electrophiles attack at the alpha position. The selectivity for alpha over beta substitution can be rationalized in terms of the resonance structures of the intermediate: for the alpha substitution intermediate, seven resonance structures can be drawn, of which four preserve an aromatic ring. For beta substitution, the intermediate has only six resonance structures, and only two of these are aromatic. Sulfonation gives the "alpha" product naphthalene-1-sulfonic acid as the kinetic product but naphthalene-2-sulfonic acid as the thermodynamic product. The 1-isomer forms predominantly at 25 °C, and the 2-isomer at 160 °C. Sulfonation to give the 1- and 2-sulfonic acid occurs readily: H2SO4 + C10H8 → C10H7SO3H + H2O Further sulfonation give di-, tri-, and tetrasulfonic acids. Lithiation Analogous to the synthesis of phenyllithium is the conversion of 1-bromonaphthalene to 1-lithionaphthalene, by lithium–halogen exchange: C10H7Br + BuLi → C10H7Li + BuBr The resulting lithionaphthalene undergoes a second lithiation, in contrast to the behavior of phenyllithium.

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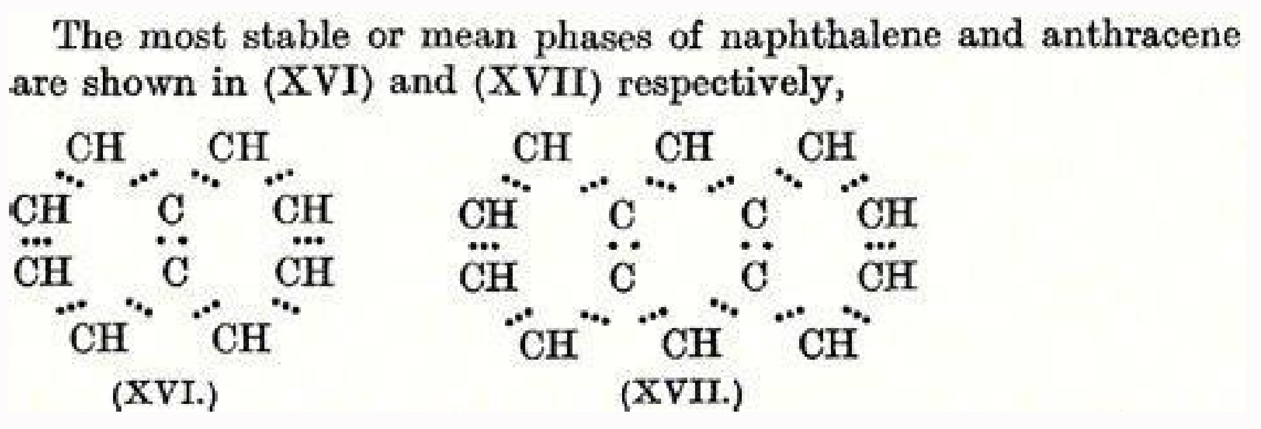

The most stable or mean phases of naphthalene and anthracene are shown in (XVI) and (XVII) respectively,

(XVI.)

(XVII.)

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Naphthalene can be hydrogenated under high pressure in the presence of metal catalysts to give 1,2,3,4-tetrahydronaphthalene(C10H12), also known as tetralin. Further hydrogenation yields decahydronaphthalene or decalin (C10H18). Oxidation with O2 in the presence of vanadium pentoxide as catalyst gives phthalic anhydride: C10H8 + 4.5 O2 → C6H4(CO)2O + 2 CO2 + 2 H2O This reaction is the basis of the main use of naphthalene.

Oxidation can also be effected using conventional stoichiometric chromate or permanganate reagents. Production Naphthalene Most naphthalene is derived from coal tar.

