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| **Chemical Name: CYANIDE SALTS****(and suspensions/solutions)****STANDARD OPERATING PROCEDURES****Type of SOP:** [x] **Hazardous Class** [ ] **Hazardous Chemical** [ ] **Process**According to the Safety Data Sheet (SDS) for CYANIDE SALTS (and suspensions/solutions), including Potassium, sodium, silver, potassium silver, copper, gold and zinc cyanides, special precautions must be taken when working with this chemical. This Standard Operating Procedure (SOP) briefly describes the use of equipment and supplies maintained in the lab/facility, procedures that must be followed, and the responsibilities of personnel when working in these labs/facilities. PI or the designee should **amend this SOP by entering text in the highlighted yellow area to include specifics for your lab. Users shall** not conduct experiments, even pilot studies, which are not described in this approved SOP. It is essential that all personnel follow the appropriate procedures outlined in this SOP. **Please provide the SDS associated with this chemical to all lab personnel working with it.** |
| **PI Information** |
| Name: |  |
| Dept.: |  |
| PS ID: |  |
| Date: |  |
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| **1. PI Responsibilities (Please click the Check Box on every shaded section header.)**  |
|[ ]  The PI is responsible for training students/employees using the chemical. The training should include a discussion of the known and potential hazards and an explanation of the relevant policies, techniques and procedures including the proper use of personal protective equipment and containment equipment. |
|[ ]  Students/employees should be trained initially and then annually thereafter. Their knowledge, competence and practices should be evaluated and documented.  |
|[ ]  Implement a safety program and include this information in the chemical hygiene plan. |
|[ ]  Limit access to authorized users. |
|[ ]  Minimize the possibility of direct skin or eye contact with the drug or inadvertent ingestion/inhalation. |
|[ ]  Transportation of the chemical within the facility should be performed using a sealed non-breakable secondary container. |
|[ ]  Develop Standard Operating Procedures (SOP) for delivery and storage of the chemical. The SOP should have a contingency plan for broken or leaking bottles. |
|[ ]  Properly label containers and any secondary containers of the chemical. |
|[ ]  Provide SDS via email to ehs@uh.edu upon request. |

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| **2. Chemicals/Hazards** |
| * Chemical Names: Potassium, sodium, silver, potassium silver, copper, gold, and zinc cyanides

**Indicate why this is a PHS (there may be more than one category):**

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|[x]  High Acute Toxicity |[ ]  Carcinogen |[ ]   Reproductive toxin |
| [ ]   | Air Reactive/Pyrophoric material |[x]  Water reactive |[ ]   Explosive/unstable |
|[ ]  Other (specify) |[ ]   |  |  |

 Click here to enter text.**Indicate other hazards:**

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|[ ]  Flammable |[x]  Corrosive |[ ]  Oxidizer |
| [x]  | Reactive |[ ]  Temperature sensitive |[ ]  Sensitizer  |
|[ ]  Other (specify) |  |  |  |  |

 * Circumstances of Use:

Click here to enter text.* All above-mentioned cyanide salts are acutely toxic, fatal in contact with skin, if inhaled or if swallowed. All are high risk for skin toxicity (category 1); potassium and sodium cyanide are also high risk for inhalation (category 1). Doses in milligram quantities can be fatal.
* All above-mentioned cyanide salts will react with acid (or water, including moisture in air) to form hydrogen cyanide, a flammable and toxic gas that may produce a bitter almond odor.
* Potassium and sodium cyanide also cause target organ damage, with single exposures targeting the brain, heart, and testes; repeated exposures may affect the thyroid.
* Potassium, sodium, and silver cyanide may also corrode metals, cause eye damage, or irritate skin.
* These compounds inhibit cellular respiration, which leads to anoxia. Cyanide poisoning is associated with blue skin discoloration (cyanosis) but the cyanide-hemoglobin reaction can cause pink/cherry red skin. Initial symptoms of exposure are difficulty breathing, weakness, headache, dizziness, nausea, and vomiting.
* The Permissible Exposure Limit (PEL) is 5 mg/m3. The PEL for hydrogen cyanide is 10 ppm.
* Toxic metal cyanides (cadmium, nickel, mercury) have other hazards not covered here.
* See compound-specific Safety Data Sheet (SDS) for detailed hazard information.
* Special Circumstances of Use in your lab: XXX
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|  **3. Engineering Controls** |
| * Any work with mentioned cyanide salts must be done in a properly functioning chemical fume hood.
* Any eyewash station is strongly recommended in immediate work area.

Please list the locations of the eye wash, safety shower and fume hood below.

