IDENTIFICATION OF SOLUTIONS

**Introduction:**

The identification of a compound is based on the chemical and physical properties of that compound. In order to identify an unknown efficiently, a plan should be followed that will narrow the choices and then give a specific identification. In this experiment eight solutions are placed in unlabeled bottles and by determining their chemical and physical properties each solution can be identified.

**Purpose:** The purpose of this lab activity is to identify the eight unknown solutions.

**Equipment/Materials:**

*Van Provides:*

Dropper bottles containing unknown 24-well microplate

Solutions #1 through 8 which include: 2 dropper pipets

1M HCl neutral litmus paper

3M ammonia water 1M AgNO3

1M NaOH 3 small test tubes

1M NaCl

1.5M Na2CO3

1M CH3COOH (acetic acid)

1M sugar

distilled water

*Teacher Provides:*

Styrofoam cup

(NOTE: The teacher should heat tap water in a large beaker on a hot plate (not to boiling) for students to use later in the experiment. Heat-resistant gloves or beaker tongs should be made available for transferring hot water to the styrofoam cup.)

**Safety Considerations:**

* Always wear aprons and safety goggles in the lab.
* Be very careful handling hot liquids.
* Do not get the 1M AgNO3 liquid on your skin. It can cause minor burns but will also discolor your skin.
* Always treat unknown liquids with EXTREME care since you don’t know what they are. They are potentially dangerous. If you get any of the liquids on your skin, wash them off IMMEDIATELY.

**Procedure:**

1. Place ten drops of each of the unknown solutions in separate wells of the well plate. Be sure to record which well contains which solution.
2. Test each solution with neutral litmus paper. Record the results in the Data Table.
3. Use a dropper pipet to add 5 drops of silver nitrate to each well. Record the results in the Data Table.
4. Use the Flow Chart following the Data Table to identify some of the solutions. Six of the solutions can be identified using the data collected. Write the names of these 6 solutions in the appropriate place in the Data Table. Note which two solutions cannot yet be identified.
5. Label a test tube with the number of one of the solutions you could not identify in Step 4 and place 10 drops of that solution in the labeled test tube.
6. Label a second test tube with the number of the other solution you could not identify in Step 4 and place 10 drops of that solution in the labeled test tube.
7. In the third clean test tube add 10 drops of silver nitrate (1M AgNO3) followed by 10 drops of sodium hydroxide. (NOTE: Sodium hydroxide should be one of the unknown solutions that ***could*** be identified in Step 4.) Add ammonia dropwise, mixing well after the addition of each drop, until **all** of the dark precipitate dissolves. ***Make sure that the solution is completely clear.*** Once dissolved, add 5 extra drops of ammonia. (NOTE: The ammonia is another of the unknown solutions that should have been identified in Step 4.)
8. Use a dropper pipet to transfer half of the silver-ammonia solution prepared in Step 7 into one of the test tubes containing an unknown solution and mix.
9. Transfer the other half of the silver-ammonia solution to the other test tube containing an unknown solution. Mix
10. Obtain a styrofoam cup and fill about half full with hot water (not boiling water). Place the two test tubes into the water being careful not to allow any water into the tubes. Record the results in the Data Table.
11. The test tube, which becomes dark or plates out a silver mirror can now be identified as the sugar solution.
12. To clean up, dispose of the used dropper pipets and litmus paper in the garbage. Dispose of the test tube containing the silver mirror in a broken glass container. Wash out the other two test tubes well, rinse with distilled water and leave them inverted in a rack to dry.

IDENTIFICATION OF SOLUTIONS

**Data Table**

# Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period/Lab Group: \_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Data Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| Unknown # | Litmus Test Result | ***Silver Nitrate Test Result*** | Identity of Solution |
| ***1*** |  |  |  |
| ***2*** |  |  |  |
| ***3*** |  |  |  |
| ***4*** |  |  |  |
| ***5*** |  |  |  |
| ***6*** |  |  |  |
| ***7*** |  |  |  |
| ***8*** |  |  |  |

**Flow Chart:** Use the following Flow Chart to aid in identifying the eight unknown solutions.

**LITMUS TEST**

***red blue no ch*ange**

HCl ammonia salt water

acetic acid NaOH sugar

Na2CO3 distilled water

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**SILVER NITRATE SILVER NITRATE SILVER NITRATE**

** **

***ppt no ppt ppt no ppt ppt no ppt***

HCl acetic acid ammonia (disappears) NaCl sugar

NaOH (dark) distilled water

Na2CO3 (white)

### *Silver Mirror No Silver Mirror*

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sugar distilled water

**Questions:**

1. Which two solutions cannot be distinguished based on the litmus and silver nitrate tests?
2. How are these two solutions identified?