From the 1960s until the 1990s, significant amounts of naphthalene were also produced from heavy petroleum fractions during petroleum refining, but present-day production is mainly from coal tar. Approximately 1.3M tons are produced annually. Naphthalene is the most abundant single component of coal tar. The composition of coal tar varies with coal type and processing, but typical coal tar is about 10% naphthalene by weight. In industrial practice, distillation of coal tar yields an oil containing about 50% naphthalene, along with twelve other aromatic compounds. This oil, after being washed with aqueous sodium hydroxide to remove acidic components (chiefly various phenols), and with sulfuric acid to remove basic components, undergoes fractional distillation to isolate naphthalene. The crude naphthalene resulting from this process is about 95% naphthalene by weight. The chief impurities are the sulfur-containing aromatic compound benzothiophene (< 2%), indane (0.2%), indene (< 2%), and methylnaphthalene (< 2%). Petroleum-derived naphthalene is usually purer than that derived from coal tar. Where required, crude naphthalene can be further purified by recrystallization from any of a variety of solvents, resulting in 99% naphthalene by weight, referred to as 80 °C (melting point).[25] In North America, the coal tar producers are Koppers Inc., Ruetgers Canada Inc. and Recochem Inc., and the primary petroleum producer is Monument Chemical Inc. In Western Europe the well-known producers are Koppers, Ruetgers, and Deza. In Eastern Europe, naphthalene is produced by a variety of integrated metallurgy complexes (Severstal, Evraz, Mechel, MMK) in Russia, dedicated naphthalene and phenol makers INKOR, Yenakievsky Metallurgy plant in Ukraine and ArcelorMittal Temirtau in Kazakhstan. Other sources and occurrences Naphthalene and its alkyl homologs are the major constituents of creosote. Trace amounts of naphthalene are produced by magnolias and some species of deer, as well as the Formosan subterranean termite, possibly produced by the termite as a repellant against "ants, poisonous fungi and nematode worms."[27] Some strains of the endophytic fungus Muscodor albus produce naphthalene among a range of volatile organic compounds, while Muscodor vitigenus produces naphthalene almost exclusively.[28] Uses Naphthalene is used mainly as a precursor to derivative chemicals. The single largest use of naphthalene is the industrial production of phthalic anhydride, although more phthalic anhydride is made from o-xylene. Fumigant Naphthalene has been used as a fumigant. It was once the primary ingredient in mothballs, although its use has largely been replaced in favor of alternatives such as 1,4-dichlorobenzene. In a sealed container containing naphthalene pellets, naphthalene vapors build up to levels toxic to both the adult and larval forms of many moths that attack textiles. Other fumigant uses of naphthalene include use in soil as a fumigant pesticide, in attic spaces to repel insects and animals such as opossums,[29] and in museum storage-drawers and cupboards to protect the contents from attack by insect pests. Solvent Molten naphthalene provides an excellent solubilizing medium for poorly soluble aromatic compounds. In many cases it is more efficient than other high-boiling solvents, such as dichlorobenzene, benzonitrile, nitrobenzene and durene. The reaction of C60 with anthracene is conveniently conducted in refluxing naphthalene to give the 1:1 Diels–Alder adduct.[30] The aromatization of hydroporphyrins has been achieved using a solution of DDQ in naphthalene.[31] Derivative uses The single largest use of naphthalene is the production of phthalic anhydride, which is an intermediate used to make plasticizers for polyvinyl chloride, and to make alkyd resin polymers used in paints and varnishes. Sulfonic acids and sulfonates Many naphthalenesulfonic acids and sulfonates are useful. Naphthalenesulfonic acids are used in the synthesis of 1-naphthol and 2-naphthol, precursors for various dyestuffs, pigments, rubber processing chemicals and other chemicals and pharmaceuticals.[25] They are also used as dispersants in synthetic and natural rubbers, in agricultural pesticides, in dyes, and in lead–acid battery plates. Naphthalenedisulfonic acids such as Armstrong's acid are used as precursors and to form pharmaceutical salts such as CFT. The aminonaphthalenesulfonic acids are precursors for synthesis of many synthetic dyes. Alkyl naphthalene sulfonates (ANS) are used in many industrial applications as nondetergent surfactants (wetting agents) that effectively disperse colloidal systems in aqueous media. The major commercial applications are in the agricultural chemical industry, which uses ANS for wettable powder and wettable granular (dry-flowable) formulations, and in the textile and fabric industry, which uses the wetting and defoaming properties of ANS for bleaching and dyeing operations. Some naphthalenesulfonate polymers are superplasticizers used for the production of high strength concrete. They are produced by treating naphthalenesulfonic acid with formaldehyde, followed by neutralization with sodium hydroxide or calcium hydroxide. Other derivative uses Propranolol is a beta blocker. Many azo dyes are produced from naphthalene. Useful agrichemicals include naphthoxyacetic acids.