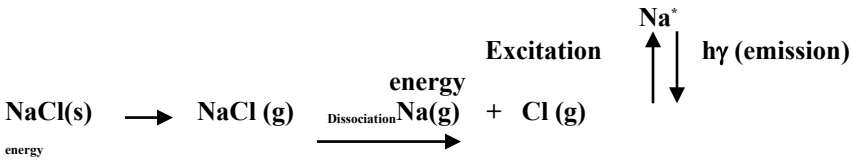
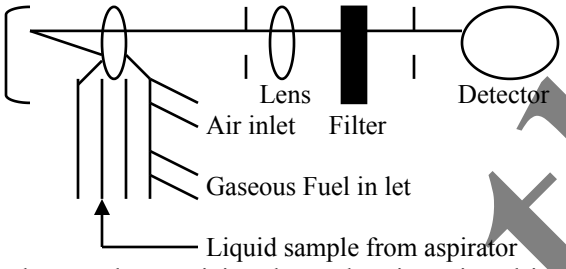
Flame Photometric estimation of Sodium and Potassium in the given sample of Water

PRINCIPLE: Flame photometry is an atomic emission technique used for detection of alkali metals. It works on the basis that if a solution containing metallic salts is aspirated into a flame, a vapour, which contains metallic atoms, will be formed. These metallic atoms are then excited from ground state (E_1) to higher energy state En where n=2,3,4,7, by making use of thermal energy of flame. From higher energy states these atoms will return to the ground state by emitting radiations ($E_n - E_1 = h\gamma$ where n=2,3,4……7), which are the characteristic of each element.



Flame photometer correlates the emitted radiations with the concentration of these elements. It is simple and rapid method for the elements that can be easily excited (Sodium and other alkali metals)

A flame photometer is composed of the pressure regulator and flow meter for fuel gases an automiser, burner, optical system, photosensitive detector and output recorder. A filter of the element whose concentration is to be determined is inserted between the flame and the detector. Propane gas is used as fuel and air or oxygen is used as oxidant. Combination of these two will give a temperature of 1900^{0}C, which is required for the experiment. The whole analysis depends on the flow rate of the fuel oxidant, the rate of introduction of the sample and droplet size.



The sample containing the analyte is aspirated into the flame through automiser. Radiation from resulting flame is collected by the lens and allowed to pass through an optical filter, which permits only the radiation characteristic of the element under investigation to pass through the filter and photocell. The output from the photocell is displayed digitally on the flame photometer.

Procedure for determination of sodium: Transfer 5, 10, 15, 20 and 25 cm^3 of standard sodium solution into different 25-cm3 volumetric flasks from a burette. Make up all the solutions using distilled water. Stopper the flasks and shake well to get uniform concentration. To the given unknown solution or sample of water also, add distilled water and shake well. Switch on the instrument, turn the gas supply on and light the gas at the burner. Adjust the air supply from the compressor to 10 lbs/sq inch using pressure regulator knob. Place the sodium filter (589nm) in position. Now dip the capillary tube in a cell containing distilled water. The stream of air and automised as a fine mist draws up the liquid. Regulate the gas supply so that the colour of the flame completely turns to blue. Adjust the flame photometer to zero by means of zero control knob. Now feed the 100 ppm sodium solution and adjust the reading to hundred. Repeat the process to confirm the accuracy of the calibration.

Feed the various sodium solutions prepared through the flame by spraying with automiser one by one including the unknown solution. Note down the flame photometer reading. Plot a graph of flame photometer readings against concentrations of the solution to form the calibration curve. Using the curve obtained find out the volume of the unknown solution containing sodium ions .and calculate the amount of sodium ions in it.

For estimation of potassium repeat the entire experiment with the given potassium chloride solution and sample of water.

Experiment No:

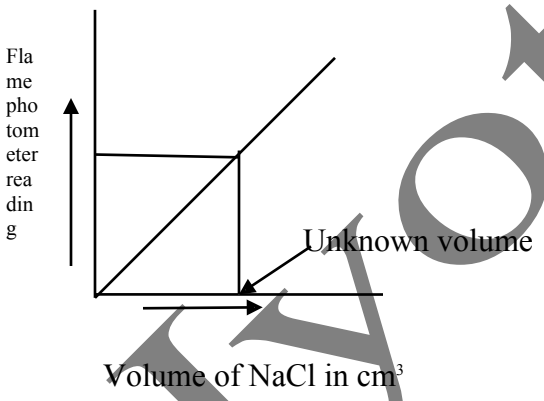
Observation and Calculations

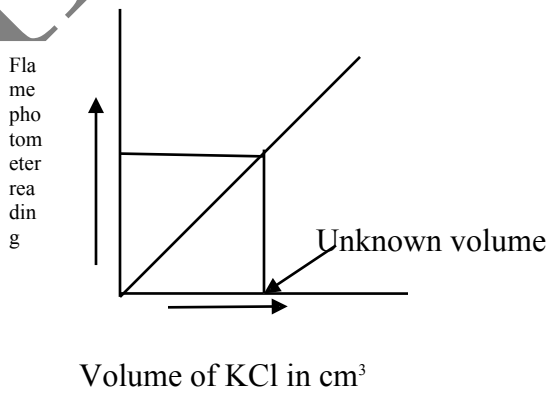
Weight of sodium chloride present in 100cm^3 of its solution= (W) g
Flame photometerreading

Weight of sodium in 1cm^3 of the solution = $\frac{W \times 23}{100 \times 58.5}$ = ---------- (X) g

Molecular weight of Sodium chloride= 58.5, atomic weight of Sodium=23
Molecular weight of Potassium chloride= 58.5, atomic weight of Potassium=23

Serial number	Volume of NaCl solution	Weight of sodium	Flame photometer reading	Weight of sodium	Flame photometer reading
1	10 cm^3				
2	20 cm^3				
3	30cm^3				
4	40cm^3				
5	50cm^3				
6	Test solution				





From the graph unknown volume of Sodium test solution is = cm^3

From the graph unknown volume of Potassium test solution is = cm^3

REPORT: Amount of sodium in unknown volume of test solution is= g

Amount of Potassium in unknown volume of test solution is= g