# Analysis for neutralizing solution of glacial acetic acid, zinc sulfate heptahydrate, potassium chloride, and water

Table 9–2

| **Job Hazard Analysis** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Job Location: Laboratory Group: Date:** | | | | | | |
| **Activity or Job** | **Neutralizing the contents of a volumetric flask containing 350 mL of a solution of glacial acetic acid (200 mL); zinc(II) sulfate heptahydrate (10 g); potassium chloride (35 g); and water (150 mL). This procedure can be followed for neutralization of aqueous solutions where pH is the characteristic hazard. Down the drain disposal depends on federal, state, and local ordinances.** | | | | | |
| **Completed By** |  | | | | | |
| **Equipment and Chemicals Required** | **Stir plate; magnet; fume hood; ice; beakers; thermometer; 6 M sodium hydroxide; spill kit; waste container**  **PPE required: chemical splash goggles; nitrile gloves; lab coat**  **PPE optional: Face shield** | | | | | |
| **Work Steps and Tasks**  *Describe the tasks or steps involved in the work in the order performed* | **Hazards Identified for each Task/Step** | | **Risk Level**  Risk [Nomogram](http://www.safetyrisk.com.au/free-safety-and-risk-management-downloads-page-1/) can be used | | **Control/Safe Work Procedures for each Task/Step**  Controls to be implemented | |
| STEP 1: Add stir magnet to beaker. Transfer contents from the volumetric flask to a beaker of appropriate size (the beaker should be no more than ⅓ full) | **Inhalation, Spill,**  **Dermal Contact**  CHEMICAL  (see below) | | Low-to-Moderate Risk | | * Work in fume hood (work behind glass with sash as low as possible) * Wear chemical splash goggles, gloves (nitrile will be sufficient for incidental exposure; remove and replace contaminated gloves), and lab coat. * Have a spill kit on location | |
| STEP 2: Place beaker in an ice bath on stirring unit (no heat) and stir at a moderate rate. Suspend thermometer (0 ºC to 220 ºC capacity); if possible use a nonmercury thermometer. | Same as above | | Low-to-Moderate Risk | | * Same controls as above * Ensure the spill kit includes a mercury clean-up kit if using a mercury thermometer | |
| STEP 3: Using a pH meter and electrode to monitor, add 6 M sodium hydroxide slowly to attain a pH between 5–9  Full range pH paper on a stirring rod can be used to avoid damaging a probe | Exothermic Reaction  CHEMICAL  (self-heating–  physical hazard) | | Moderate Risk | | * Same controls as above * Stirring and a large enough beaker should be sufficient to dissipate the heat of neutralization * To prevent splashing, run base down a stir rod * Monitor temperature closely with the thermometer, if temperature approaches 90 ºC allow cooldown time * If heat generation cannot be controlled, lower hood sash, leave room, and notify PI or lab supervisor | |
| STEP 4: Allow time for cooling and off-gassing and transfer to labeled waste container | Same as Steps 2 & 3 | | Low-to-Moderate Risk | | Same controls as Steps 1 & 2 | |
| **Hazards Checklist** | | | | | | |
| Can someone be exposed to chemicals? Yes | | If so, what is the nature of the chemical hazard? (skin corrosion or irritation; specific target organ toxicity (single or repeated exposure)–health hazards | | | | |
| Can someone slip, trip, or fall? No | | Can someone injure someone else? Yes | | | | |
| Can someone be caught in anything? No | | Can someone strike against or make contact with any physical hazards? Heat can be generated and expel contents if not controlled | | | | |
| Laboratory supervisor or PI comments: Never neutralize in a volumetric flask. Volumetric glassware is not suitable for energetic chemical reactions due to the narrow neck which restricts heat and gas from escaping and can violently expel the contents. Never use a solid base (sodium hydroxide or potassium hydroxide) to neutralize an acid. Always work in a fume hood with glacial acetic acid. Glacial acetic acid is flammable. Evaluate the necessity for neutralization of this solution because this solution is not suitable for drain disposal due to the environmental hazards of zinc(II) sulfate on aquatic life. | | | | | | |
| Laboratory supervisor or PI signature | | | | Date | |
| Lab worker signature | | | | Date | |

This file is excerpted from “Identifying and Evaluating Hazards in Research Laboratories: Guidelines developed by the Hazard Identification and Evaluation Task Force of the American Chemical Society’s Committee on Chemical Safety”.

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