

Volumetric Methods of Analysis

Definitions and terms :

A volumetric method is one in which the analysis is completed by measuring the volume of a solution of known concentration needed to react completely with the substance being determined.

A titration is a process for determining the amount of a substance by measurement of the quantity of a reagent (the titrant) required to react completely with that substance.

A standard solution is a reagent of exactly known composition used in a titration.

A primary standard is a highly purified chemical compound.

Standardization :

Is a process where by the concentration of a standard solution is determined by titrating with a primary standard solution.

Requirements of a primary standard :

1. It must be of the highest purity.
2. It should be stable and not attacked by atmosphere.
3. It should not be hygroscopic.
4. It should be available and not too expensive.
5. It should have high equivalent to minimize weighing errors.

The **equivalence point** : is the point where the amount of standard solution added is chemically equivalent to the substance with which it reacts.

The **end point** of a titration :-

Is the point at which physical changes associated with the equivalence point can be observed.

An **indicator** : is a chemical compound that exhibits a change in color as a result of concentration changes occurring near the equivalence point.

Concentration units :

Normality : Is the number of equivalent weights contained in one liter of solution.

Molarity : Is the number of gram molecular weights or the number of moles of solute in one liter of solution.

Formality : Is the number of gram formula weights per liter of solution.

Volumetric methods can be divided into four types :

1. Acid–base titrations.
2. Oxidation–reduction titrations.
3. Complexometric titrations.
4. Precipitation titrations.



HAND INJURY



MOVING PARTS



COLD



DO NOT ENTER



HOT



STEP DOWN



SOCIAL
DISTANCING



STRONG
MAGNETIC FIELD



OVERHEAD
CRANE



STEPS UP



HIGH
TEMPERATURE



CORROSION



WATER SKIING
AREA



SURFBOARD
AREA



HARD HAT
AREA





UNDER
CONSTRUCTION



HIGH
PRESSURE



HOT SURFACE

						
Flammable materials	Explosion risk	Toxic	Corrosive	Danger overhead crane	Fork lift trucks	High voltage
						
General Warning	Laser Radiation	Biohazard	Oxidising	Hot surface	Danger of entrapment	Danger of death
						
Irritant	Slippery floor	Watch your step	Cutting	High temperatures	Glass hazard	Danger of suffocation
						
Gas bottles	Watch for falling objects	Electricity	Danger for cutter	Entrapment hazard	Battery hazard	Rotating parts
						
Low temperature	Strong magnetic field	Optical radiation	Non ionizing radiation	Radiation	Hazardous to the Environment	Danger of harming your hands



Flammable



Poison



Radioactive



**Non-ionizing
Radiation**



Biohazard



High Voltage



Use Gas Mask



Risk of Explosion

HAZARD SYMBOLS



Compressed Gas

Explosion Danger - Gas under pressure.
May explode if heated, punctured or dropped.



Health Hazard

May cause allergic reaction, cancer, birth defects, damage organs or harm fertility or unborn children.



Flammable Material

Potential Fire Hazard.
Catches fire spontaneously if exposed to air or water or when exposed to heat sparks or flames or as a result of friction.



Harmful or Fatal

Acute Toxicity.
Potentially fatal poisonous substance if inhaled, swallowed, or through skin contact, even in small amounts.



Oxidizing

Fire and/or Explosion Risk in the presence of flammable or combustible material.
May cause fire or enhance the combustion of other materials



Harmful

to skin, eyes or respiratory system. Fatal in large quantities. Hazardous to the Ozone Layer.



Explosion Hazard

Risk of explosion due to fire, shock, friction, heat or puncture



Harmful to the Environment

and/or aquatic life with long-lasting effects.



Corrosive

Causes severe Skin Burns & Eye Damage.
Is corrosive to metal.



Biohazardous Infectious Materials

For organisms or toxins that can cause serious disease in people or animals resulting in illness or death.



Biological Hazard



Ionizing Radiation



Poison



Generic Caution



Non-ionizing Radiation



Carcinogen



High Voltage



Laser Hazard



Chemical Weapon



High Voltage Overhead



Electrical Hazard



Explosive



Oxidizer



Flammable



Corrosive



Block magnet



Suspended load



Forklift Trucks



Tripping Hazard



Falling Hazard



Tsunami Hazard



Loading Battery



Entanglement hazard



Risk of crushing



Optical Radiation



Magnetic field



Hot Surface



Extreme Cold



Compressed Gas



Slippery Floor



Pinch Point



Dangerous for environment



Slippery Road



Generic caution



Bear Zone



Explosive atmosphere

Laboratory Equipment



More than 100 lab equipment symbols...

Laboratory Equipment



Solid



Particle



Solid



Diamond



Dry Ice



Ferric Sulfate



Graphite



Sodium Hydroxide



Copper Sheet



Cotton



Stopcock



Stopcock



Wood Block



Balance



Weight



Wood Block



Three-neck... Bottle



Two Mouth Pear-shap...



Pear-shap... Flask



Pear-shap... Flask



Round-bo... Flask



Pear-shap... Fractional



Measuring Bottle



Iodin flask



Iodin flask



Drying Tube



U Tube



U Tube



Kjeldahl Distilling



Distilling Head



Triangle Thiele Tube



Dryer



Culture Dish



Flat-bottom Evaporating



Crucible



Crucible Tong



Medicine Spoon



Tweezer



Asbestosed Wire Gauze



Glass Sheet