## COEI-3-REASOL List of reagents and titrated solutions ${ }^{[1]}$

## Mention(R) ${ }^{[2]}$

| Acetic | crystallisable acid 98-100\% |
| :---: | :---: |
|  | diluted acid ( $10 \% \mathrm{~m} / \mathrm{m}$ ) |
|  | neutral lead acetate (see Lead) |
|  | potassium acetate (see Potassium) |
|  | sodium acetate (see Sodium) |
|  | uranyl and magnesium acetate |
| Starch | Paste (aqueous solution at $5 \mathrm{~g} / \mathrm{l}$ ) |
| Ammonium | concentrated hydroxide solution (20\% $\mathrm{NH}_{3}, \mathrm{~d}(20 / 4)=0.92$ |
|  | diluted hydroxide solution ( 10 g concentrated solution/100 g) |
|  | Aqueous hydroxide solution about 5 M |
|  | chloride in solution at $20 \%(\mathrm{~m} / \mathrm{m})$ |
|  | citrate in solution |
|  | oxalate in solution at $4 \%(\mathrm{~m} / \mathrm{m})$ |
|  | persulphate in solution at $15 \%(\mathrm{~m} / \mathrm{m})$ |
| Aniline | reagent |


| Silver | Nitrate (99.5\%) |
| :---: | :---: |
|  | nitrate solutions at $5 \%(\mathrm{~m} / \mathrm{m})(\mathrm{R} 1)$ |
|  | Nitrate solution at 1\% (m/m) (R2) |
|  | ammonia nitrate solution |
| Barium | $\mathrm{BaCl}_{2} \cdot 2 \mathrm{H}_{2} \mathrm{O}$ solution at $10 \%(\mathrm{~m} / \mathrm{m})$ chloride |
| Bore | boric acid, $\mathrm{H}_{3} \mathrm{BO}_{3} 99 \%$ concentrated boric acid solution at $4 \% ~(m / v)$ |
| Bromine | $\operatorname{Br}_{2}(\mathrm{~d}(20 / 4)=3.12)$ bromine water |
| Bromophenol | tetrabromophenolsulfonephtaleine (blue) alcoholic solution (blue) |
| Bromothymol | dibromothymolsulfonephtaleine (blue) alcoholic solution (blue) |
| Bromocresol | tetrabromo-m-cresol-sulfonephtaleine (green) (green) alcoholic solution |
|  | methyl red and (green) in solution (mixed indicator) |
| Calcium | acetate aqueous solution at $25 \%(\mathrm{~m} / \mathrm{v}$ ) |
|  | chloride saturated solution |
|  | chloride solution at $20 \%(\mathrm{~m} / \mathrm{v}$ ) |
|  | hydroxide (milk of lime) |
|  | saturated sulphate solution |
| Mineralisation catalyser |  |


| Chloramine T | solution at $1 \%(\mathrm{~m} / \mathrm{v})$ |
| :---: | :---: |
| Chlorine | concentrated hydrochloric acid at 35\% (d(20/4)=1.19) <br> hydrochloric acid diluted at $30 \% ~(\mathrm{v} / \mathrm{v}$ ) hydrochloric acid diluted at $10 \%(\mathrm{~m} / \mathrm{m})$ hydrochloric acid diluted at $10 \%(\mathrm{v} / \mathrm{v})$ potassium dichromate (see Potassium) |
| Chrome | potassium dichromate (see Potassium) |
| Chromotropic acid | sodium salt sodium salt solution |
| Citric acid | Monohydrated 99\% aqueous solution at $21 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $20 \%(\mathrm{~m} / \mathrm{v})$ aqueous solution at $10 \%(\mathrm{~m} / \mathrm{v})$ aqueous solution at $5 \%(\mathrm{~m} / \mathrm{v})$ aqueous solution 0.003 M |
|  | hydrochloric solution solution adjusted to pH 3 |
| Cobalt | chloride CoCl 2.6 H 20 <br> aqueous solution at $5 \%(\mathrm{~m} / \mathrm{m})$ |
| Copper | sulphate CuSO4.5H2O <br> sulphate solution at 1 g of copper per litre |
|  | sulphate solution at 0.01 g of copper per litre copper sulphate ammonia solution (II) |
|  | alkaline copper reagent |
| Dichlorophenolindo phenol | sodium salt of 2,6-dichlooro-N-(4-hydroxyphenyl)-1,4benzoquinone monoimine dihydrate aqueous solution at 0.5 g per litre |
| Diphenylcarbazide | 1,5-diphenylcarbonodihydrazide at 0.5 g per litre of alcoholic solution at $95 \%$ vol. |


