

THE PERIODIC TABLE

OBJECTIVE

1. To show how chemical properties are related to position of the component elements on the periodic table.

INTRODUCTION

The periodic table is one of the most useful tools a chemist has. It not only relates information about the atomic structures of atoms but allows the prediction of many physical properties.

Different sections of the periodic table have been grouped together and given specific names. Elements in these groupings often share similar chemical and physical properties.

Vertical columns of the periodic table are called groups. Elements of group I, which is on the far left, are called alkali metals. Elements of group II, one column to the right of group I, are the alkali earth metals. On the far right of the periodic table, the elements of the group, which is sometimes labeled group VIII and sometimes group 18 (a more modern numbering system), are called the noble gases. Next to them, in group VII (or 17), are the halogens.

Horizontal rows are called periods. The higher the period, the larger the atom.

Other groupings in the periodic table include the transition metals which are inserted between group II and group III (or 13). These are sometimes labeled as group B elements or groups 3-12. At the bottom of the table are two rows of elements called the lanthanide series and the actinide series. Together they are called either the inner-transition metals or rare earths. These elements actually belong in periods 6 and 7 but are not commonly put there due to size restrictions.

Another way the periodic table is grouped uses a "staircase" which separates B and Al, Al and Si, Ge and As and so forth. This staircase separates the metals (to the left) from the nonmetals (to the right). Elements directly on the staircase have properties of both metals and nonmetals and are usually called metalloids. This staircase does not appear on all periodic tables since it is somewhat arbitrary. However, it is often a useful division.

In this experiment, you will consider some physical properties of several compounds and look for how those properties relate to the position of the component atoms on the periodic table. One of the properties you will be looking at is conductivity. Conductivity is the ability of a solution to conduct electricity. It requires that a solution contains mobile, charged particles (called ions) to transport the electrical current. The more ions, the better the solution is able to conduct electricity.

PROCEDURE

Attempt to dissolve about 1 g of the solid compounds and 1 mL of each liquid listed in your report section in about 100 mL of water. Measurement may be very approximate.

Carefully observe this process, noticing things such as how fast and completely the substance dissolves, colors of solutions, how the substance looks both before and after dissolution.

Use the light bulb device (with the help of the lab instructor or assistant) to test conductivity. The brighter the light bulb shines, the more conductive the solution. Consider how the compounds fit into the periodic table. Especially consider metal/nonmetal differences.

In the report, for each compound:

- | | |
|-----------------|---|
| "M/N?" | Write M for each element of the compound which is a metal. Write N for each element which is a nonmetal. |
| "soluble?" | Write "yes" if the compound dissolves in water, "no" if it does not. |
| "conducts?" | Record how intensely the light shines. |
| "observations?" | Record anything which strikes you as unusual. Be sure to include colors, but there are many other possible observations you can make. For example, does it dissolve especially quickly or slowly? If you wish to make more observations than there is space for, use the back of this page. Be sure to note the compound to which these observations apply. |

PERIODIC TABLE
LABORATORY REPORT

NAME _____
DATE _____

compound	M/N?	soluble?	conducts?	observations?
$C_xH_y^*$ mineral oil				
C_2H_6O ethanol				
$C_{12}H_{22}O_{11}$ sugar				
$CaCl_2$ calcium chloride				
$CuBr_2$ cupric bromide				
$Cu_xZn_y^*$ brass				
KI potassium iodide				
$MnCl_2$ manganese chloride				
$FeCl_3$ ferric chloride				
NH_3 ammonia				

*the numeric value of x and y varies in this compound

QUESTIONS

1. What do the compounds which conduct electricity well have in common?
2. For a compound which conducts electricity in solution, what do you expect to happen to conductivity if a larger amount of that compound is added to the same amount of water?
3. What relationships do you observe? For example, compare the position of the component elements of a compound on the periodic table. Report at least two relationships.
4. If you allowed your KI solution to evaporate to dryness, what (if anything) would remain? If only half the solution was poured into another beaker and this half was allowed to evaporate to dryness, how would what remains be different from evaporating the whole solution?
5. Explain the conductivity behavior of ammonia.