# EXPERIMENT-2

**To prepare dilute solutions of given concentrations of hydrochloric acid, sulphuric acid and nitric acid from their stock solution.**

## 2.1 OBJECTIVES

After performing this experiment, you should be able to :

- *explain the meaning of the terms saturated solution, standard solution and dilution.;*
- *use proper glassware to prepare solutions of different dilutions; and*
- *prepare solutions of given concentrations by dilution.*

## 2.2 WHAT YOU SHOULD KNOW

The most commonly used acids in laboratories are hydrochloric, sulphuric and nitric acids. The concentration of these commercially available acids are 12M, 18M and 16M respectively. But except a few cases, we need these acids in lower concentrations. The acids in their lower concentrations can be obtained by dilution of concentrated acids.

To make a solution of required concentration, we use the standard relation

$$M_1 V_1 = M_2 V_2$$

Where, $M_1$ = molarity of concentrated acid. and $V_1$ = Volume of concentrated acid. $M_2$ = Molarity of acid required, $V_2$ = Volume of acid required.

## 2.3 MATERIALS REQUIRED

| (1) Apparatus | (2) Chemicals |
| --- | --- |
| Standard flask (100 ML), | Hydrochloric acid (12M), Sulphuric |
| Funnel, Glass rod, Wash bottle, | acid (18M), Nitric acid (16M) and |
| Pipette and burette | Distilled water. |

## 2.4 HOW TO PERFORM THE EXPERIMENT

You are required to prepare

1.  100 mL of 1 molar solution of hydrochloric acid;
2.  100 mL of 0.5 molar solution of sulphuric acid and
3.  100 mL of 2 molar solution of nitric acid from the commercially available acids.

For preparing 100 ml of 1 molar hydrochloric acid we use the equation, $M_1 V_1 = M_2 V_2$. We first calculate the volume of concentrated acid and water required.

$M_1$ = molarity of concentrated acid = 12M

$V_1$ = Volume of concentrated acid = ?

$M_2$ = Molarity of acid required = 1M

$V_2$ = Volume of acid required = 100 Ml

$$V_1 = \frac{M_2 V_2}{M_1} \qquad = \frac{1 \times 100}{12} \qquad = 8.33 \text{ mL} \approx 8.3 \text{ mL}$$

Take about 50 ml of distilled water in a 100 ml standard flask. Transfer 8.3 ml of concentrated acid from a burette to the standard flask. Shake the mixture gently. Add water to make up the volume of acid in the standard flask upto the mark. Close the flask with glass-stopper. Mix the solution by tilting the flask upside down.

For the preparation of dilute solution of sulphuric and nitric acids, follow the same procedure as given above.

## 2.5 PRECAUTIONS

(i)   The acids should be used with utmost care.
(ii)  All the three acids are corrosive to skin.
(iii) Add concentrated acids slowly to water with constant stirring.

## 2.6 OBSERVATIONS

(i)   Volume of 12 M HCl taken for preparing 1M HCl, (100ml solution = 8.3 ml)
(ii)  Volume of 18M $H_2SO_2$ taken for preparing 0.5 M, $H_2SO_4$ (100 ml solution) = ......
(iii) Volume of 16 M $HNO_3$ taken for preparing 2M $HNO_3$, (100 ml solution) = ..............)

## 2.7 CONCLUSION

The solution of required concentrations may be prepared from their concentrated by the dilution method.

## 2.8 CHECK YOUR UNDERSTANDING

1. *What are the components of a solution?*

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2. *What do you understand by dilution?*

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3. *What is molarity?*

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4. *Calculate the volume of 8M HCl required to prepare 250 ml of 2M hydrochloric acid.*

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## 2.9 NOTE FOR THE TEACHER

All the three concentrated acids are highly corrosive. One should be careful while students handle these acids. The students need help in transferring acids from the commercial bottles into regent bottles. The students should not be allowed to take acids from the commercial bottles.

## 2.10 CHECK YOUR ANSWERS

Ans.1 There are two components in a solution (a) the solvent (b) solute.

Ans.2 Dilution is a physical process involving addition of a solvent to the con centrated solution.

Ans.3 Molarity is the number of moles of solute present in 1 litre of the solution.

Ans.4 $M_1 V_1 = M_2 V_2$

$$V_1 = \frac{M_2 V_2}{M_1}$$

$$V_1 = \frac{2 \times 250}{8} = 62.5mL$$