| Dithizone | $1,5-$ diphenylthiocarbazone <br> solution at 0.5 g/l in chloroform <br> extemporaneous preparation |
| :--- | :--- |
|  | iron sulphate (II) FeSO4.7H2O 99\% |
|  | iron sulphate (II) solution at 5\% (m/m) |
|  | iron sulphate (II) and ammonium <br> Fe(NH4)2(SO4)2.6H2O 98.5\% <br> iron sulphate (II) solution and ammonium at 10\% (m/m) <br> iron sulphate (III) Fe2(SO4)3.7H2O <br> solution at 0.01 g of iron (III) per litre |
| Formaldehyde | aqueous solution at 35\% (m/m) |
| Basic fuchsine | Mixture of rosaniline hydrochloride and <br> pararosaniline hydrochloride <br> Solution bleached by sulphur dioxide |
| Hydrazine | dihydrochloride aqueous solution |
| Hydrogen peroxide | concerntrated solution at 30\% (m/m) <br> (=110 volumes) <br> diluted solution 3\% (m/m) (10 vol.) |
| Iodine | $99.5 \%$ <br> iodine solution |
| Mercury | (see sodium) |
| Sodium indigo- <br> sulphonate | maged indicator <br> (see methyl red) <br> maxide 99\% <br> mercury sulphate (II) solution |
| magnesian mixture |  |


| Metaphenylene-diamine | (see m-phenylenediamine) |
| :--- | :--- |
| Methyl (red) | (see red methyl) |
| Methyl orange | sodium 4(dimethylamino)azobenzene-4-sulfonate. <br> Methyl orange alcoholic solution at 1\% (m/v) |
| Molybdenum | reagent (see Nitric) |
| Naphthol | 口-naphthol (2-naphtol) |
|  | solution at 5\% (m/m) |
|  | concentrated acid 63\% |
| Nitric | nitromolybdic reagent |
|  | nitro-vanadomolybdic reagent 10\% (m/m) |
|  | lead nitrate (see Lead) |
| Eriochrome black T | Biting black 11 <br> solution at 0.2\% (m/v) in triethanolamine |
| Oxalic acid | acid C2O4H2.2 H2O 99\% <br> aqueous solution at 5\% (m/m) |
| Phenol (red) | dihydrochloride C6H8N2.3 HCl 99\% |
| Phenylenediamine | (see phenol red) |

## Reagents and titrated solutions

| Phosphorus | concentrated phosphoric acid (orthophosporic acid) $85 \%$ <br> $\mathrm{~d}(20 / 4)=1.7$ |
| :--- | :--- |
|  | Diluted solution of phosphoric acid at $50 \%(\mathrm{~m} / \mathrm{m})$ |
|  | Diluted solution of phosphoric acid at $25 \%(\mathrm{~m} / \mathrm{v})$ <br> Dihydrogenophosphate (see Potassium) |
|  | neutral lead acetate C4H6O4Pb.3H2O |
|  | aqueous solution at $10 \%(\mathrm{~m} / \mathrm{m})$ (in water free from carbon <br> dioxide) <br> nitrate Pb(NO3)2 99\% <br> lead nitrate aqueous solution at 1 g of lead per litre <br> lead nitrate aqueous solution at 0.01 g of lead per litre |


