Flame photometer

It is an instrument used to determine the concentration of certain metal ions among them sodium, potassium, calcium and lithium. It based on measurement of intensity of the light emitted when a metal is introduced into flame. The wavelength of color determined what the element is (qualitative) and The color's intensity determined how much of the element present (quantitative) .

Parts of flame photometer:

1- Source of flame : A burner provides flame and can be maintained in a constant form and at a constant temperature.

2- Nebulizers and mixing chamber: It helps to transport the homogeneous solution of the substance into the flame at a steady rate.

3- Optical system (optical filter) : It comprises three parts:

A- Convex mirror : It helps to transmit light emitted from the atoms and focus the emissions to the lens.

B- Convex lens :It focus the light on a point called slit. The reflections from the mirror pass through the slit and reach the filters .

C- filter : This will isolate the wavelength to be measured from that of any other extraneous emissions that acts as interference type color filters.

4- Photo detector: Detect the emitted light and measure the intensity of radiation emitted by the flame. The emitted radiation is converted to an electrical signal with the help of photo detector. The produced electrical signals are directly proportional to the intensity of light.

Mechanism of working

The working of the flame photometer involves a series of steps :

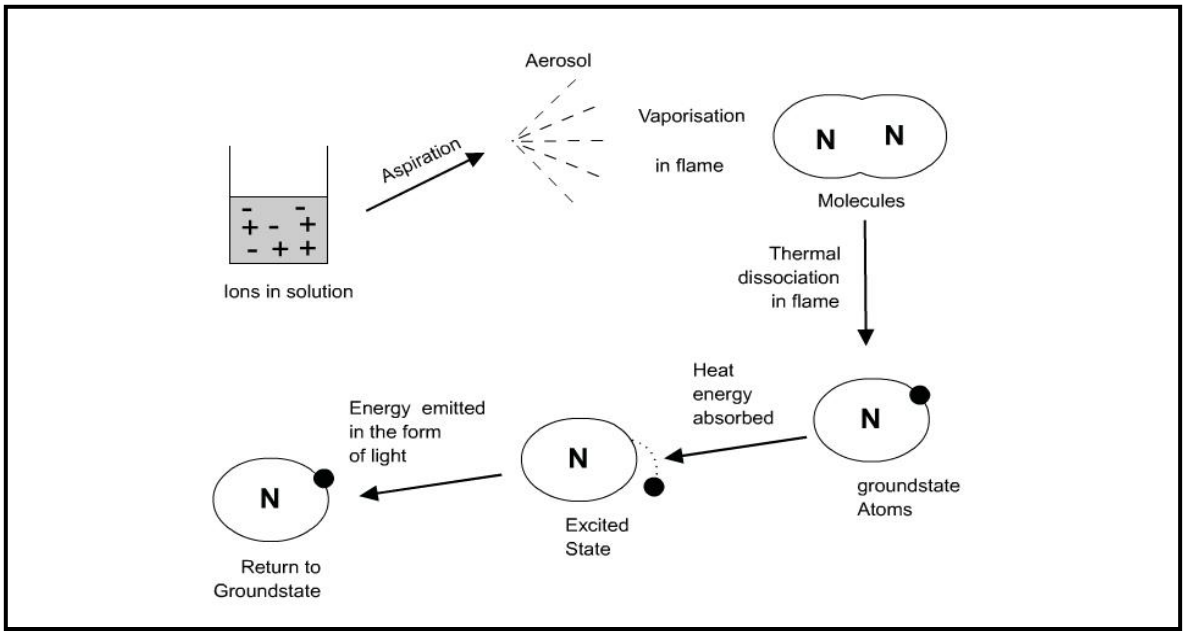
1- The solvent is first evaporated leaving fine divided solid particles.

2- This solid particles move towards the flame, where the gaseous atoms and ions are Produced .

3-The ions absorb the energy from the flame and excited to high energy levels.

4-When the atoms return to the ground state radiation of the characteristic element is emitted.

