TABLES FOR SIMPLE QUALITATIVE ANALYSIS FOR LABORATORY USE

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Trieste

TABLES

FOR

SIMPLE QUALITATIVE ANALYSIS

FOR

LABORATORY USE.

The following tables are intended for practice in elementary chemical analysis, and to apply only to simple salts, consisting of one base and one acid, mostly soluble in water, or of the acids and bases uncombined. Many bases (oxides) are insoluble in water, but can be readily dissolved in nitric or hydrochloric acid; some few acids are insoluble in water, but can be dissolved in potassium hydrate. Some salts are decomposed by water, but solutions can be obtained by adding a little nitric acid, and heating; as little acid should be used as possible. Many salts which are insoluble in water, such as many carbonates, phosphates, &c., may be dissolved in the same way, using either nitric or hydrochloric acid, and the solutions can in most cases be examined in the ordinary manner.

In examining a salt, about one-third should be dissolved in a small quantity of water, and the test tube containing the solution placed always in one particular part of the stand, say the left hand upper hole. A small part of this can be diluted with two or three parts of water in another test tube, and the experiments proceeded with. The *same* solution can be used for the first three groups of Table I. Thus if hydrochloric acid produces no change, pass to Group II., adding three times the bulk of hydrosulphuric acid; if this produces no change, pass to Group III., adding first twice the bulk (of the original solution) of ammonium chloride, then ammonia until it smells strongly after shaking, and, lastly, a *small* quantity of ammonium sulphide, whether any change has been produced by the ammonia or not.

The same solution may be used for Group IV. if the salt does not belong to either of the first three, but it is preferable now to employ some of the original solution. It may happen that no base whatever is found, as would be the case in the examination of acids, and *vice versa*, no acid if the substance is a base. In the case of no metal being found, the base is in all probability hydrogen, which takes the place of true metals in salts, producing acids. When in the investigation for acids none have been found, the compound under examination is probably a hydrate, *i.e.* a combination of an oxide with water. Arsenic is conveniently ranked under both heads.

It is best to commence with the detection of the base, as this knowledge obviates the necessity of searching for many acids, if the substance examined has been found to be soluble in water. Thus lead in an easily soluble salt would exclude hydrochloric, hydriodic, hydrobromic, carbonic, phosphoric, sulphuric acids, &c., &c.

Barium would exclude sulphuric, carbonic, phosphoric acids, &c., &c., but not hydrochloric, hydriodic, or hydrobromic acids, &c.

A knowledge of the solubilities of salts will greatly aid the investigation.

TABLE I.—BASES.

GROUP I.

Hydrochloric acid produces a white precipitate, insoluble in excess of the acid. The solution employed should not be very concentrated.

Silver
Lead
Mercury, in mercurous salts.

As lead chloride is somewhat soluble in water, this metal may escape detection in dilute solutions, but will be found in the next Group.

Tartar emetic will give a white precipitate soluble in excess of acid. Pass to Group II.

Tungstates will give a white precipitate with hydrochloric acid, insoluble in excess, turning blue on the addition of metallic zinc, yellow by boiling with nitric acid, and soluble in ammonia after washing.

GROUP II.

Hydrosulphuric acid produces a precipitate.

A white milkiness or opalescence may be caused by ferric oxide, chromic acid and some other bodies, such as chlorine, *&c.*

DIVISION I.

Soluble in ammonium sulphide.

Platinum—black
Gold—black
Tin in stannic salts—pale yellow
Arsenic—yellow
Antimony—orange

DIVISION II.

Soluble in the sulphide when boiled with sulphur.

Tin in stannous salts—brown

DIVISION III.

Insoluble in the sulphide.

Lead—black
Copper—black
Mercury—black
Bismuth—brown-black
Cadmium—yellow

GROUP III.

After addition of ammonium chloride and excess of ammonia, a precipitate is produced by ammonium sulphide.

DIVISION I.

Iron, Cobalt, Nickel } black

DIVISION II.

Manganese—buff
Zinc—white
Aluminum—white
Chromium—greenish

If the salt of manganese is not pure, the colour of the precipitate may be not buff but dirty grey: the same with zinc and aluminum.

The aluminum precipitate (oxide) is often scarcely visible in dilute solutions until after standing some time.

The chromium precipitate (oxide) is often greyish.

GROUP IV.

Original solution gives white precipitate with sodium carbonate.

Barium
Strontium
Calcium
Magnesium

GROUP V.

Not precipitated by preceding re-agents.

Potassium
Sodium
Ammonium

GROUP I.

The white precipitate is allowed to settle, the liquid poured off, washed with water by decantation, and ammonia added.

Precipitate dissolves.	Turns black or grey.	Remains almost unchanged.
Silver.	Mercury.	Lead.
Original solution gives a crimson precipitate with potassium chromate. Solution of ferrous sulphate produces a greyish precipitate of metallic silver.	Solutions produce a grey stain on copper or gold, which volatilises on heating. The salts are volatile. The white precipitate formed by hydrochloric acid, when boiled with excess of the same, turns greyish.	The original white precipitate formed by hydrochloric acid is soluble in a large quantity of boiling water. To try this, most of the precipitate should be poured off, and the residue boiled with much water. The original solution gives a yellow precipitate with potassium chromate, soluble in large excess of potassium hydrate. Only a small quantity of the yellow precipitate should be employed.