[25] Hydrogenation of naphthalene gives tetrahydronaphthalene (tetralin) and decahydronaphthalene (decalin), which are used as low-volatility solvents. Tetralin is used as a hydrogen-donor solvent.[25] Alkylation of naphthalene with propylene gives a mixture of diisopropylnaphthalenes, which are useful as nonvolatile liquids for inks.[25] Substituted napthalenes serve as pharmaceuticals such as propranolol (a beta blocker) and nabumetone (a nonsteroidal anti-inflammatory drug). Other uses Several uses stem from naphthalene's high volatility: it is used to create artificial pores in the manufacture of high-porosity grinding wheels; it is used in engineering studies of heat transfer using mass sublimation; and it has been explored as a sublimable propellant for cold gas satellite thrusters.[32][33] Health effects Exposure to large amounts of naphthalene may damage or destroy red blood cells, most commonly in people with the inherited condition known as glucose-6-phosphate dehydrogenase (G6PD) deficiency,[34] from which over 400 million people suffer. Humans, in particular children, have developed the condition known as hemolytic anemia, after ingesting mothballs or deodorant blocks containing naphthalene. Symptoms include fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may cause confusion, nausea, vomiting, diarrhea, blood in the urine, and jaundice (yellow coloration of the skin due to dysfunction of the liver).[35] The US National Toxicology Program (NTP) held an experiment where male and female rats and mice were exposed to naphthalene vapors on weekdays for two years.[36] Both male and female rats exhibited evidence of carcinogenesis with increased incidences of adenoma and neuroblastoma of the nose. Female mice exhibited some evidence of carcinogenesis based on increased incidences of alveolar and bronchiolar adenomas of the lung, while male mice exhibited no evidence of carcinogenesis. The International Agency for Research on Cancer (IARC)[37] classifies naphthalene as possibly carcinogenic to humans and animals (Group 2B). The IARC also points out that acute exposure causes cataracts in humans, rats, rabbits, and mice; and that hemolytic anemia (described above) can occur in children and infants after oral or inhalation exposure or after maternal exposure during pregnancy. Under California's Proposition 65, naphthalene is listed as "known to the State to cause cancer".[38] A probable mechanism for the carcinogenic effects of mothballs and some types of air fresheners containing naphthalene has been identified.[39][40] Regulation US government agencies have set occupational exposure limits to naphthalene exposure. The Occupational Safety and Health Administration has set a permissible exposure limit at 10 ppm (50 mg/m3) over an eight-hour time-weighted average. The National Institute for Occupational Safety and Health has set a recommended exposure limit at 10 ppm (50 mg/m3) over an eight-hour time-weighted average, as well as a short-term exposure limit at 15 ppm (75 mg/m3).[41] Naphthalene's minimum odor threshold is 0.084 ppm for humans.[42] Mothballs and other products containing naphthalene have been banned within the EU since 2008.[43][44] In China, the use of naphthalene in mothballs is forbidden.[45] Danger to human health and the common use of natural camphor are cited as reasons for the ban. Naphthalene derivatives The partial list of naphthalene derivatives includes the following compounds: Name Chemical formula Molar mass [g/mol] Melting point [°C] Boiling point [°C] Density [g/cm3] Refractive index 1-Naphthoic acid C11H8O2 172.18 157 300 – 1-Naphthoyl chloride C11H7ClO 190.63 16–19 190 (35 Torr) 1.265 1.6552 1-Naphthol C10H8O 144,17 94–96 278 1.224 – 1-Naphthaldehyde C11H8O 156,18 1–2 160 (15 Torr) 1-Nitronaphthalene C10H7NO2 173.17 53–57 340 1.22 – 1-Fluoronaphthalene C10H7F 146.16 −19 215 1.323 1.593 1-Chloronaphthalene C10H7Cl 162.62 −6 259 1.194 1.632 2-Chloronaphthalene C10H7Cl 162.62 59.5 256 1.138 1.643 1-Bromonaphthalene C10H7Br 207.07 −2 279 1.489 1.670 1,2,7-Trimethylnaphthalene (Sapotalin) C13H14 170.25 143 128 0.987   See also Camphor Dialin, Tetralin, Decalin List of interstellar and circumstellar molecules Mothballs 1-Naphthol, 2-Naphthol Sodium naphthalenide Wagner-Jauregg reaction (classic naphthalene synthesis) References ^ Naphthalene: trade names ^ Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013 (Blue Book). Cambridge: The Royal Society of Chemistry. 2014. pp. 13, 35, 204, 207, 221–222, 302, 457, 461, 469, 601, 650. doi:10.1039/9781849733069-FP001. ISBN 978-0-85404-182-4. ^ a b c "Ambient Water Quality Criteria for Naphthalene" (PDF). United States Environmental Protection Agency. 2014-04-23. Retrieved 2014-06-21. ^ a b c d e f g h i j k l m n Lide, David R., ed. (2009). CRC Handbook of Chemistry and Physics (90th ed.). Boca Raton, Florida: CRC Press. ISBN 978-1-4200-9084-0. ^ a b c Anatolievich, Kiper Ruslan. "naphthalene". chemister.ru.

