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MATERIAL SAFETY DATA SHEET (MSDS) EXPLANATION, SAMPLE AND GLOSSARY

Material Safety Data Sheets (MSDS) are available through your supervisor or on-line at the Department of Environmental Health and Safety website. Call EH&S at 412-624-9505 for assistance, if necessary. OSHA specifies the information that must be included in English on an MSDS. MSDS formats will vary depending on the product's manufacturer:

Section I. Chemical Identity

The chemical and common name(s) is provided for single chemical substances. An identity on the MSDS must be cross-referenced to the identity found on the label.

Section II. Hazardous Ingredients

For a chemical mixture that has been tested in whole to determine hazards, the chemical and common names of ingredients that are associated with the hazards, and the common name of the mixture is listed. If the mixture has not been tested as a whole, the chemical and common names of all ingredients determined to be health hazards and comprising 1% or greater of the composition are listed. Carcinogens must be listed if they are present at levels of 0.1% or greater.

Section III. Physical and Chemical Characteristics

The physical and chemical characteristics of the product are listed. These include facts such as boiling and freezing points, density, vapor pressure, specific gravity, solubility, volatility, and the product's general appearance and odor.

Section IV. Fire and Explosion Hazard Data

The compound's potential for fire and explosion is described. The fire hazards of the chemical and conditions under which it could ignite or explode are identified along with recommended extinguishing agents and fire-fighting methods.

Section V. Reactivity Data

Substances that the chemical is not compatible with or reacts with are listed. Information on any hazardous decomposition products, such as carbon monoxide, is also included in this section.

Section VI. Health Hazards

The health hazards of the chemical, including signs and symptoms of exposure, are listed. Medical conditions that may be aggravated by exposure to the product are also listed.

The route of entry (i.e. the primary pathway by which the chemical enters the body) is provided. There are four principal routes of entry: inhalation, ingestion, injection, and skin absorption. The

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MSDS also supplies exposure levels that are deemed unhealthful, as determined by standards or recommended by the manufacturer.

Section VII. Precautions for Safe Handling and Use

The precautions for safe handling and use of the product along with procedures for cleaning up spills are described.

Section VIII. Control Measures

Any applicable control measures for using the product, including engineering controls, safe handling procedures, and personal protective equipment are provided.

Sample MSDS for Acetone

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetone

Catalog Numbers: 57025

Synonyms: Dimethylformaldehyde; Dimethyl ketone; 2-Propanone; Pyroacetic acid; Pyroacetic ether.

Company Identification:

For information, call: 800-524-0294

Emergency Number: 800-524-0294

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-64-1	Acetone	100.0	200-662-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless. Flash Point: -4 deg F. Causes respiratory tract irritation. Causes eye irritation. Breathing vapors may cause drowsiness and dizziness. Prolonged or repeated contact may dry the skin and cause irritation. **Danger!** Extremely flammable liquid and vapor. Vapor may cause flash fire.

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.

Skin: May be absorbed through the skin. Repeated or prolonged exposure may cause drying and cracking of the skin.

Ingestion: May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to

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respiratory failure.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause motor incoordination and speech abnormalities.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause effects similar to those of acute inhalation.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May be ignited by heat, sparks, and flame. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. Cool containers with flooding quantities of water until well after fire is out.

Flash Point: -4e deg F (-20.00 deg C)

Autoignition Temperature: 869 deg F (465.00 deg C)

Explosion Limits, Lower:2.5%

Upper: 12.8%

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

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Section 7 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetone	500 ppm TWA; 750 ppm STEL	250 ppm TWA; 590 mg/m ³ TWA 2500 ppm IDLH	1000 ppm TWA; 2400 mg/m ³ TWA

Personal Protective Equipment

Eyes: Wear chemical goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 8 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colourless

Odor: acetone-like

pH: 7

Vapor Pressure: 180 mm Hg

Vapor Density: 2.0 (Air=1)

Evaporation Rate: 7.7 (n-Butyl acetate=1)

Viscosity: Not available

Boiling Point: 133.2 deg F

Freezing/Melting Point: -139.6 deg F

Decomposition Temperature: Not available.

Solubility: Soluble.

Specific Gravity/Density: 0.79 (Water=1)

Molecular Formula: C₃H₆O

Molecular Weight: 58.08

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: High temperatures, ignition sources, temperatures above 220°C.

Incompatibilities with Other Materials: Strong acids, strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Has not been reported.