| Potassium | acetate C2H3KO2 99\% <br> aqueous solution at $5 \%(\mathrm{~m} / \mathrm{m})$ |
| :---: | :---: |
|  | anhydrosulphite K2S2O5 (disulphite) 94\% free from selenium |
|  | potassium anhydrosulfite aqueous solution at $2 \%(\mathrm{~m} / \mathrm{m})$ cyanide KCN 98\% aqueous solution at 10 g per 100 ml |
|  | potassium cyanide aqueous solution at 1 mg of hydrocyanic acid per litre |
|  | dichromate $\mathrm{K} 2 \mathrm{Cr} 2 \mathrm{O} 799 \%$ <br> aqueous solution at $10 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at 1 g of chromium per litre aqueous solution at 0.01 g of chromium per litre |
|  | dihydrogenophosphate H2KPO4 99\% aqueous solution at 0.05 g of phosphorous per litre hexacyanoferrate (II) K4Fe(CN)6.3 H2O 98\% |
|  | aqueous solution at $5 \%(\mathrm{~m} / \mathrm{m})$ hydroxide KOH 85\% |
|  | aqueous solution at $40 \%(\mathrm{~m} / \mathrm{m}) ; \mathrm{d}(20 / 4)=1.38$ iodide KI 99\% |
|  | iodine potassium iodide solution permanganate KMn04 99\% aqueous solution at $5 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $3 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $2 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $1 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $0.5 \%(\mathrm{~m} / \mathrm{m})$ aqueous solution at $0.2 \%(\mathrm{~m} / \mathrm{m})$ |
|  | potassium permanganate phosphoric solution saturated aqueous solution |
|  | thiocyanate KSCN 99\% aqueous solution at $5 \%(\mathrm{~m} / \mathrm{m})$ |

## Reagents and titrated solutions

| Pyridine-pyrazolone | reagent |
| :--- | :--- |
| Quinine | sulphate C40H48N4O4.H2SO4.2 H2O 99\% <br> quinine sulphate sulphuric solution at 0.1 mg per litre of <br> sulphuric acid 0.05 M |
| Rosaniline | hydrochloride (see fuchsine) <br> aqueous solution at 0.1 g per 100 ml |
| Methyl red | acid 4-dimethylamino-2-phenylazobenzoic <br> red methyl alcoholic solution <br> methyl red mixed indicator |
| Phenol red | phenolsulfonephtaleine 98\% <br> phenol red solution |
| Selenium | dioxide SeO2 99\% <br> aqueous solution at 100 mg of selenium per litre |


| Sodium | acetate C 2 H 3 NaO 2.3 H 2 O |
| :---: | :---: |
|  | aqueous solution at $10 \%(\mathrm{~m} / \mathrm{m})$ |
|  | borate (tetraborate) Na2B4O7.10 H2O 99\% saturated aqueous solution |
|  | decahydrate carbonate $\mathrm{Na} 2 \mathrm{CO} 3.10 \mathrm{H} 2 \mathrm{O} 99 \%$ aqueous solution at $25 \%(\mathrm{~m} / \mathrm{m})$ |
|  | diethyldithiocarbamate C5H10NS2Na. 3 H2O 99\% alcoholic solution at $1 \%(\mathrm{~m} / \mathrm{v})$ |
|  | ethylenediaminetetracetate (disodic edetate) C10H14N2O8Na2.2 H2O 98.5\% aqueous solution 0.01 M |
|  | fluoride NaF 98.5 \% aqueous solution at $4 \%(\mathrm{~m} / \mathrm{m})$ |
|  | concentrated hydroxide solution <br> (caustic soda) at $30 \%(\mathrm{~m} / \mathrm{m})$; $\mathrm{d}(20 / 4)=1.33$ <br> diluted aqueous solution of sodium hydroxide at $10 \%$ (m/m) |
|  | hydrogenophosphate (disodic dihydrate phosphate) HNa2PO4.2 H2O 99.5\% aqueous solution at $10 \%(\mathrm{~m} / \mathrm{m})$ |
|  | pyrophosphate Na4P2O7.10 H2O <br> (diphosphate decahydrate tetrasodium) 98\% |
|  | aqueous solution at $1 \%(\mathrm{~m} / \mathrm{m})$ thiosulphate $\mathrm{Na} 2 \mathrm{~S} 2 \mathrm{O} 3.5 \mathrm{H} 2 \mathrm{O} 99 \%$ aqueous solution at $25 \%(\mathrm{~m} / \mathrm{v})$ |
|  | disodic indigo-sulphonate (see indigo carmine) indigo carmine solution |