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Naphthalene—National Pesticide Information Center Naphthalene—EPA Air Toxics Web Site Naphthalene (PIM 363)—mostly on toxicity of naphthalene Naphthalene—CDC – NIOSH Pocket Guide to Chemical Hazards Naphthalene in the Pesticide Properties DataBase (PPDB) Retrieved from " 2 1-Naphthol Names Preferred IUPAC name Naphthalen-1-ol Other names 1-Hydroxynaphthalene; 1-Naphthalenol; α-Naphthol Identifiers CAS Number 90-15-3 Y 3D model (JSmol) Interactive image ChEBI CHEBI:10319 Y ChEMBL ChEMBL122617 Y ChemSpider 6739 Y ECHA InfoCard 100.001.791 KEGG C11714 Y PubChem CID 7005 UNII 2A71EAQ389 Y CompTox Dashboard (EPA) DTXSID6021793 InChI InChI=1S/C10H8O/c11-10-7-3-5-8-4-1-2-6-9(8)10/h1-7,11H YKey: KJCVRFUGPWSIIH-UHFFFAOYSA-N YInChI=1/C10H8O/c11-10-7-3-5-8-4-1-2-6-9(8)10/h1-7,11HKey: KJCVRFUGPWSIIH-UHFFFAOYAZ SMILES Oc2cccc1ccccc12 Properties Chemical formula C10H8O Molar mass 144.17 g/mol Appearance Colorless or white solid Density 1.10 g/cm3 Melting point 95 to 96 °C (203 to 205 °F; 368 to 369 K) Boiling point 278 to 280 °C (532 to 536 °F; 551 to 553 K) Magnetic susceptibility (χ) -98.2·10−6 cm3/mol Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa). Y verify (what is YN ?) Infobox references Chemical compound 1-Naphthol, or α-naphthol, is a fluorescent organic compound with the formula C10H7OH. It is a white solid. It is an isomer of 2-naphthol differing by the location of the hydroxyl group on the naphthalene ring. The naphthols are naphthalene homologues of phenol, with the hydroxyl group being more reactive than in the phenols. Both isomers are soluble in simple alcohols, ethers, and chloroform. They are precursors to a variety of useful compounds. Naphthols (both 1 and 2 isomers) are used as biomarkers for livestock and humans exposed to polycyclic aromatic hydrocarbons.[1] Production 1-Naphthol is prepared by two main routes.[2] In one method, naphthalene is nitrated to give 1-nitronaphthalene, which is hydrogenated to the amine followed by hydrolysis: C10H8 + HNO3 → C10H7NO2 + H2O C10H7NO2 + 3H2 → C10H7NH2 + 2H2O C10H7NH2 + H2O → C10H7OH + NH3 Alternatively, naphthalene is hydrogenated to tetralin, which is oxidized to 1-tetralone, which undergoes dehydrogenation. Reactions Some reactions of 1-naphthol are explicable with reference to its tautomerism, which produces a small amount of the keto tautomer. One consequence of this tautomerism is the Bucherer reaction, the ammonolysis of 1-naphthol to give 1-aminonaphthalene. 1-Naphthol biodegrades via formation of 1-naphthol-3,4-oxide, which converts to 1,4-naphthoquinone.[3] The 4-position of 1-naphthol is susceptible to electrophilic attack. This regioselective reaction is exploited in the preparation of diazo dyes, which are form using diazonium salts. Reduction of the diazo derivatives gives 4-amino-1-naphthol.[4][5] Partial reduction of 1-naphthol gives the tetrahydro derivative, leaving intact the phenol ring.[6] Full hydrogenation is catalyzed by rhodium.[7] Applications and occurrence 1-Naphthol is a precursor to a variety of insecticides including carbaryl and pharmaceuticals including nadolol[8][9] as well as for the antidepressant sertraline[10] and the anti-protozoan therapeutic atovaquone.[11] It undergoes azo coupling to give various azo dyes, but these are generally less useful than those derived from 2-naphthol.[2][12] 1-Naphthol is a metabolite of the insecticide carbaryl and naphthalene. Along with TCPy, it has been shown to decrease testosterone levels in adult men.[13] Other uses 1-Naphthol is used in each of the following chemical tests: Molisch's test gives a red- or purple-colored compound to indicate the presence of carbohydrate. rapid furfural test turns purple quickly (<30s) if fructose is present, distinguishing it from glucose. Sakaguchi test turns red to indicate the presence of arginine in proteins. Voges–Proskauer test changes color from yellow to red to indicate that glucose is being broken down into acetoin which is used by bacteria for external energy storage. References ^ Sreekanth, R; Prasanthkumar, KP; Sunil Paul, MM; Aravind, UK; Aravindakumar, CT (7 November 2013). "Oxidation reactions of 1- and 2-naphthols: an experimental and theoretical study". The Journal of Physical Chemistry A. 117 (44): 11261–70. Bibcode:2013JPCA..11711261S. doi:10.1021/jp4081355. PMID 24093754. ^ a b Booth, Gerald (2005). "Naphthalene Derivatives".

