The Periodic Table : Reactivity of Elements

Prepared by
Prof. Nalband S. Hussain,
Dept of Natural Sciences (Chemistry)
LaGuardia Community College

Goals:
In this experiment you will verify the similarity of family properties by carrying out a number of chemical reactions on representative elements (actually using ions of the elements) and using the results to classify the elements in to related groups. You will then observe the reaction of a number of elements with water and acid and use these results to predict variation of chemical reactivity position of an element in a given group or row of the table.

The Periodic Table: The elements known to us are arranged in the order of increasing atomic mass or mass number and atomic number. In the form of a Periodic Table. The table is comprised of groups (families) represented by vertical columns with elements of similar properties. The group #s are given as 1A – 8A represented in Roman numerals also. In the center of the periodic table is a block of elements known as the transition elements.
The elements in the first group (1A) are known as Alkali Metals and the 2A group metals are known as Alkaline Earth Metals, 7A group elements are known as Halogens and the 8A are known as Noble gases or Inert Gases.

The reactivity of the elements in a given group is similar but the reactivity is increased as you go down in a group. For example reactivity of K is more than Li.

Procedure:

1. Arrange 9 test tubes in a rack and number them 1-9 and add about 10 drops of the corresponding numbered solution to the appropriate tube.

Tube #	Solution	Ion
1	**Barium nitrate**	**Ba^{2+}**
2	**Ammonium chloride**	**Cl^{1-}**
3	**Calcium nitrate**	**Ca^{2+}**
4	**Lithium nitrate**	**Li^{1+}**
5	**Ammonium iodide**	**I^{1-}**
6	**Potassium nitrate**	**K^{1+}**
7	**Sodium nitrate**	**Na^{1+}**
8	**Strontium nitrate**	**Sr^{2+}**
9	**Ammonium bromide**	**Br^{1+}**

2. To each tube ass about 10 drops of ammonium carbonate (A). Mix well and record your observations on the Lab report sheet under A. You can observe either a solid (insoluble material) called a precipitate (ppt) forming in the test tube or no change occurring (contents in the test tube will be clear). If there is precipitate record the observation as PPT on the lab sheet. If there is no change, record as NR (for no reaction).

3. Discard the contents of the tubes in to waste container provided. Rinse the test tubes with dist. Water.

4 Repeat steps 1-3 using ammonium phosphate (B) in place of ammonium carbonate. Repeat steps 1-3 using silver nitrate(C) in place of ammonium carbonate

2. Reaction of the metals with water and diluted hydrochloric acid (HCl):

This part of the experiment should be performed by the instructor.

Take few pieces of Magnesium (Mg) ribbon and treat with water. Leave the tube for 5 min and let the student record their observation. (Bubbles of hydrogen gas are formed)

In a second test tube react few pieces of Mg with diluted hydrochloric acid (HCl). Let the student observe and record observations.

Repeat these two reactions with Calcium metal and Copper metal.

Questions:

1. Did any of the ions react similarly with A, B or C. If so list the ions that reacted similarly in the group?

2. List two things that the elements of a group in the periodic table have in common?

3. Write the formulas of the products formed by the reaction of Mg and Ca with water and diluted HCl.

4. Arrange the following elements in the order of increasing reactivity

   a. Be, Ba, Sr, Mg

   b. Na, K, Cs, Li

Results: Part !.

Tube #	Solution	Ion	Reaction with A $(CO3)2-$	Reaction with B $(PO4)3-$	Reaction with C $Ag\ 1+$
1	Barium Nitrate	Ba^{2+}			
2	Ammonium chloride	Cl^{1-}			
3	Calcium Nitrate	Ca^{2+}			
4	Lithium nitrate	Li^{1+}			
5	Ammonium iodide	I^{1-}			
6	Potassium nitrate	K^{1+}			
7	Sodium Nitrate	Na^{1+}			
8	Strontium Nitrate	Sr^{2+}			
9	Ammonium Bromide	Br^{1-}			

Part 2.

Reaction of Metals with water and dil HCl

Metal used	Observation of the reaction with water	Observation of the reaction with dil HCl
Mg		
Ca		
Cu		