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Preparation & Standardization of 0.1 N HCl Solution

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A reagent bottle of concentrated HCl has the following informations on it's lable:

Molar mass = 36.5 g.mol⁻

sp.gr = 1.18

37% HCl (*w/w*)

How could you prepare: 1L of 0.1 N HCl solution from this conc. HCl ?

1- Calculation of the Normality of the concentrated HCl:

$$N_{HCl} = \frac{\text{Specific gravity} * \%\,(w/w) * 1000}{\text{Eq.mass of HCl}}$$

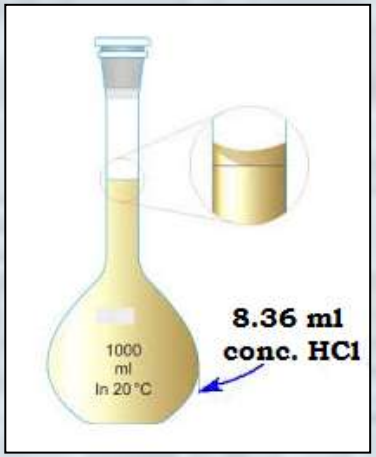
$$N_{HCl} = 11.961\ N$$

2- Calculation of the volume of 11.961N HCl that should be taken to prepare 1L of 0.1N HCl soln.

$$N_1 * V_{1\ \text{concentrated}} = N_2 * V_{2\ \text{diluted}}$$

$$11.961 * V_1 = 0.1 * 1000$$

V_1 = 8.36 ml of concentrated HCl should be taken and diluted to the mark with distilled water in a 1000 ml volumetric flask.



Standardization of the prepared HCl solution

If the chemical is available in a pure state, e.g. anhydrous Na_2CO_3, weigh out an exact quantity, dissolve it in water up to volume.

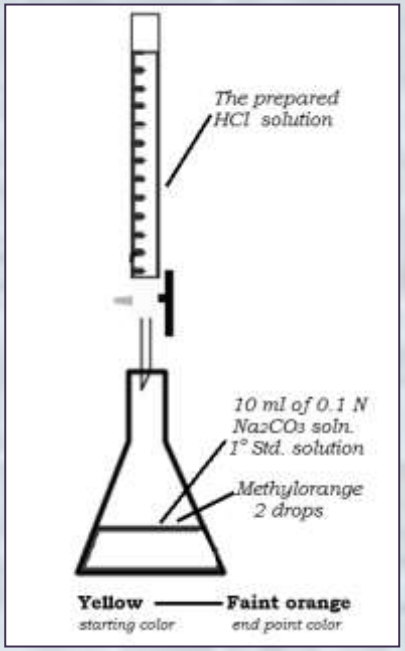
How could you prepare 0.5 L of 0.1 N Na_2CO_3? Knowing that, atomic masses of Na = 23, O = 16 and C = 12.

Substances which are not usually obtained in a pure state , e.g. mineral acids and caustic alkali, are prepared as approximate solutions and standardized against a known pure std., e.g. Na_2CO_3 as a primary std. soln.

Procedure:

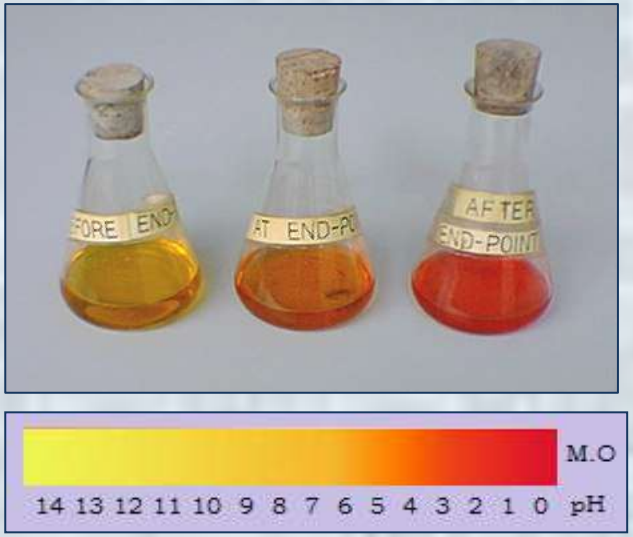
1- Fill the burette with the prepared HCl soln.

2- Transfer 10 ml of exactly 0.1 N Na_2CO_3 solution (1° - standard) in to a conical flask by using a 10 ml bulb pipette.



3- Add 2 drops of methyl orange as indicator. Yellow color is obtained.

