**Administrative Information**

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| School |  | Department |  |
| PI name |  | PI email |  |
| Lab manager name (if applicable) |  | Lab manager email (if applicable) |  |
| Locations covered by this SOP (buildings/rooms) |  | | |
| SOP version number |  | SOP approval date |  |
| Reviewed and approved by (name) |  | Reviewed and approved by (initials) |  |
| **Emergency contact name** |  | **Emergency contact phone\*** |  |
| Secondary emergency contact name |  | Secondary emergency contact phone\* |  |
| \* Provide emergency contact phone numbers that will be active both during normal work hours and after hours, e.g., personal mobile phone. Alternatively, give separate daytime and after-hours numbers for both contacts. | | | |

SOP Requirements

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| **Instructions Document** | You are responsible for reading the [SOP Instructions](https://tiny.cc/usc-sop-instructions) outlining roles, responsibilities, and other important safety information. In addition, you must include that document as part of your records. |
| **Recordkeeping** | Acknowledgement forms for this SOP and any associated training are included at the end of this document. Additional copies of the forms are available online ([SOP Acknowledgement](https://tiny.cc/usc-sop-acknowledgement), [Internal Training Record](https://tiny.cc/usc-sop-training)). |
| **Customization** | It is intended that personnel add lab-specific information to the SOP template to produce a finished and functional SOP. Suggested places to add customization are highlighted in yellow throughout the document. |

