Prepare $\frac{M}{10}$ Oxalic Acid Solution

Theory

The molecular mass of oxalic acid is 126. In order to prepare $\frac{M}{10}$ oxalic acid solution, 12.6 g of oxalic acid should be dissolved per litre of solution. Alternatively, $\frac{12.6}{4}$ = 3.15 g of oxalic acid crystals should be dissolved in water and the solution be made exactly 250 ml.

Apparatus

Weight box, chemical balance, watch glass, 250 ml beaker, glass rod, 250 ml measuring flask, wash bottle.

Procedure

1. Take a watch glass, wash it with distilled water and then dry it.
2. Weigh the clean and dried watch glass accurately and record its weight in the note-book.
3. Weigh 2.650 g sodium carbonate on the watch glass accurately and record this weight in the note-book.
4. Transfer gently and carefully sodium carbonate from the watch glass into a clean and dry measuring flask using a funnel. Wash the watch glass with distilled water with the help of a wash bottle to transfer the particles sticking to it into funnel [Fig. 8.7(a)]. The volume of distilled water for this purpose should not be more than 50 ml.
5. Wash funnel several times with distilled water by using a wash bottle to transfer the sticking particles into the measuring particles into the measuring flask. While washing the funnel, add water in small amounts. The volume of distilled water used for this purpose should not be more than 50 mL.
6. Finally wash the funnel thoroughly with distilled water with the help of a wash bottle to transfer the solution sticking to the funnel into the measuring flask [Fig. 8.7(6)].
7. Swirl the measuring flask till solid sodium carbonate dissolves.
8. Add enough distilled water to the measuring flask carefully upto just below the etched mark on it, with the help of wash bottle.
9. Add the last few mL of distilled water dropurse until the lower level of the meniscus just touches the mark on the measuring flask [Fig. 8.7(c)].
10. Stopper the measuring flask and shake gently to make the solution uniform throughout. Label it as $\frac{M}{10}$ oxalic acid solution.