4- Titrate with HCl soln. drop by drop from the burette in to the conical flask until a faint orange color is obtained.



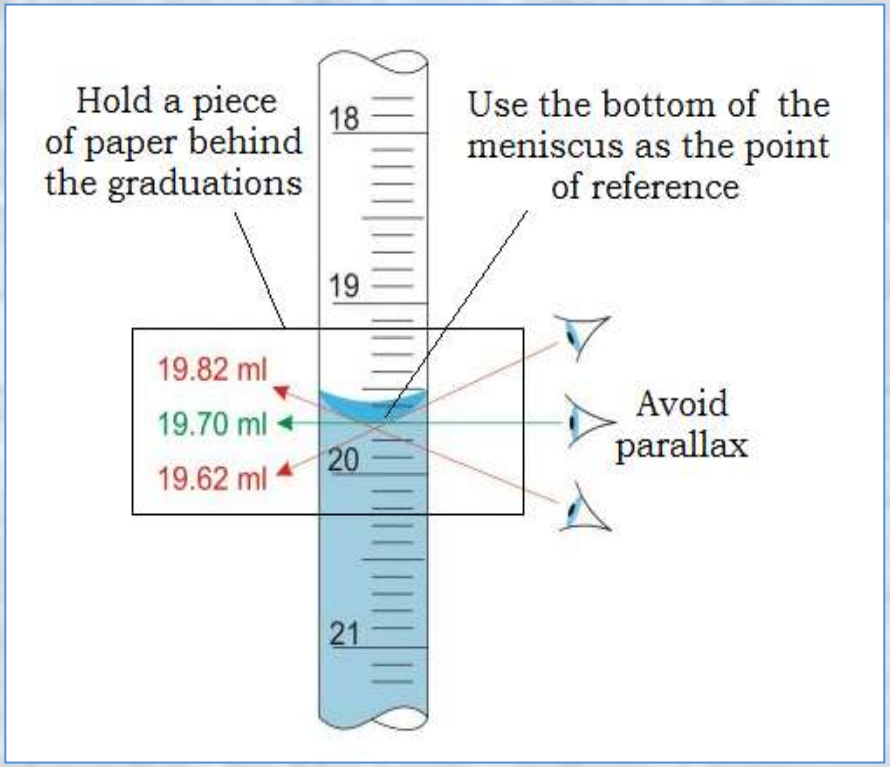
5- The exact normality can be calculated from the following equation,

$$Na_2CO_3 + 2\,HCl \longrightarrow 2\,NaCl + H_2O + CO_2$$

$$N_1 * V_{1\,Na_2CO_3} = N_2 * V_{2\,HCl}$$

Directions for reading a burette:

1- Hold an opaque card or a piece of paper behind the gradua - tions.



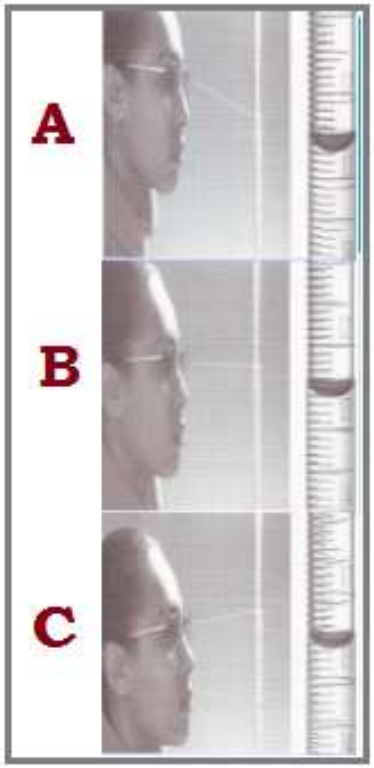
2- Avoiding a parallax . In reading volumes, the eye must be at the level of the liq- uid surface to avoid an error due to parallax.

3- It is common practice to use the bottom of the meniscus as the point of reference in calibrating and using volumetric equipment.

What is the reading of this burette ?

A. 21.20 ml
B. 21.30 ml
C. 22.60 ml
D. 22.70 ml

Encircle the letter that represents the right position in reading a burette .



Post Lab Exercise:

A bottle of concentrated HCl has the following informations on it's label: molar mass is 36.5 g/mol, sp.gr. 1.18 and 40% HCl (*w/w*) .

a- What is the normality of the HCl in the bottle?

b- How could you prepare 2 liters of about 0.1 N HCl solution from the concentrated reagent?