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| Standard (Safe) Operating Procedure: PHENOL | |
| **Hazard and Classification** | Phenol is readily adsorbed through intact skin and is highly toxic to cells. Cellular damage and death at the site of entry results in a chemical burn, which may be extremely serious. There can be a time delay between absorption of phenol and the appearance of burn symptoms, and phenol is a local anesthetic which numbs sensory nerve endings; for both these reasons, phenol contamination may not be noticed until considerable absorption and damage has occurred.  Phenol is often used as a concentrated solution in chloroform, which may have a faster penetrating ability than phenol alone, particularly with glove materials.  Besides the local toxic effect leading to burns, phenol also exerts systemic toxic effects on humans, which may lead to rapid poisoning if sufficient phenol is absorbed. Any exposure covering more than a few cm2 of skin is potentially fatal and must be considered a medical emergency.  Within the OSHA/GHS hazard classification system (used in supplier’s labelling and safety data sheets (SDSs)), phenol is classified as:   * Acute toxicity, Oral (Category 3) * Acute toxicity, Inhalation (Category 3) * Acute toxicity, Dermal (Category 3) * Skin corrosion (Category 1B) * Serious eye damage (Category 1) * Germ cell mutagenicity (Category 2) * Specific target organ toxicity - repeated exposure (Category 2) * Acute aquatic toxicity (Category 2) * Chronic aquatic toxicity (Category 2) * (Source: Sigma Aldrich phenol SDS)   Refer to Section 6 of the [Chemical Hygiene Plan (CHP)](http://tiny.cc/chem-hygiene-plan) for details of the OSHA/GHS hazard classification system. **All personnel who agree to abide by this SOP are required to familiarize themselves with the contents of Section 6 of the CHP.** |
| **PHS** | Phenol falls under the Cal-OSHA definition of *Particularly Hazardous Substances* (PHS) which require additional precautions in use ([8 CCR §5191](https://www.dir.ca.gov/title8/5191.html); also see *SOP Instructions* document). Please refer to the [CHP](http://tiny.cc/chem-hygiene-plan) (Sections 6 and 8[[1]](#footnote-1)) for more information on the classification and identification of PHS, and safe practices for working with these materials. |
| **Specific Substances** | [Add details of specific substances you will be using in the lab under this SOP, e.g., Trizol, or phenol-chloroform.] |
| **Designated Work Areas/ Signage** | For low-hazard work with phenol (e.g. very dilute solutions), the lab may be considered the designated area provided the lab door signs include appropriate warning pictograms. More hazardous work with phenol should be done at designated areas within the lab (e.g. a fume hood) which should be signed “Phenol — Toxic, corrosive, reproductive toxicant” (or equivalent wording). If highly hazardous work is being performed, additional signage giving the name of the responsible individual and contact number is also recommended.  Phenol shall NOT be used in areas which do not have ready access to a safety shower/eyewash. For more detailed information about eye wash and safety shower requirements please reference the CHP (Section 4, Subsection *Emergency Equipment and Supplies*).  [Add lab-specific work area and signage information here, if needed.] |
| **Unattended Experiments** | Unattended hazardous experiments should be signed according to the requirements of the [Unattended Experiments Fact Sheet](https://tiny.cc/usc-unattended-operations). |
| **Storage Requirements** | Phenol should be stored in labeled secondary containment (e.g. polypropylene trays). Phenol shall not be stored under sinks. Phenol should be stored below eye level and upright in a well-ventilated area. Keep phenol segregated from chemically incompatible materials. Refer to the [CHP](http://tiny.cc/chem-hygiene-plan) (Section 7) for further information on storage and inventory-keeping requirements. |
| **Labeling** | Phenol-containing materials not in active use shall be labelled to indicate the hazard. Phenol storage areas (cupboards, shelves, or secondary containment) should be labelled “Danger! Toxic, Corrosive, Reproductive Toxicant”. Label templates are available at the [Chemical Labeling and Signage](http://tiny.cc/usc-chm-lbl-sign) web page. Refer to [CHP](http://tiny.cc/chem-hygiene-plan) (Section 5) for detailed requirements on hazardous materials labelling |
| **Personal Protective Equipment** | Appropriate PPE shall be worn for all work with hazardous materials, in accordance with the USC [Minimum Standard](https://tiny.cc/usc-ppe-standard), [CHP](http://tiny.cc/chem-hygiene-plan), and [fact sheets](https://tiny.cc/usc-ehs-fact-sheets). Most commonly, research lab PPE consists of a lab coat, eye protection (safety glasses; goggles required if there is a splash hazard) and chemical protective gloves. A face shield may be needed in addition to goggles for severe splash hazards. Note that for reasons of safety and regulatory compliance, respirator usage is NOT permitted outside of the [USC Respiratory Protection Program](https://tiny.cc/usc-ehs-RPP-fs). Refer to the CHP (Section 8) and [EH&S Fact Sheets](https://tiny.cc/usc-ehs-fact-sheets) for additional information about PPE requirements.  Phenol is extremely harmful to eyes. Goggles shall be employed for all phenol work where there is any reasonably foreseeable splash hazard. This includes using small volumes of phenol solutions for DNA/RNA extractions. The sash of a fume hood or biosafety cabinet does NOT constitute acceptable eye protection.  [Add details of any lab- or procedure-specific PPE rules/requirements.] |