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17 (1): 61–68. doi:10.1097/01.ede.0000190602.14691.70. PMID 16357596. S2CID 24829926. External links NIST Chemistry WebBook 1-Naphthalenol Retrieved from " 3 The following pages link to 1-Naphthol External tools: Link count Transclusion count Sorted list Displayed 47 items. View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Naphthalene  (links | edit) Bhopal disaster  (links | edit) Molisch's test  (links | edit) Naphthol  (links | edit) Azo coupling  (links | edit) Russula emetica  (links | edit) 1-naphtol (redirect page)  (links | edit) 1-Naphthylamine  (links | edit) 1-naphthol (redirect page)  (links | edit) Aromatic compound  (links | edit) Naphthalene  (links | edit) Bhopal disaster  (links | edit) Carbaryl  (links | edit) Hydroxynaphthoquinone  (links | edit) N,N-Dimethyl-1-naphthylamine  (links | edit) Talk:1-Naphthylamine  (links | edit) User:Edgar181/articles  (links | edit) User:Mogsan1/sandbox  (links | edit) User:Primary resource/Aromatic compound  (links | edit) Wikipedia:Reference desk/Archives/Science/2009 December 29  (links | edit) 2-Naphthol  (links | edit) Naphthol yellow S  (links | edit) Five past Midnight in Bhopal  (links | edit) 1-Naphthol (transclusion)  (links | edit) C10H8O  (links | edit) Dendrocollybia  (links | edit) Voges–Proskauer test  (links | edit) Alpha-naphthol (redirect page)  (links | edit) Union Carbide India Limited  (links | edit) IMViC (links | edit) User:The Anome/Moby nouns/A  (links | edit) User:MichaelParkTaylor/Union Carbide India Limited  (links | edit) Discovery and development of beta-blockers  (links | edit) Sakaguchi test  (links | edit) Rapid furfural test  (links | edit) 1-Tetralone  (links | edit) A-naphthol (redirect page)  (links | edit) Wilhelm Rudolph Fittig  (links | edit) Isocrotonic acid  (links | edit) Hugo Erdmann  (links | edit) Glucose phosphate broth  (links | edit) User:Mykhal/Articles with name in multiple scripts  (links | edit) Naphthalene-1-sulfonic acid  (links | edit) Geletrol  (links | edit) Talk:1-Naphthol (transclusion)  (links | edit) User:AlexNewArtBot/ChemistrySearchResult/archive16  (links | edit) User:AlexNewArtBot/ReferencesSearchResult/archive20  (links | edit) User:Leyo/InfoCard/0–K  (links | edit) Wikipedia:WikiProject Chemicals/AlphabeticalList  (links | edit) Wikipedia:WikiProject Chemicals/Log/2009-10-16  (links | edit) Wikipedia:WikiProject Chemicals/Log/2009-10-24  (links | edit) Wikipedia:WikiProject Chemicals/Log/2009-11-13 (links | edit) Wikipedia:WikiProject Chemicals/Log/2010-10-11  (links | edit) Wikipedia:Featured article candidates/Dendrocollybia/archive1  (links | edit) Wikipedia:Featured article candidates/Featured log/November 2010  (links | edit) Wikipedia:WikiProject Chemicals/Log/2010-11-03  (links | edit) Wikipedia:WikiProject Chemicals/Log/2010-12-08 (links | edit) Wikipedia:WikiProject Chemicals/Log/2010-12-10  (links | edit) Wikipedia:WikiProject Chemicals/Log/2011-02-10  (links | edit) Wikipedia:WikiProject Chemicals/Log/2011-07-28  (links | edit) Wikipedia:WikiProject Chemicals/Log/2011-08-05  (links | edit) Wikipedia:WikiProject Chemicals/Log/2011-10-25  (links | edit) Wikipedia:WikiProject Chemicals/Log/2011-12-13  (links | edit) Wikipedia:WikiProject Chemicals/Log/2012-01-04  (links | edit) Wikipedia:WikiProject Chemistry/Lists of pages/Chembox articles  (links | edit) Wikipedia:Chemical infobox/Wikipedia:WikiProject Chemistry and Template:Chembox articles  (links | edit) Category:1-Naphthols  (links | edit) View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500) Retrieved from " WhatLinksHere/1-Naphthol" Give the electron configuration and the Lewis dot symbol for the following. How many more electrons can each atom accommodate? Give the electron configuration and the Lewis dot symbol for the following. How many more electrons can each atom accommodate? Based on Lewis dot symbols, predict the preferred oxidation state of Be, F, B, and Cs. Based on Lewis dot symbols, predict the preferred oxidation state of Br, Rb, O, Si, and Sr. Based on Lewis dot symbols, predict how many bonds gallium, silicon, and selenium will form in their neutral compounds. Determine the total number of valence electrons in the following. Cr Cu+ NO+ XeF2 Br2 CH2Cl2 NO3− H3O+ Determine the total number of valence electrons in the following. Ag Pt2+ H2S OH− I2 CH4 SO42− NH4+. Draw Lewis electron structures for the following.