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Section 11 - Toxicological Information

RTECS#:

CAS# 67-64-1: AL3150000

LD50/LC50:

CAS# 67-64-1:

Carcinogenicity:

CAS# 67-64-1:

ACGIH: A4 - Not Classifiable as a Human Carcinogen

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: TDLo(Oral, rat) = 273 gm/kg; Reproductive - Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).

Neurotoxicity: No information available.

Mutagenicity: Sex chromosome loss and nondisjunction(Yeast - *Saccharomyces cerevisiae*) = 47600 ppm; Cytogenetic analysis(Rodent - hamster Fibroblast) = 40 gm/L.

Other Studies: Standard Draize Test: Administration onto the skin (human) = 500 mg/7days (Mild). Standard Draize Test: Administration onto the skin (rabbit) = 500 mg/24H (Mild). Standard Draize Test(Eye, Rabbit) = 20 mg; Severe.

Section 12 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 67-64-1: waste number U002 (Ignitable waste).

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Revision #7 Date: 2/26/2002

MSDS Glossary

Action Level. The exposure level (concentration in air) at which OSHA regulations to protect employees takes effect (29 CFR 1910.1001-1047); e.g. workplace air analysis, employee training, medical monitoring, and recordkeeping. Exposure at or above action level is termed occupational exposure. Exposure below this level can also be harmful. This level is generally half the PEL.

Acute Exposure. Exposure of short duration, usually to relatively high concentrations or amounts of material.

Air Purifying Respirator - A respirator that uses chemical sorbents to remove specific gases and vapors from the air or that uses a mechanical filter to remove particulate matter. An air purifying respirator must only be used when there is sufficient oxygen to sustain life.

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Allergen. A substance that causes an allergic reaction.

Allergy. A condition in which an initial symptomless exposure to a specific allergen later gives rise to a sensitivity to further exposure. Symptoms may be exhibited in a variety of ways, usually by respiratory distress or skin eruptions.

Asphyxiant. A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce (displace) the available oxygen in the air (normally about 21%) to dangerous levels (18% or lower). Examples of simple asphyxiants are carbon dioxide, nitrogen, hydrogen, and helium. Chemical asphyxiants like carbon monoxide (CO) reduce the blood's ability to carry oxygen, or like cyanide, interfere with the body's utilization of oxygen.

Autoignition Temperature. The minimum temperature at which a substance ignites without application of a flame or spark. Do not heat materials to greater than 80% of this temperature.

Boiling Point, BP. The temperature at which a liquid's vapor pressure equals the surrounding atmospheric pressure so that the liquid rapidly vaporizes. Flammable materials with low BPs generally present special fire hazards [e.g. butane, BP = -0.5°C (31°F); gasoline, BP = 38°C (100°F)]. For mixtures, a range of temperature is given.

Carcinogen. A material that either causes cancer in humans, or, because it causes cancer in animals, is considered capable of causing cancer in humans.

Ceiling Limit, C. The concentration not to exceed at any time. "An employee's exposure [to a hazardous material] shall at no time exceed the ceiling value" (OSHA).

Chronic Exposure. Continuous or intermittent exposure extending over a long time period, usually applies to relatively low material amounts or concentrations.

Chronic Health Effect. An adverse effect on a human or animal body with symptoms that develop slowly over a long time period and persist or that recur frequently. See Acute Health Effect.

Chronic Toxicity. A material's property that produces chronic health effects (see above), usually resulting from repeated doses of or exposure to the material over a relatively prolonged time period. Ordinarily used to denote effects noted in experimental animals.

Combustible. A term the NFPA, DOT, and others use to classify certain materials with low flash points that ignite easily. Both NFP A and DOT generally define combustible liquids as having a flash point of 38°C (100°F) but below 93.3°C (200°F).

Corrosive. A chemical that causes visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact, or that causes a severe corrosion rate in steel or aluminum.

Cryogenic. Relating to extremely low temperatures as for refrigerant gases

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Engineering Controls. Engineering control systems reduce potential hazards by isolating the worker from the hazard or by removing the hazard from the work environment. Methods include substitution, ventilation, isolation, and enclosure. This is preferred over administrative controls and personal protective equipment.

Explosive. A material that produces a sudden, almost instantaneous release of pressure, gas, and heat when subjected to abrupt shock, pressure, or high temperature.