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| Type | Location (Building and Room Numbers) |
| Fume Hood(s) |  |
| Safety Shower (s) |  |
| Eyewash Station(s) |  |

**More lab-specific information regarding storage and segregation to train users:** Click here to enter text. |

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| **4. Personal Protective Equipment (PPE)** |
| * Lab coat, safety goggles and **2 pairs of nitrile gloves** are required. Leave lab coats in the lab when your work is complete to prevent the spread of this or other chemicals outside of the lab.
* Change gloves immediately if contaminated & every two hours.
* Wash hands at time of glove change and after removing gloves.
* Respiratory protection may be needed if aerosol hazard is present and work is conducted outside of a fume hood. If any procedure may pose an external hazard it should be eliminated or strictly isolated. If a potential exposure hazard cannot be eliminated, please contact the EHS Respiratory Protection Program administrator to discuss respiratory protection or to enroll in the program. Program enrollment includes medical evaluation, training, and fit testing for an appropriate respirator. For information see EHS Respiratory Protection Program or email ehs@uh.edu.
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|  **5. Work Practice Controls (Preparation and Handling)** |
| **Preparation*** Consider alternate methods and use a safer alternative if possible.
* Purchase the smallest quantity feasible.
* When possible, order the material as granules instead of powder.
* If other specific written procedures are required for work with cyanide salts, step-by-step procedures must be listed in *Section 10. Lab-specific Protocol/Procedure* in this SOP.
* This SOP must be approved in advance by the Principal Investigator.
* Provide hazardous chemical and specific SOP training by PI or designee to personnel working with cyanide salts and any other personnel authorized or required to be in the laboratory or shared space during work with cyanide salts.
* Enter cyanide salts into chemical inventory. Make sure the safety data sheet (SDS) in the process.
* Ensure all containers of cyanide salts are appropriately labeled according to UH Guidelines.
* Confirm fume hood, emergency eyewash and/or shower are located within cyanide salts working area and have a current certification date.
* Ensure all staff are trained to use cyanide salts safely and to manage emergencies.

**Handling** * Cyanide salts will be stored in designated areas only. Store and/or label cyanide salts so they will only be handled by those trained to use it. Complete section 13 to designate the work area for cyanide salts.
* Designate a specific work area for cyanide salts and solutions and label it.
* Never work alone when handling cyanides.
* Line work area with absorbent, leak-proof bench pads.
* Keep containers close as much as possible.
* If weighing dry powders, place balance in hood or
* tare (pre-weigh) an empty container with a lid
* go to hood, add powder to container, close lid
* go to balance to weigh.
* return to hood to make solution or manipulate powder.
* Decontaminate the work area:
* Carefully fold bench pad keeping contaminated surface inward. Place in waste container and seal; dispose as P-list chemical waste.
* Wash contaminated surfaces, glassware, and equipment using a pH 10 buffer solution: rinse with 10% bleach solution.
* Maintain awareness of the pH of cyanide salt solutions. (An acidic pH will release flammable and highly toxic hydrogen cyanide gas.)
* All decontamination materials must be disposed of as hazardous waste.
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|  **6. Work Practice Controls (Storage and Transport)** |
| **STORAGE*** Cyanide salts must be in sealed shatter-resistant containers during transportation. Use a secondary container if the container is not shatter resistant.
* Store in secondary container below eye level. Consider storing in a locked cabinet.
* Keep cyanide salts away from acids and water.
* Store away from incompatibles such as strong oxidizers and CO2. (See SDS for specifics.)
* Potassium, silver, and potassium silver cyanides are light sensitive.
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| **7. Spill and Accident Procedures****[Specific cleaning and waste disposal procedures must be determined.]** |
| Chemical spills must be cleaned up as soon as possible by properly protected and trained personnel. All other persons should leave the area. Spill response procedures must be developed based on the chemical and potential spill or release conditions. Clean up spills using contents of the laboratory spill kit. Do not attempt to clean up any spill if not trained or comfortable. If the spill is large or more concentrated or people have been exposed, evacuate the area, and call 911 on campus phone or 713-743-3333 for help. If a person is exposed follow EXPOSURE PROCEDURES in section 8 below.**SPILL CLEANUP PROCEDURES**1. ANY spill of non-water cyanide solution: Remove everyone from the room and contact the EHS waste team for assistance & consultation by calling 911 on campus phone or 713-743-3333 for help.
2. Spills of dry powder or water-based solutions outside the hood: Remove everyone from the room and contact the EHS spill team by calling 911 on campus phone or 713-743-3333 for help.
3. Spills inside hood:
* Small (<10 mg) amounts of powder or granules: wear PPE indicated above and wet an absorbent pad with PH 10 buffer solution, cover the spill, and wipe carefully.
* <10 ml spill of water-based solution: wear PPE indicated above; use absorbent pads.
1. Clean spill area thoroughly with pH 10 buffer solution followed by a 10% bleach solution.
2. Submit an online waste collection request. Store double-bagged in hood until pickup.
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|  **8. Exposure Procedures in Case of Emergency** |
| *Immediate first aid and medical treatment is essential for people exposed to cyanide salts or hydrogen cyanide. People working in and around cyanide salts must be familiar with the first aid procedures.*1. **Provide First Aid Immediately**
* For **inhalation** exposure, move out of contaminated area. Call 911 on campus phone or 713-743-3333.
* For **eye or skin** exposure, call 911 on campus phone or 713-743-3333. Use the safety eyewash for at least 15 minutes or until medical treatment is given.
1. **Get Help**
* Call 911 on campus phone or 713-743-3333 or go to nearest Emergency Department to seek medical attention. Give details of exposure:
	+ Chemical name and concentration
	+ Amount of exposure
	+ Route of exposure (skin, eyes, respiratory)
	+ Time since exposure
* Bring the SDSs and SOPs of cyanide salts to the Emergency Department.
* Notify your supervisor as soon as possible for assistance.
* Secure area before leaving. Lock doors and indicate spill if needed.
1. **Report Incident to Environmental Health and Safety**
* Notify EHS immediately after providing first aid and/or getting help.
	+ During business hours (M-F/8-5) call 713-743-5858.
	+ After hours call 911 on campus phone or 713-743-3333 to be routed to EHS staff on call.
* For all incidents and near misses, the involved person or supervisor should report to EHS at 713-743-5858.
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|  **9. Waste Disposal** |
|  **WASTE COLLECTION AND DISPOSAL**1. Cyanide salts are P-listed wastes. Keep separate from other wastes.
* Cyanide salts waste must be collected by EHS as a hazardous waste.
* Label with EHS Unwanted Material Waste label that states Cyanide salts waste and the primary hazards (mutagen, toxic), PI name. Unwanted Material Waste labels are available for on [EHS’s website](https://www.uh.edu/ehls/labs/labels/).
1. **Other Cyanide salts waste**

