EXPERIMENTAL PROCEDURES AND OBSERVATION TABLES

# Introduction to Double Displacement Reactions and Solubility Rules

Materials:

Textbook, overhead projector transparency, markers and dry board, Small Scale Chemistry Reaction Surface, droppers, see Small-Scale Chemistry reaction surface for a list of the various chemicals, paper towels.

**Safety Precautions & Waste Management:**

* **You must wear your safety goggles at all times, as some of the chemicals used in this experiment are hazardous.**
* **Ensure that all bottle are closed or the droppers and tops from each bottle is placed back into or onto its respective bottle if you are not dispensing the solution.**
* **Keep workspace clutter-free of unnecessary items.**
* **On completion of experiment wipe all chemicals off the reaction surface with a dry paper towel, and discard in the garbage.**
* **Wash your hands after you have clean your workspace.**

Procedures:

* 1. Take a damp paper towel and wipe of the Small-Scale Chemistry Reaction surface. Follow this by drying the surface with a dry paper towel.
  2. Read through all the procedures in this section.
  3. Carryout the each experiment that is presented on the Small-Scale Chemistry Reaction surface. **Ensure that you follow the procedures to the left of each row before you carryout the procedures at the top of each column.** e.g AlCl3 + Na2CO3

Place two drops of AlCl3 on the reaction surface at the center of the “X”. Then add the two drops of Na2CO3 on top of the AlCl3.

HINT: REACT ALL THE SUBSTANCES FIRST AND THEN BEGIN RECORDING RESULTS, AS SOME REACTIONS MAY TAKE LONGER TO REACT THAN OTHERS (especially true of some Ca2+ precipitates). DO NOT WAIT FOR THE REACTIONS TO OCCUR. PRECEDE WITH THE OTHER REACTIONS AND CHECK BACK LATER TO SEE IF ANY CHANGES HAVE OCCURRED. Do not wipe surface clean until you have completed all the reactions and are confident in your results.

* 1. Before you react the substances together observe the initial properties of the reactants. (Note the initial color and state, but you not need to record these properties).
  2. As the reaction is taking place ensure you mix the reactants, by taking a clean and dry dropper, and pointing it at the reactants. Then squeeze the bulb gently to blow air on the mixture. Blowing air on the mixture will circulate all the reactants that are within contact with each other. When the properties of the products appear to be unchanging record your final observations. If there appears to be no change in properties between reactants and products indicate this by writing “NVR,” an abbreviation for “No Visible Reaction”.
  3. Clean up the reaction surface as instructed in the safety and waste management section, and then repeat step 1 of the procedures.

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| --- | --- | --- | --- | --- | --- | --- |
| **CATIONS** | **ANIONS** | | | | | |
| Na2CO3  (CO32-) | NaCl  (Cl-) | NaOH  (OH-) | NaNO3  (NO3-) | Na3PO4  (PO43-) | Na2SO4  (SO42-) |
| AlCl3  (Al3+) |  |  |  |  |  |  |
| NH4Cl  (NH4+) |  |  |  |  |  |  |
| CaCl2  (Ca2+) |  |  |  |  |  |  |
| CuCl2  (Cu2+) |  |  |  |  |  |  |
| NaCl  (Na+) |  |  |  |  |  |  |
| Pb(NO3)2  (Pb2+) |  |  |  |  |  |  |
| MgCl2  (Mg2+) |  |  |  |  |  |  |
| AgNO3  (Ag+) |  |  |  |  |  |  |
| ZnCl2  (Zn2+) |  |  |  |  |  |  |
| FeCl3  (Fe3+) |  |  |  |  |  |  |

**DATA SHEET FOR SMALL SCALE DOUBLE DISPLACEMENT REACTIONS**

**Analysis:**

1. WRITE ALL YOUR MOLECULAR EQUATIONS FOR REACTIONS WITH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, INCLUDE STATE SYMBOLS FOR ALL REACTANTS AND PRODUCTS.

Where your observation were NVR no molecular equation is necessary.

2. Write your solubility rules on this page in full sentences, as shown in the examples below:

e.g All Sulfides (S2-) and Chromates (CrO42-) are insoluble except K+, Na+ and NH4+.

e.g All Bicarbonates/Hydrogen Carbonates (HCO3-) and Chlorates are soluble.

**Carbonates (CO32-):**

**Halides (Cl-, Br- and I-):**

**Hydroxides (OH-):**

**Nitrates (NO3-):**

**Phosphates (PO43-):**

**Sulfates (SO42-):**

**Alkine metals and NH4+**

|  |
| --- |
|  |
| CATIONS | Na2CO3  (CO32-) | NaCl  (Cl-) | NaOH  (OH-) | NaNO3  (NO3-) | Na3PO4  (PO43-) | Na2SO4  (SO42-) |
| AlCl3  (Al3+) | X |  | X | X | X | X |
| NH4Cl  (NH4+) | X |  | X | X | X | X |
| CaCl2  (Ca2+) | X |  | X | X | X | X |
| CuCl2  (Cu2+) | X |  | X | X | X | X |
| NaCl  (Na+) | X |  | X | X | X | X |
| Pb(NO3)2  (Pb2+) | X | X | X | X | X | X |
| MgCl2  (Mg2+) | X | X | X | X | X | X |
| AgNO3  (Ag+) | X | X | X | X | X | X |
| ZnCl2  (Zn2+) | X | X | X | X | X | X |
| FeCl3  (Fe3+) | X | X | X | X | X | X |

SMALL SCALE REACTION SURFACE FOR DOUBLE DISPLACEMENT REACTIONS