| **PPE: Glove Selection** | The strongly corrosive nature of phenol and its ability to penetrate many glove materials makes appropriate glove selection and usage very important.  Phenol and Aqueous Phenol  Disposable nitrile gloves are rapidly penetrated by phenol, but they can be used provided they are exchanged for fresh gloves immediately upon becoming contaminated. Double-gloving is recommended.  Disposable neoprene (polychloroprene) provides somewhat greater protection than nitrile, but gloves must still be changed if contaminated.  Butyl, Viton®, and Viton®-coated butyl (e.g. ChemTek® butyl, ChemTek® butyl/Viton®) provide superior protection with long breakthrough time. These gloves can be re-used if suitably decontaminated before removal, e.g. by thoroughly washing with soap and water, taking care not to contaminate the faucet and soap dispenser.  Phenol-Chloroform  Penetrates a wider variety of glove materials than pure phenol and penetrates more rapidly.  Disposable gloves (nitrile or neoprene) provide minimal protection. If disposable gloves must be used for dexterity, double-glove and exchange for fresh gloves **immediately** upon becoming contaminated. (Both the outer and inner gloves should be replaced.)  Laminate film (Barrier®, Silver Shield®) provides reasonable protection but poor ergonomics.  Viton® and Viton®-coated butyl provide the longest breakthrough time and the best protection.  Butyl alone (i.e. not coated in Viton®) is penetrated rapidly by chloroform — **do NOT use butyl gloves for phenol-chloroform mixtures.**  Notes:  Butyl and Viton® gloves can become extremely slippery when wet — take great care when handling wet glassware!  Butyl gloves are easily penetrated by low-polarity solvents, e.g. hydrocarbons, aromatic solvents, chlorinated solvents. Viton® is dissolved/degraded by ketones and related solvents — do NOT clean Viton gloves with acetone!  Consult manufacturers for further information on glove compatibilities, e.g., Ansell® Guardian Partner online glove selection guide: <https://www.ansellguardianpartner.com/>, and North® online glove selector, <http://ezguide.northsafety.com/IndGlovesMain.aspx>.  Note: Nitrile gloves listed in online guides are often thick reusable gloves. Disposable nitrile gloves are much thinner and far less chemically resistant. Make sure you understand which type of glove the guide is referring to.  [Add details of any lab- or procedure-specific chemical resistant glove rules/requirements.] |
| **Exposure Control** | Secondary containment (e.g. polypropylene trays) should be used for experiments wherever there is potential for spillage of phenol.  Phenol is toxic by inhalation and is moderately volatile. Small-scale, time-limited use of phenol in the open lab is permissible, although a fume hood is always preferable. **A fume hood shall be employed if phenol is heated, sprayed, powdered, or used in large quantities.** Please consult the CHP for detailed information on fume hoods and other engineering safety controls.  Coarsely crystalline phenol may be weighed in the open lab; however, **phenol should be weighed in a fume hood if finely powdered or if used in large quantities.** |
| **Decontamination** | All work areas and equipment is to be cleaned and decontaminated after use.  Potentially contaminated PPE shall be removed before entering clean areas. Hands shall be washed before entering clean areas and after completion of work.  [Add details of specific decontamination/cleaning procedures, if needed.] |
| **Work Practices** | Phenol should not be handled while working alone. Purchasing, working, and storage quantities should be kept as small as possible.  Phenol is commonly supplied as a solid lump, and chipping at the material may result in flying crystals entering clothing and causing burns. Warm the container in a water bath and pipette out the melted phenol.  Phenol is considered a *Particularly Hazardous Substance* (PHS) by Cal-OSHA ([8 CCR §5191 (e) (H)](https://www.dir.ca.gov/title8/5191.html)). PHS must be handled with special care, please refer to CHP Section 8 for guidance.  [Add details of specific work practices you will be using in the lab under this SOP. Work practices are rules which personnel are required to follow to be safe, for example, that certain procedures may not be done out-of-hours or alone. Work practices can also be a defined way of doing things, for example, diluting concentrated acids by pouring the acid slowly into water while stirring, with a prohibition on pouring water into the acid.] |
| **Experimental Procedures** | [Add details of specific experimental procedures/protocols you will be using in the lab under this SOP] |
| **Other Requirements** | Refer to the [Phenol Fact Sheet](https://tiny.cc/usc-phenol) for further information. **All personnel who agree to abide by this SOP are required to download and familiarize themselves with the contents of the Phenol Fact Sheet.** |
| **Waste Disposal** | Contaminated materials shall be disposed as hazardous chemical waste. Please follow all EH&S directions ([hazmat webpages](http://tiny.cc/usc-hazmat), [fact sheets](https://tiny.cc/usc-ehs-fact-sheets), [CHP](http://tiny.cc/chem-hygiene-plan)). Please email [hazmat@usc.edu](mailto:hazmat@usc.edu) if you have questions that are not answered by EH&S online resources.  Phenol-chloroform mixture should be segregated into dedicated waste bottles and not mixed with other waste streams.  [Add details of any lab-specific waste disposal rules.] |