Dispose of empty manufacturer’s container as waste, as well as syringes, pipette tips and other containers if thecyanide salt was the sole active ingredient in the container. Sharps used with cyanides must be collected in a special SHARPS container labeled for cyanide wastes.1. **Disposal**

For chemical waste pickup: Complete Online [waste pickup request form](https://www.uh.edu/ehls/train/waste/index). 1. **Contacts**

 For questions regarding chemical and hazardous chemical collection* visit the EHS [Chemical Waste](https://www.uh.edu/ehls/waste/) website or,
* email ehs@uh.edu or,
* call 713-743-5858
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|  **10. Lab-specific Protocol/Procedure**  |
|  This SOP must be customized for each lab using cyanide salts. Use this section to describe or attach what is being done with Cyanide salts, including specific laboratory procedures and quantities used.  |

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| Particularly HazardousSubstance involved? | X YES: | Blocks #11 to #13 are Mandatory |
|  NO: | Blocks #11 to #13 are Optional. |
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| **11. Approval Required** |
| All staff working with Cyanide salts must be trained on this SOP prior to starting work. They must also be trained on the Cyanide salts SDS, and it must be readily available in the laboratory. All training must be documented and maintained by the PI or their designee. |
| **12. Decontamination** |
| * Decontaminate the work area:
* Carefully fold bench pad keeping contaminated surface inward. Place in waste container and seal; dispose as P-list chemical waste.
* Wash contaminated surfaces, glassware, and equipment using a pH 10 buffer solution; rinse with 10% bleach solution.
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| **13. Designated Area** |
| * All work with Cyanide salts must be done in a designated laboratory, workspace, and fume hood. This work will be conducted in *[room #]*.
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| PI’s Name: | PISD: |
| Department:  | Date: |
| Signature: |  |

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| **[Laboratory Name]****Documentation of Training\*****Standard Operating Procedure for cyanide salts**  |
| *“I have read and understand this SOP. By signing below, I agree to fully adhere to its requirements.”* |
| Last | First | PSID | Email | Signature | Date |
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\* This document, including the signature page with signatures by all involved personnel shall be maintained by the Principal Investigator or Designee, and be submitted to EHS either electronically via the ehs@uh.edu or hard copy upon request.

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|  **Template Revision History** |
| Version | Date Approved | Author | Revision Notes: |
| 1.0 | 03/30/2019 | EHLS Chemical Safety  | New Template. |
| 1.1 | 06/10/2020 | EHS Chemical Safety | Name & logo change, and review. |
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