| Hydrogen sulphide | saturated aqueous solution acid <br> aqueous acid solution at 1 g of sulphur per litre <br> aqueous acid solution at 0.01 g of sulphur per litre |
| :--- | :--- |
| Sulforesorcinic | reagent |
| Sulphuric | concentrated acid 95\% d(20/4) <br> concentrated acid $97 \%(\mathrm{~m} / \mathrm{m})$ |
|  | aqueous solution at 25\% (m/m) <br> aqueous solution diluted at 10\% (m/m) <br> aqueous solution diluted at 5\% (m/m) <br> acid free from nitrogen |
| Buffers | purified acetate (search for zinc) |$|$| ammoniac |
| :--- | :--- |
| pH 7.5 |

## Reagents and titrated solutions

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## Reagents and titrated solutions

## Crystallisable acetic（acid）

口20＝1．051；contains as a minimum $98.0 \%(\mathrm{~m} / \mathrm{m})$ of C 2 H 4 O 2 ．

## Diluted acetic（acid）

Aqueous solution containing about 10 g of acetic acid in 100 g of reagent．
口20＝1．0125 approximately．
Starch（paste）at $0.5 \%(\mathrm{~m} / \mathrm{v})$
In a mortar，grind 2.5 g of soluble starch and 10 mg mercury iodide（II）with the necessary amount of water in order to obtain a fluid slurry．Introduce this in 500 ml of boiling water that is maintained 10 minutes．The liquid obtained is clear．Filter if necessary．

## Concentrated ammonium hydroxide solution

口20＝0．922．
Concentrated aqueous solution of ammonia gas containing about 20 g of ammonia （NH3）in 100 g of reagent．

## Diluted ammonium hydroxide solution

Aqueous solution of ammonia gas containing about 10 g of ammonia（NH3）in 100 g of reagent．
口20 $=0.959$ approximately．

## Ammonium（chloride）in solution

Aqueous solution containing 20 g of ammonium chloride in 100 g of reagent．

## Ammonium（citrate）in solution

Slowly pour 500 ml of concentrated ammonium hydroxide solution（R）in 400 g of citric acid in a 1000 ml graduated flask．The mass is heated and the dissolution is carried out．After cooling，complete the volume of 1000 ml with concentrated ammonium hydroxide（R）．
Ammonium（hydroxide）in solution about 5 M
Dilute 460 ml of concentrated ammonium hydroxide（ $\mathrm{a} 20=0.922$ ）with a sufficient amount of water to obtain 11 ．

Ammonium（oxalate）in solution at $4 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 4 g of diammonium oxalate in 100 g of solution．
Ammonium（persulphate）in solution at $15 \%$（ $\mathrm{m} / \mathrm{m}$ ）
Aqueous solution containing 15 g of ammonium persulphate for 100 g of solution．
Aniline
C6H5NH2＝93．1．

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Reagents and titrated solutions

The product used as a reagent must be clear and barely yellow. $\square 20=1.020$ to 1.023 .