| **Spill Response** | Chemical spill clean-up shall not be attempted if lab personnel do not have proper training and experience, necessary spill kit supplies, and/or appropriate personal protective equipment. **Before starting work, review the** [**Spill Response and Clean-Up**](http://tiny.cc/usc-spill-clnup) **web page and Section 10 of the** [**CHP**](http://tiny.cc/chem-hygiene-plan)**. All personnel operating under this SOP shall familiarize themselves with this information and shall re-review these references at least annually.**  Please refer to the EH&S [Chemical Spill Kit Guide Sheet](https://tiny.cc/usc-ehs-chmSplkit-gs) for guidance on appropriate spill kit materials.  **The high contact hazard posed by phenol makes it inadvisable for lab personnel to attempt clean-up of substantial phenol spills.** Call DPS and request Hazmat. If safe to do so, place absorbent on and around the spill to prevent it from spreading — this will make subsequent clean-up by Hazmat quicker and safer.  **Call DPS for all spills, even if they get cleaned up by lab personnel.** DPS will pass information to the EH&S and Hazmat on-call system. If needed, trained staff will be sent to the lab to clean and decontaminate the spill. If lab personnel clean the spill themselves, notification should still be made as lab safety specialists may wish to follow up with a routine safety investigation.  **Major spills outside a fume hood SHALL NOT be cleaned by lab personnel. Evacuate the area, restrict access, call DPS.** |
| **Mandatory Phenol First Aid Kit** | All labs utilizing phenol shall keep a first aid kit on hand containing:   * At least one liter pharmaceutical grade polyethylene glycol (PEG), 300 or 400 molecular mass, e.g. Kollisolv® PEG 300 or 400 (Sigma Aldrich [91462-1KG](https://www.sigmaaldrich.com/catalog/product/sigma/91462?lang=en&region=US) or [06855-1KG](https://www.sigmaaldrich.com/catalog/product/sigma/06855?lang=en&region=US)). PEG 300/400 is a skin-safe, excellent phenol solvent. * Laminate film gloves (Barrier®, Silver Shield®) for use by colleagues who are helping with decontamination. Do not put gloves on if your hand is already contaminated! * Large cotton roll (e.g. VWR 470161-446). * Wiping cloths (e.g. VWR 500030-610 or 500030-611). * Selection of thick polyethylene bags for holding contaminated waste (e.g. large Ziploc® storage bags). * Large squeeze-bottle of liquid hand soap (A squeeze bottle allows for faster application to the body than a pump dispenser.) * Copy of this SOP with the first aid section highlighted and copy of a phenol SDS from a reputable supplier (e.g. Sigma Aldrich).   Note: PEG suffers peroxidation on storage. Store out of light, do not open the bottle unless needed, and replace after the expiry date (or after 2 years if no expiration date is given). |
| **Phenol First Aid: Skin exposure** | **Speedy and thorough decontamination is essential! Immediately remove all contaminated clothing — do not worry about modesty, phenol can kill you!**  Labmates should assist decontamination using laminate film gloves from the phenol first aid kit to protect their hands. A lab member should call DPS.  Small-Area  Irrigating, swabbing, or wiping with PEG 300/400 - See phenol first aid kit section (above) for information on PEG requirements - will remove phenol. Even after there is no phenol smell, continue applying PEG to draw-out as much absorbed phenol as possible until medical attention is available. Seek urgent medical attention at the earliest opportunity.  Large-Area (more than a few cm2) **— Medical Emergency!**  **Immediately wash all contaminated areas with lots of water and lots of soap — use safety shower/drench hose.** (The soap is important as it greatly helps disperse and remove phenol. Do NOT attempt initial decontamination of a large area by swabbing with PEG as that will prove too slow.)  **If soap is not available, drench with large quantities of water.** Phenol is not very soluble in water, and insufficient water will merely spread it over more skin.  **After thorough washing, follow-up by continually swabbing with PEG to draw phenol out from the skin until paramedics arrive.** (Paramedics will likely continue PEG treatment during transport to hospital.)  **If PEG is not available, continue under shower until paramedics arrive.**  Notes:  Do NOT attempt decontamination using ethanol, isopropanol, or other solvents as they may increase phenol absorption!  During decontamination, dab and lightly rub skin; avoid harsh abrasion.  If the face/head is contaminated, goggles are worn, and there is nothing in the eyes, use the following procedure: Close the eyes tightly, wash face/head under safety shower, remove goggles (still keeping eyes closed and face under safety shower), wash face and head again thoroughly before opening eyes.  Give a copy of the SDS to medical responders. |
| **Emergency Response** | **Before starting work, review the** [**EH&S emergency webpage**](https://tiny.cc/usc-injury) **and the** [**1-2-3 poster**](https://tiny.cc/usc-123)**. Ensure that the 1-2-3 poster is posted in the lab.** **All personnel operating under this SOP shall familiarize themselves with these documents and webpage.**  **All personnel operating under this SOP shall have downloaded and read Section 10 of the** [**CHP**](http://tiny.cc/chem-hygiene-plan) (“*Emergency Response / Injury and Illness Reporting*”). This section provides information on chemical exposure response, spill response, and injury reporting.  **The 1-2-3 poster, CHP Section 10, and the EH&S emergency webpage are hereby incorporated into this SOP by reference.**  **All personnel operating under this SOP shall have the DPS emergency number programed into their phone** (UPC 213-740-4321; HSC 323-442-1000).  **Phone the DPS emergency line in an emergency!!** DPS have 24 h/day immediate communication access to primary and backup personnel on the EH&S and Hazmat on-call rota. **Do NOT call the EH&S general phone line or individual EH&S personnel in an emergency as access is not guaranteed.** |

