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# Treatment and identification of existence unlabeled disposed waste chemicals

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**Abstract**
A sum of tens of unidentified non labeled disposed waste chemical materials were collected from different colleges and scientific centers within Basrah University and stored in safe place prepared for this purpose. They all were assigned as waste and separated into solids and liquids, organic or inorganic materials, hazardous as ignitable, corrosive, reactive, oxidizer, flammable, toxic and radioactive hazardous materials or nonhazardous materials. Those classified as inorganic compounds were treated with acid-base reagents for the identification of their basic cations and anions, while those which classified as organic compounds were identified by spectroscopic techniques. Hazardous disposed waste materials were treated separately in order to turn out to be perfectly harmless chemicals that could be disposed of as ordinary waste, or moderately hazardous chemicals that can be easily treated to render them non-hazardous.

**Keywords:** waste chemicals, disposed materials, treatment, unlabeled materials, hazardous waste

## Introduction
A certain chemicals in different containers are store or hide in undergraduate or postgraduate laboratories [1] or even in the offices of the staff for ages before safety personnel will notice the unidentified ones [2]. Moreover, unlabeled containers left behind when labs are closed or abandoned should require significant time and resources to identify and properly dispose of unknown substances, furthermore, unknown materials should be identify according to hazard class before disposal [3].

Most of these materials represent as unknown materials which should identify properly. These unidentified chemicals are unhallowed to be transported, stored, or disposed as waste unless they identified [4] Unknown chemicals present serious legal and safety problems for the university, the process of disposal became very dangerous and chemical should be first identify before disposal. Consequently, some of these items may be unlabeled, or their labels may be deteriorated, or become covered or unreadable, or was improperly labeled, as shown in figure (1). All are considered as unknown.


A B C

**Fig 1:** Different unlabeled chemicals. (A) Concealed, (B) deteriorated, and (C) unreadable.

The purpose of this study is to outline the criteria and processes from disposal chemicals used in laboratories for post and under graduate students as well as those stored by the staff in the University of Basrah.

## Experimental
Typical procedure to state with treatment of unknown chemical materials could be set as perioratories [5].

1. Investigate precisely about personals responsible for such materials and ask whether they are still familiar with these materials.
2. The type of research conducted in the lab can be helpful information for making determination for the chemicals left on the shelf or under a sink.
3. Eliminating certain chemicals as a possibility will also help narrow down the problem. This is especially

important for chemicals such as Mercury, PCB or Dioxin, etc., because they must be handled differently from other hazardous materials.

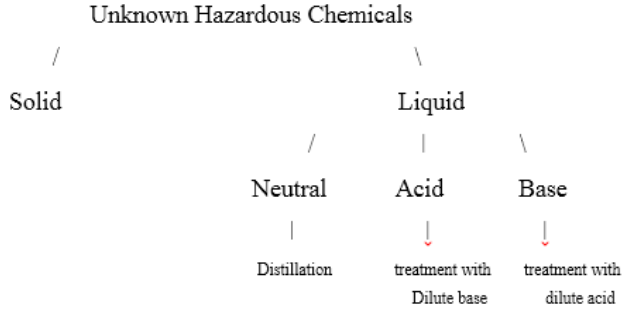
Steps for identification of disposed chemical materials are:

1. Assigned as a waste,
2. Assigned whether it is solid or liquid,
3. Classify as organic or inorganic materials,
4. Identify whether it is hazardous or not,
5. Treatment for specific assignment and hazardous reduction.

Certain quick tests could be perform for all unlabeled bottles, according to Scheem 1:

1. Observation of the physical appearance of the chemical materials such as, color, smell, volatility, etc.
2. Solubility test by dissolving a certain amounts in known solvent to identify whether or not any of the solids dissolve.
3. Density measurement,
4. Acid - base behavior

Scheem 1. Quick tests for unlabeled containers




**Complexes and Heavy Metal Test**

For unknown chemical material few drops of sodium or ammonium sulfide solution were added to the unknown solution, formation of a precipitate indicates that the material contains a heavy metal. Then specific tests should be performed to complete identification of unknowns.

**Acid - Base Test**

Acids taste sour and react with active metals and bases, while bases are bitter and feel slippery or soap.

For acid-base identification, a strip of broad-range pH paper was hold over the mouth of an unknown bottles, fumes from concentrated hydrochloric or nitric acids will cause the paper to turn red without even touching the liquid. On the other hand fumes from ammonium hydroxide, even fairly dilute solutions, will turn the paper blue. If no color change occurs, the pH paper should be wetted with the liquid. If the paper indicates an acidic solution, it could be an acid, an ester or a solution of an acidic salt. If the solution is basic, it could be a solution of a hydroxide, a basic salt or an amine. For solution having a pH equal to or less than 2.0, or equal to or greater than 12.5, the unknowns are identified as a corrosive hazardous waste.

