

Small-Scale LAB



I & E Standard: 1d

Analysis of Anions and Cations

Purpose

To develop tests for various ions and use the tests to analyze unknown substances.

Materials

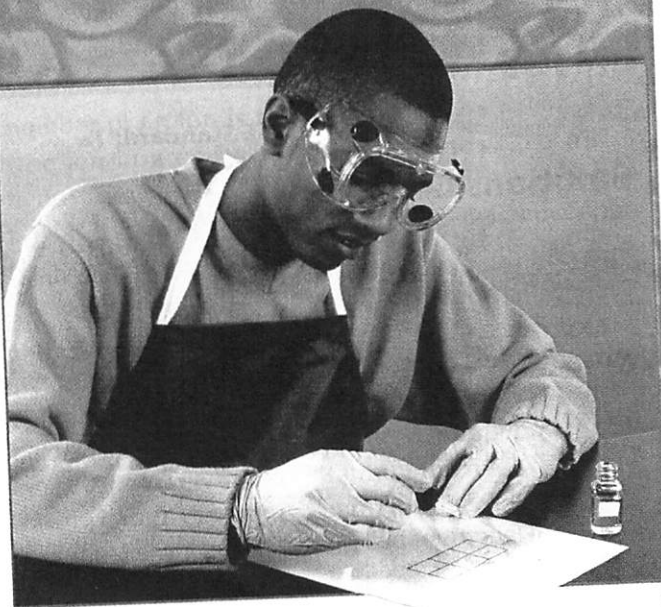
- pencil
- ruler
- medicine droppers
- chemicals shown in Figures A and B
- paper
- reaction surface
- pipet

	Na_2SO_4 (SO_4^{2-})	HNO_3 (NO_3^-)	Na_3PO_4 (PO_4^{3-})
AgNO_3			
HCl plus 1 piece of Fe(s)			
$\text{Pb}(\text{NO}_3)_2$			

Figure A
Anion Analysis

	KI (K^+)	CaCl_2 (Ca^{2+})	FeCl_3 (Fe^{3+})
NaOH			
KSCN			

Figure B
Cation Analysis



Procedure



On one sheet of paper, draw grids similar to Figure A and Figure B. Draw similar grids on a second sheet of paper. Make each square 2 cm on each side. Place a reaction surface over the grids on one of the sheets of paper and add one drop of each solution or one piece of each solid as shown in Figures A and B. Stir each solution by blowing air through an empty pipet. Use the grids on the second sheet of paper as a data table to record your observations for each solution.

Analyze

Using your experimental data, record the answers to the following questions below your data table.

1. Carefully examine the reaction of Fe(s) and HCl in the presence of HNO_3 . What is unique about this reaction? How can you use it to identify nitrate ion?
2. Which solutions from Figure A are the best for identifying each anion? Which solutions from Figure B are the best for identifying each cation? Explain.
3. Can your experiments identify K^+ ions? Explain.

You're the Chemist

The following small-scale activities allow you to develop your own procedures and analyze the results.

1. **Design It!** Obtain a set of unknown anion solutions from your teacher and design and carry out a series of tests that will identify each anion.
2. **Design It!** Obtain a set of unknown cation solutions from your teacher and design and carry out a series of tests that will identify each cation.
3. **Design It!** Obtain a set of unknown solid ionic compounds from your teacher. Design and carry out a series of tests that will identify each ion present.