Exposure Limits. The concentration in workplace air of a chemical deemed the maximum acceptable. This means that most workers can be exposed at given levels or lower without harmful effects. Exposure limits in common use are: 1) TLV-TWA (threshold limit value-time-weighted average); 2) STEL (short-term exposure limit); and 3) C (ceiling value).

Flammable. Describes any solid, liquid, vapor, or gas that ignites easily and burns rapidly. Both NFPA and DOT generally define flammable liquids as having a flash point below 38°C (100°F)

Flammable Limits (Flammability Limits, Explosive Limits). Minimum and maximum concentrations of a flammable gas or vapor between which ignition can occur. Concentrations below the lower flammable limit (LFL) are too lean to burn, while concentrations above the upper flammable limit (UFL) are too rich. All concentrations between LFL and UFL are in the flammable range, and special precautions are needed to prevent ignition or explosion.

Flash Point(FP), Lowest temperature at which a flammable liquid gives off sufficient vapor to form an ignitable mixture with air near its surface or within a vessel. Combustion does not continue. FP is determined by laboratory tests in cups.

Fume. An airborne dispersion of minute solid particles arising from the heating of a solid (such as molten metal, welding).

Gas. A formless fluid that occupies the space of its enclosure. It can settle to the bottom or top of an enclosure when mixed with other materials. It can be changed to its liquid or solid state only by increased pressure and/or decreased temperature.

General Ventilation (Also known as dilution ventilation). The removal of contaminated air and its replacement with clean air from the general workplace area as opposed to local ventilation, which is specific air changing in the immediate area of a contamination source. An example of local ventilation is a laboratory fume hood.

Hazard Communication. Requires chemical manufacturers and importers to assess the hazards associated with the materials in their workplace (29 CFR 1910.1200). Material safety data sheets, labeling, and training are all results of this law.

Hazardous Chemical, Material. In a broad sense, any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human. Included are substances that are carcinogens, toxic, irritants, corrosives, sensitizers, and agents that damage the lungs, skin, eyes, mucous membranes, etc.

HEPA. High-efficiency particulate air filter. Has a 99.97% removal efficiency for .03-micron

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particles.

Incompatible. Describes materials that could cause dangerous reactions and the release of energy from direct contact with one another.

Irritant - A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Label. Any written, printed, or graphic sign or symbol displayed on or affixed to containers of hazardous chemicals. A label should identify the hazardous material, appropriate hazard warnings, and name and address of the chemical manufacturer, importer, or other responsible party.

Latency Period. Time that elapses between exposure and first manifestations of disease or illness. Latency periods can range from minutes to decades, depending on hazardous material and disease produced.

Local Ventilation. The drawing off of contaminated air directly from its source. This type of ventilation is recommended for hazardous airborne materials. Treatment of exhausted air to remove contaminants may be required.

Lower Explosive Limit, Lower Flammable Limit. Refers to the lowest concentration of gas or vapor (% by volume in air) that burns or explodes if an ignition source is present at ambient temperatures.

Material Safety Data Sheet. Also MSDS. Material safety data sheet. OSHA has established guidelines for descriptive data that should be concisely provided on a data sheet to serve as the basis for written hazard communication programs. The thrust of the law is to have those who make, distribute, and use hazardous materials responsible for effective communication.

Mutagen - A substance or agent capable of altering the genetic material in a living cell.

Neurotoxin - A material that affects the nerve cells and may produce emotional or behavioral abnormalities.

NFPA. National Fire Protection Association.

NIOSH. National Institute of Occupational Safety and Health.

Nonflammable. Incapable of easy ignition. Does not burn, or burns very slowly. Also, a DOT hazard class for any compressed gas other than a flammable one.

Nuisance Particulates. Dusts that do not produce significant organic disease or toxic effect from "reasonable" concentrations and exposures.

Odor Threshold. The lowest concentration of a material's vapor (or a gas) in air that is detectable by odor.

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OSHA. The Occupational Safety and Health Administration. Part of the U.S. Department of Labor.

Oxidizer. The DOT defines an oxidizer or oxidizing material as a substance that yields oxygen readily to stimulate the combustion (oxidation) of organic matter. Chlorate (ClO₂), permanganate (MnO₄), and nitrate (NO₃) compounds are examples of oxidizers. Note that they all contain large amounts of oxygen (O).