**Flammability Test**

Liquid: Using a lighter or Bunsen burner, try to light the wetted pH paper. If the material burns, observe how it burns. Lightweight alcohols burn with a nearly invisible flame; simple alkane's burn fairly cleanly, while aromatic compounds or those with double or triple bonds will produce a smoky flame. If the compound contains a significant amount of halogens, nitrogen or sulfur the pH paper will turn red due to the acidic products of combustion. All flammables should be handled as hazardous waste.

Moreover, further identification should be proceed to complete the task [6]

**Identification of Unlabeled Container Depending upon Appearance and types of containers**

If a container has a fragment of a label still on it, investigators may be able to glean enough information to identify its contents or at least narrow the possibilities. Perhaps the partial label indicates part of a name, molecular weight, boiling or melting point, warning statements, or even the antidote, all these are valuable clues. Often, some bottles are labeled while others are not, the appearance and characteristics of the contents of the labeled ones will help identify those that are unlabeled.

The type and condition of a chemical's container offer clues as to the identity of its contents. Chemicals are often sold in distinctive containers. For example, clear glass bottles with color-coded caps suggest acids or ammonium hydroxide, brown bottles suggest organic solvents, and steel cans with screw tops often contain ethyl ether, and so on. Even the size of the container can provide a hint as to its contents; large containers generally contain common reagents or solvents. A plastic bottle that has swollen or even been split by pressure from its contents probably contains a material that has reacted with air or water, such as anhydrous calcium oxide. Old containers of sodium or potassium hydroxide often have formed a "crown" of carbonate salts around their lids. Caps on bottles of hydrochloric acid and ammonium hydroxide will, if stored in proximity to one another, form a "wig" of ammonium chloride crystals.

Physical characteristics, such as color, type of crystal and density can suggest what an unknown might be. For example, a bright blue crystal suggests copper sulfate; a very heavy crystal might be a lead salt; a yellow solution could be a chromate, iron, or iodine. Simple tests can confirm these possibilities.

Very often unknowns are in volumetric or Erlenmeyer flasks or in beakers. Volumetric flasks usually contain standard solutions, commonly an acid, base or buffer. If the flask has been covered in aluminum foil, its contents are probably a light-sensitive compound, such as silver nitrate. Liquids in small dropper bottles are likely to be test solutions or indicators.

**Results and Discussion**

The possibilities and trueness of identification were satisfied by spectrometry, chromatography or combination of different techniques [7]

Materials difficult to identify were assigned as dangerous disposal materials which should be package, stored, transported, and disposed in a safe and legal manner [8].

Certain unlabeled or unknown chemical materials were difficult to assign directly due to incompatibility and interferences [7], therefore, materials should be treated before identification [9].

When a chemical or solution has not been labeled, was improperly labeled, or its label has deteriorated, become obscured or illegible, it becomes an unknown. Fortunately, it

is not necessary to know the exact identity of an unknown. It is usually sufficient to determine if an unknown is a hazardous material, and if it is, to assign it to an appropriate hazard class for safe transportation, treatment, and disposal. Many unknowns turn out to be perfectly harmless chemicals that could be disposed of as ordinary waste, or moderately hazardous chemicals that can be easily treated to render them non-hazardous. The process for identifying an unknown chemical can be tedious and costly. However, some activities can be done to prevent the generation of an unknown as well as identification. Unknown chemicals must be properly identified according to hazard class before proper disposal. The hazards that should be noted include: corrosive, ignitable, oxidizer, reactive, toxic and radioactive.

Disposal of hazardous waste is dangerous and expensive whether it is known or unknown. On the other hand, the disposal of unidentified chemical materials is even more dangerous, expensive, and difficult. Without any identified information's, unknown materials have to be treated as potentially lethal and hazardous [10].

**Recommendations**

1. At least once a year each laboratory or experimental activity should review their chemical inventory and dispose of unwanted or expired materials.
2. Prior to the departure of a principal investigator faculty member, all materials should be identified.
3. When a graduate student completes their research, all materials with their work should be properly Identified and labeled.
4. Minimization of hazardous waste by using small batch or micro scale reactions when possible.
5. Decrease disposal materials by ordering only the minimum amount of materials for running any project.
6. To avoid accumulation of unknown chemical materials, do not accept any gifts from companies and/or identical institutions.
7. Do not remove manufacturers label from the container.
8. Immediately replace labels that have fallen off, become damaged or illegibl

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