

1-4 Atomic Structure Lab – Student Edition

Flame Tests – Identifying Metal Ions

Student Lab Sheet

Background Information:

Flame testing is an analytical procedure that chemists utilise to detect the presence of certain metal ions. Each metal ion produces a flame of a different colour and can, therefore, be identified. As the substance is heated in the flame, the electrons in the metal ion become excited causing them to jump into higher energy levels. This is because the heat provides the electrons with extra energy. Electrons do not remain in an excited state, so they return to their normal or 'ground' level where they were before. When this occurs the energy is released as light energy which is the colour we see.

Pre-Lab Questions:

1. Name the group one alkali metals.
2. Give the chemical formula for each of the IONS of the group one metals.
3. What do the group one metals have in common?
4. Name the group two alkaline earth metals.
5. Give the chemical formula for each of the IONS of the group two metals.
6. What do the group two metals have in common?

Practical Activity:

Safety Precautions:

Hydrochloric acid is corrosive; please refer to the relevant safety advice provided by your teacher.

Substances may 'spit' when placed into the Bunsen flame; safety glasses should be worn at all times.

You Will Need:

- Bunsen burners
- Flame test wires (one per two students)
- Hydrochloric acid
- Labelled solid samples of the metal ions you plan to test:
- Three mystery samples labelled 'W', 'X' and 'Y'

Method:

1. Dip a flame test wire into hydrochloric acid and then hold it in a blue Bunsen flame.
2. Dip the wire into a sample of the compound and place it into the edge of a blue Bunsen flame. The flame color produced indicates which metal ion is present in the compound.
3. Clean the wire loop and continue testing with other samples.
4. Once you have completed each of the named solutions, carry out a flame test and identify substances.

Results:

Name of Substance	Metal Ion Present	Flame Color
Copper chloride		
Potassium iodide		
Calcium chloride		
Strontium chloride		
Lithium chloride		
Barium chloride		
Sodium chloride		
'W'		
'X'		
'Y'		

Post-Lab Questions:

1. Using the information recorded in your table, name substances 'W', 'X' and 'Y'.
2. Which substances (if any) would you expect to be most difficult to identify using a flame test? Explain why.
3. Draw a simple diagram to show what happens when a metal ion such as lithium is heated.
4. Give the electron configuration for sodium and calcium.