

What is phenol?

Phenol (C₆H₅OH) is an organic compound and is both a manufactured chemical and a natural substance with a sweet, tarry odor. It ranges from colorless to pink in color. The commercial product is a thick liquid. Natural, pure phenol is a crystalline solid. Synonyms for phenol include carboic acid, benzophenol, and hydroxybenzene.

Phenol is the preferred chemical for embalming bodies for study because of its ability to preserve tissues for extended periods of time. Phenol:Chloroform Extraction is a common laboratory technique used to isolate DNA, RNA and proteins.



What are the health effects of phenol?

Exposure to phenol can pose a severe health hazard and should be handled with extreme caution. Phenol is highly corrosive and is readily absorbed through to the skin, whereupon it can affect the central nervous system and cause damage to the liver and kidneys. It is also a mutagen, and there is some evidence that phenol may be a reproductive hazard. When heated, phenol will produce flammable vapors that are highly toxic (at just a few parts per million) and explosive (at concentrations of 3% to 10% in air).

Inhalation	<ul style="list-style-type: none"> • Can irritate the nose, throat, and lungs • Higher exposures may cause a build-up of fluid in the lungs
Oral	<ul style="list-style-type: none"> • Ingestion of as little as 1 gram can be fatal to humans
Eyes	<ul style="list-style-type: none"> • Can also cause severe eye damage, including blindness
Skin	<ul style="list-style-type: none"> • Irritating and corrosive to the skin • Little or no pain may be felt on initial contact due to its local anesthetic effect • Skin contact will cause the skin to turn white; later severe burns may develop • Rapidly absorbed through the skin; toxic or fatal amounts can be absorbed through relatively small areas
Chronic Exposure	<ul style="list-style-type: none"> • Repeated or prolonged exposure to phenol or its vapors may cause headache, nausea, dizziness, difficulty swallowing, diarrhea or vomiting • Can affect the central nervous system, liver and kidneys
Physical Hazards	<ul style="list-style-type: none"> • May be combustible at high temperature • Flammable in the presence of open flames, sparks and heat
Exposure Limits (Cal/OSHA)	<ul style="list-style-type: none"> • Cal/OSHA: Permissible Exposure Limit (PEL) is 5 ppm for an 8 hour work shift • NIOSH: Short Term Exposure Limit (STEL) is 15.6 ppm for a 15 minute, high exposure activity

How can I protect myself from phenol?

- Work with phenol in a chemical fume hood
- Never heat or melt phenol in an incubator, microwave, drying oven, autoclave, or similar appliance
- Review a Phenol Material Safety Data Sheet (MSDS) before handling the material (see [UC MSDS website](#))
- Ensure that there is immediate and unobstructed access to an eyewash/shower unit in your work area
- As with any chemical, do not eat, drink, or smoke where phenol is handled, processed, or stored
- Store phenol in a cool, dry, well-ventilated area, away from heated surfaces, ignition sources, strong oxidizers and strong bases
- Store below eye level to prevent injuries in case of a spill
- Always wash hands thoroughly after handling phenol, even though gloves are used

What personal protective equipment (PPE) is required?

PPE: Remember, when working with hazardous chemicals, long pants, closed-toe shoes, safety glasses or goggles are ALWAYS required (see [UCLA PPE Policy](#) and [EH&S PPE Selection Guide](#)). The following PPE table outlines specific requirements for working with phenol.

Gloves and Clothing	<ul style="list-style-type: none">• Neoprene gloves when working with only phenol• Double nitrile gloves may be worn when working with phenol:chloroform (see note below)• Lab coat
Eye Protection	<ul style="list-style-type: none">• For liquid phenol: impact and splash resistant chemical goggles• For solid phenol: eye protection with side shields or goggles
Respiratory Protection	<ul style="list-style-type: none">• Respiratory protection must be worn if the ambient concentration of phenol exceeds regulated exposure limits (see table on previous page)• Respirator users must receive an assessment and complete training through the UCLA Respiratory Protection Program before using a respirator

What special precautions are needed for phenol:chloroform extractions?

Chloroform is a skin and eye irritant, and it is a suspected human carcinogen and reproductive hazard. Adding chloroform to phenol enhances the ability of phenol to be absorbed by the skin. Also remember that phenol can cause severe burns to the eyes.

- Perform all procedures involving greater than 500 ml of phenol or chloroform or any amount of ether in a chemical fume hood
- Wash hands thoroughly immediately after removing gloves when working with these chemicals
- Grasp both the tube and the cap when vortexing to prevent the cap from opening, causing a splash or aerosol
- Use sealed safety cups when centrifuging phenol:chloroform, and wait at least 10 minutes before opening the centrifuge to prevent exposure to aerosols
- Segregate pipette tubes/tips from liquid waste
- Wear chemical splash goggles when there is a splash hazard (for example, when pouring phenol)
- Wear disposable nitrile gloves to protect against accidental hand contact (if accidental contact occurs, remove and discard contaminated gloves immediately)
- The breakthrough time for a 4 ml nitrile glove is approximately 3 minutes for chloroform
- If a spill occurs, wear Viton or Silver Shield/4H gloves (do not wear nitrile gloves due to the risk of direct or prolonged contact when cleaning up a spill)

Please note: Neoprene gloves are recommended for handling large quantities of phenol where there is risk of accidental splash hazards. If more finger dexterity is required, double Nitrile gloves may be worn but users should be aware that glove permeation may occur in several minutes. Change gloves immediately if any liquid contacts your gloves, and frequently during handling of phenol:chloroform solutions.

How do I dispose of phenol waste?

- Handle & dispose of as hazardous waste
- Phenol is categorized as an extremely hazardous waste, so dispose of empty phenol containers as hazardous waste

What do I do if there's a spill or emergency?

- **Spills of undiluted phenol should be considered serious and cleaned up immediately**
- Clean up small spills (<50 ml) with absorbent material, place in a sealed container or double plastic bags
- For large spills (>50 ml), remove ignition sources, provide adequate ventilation, evacuate the laboratory, close the doors, contact 911 or EH&S (x59797)
- For dermal & eye exposure, wash area immediately in eyewash/shower for at least 15 minutes
- For medical treatment, go to the:
Occupational Health Facility, Monday - Friday, 7:00 a.m. to 4:00 p.m., located at CHS 67-120, x56771
- In case of medical emergency or after hours and on weekends, go to the:
Ronald Reagan UCLA Medical Center - enter from Gayley Avenue, x52111

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