5- The intensity of emitted light is related to the concentration of the element.



Events occurring in the flame:

The various processes in the flame are :

1- **Desolvation** 2- **Vaporization** 3- **Atomization**

4-Excitation 5-Emission process

Applications of Flame photometer:

1- **In agriculture** : the fertilizer requirement of the soil is analyzed by flame test analysis of the soil.

2- **In clinical field** : Determined of Na and K ions in body fluids, muscles and heart.

3-**Analysis** of soft drinks, fruit juices and alcoholic beverages .

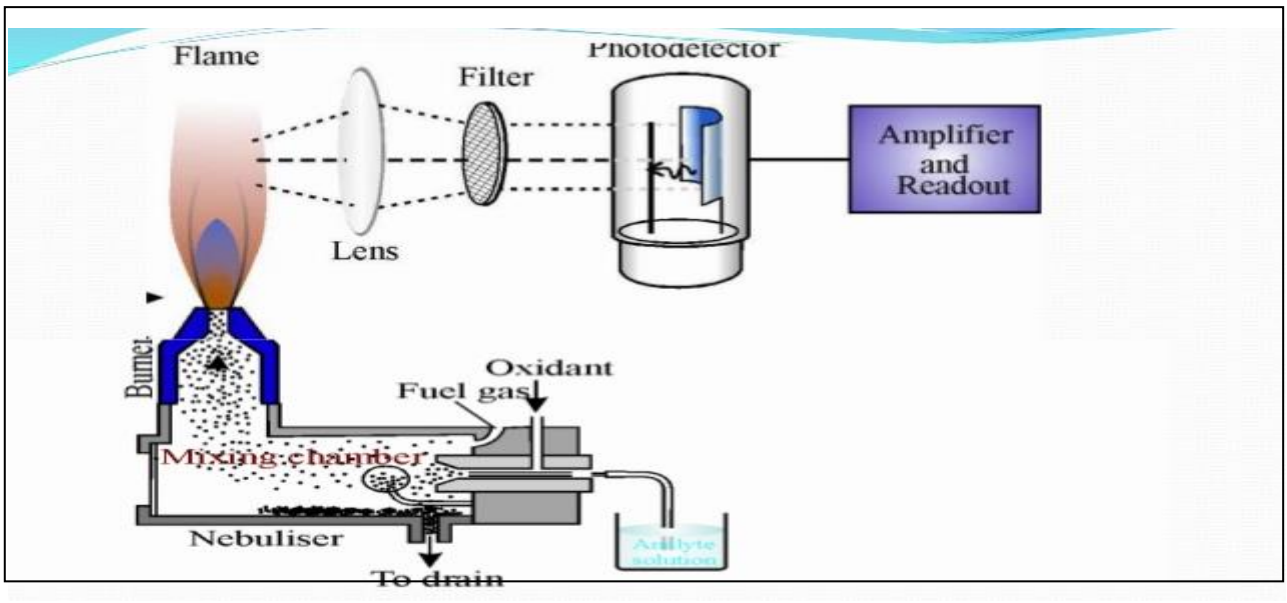
The flame emissions of the alkali and alkaline earth metals in terms of the emission wavelength and the characteristic color produced by each element is shown below :

Elements	Emitted wavelength range (nm)	Observed colour of the flame
Potassium (K)	766	Violet
Lithium (Li)	670	Red
Calcium (Ca)	622	Orange
Sodium (Na)	589	Yellow
Barium (Ba)	554	Lime green

Maintenance

1. Remove the atomizer from the instrument and flush water through it.
2. Clean the metal capillary tube with thin wire to remove fibrin, dried serum, or plasma. Flush with water again.

3. If there is a built-in diluting pump, check the condition of the pump tubes and replace if necessary. Check that the dilution is correct (approximately) by preparing a calibrator, appropriately diluted using volumetric glassware, and comparing it with the dilution prepared by the pump.



Various component of a flame

flame photometer