F2 SO2 AlCl4− SO32− BrCl XeF4 NO+ PCl3 Draw Lewis electron structures for the following. Br2 CH3Br SO42− O2 S22− BF3 Draw Lewis electron structures for CO2, NO2−, SO2, and NO2+. From your diagram, predict which pair(s) of compounds have similar electronic structures. Write Lewis dot symbols for each pair of elements. For a reaction between each pair of elements, predict which element is the oxidant, which element is the reductant, and the final stoichiometry of the compound formed. Write Lewis dot symbols for each pair of elements. For a reaction between each pair of elements, predict which element is the oxidant, which element is the reductant, and the final stoichiometry of the compound formed. Use Lewis dot symbols to predict whether ICl and NO4− are chemically reasonable formulas. Draw a plausible Lewis electron structure for a compound with the molecular formula Cl3PO. Draw a plausible Lewis electron structure for a compound with the molecular formula CH4O. While reviewing her notes, a student noticed that she had drawn the following structure in her notebook for acetic acid: Why is this structure not feasible? Draw an acceptable Lewis structure for acetic acid. Show the formal charges of all nonhydrogen atoms in both the correct and incorrect structures. A student proposed the following Lewis structure shown for acetaldehyde. Why is this structure not feasible? Draw an acceptable Lewis structure for acetaldehyde. Show the formal charges of all nonhydrogen atoms in both the correct and incorrect structures. Draw the most likely structure for HCN based on formal charges, showing the formal charge on each atom in your structure. Does this compound have any plausible resonance structures? If so, draw one.

Draw the most plausible Lewis structure for NO3−. Does this ion have any other resonance structures? Draw at least one other Lewis structure for the nitrate ion that is not plausible based on formal charges. At least two Lewis structures can be drawn for BCl3. Using arguments based on formal charges, explain why the most likely structure is the one with three B–Cl single bonds. Using arguments based on formal charges, explain why the most feasible Lewis structure for SO42− has two sulfur–oxygen double bonds. At least two distinct Lewis structures can be drawn for N3−.

Use arguments based on formal charges to explain why the most likely structure contains a nitrogen–nitrogen double bond. Is H–O–N=O a reasonable structure for the compound HNO2? Justify your answer using Lewis electron dot structures. Is H–O=C–H a reasonable structure for a compound with the formula CH2O? Use Lewis electron dot structures to justify your answer. Explain why the following Lewis structure for SO32− is or is not reasonable. Draw all the resonance structures for each ion.