## INSTRUCTION LEAFLET FOR UNIQUE CHEMICAL SLIDE RULE:

The Unique Chemical Slide Rule is designed to facilitate volumetric analytical calculations. Scale C is marked with gauge points opposite the equivalent weights of chemical compounds. Pipette volumes are underlined on scale B. The rule also contains the International Table of Atomic Weights arranged in alphabetical order of their chemical symbols for ready reference, while on the reverse face the Periodic Table of the Elements is conveniently set out.

## Volumetric Analysis:

A normal solution is one which containes the gramme equivalent weight of the dissolved substance in one litre of solution. Usually a litre does not contain the exact equivalent weight of the dissolved substance in which case the solution may be 0.5N (where half the equivalent weight is dissolved), 0.25N, 0.12N etc.

In the case of a primary standard the normality is calculated from the weight taken. In this case:

$$\text{Normality} = \frac{\text{weight of substance (grammes) per litre of solution}}{\text{equivalent weight of substance (grammes)}}$$

e.g. sodium carbonate has an equivalent weight of 53. If 5.3 grammes are taken and made up to a litre, the solution is 0.1N ( or $\frac{N}{10}$ ).

A solution of a primary standard may be made up by dissolving a definite weight of the substance in distilled water and making it up to a litre. The normality of this solution is then calculated as above.

By titration with a suitable primary standard a given solution may be standardised, that is, its normality may be determined. This solution may then be used to determine the strength of other solutions.

If the normality of a pipette solution is denoted by Np
"        "        " " burette      "      "      "      " Nb
" volume " " pipette      "      "      "      " Vp
"        "        " " burette      "      "      "      " Vb

then:

$$NbVb = NpVp$$

$$\frac{Nb}{Vp} = \frac{Np}{Vb}$$

## Calculation of Normality of Pipette Solution using Slide Rule.
## (Standard solution in burette)

1) Place pipette volume on scale B opposite normality of standard solution on scale A.

2) Read off normality of pipette solution on scale A opposite volume of burette solution required, on scale B.

## Numerical Example:

It is required to find the normality of a given solution of NaOH.

## Procedure:

25 ml of the NaOH solution are placed in a conical flask and titrated with 0.12 N-HC1 solution using a suitable indicator. 22.5 ml to HC1 are required for neutralisation.

## Calculation of result, using slide rule:

(1) Place figure 25 on scale B opposite figure 12 on scale A and read off normality of NaOH solution on scale A opposite figure 22.5 on scale B. This gives normality of NaOH solution as 0.108. It will facilitate calculations if the rule is always adjusted as shown in the sketch. If this arrangement is followed when any three quantities are known, the fourth may be readily obtained. For convenience, pipette volumes are underlined on scale B. It should be noted however that generally the pipette volumes will occur on the left hand side of scale B, e.g. pipette volume 15 millimitres would be represented by figures 1.5 on scale and not 15. The underlining of pipette volumes is omitted on the left-hand side of the scale to enhance its clarity.



| A | Burette Normality | Pipette Normality |
| B | Pipette Volume | Burette Volume |
| C | | |
| D | | |
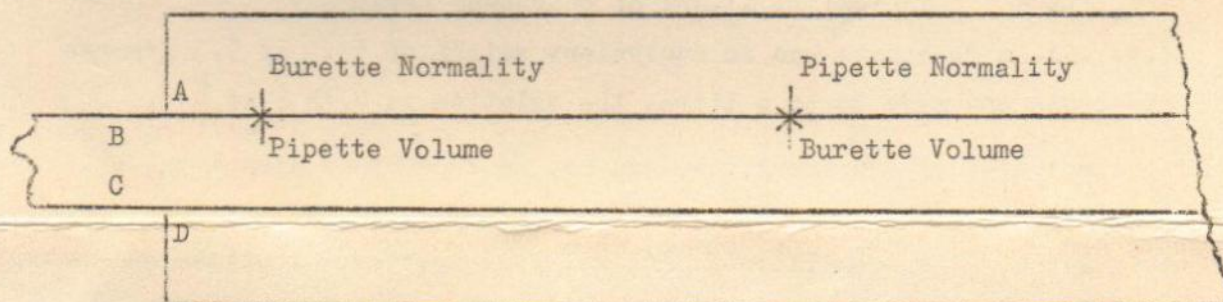
## Calculation of strength of a solution in grammes per litre, when its normality is known, by means of slide rule.

The strength of a solution in grammes per litre is governed by the relationship:

gramme equivalent weight x normality = strength in grammes per litre.

1) Place figure 1 on scale C opposite the normality of the solution on scale D.

2) Read off strength of given solution in grammes per litre on scale D opposite the gauge point representing the gramme equivalent weight of the given substance on scale C.

## Numerical Example:

It is required to find the strength of a 0.108N solution of NaOH in grammes per litre.

## Procedure:

Place figure 1 on scale C opposite normality of given solution (0.108) on scale D and read off strength of NaOH solution on scale D opposite gramme equivalent weight of NaoH (40.01) on scale C. This gives strength of NaOH solution as 4.32 grammes per litre.