SOP Acknowledgement

The undersigned acknowledge by their signature that they:

1. Have read, understood, have access to, and agree to abide by this SOP, AND;
2. Have read and understood the emergency response resources incorporated into this SOP by reference (“[**1-2-3 poster**](https://tiny.cc/usc-123)”, [**CHP Chapters 6 and 10**](http://tiny.cc/chem-hygiene-plan), and [**EH&S emergency webpage**](https://tiny.cc/usc-injury)), AND;
3. Will download, store, read, and thoroughly familiarize themselves with safety data sheets (SDSs) for all the hazardous materials they intend to use within the scope of this SOP.

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| **Name** | **USC ID** | **Email** | **Signature** | **Date** |
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Internal Training Record

If hazards are high or complex, or personnel have limited prior experience or training, then hands-on training should be provided on the contents of this SOP. For convenience, the training may be documented using this form, although PIs are free to keep internal training records in other formats if desired. Training may be conducted by the PI, or the PI may delegate a suitably experienced and knowledgeable lab member (e.g. lab manager or senior postdoc) as the trainer. If delegated, the PI still retains management responsibility for the quality and adequacy of the safety training.

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| Trainer name |  | Trainer position |  |
| Trainer USC ID |  | Trainer email |  |
| Trainee #1 name |  | Trainee #1 USC ID |  |
| Trainee #1 email |  | Trainee #1 signature |  |
| Trainee #2 name |  | Trainee #2 USC ID |  |
| Trainee #2 email |  | Trainee #2 signature |  |
| Trainee #3 name |  | Trainee #3 USC ID |  |
| Trainee #3 email |  | Trainee #3 signature |  |
| Trainee #4 name\* |  | Trainee #4 signature |  |
| Trainee #4 email |  | Trainee #4 USC ID |  |
| Date training started |  | Date training completed |  |
| Type of training (delete as appropriate) | **Initial training**  **Refresher training** | Type of training (delete as appropriate) | **Classroom training**  **Hands-on laboratory training** |
| If refresher training, provide date of initial training |  | If refresher training, was the initial training hands-on in the lab? | **YES 🞏 NO 🞏** |
| Signature of trainer confirming the above named trainees have successfully completed safety training on the contents of this SOP (and any additional subjects listed below) | |  | |
| Date of signing by trainer | |  | |
| Additional subjects covered by safety training |  | | |
| \* If there are more than four trainees, please append an additional sign-in sheet. | | | |

1. Section 6 for identification and Section 8 for safe working practices. [↑](#footnote-ref-1)