During distillation, $95 \%$ as a minimum must pass between $183^{\circ} \mathrm{C}$ and $185^{\circ} \mathrm{C}$.
Silver (nitrate) in solution at $5 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 5 g of desiccated silver nitrate for 100 g of reagent.
Silver (nitrate) in solution at $1 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 1 g of desiccated silver nitrate for 100 g of reagent.
Silver (nitrate) in ammonia solution
Ammonia solution prepared with 10 g of desiccated silver nitrate for about 100 g of reagent.
In 30 g of distilled water, dissolve 5 g of desiccated silver nitrate. Pour into this solution, drop by drop with caution, the diluted ammonium hydroxide solution (R) until nearly total redissolution of the precipitated silver oxide. Complete to 50 ml , filter and store the reagent away from light in a flask with a glass stopper.

## Barium (chloride) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$

Aqueous solution containing 10 g of BaCl 2.2 H 2 O , for 100 g of reagent.

## Concentrated boric (acid) in solution at 40 g per litre

This acid must be pure, entirely soluble in water (insoluble residue below 50 mg for 1 kg ) and must not turn brown during incineration (absence of organic matters).

The aqueous solution at 40 g for 1 l of solution must be neutral to methyl orange. The orange coloration of this indicator must be obtained with less than 3 ml of hydrochloric acid solution 0.1 M for 11 of this solution at 40 g per litre.
Boric acid that does not respond to these test trials can be purified by hot filtration of a boiling, saturated boric acid solution (at about 350 g per litre of water) and crystallisation by cooling.
Prepare a solution of 40 g of this concentrated acid for 11 of solution.

## Bromine (water)

Bromine saturated aqueous solution containing about 3.5 g of bromine for 100 ml at $20^{\circ} \mathrm{C}$.

## Bromophenol blue in solution

Alcohol solution at $95 \%$ vol. containing 0.04 g of bromophenol blue in 100 ml in total.

## Bromothymol blue in solution

Alcohol solution at $95 \%$ vol. containing 0.04 g of bromothymol blue in 100 ml in total.
Calcium (acetate) at $25 \%(\mathrm{~m} / \mathrm{v})$

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## Reagents and titrated solutions

Calcium acetate aqueous solution at 25 g for 100 ml .

## Calcium (acetate) in solution pH 6

In a cylindrical vase place:

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calcium carbonate 10 g
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acetic acid 12 g
water
100 ml

Heat until dissolution, adjust the pH to 6 and adjust to 11 .
Calcium (chloride) in saturated solution
It contains about 80 g of CaCl 2.6 H 2 O for 100 g of solution.
Calcium (chloride) in solution at $20 \%(\mathrm{~m} / \mathrm{v}$ )
Aqueous solution containing 20 g of crystallised calcium chloride CaCl 2.6 H 2 O in 100 ml of reagent.
Calcium hydroxide (milk of lime) at $10 \%$ ( $\mathrm{m} / \mathrm{m}$ )
The calcium hydroxide suspension (milk of lime) is obtained by treating 10 g of calcium oxide (quicklime) with 90 g approximately of boiling water.
Calcium (sulphate) in saturated solution
Saturated aqueous solution; it contains about 0.2 g of CaSO4 for 100 g .

## Mineralisation catalyser

Pulverise and mix:

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selenium 2.5 g
copper sulphate (II) 5 g
dipotassic sulphate 100 g
Chloramine T solution at \(1 \%(\mathrm{~m} / \mathrm{v}\) )
Aqueous solution containing 1 g of chloramine T (sodium salt of \(p\)-toluene N chlorosulphanomide) for 100 ml of reagent.
Concentrated hydrochloric (acid)
Aqueous solution of hydrochloric acid ( \(\mathrm{a} 20=1.18\) to 1.19 ) containing 35.5 to 37.25 g of hydrochloric acid \((\mathrm{HCl})\) in 100 g or 100 ml .
Hydrochloric (acid) diluted at 30\% (v/v)
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Reagents and titrated solutions

Dilute 300 ml of concentrated hydrochloric acid ( $\mathrm{\square} 20=1.19$ ) with a sufficient amount of water to obtain 1 l.
This solution contains about 13 g of HCl for 100 ml .
Hydrochloric (acid) diluted at $10 \%(\mathrm{~m} / \mathrm{m})(\square 20=1.0489)$
Aqueous solution containing 10 g of hydrochloric gas $(\mathrm{HCl})$ in 100 g .
Hydrochloric (acid) diluted at 10\% (v/v)
Aqueous solution of hydrochloric acid containing about 10 ml of concentrated hydrochloric acid (R) in 100 ml , i.e. about 3.6 g HCl for 100 ml .