PEL. Permissible Exposure Limit. Established by OSHA. This may be expressed as a time-weighted average (TWA) limit, short-term exposure limit (STEL), or as a ceiling exposure limit. A ceiling limit must never be exceeded instantaneously even if the TWA exposure limit is not violated. OSHA PELs have the force of law. Note that ACGIH TLVs and NIOSH RELs are recommended exposure limits.

Physical Hazard. Means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, and organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Polymerization - A chemical reaction in which one or more small molecules combine to form larger molecules. A hazardous polymerization is such a reaction that takes place at a rate that releases large amounts of energy.

PPE. Personal protective equipment. Devices or clothing worn to help insulate a worker from direct exposure to hazardous materials. Example include gloves and respirators.

RCRA. *Resource Conservation and Recovery Act*, PL 94-580.

Reactivity. A substance's tendency to undergo chemical reaction either by itself or with other material with the release of energy. Undesirable effects such as pressure buildup, temperature increase, or formation of noxious, toxic, or corrosive by-products may occur because of the substance's reactivity to heating, burning, direct contact with other materials, or other conditions in use or in storage.

Reproductive Health Hazard/Toxin. Any agent with a harmful effect on the adult male or female reproductive systems or on the developing fetus or child. Such hazards affect people in many ways, including loss of sexual drive, mental disorders, impotence, infertility, sterility, mutagenic effects on germ cells, teratogenic effects on the fetus, and transplacental carcinogenesis.

Respirator. A variety of devices that limit inhalation of toxic materials. They range from disposable dust masks to self-contained breathing apparatus (SCBA). All have specific uses and limitations. Their use is covered by OSHA, 29 CFR 1910.134 See SCBA, Chemical Cartridge Respirator.

Routes of Entry. To do bodily damage, a material must contact the body. The method of bodily contact is called the route of entry. The routes of entry are: 1) absorption (eye or skin contact); 2) ingestion; and 3) inhalation.

Synonyms. Alternative names by which a material may be known.

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Spontaneously Combustible - A material that ignites as a result of retained heat from processing, or which will oxidize to generate heat and ignite, or which absorbs moisture to generate heat and ignite.

Target Organ Effects. Chemically-caused effects from exposure to a material on specific listed organs and systems such as liver, kidneys, nervous system, lungs, skin and eyes.

Teratogen - A substance or agent, exposure to which by a pregnant female can result in malformations in the fetus.

TLV. Threshold limit value. A term used to express the airborne concentration of a material to which most workers can be exposed during a normal daily and weekly schedule without adverse effects. ACGIH expresses TLV s in three ways: 1) TLV TWA, the allowable time-weighted average concentration for a normal 8-hour workday or 40-hour week; 2) TLV STEL, the short-term exposure limit or maximum concentration for a continuous exposure period of 15 minutes (with a maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided that the daily TLV- TWA is not exceeded); and 3) Ceiling (C), the concentration not to exceed at any time.

Toxicology. The study of the nature, effects, and detection of poisons in living organisms. Also, substances that are otherwise harmless but prove toxic under particular conditions. The basic assumption of toxicology is that there is a relationship among the dose (amount), the concentration at the affected site, and the resulting effects.

Toxic Substance. Any chemical or material that: 1) has evidence of an acute or chronic health hazard and 2) is listed in the NIOSH *Registry of Toxic Effects of Chemical Substances* (RTECS), provided that the substance causes harm at any dose level; causes cancer or reproductive effects in animals at any dose level; has a median lethal dose (LD₅₀) of less than 500 mg/kg of body weight when administered orally to rats; has a median LD₅₀ of less than 1000 mg/kg of body weight when administered by continuous contact to the bare skin of albino rabbits; or has a median lethal concentration (LD₅₀) in air of less than 2000 ppm by volume of gas vapor, or less than 20 mg/L of mist, fume, or dust when administered to albino rats.

Upper Explosive Limit, Upper Flammable Limit. VEL, UFL. The highest concentration of a material in air that produces an explosion or fire, or that ignites when it contacts an ignition source (high heat, electric arc, spark, or flame). Any concentration above the UEL in air is too rich to be ignited. See Flammable Limits.

Vapor. The gaseous state of a material normally encountered as liquid.

Vapor density - The weight of a vapor or gas compared to the weight of an equal volume of air is an expression of the density of the vapor or gas.

VOC. Volatile organic compounds. Used in coatings and paint because they evaporate very rapidly. Regulated by the EPA per the *Clean Air Act*.