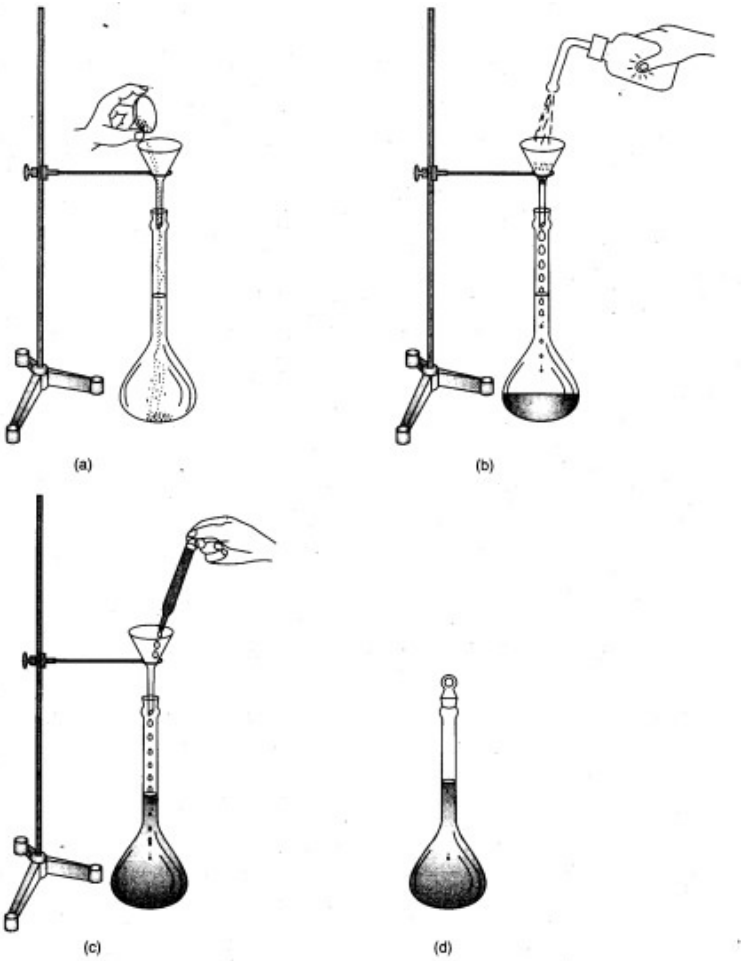

Fig. 8.7. Preparation of a standard solution.
(*a*) Transferring sodium carbonate
(*b*) Addition of water
(*c*) Adding last few mL drop wise
(*d*) Standard solution of sodium carbonate.

Preparation Of An Acid Solution Of Desireonormality Or Molarity From A Concentrated One

Acids like hydrochloric acid (HCl), sulphuric acid (H_2SO_4), nitric acid (HNO_3) and acetic acid (CH_3COOH) which are commonly used in laboratory are originally available as concentrated

aqueous solutions. The solutions required in laboratory are prepared by diluting the concentrated solutions with water. Knowing the concentration of the concentrated acid we can calculate how much volume of this acid must be diluted to prepare a definite volume of dilute acid of certain required concentration. The approximate concentrations of some acids as commercially available are given in Table 8.2.

Table 8.2. Approximate Concentrations of Some Acids

Concentrated Acid	Approximate Normality (N)	Approximate Molarity (M)
Hydrochloric acid (HCl)	12	12
Sulphuric acid (H_2SO_4)	36	18
Nitric acid (HNO_3)	16	16
Glacial acetic acid (CH_3COOH)	17	17

Calculation of the Volumes of Concentrated Acids Required for Preparing Dilute Acids of Different Molarities

Knowing the molarity of concentrated acid, it is possible to calculate the volume of this acid required for preparing a definite volume of dilute solution of known molarity. This can be done with the help of molarity equation :

$M_1V_1 = M_2V_2$

where, M_1 is the molarity of concentrated acid,
V_1 is the volume of concentrated acid,
M_2 is the molarity of dilute acid,
V_2 is the volume of dilute acid.
For example, let us calculate the volume of concentrated sulphuric acid (molarity = 18M) required to prepare 250 ml of2M acid.
According to molarity equation :

$M_1V_1 = M_2V_2$

Now, molarity of concentrated acid (M_1) = 18 M
volume of concentrated acid required (V_1) = ? molarity of dilute acid to be prepared (M_2) = 2M
volume of dilute acid to be prepared (V_2) = 250 ml.
Substituting these values in molarity equation, we get

$18 \times V_1 = 2 \times 250$

$$V_1 = \frac{2 \times 250}{18} = 27.8 \ ml$$

Therefore, 27.8 ml of 18M H_2SO_4 must be diluted with water to make the volume 250 ml. The resulting solution will be 2M H_2SO_4.

Calculation of the Volumes of Concentrated Acids Required for Preparing Dilute Acids of Different Normalities

Knowing the normality of concentrated acid, we can calculate the volume of this acid required to prepare a definite volume of dilute solution of known normality. This is done with the help of normality equation :

$N_1V_1 = N_2V_2$

where, N_1 is the normality of concentrated acid,
V_1 is the volume of concentrated acid,
N_2 is the normality of dilute acid,
V_2 is the volume of dilute acid.
For example, let us calculate the volume of concentrated hydrochloric acid (normality = 12 N) required to prepare 250 ml of 4N acid.
According to normality equation :

$N_1V_1 = N_2V_2$

Now, – normality of concentrated acid (N_1) = 12 N
volume of concentrated acid required (V_1) = ?
normality of dilute acid to be prepared = N_2 = 4N
volume of dilute acid to be prepared (V_2) = 250 ml.
Substituting these values in normality equation

12 x V_1 = 4 x 250

$$V_1 = \frac{4 \times 250}{12} = 83.3 \ ml$$

Therefore 83.3 ml of concentrated hydrochloric acid must be diluted with water to make 250 ml of 4 N HCl.