## Chromotropic (acid)

1.8-dihydroxy-3.6-naphtalene-1.6-disulphonic acid
( $\mathrm{C}_{10} \mathrm{H}_{8} \mathrm{O}_{8} \mathrm{~S}_{2} 2 \mathrm{H}_{2} \mathrm{O}=356.3$ ).
White powder that turns brown in light, soluble in water. The disodium salt of this acid is generally used which is a yellow or light brown product and very soluble in water.
Chromotropic acid solution (sodium salt) at $0.05 \%$ ( $\mathrm{m} / \mathrm{v}$ )
Dissolve 60 mg of of sodium salt of chromotropic acid in about 80 ml of water, complete to 100 ml with water. To be used within 24 hours.

Citric (acid) in solution at $21 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution at 21 g for 100 g .
Citric (acid) in solution at $20 \%(\mathrm{~m} / \mathrm{v})$
Aqueous solution of citric acid at 20 g for 100 ml .
Citric (acid) in solution at $10 \%(\mathrm{~m} / \mathrm{v})$
Aqueous solution of citric acid at 10 g for 100 ml .
Citric (acid) in solution at $5 \%(\mathrm{~m} / \mathrm{v})$
Aqueous solution of citric acid at 5 g for 100 ml .
Citric (acid) in solution 0.033 M
Solution containing exactly one tenth of the equivalent of a gramme of monohydrated citric acid per litre (i.e. 7.003 g per litre).
Citric (acid) in hydrochloric solution
Dissolve 150 g of concentrated monohydrated citric acid in 800 ml of water; add 100 ml of concentrated hydrochloric acid and add volume to 11 .
Citric (acid) in solution to 5 g per litre adjusted to pH 3

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## Reagents and titrated solutions

Dissolve 5 g of citric acid in 900 ml of water. Add 8 ml of the sodium hydroxide solution 1 M and adjust to 1 l .
Cobalt (chloride) in solution at $5 \%(\mathrm{~m} / \mathrm{m}$ )
Solution containing 5 g of cobalt chloride CoCl 2.6 H 2 O in 100 g of reagent.

## Copper (II) (sulphate) solution at 1 g and 0.01 g per litre

The aqueous solution at 1 g of copper per litre contains 3.9295 g of copper sulphate (CuSO4.5H2O) and 1 ml of concentrated sulphuric acid per litre. This solution is diluted to a hundredth to obtain the solution at 0.01 g of copper per litre.
Copper (sulphate) in ammonia solution

Copper sulphate $\mathrm{Cu} \mathrm{SO} 4.5 \mathrm{H} 2 \mathrm{O} \quad 5 \mathrm{~g}$
Water 500 ml
Concentrated ammonium hydroxide (R) 300 ml

Dissolve the copper sulphate in water. Add the ammonium hydroxide and homogenise.

## Alkaline copper (reagent)

The titrated alkaline copper reagent contains for 1000 ml :

$$
\text { Copper, } \mathrm{Cu} \quad 4.454 \mathrm{~g}
$$

It is obtained by mixing the two solutions:
a) Copper solution (II), (C)

Weigh exactly 35 g of copper sulphate (R) and introduce into a 1000 ml graduated flask with about 500 ml of distilled water and 5 ml of concentrated sulphuric acid (R). Shake to dissolve and complete to $20^{\circ} \mathrm{C}$ with distilled water until the graduated line. Mix.
b) Alkaline tartaric solution, (T)

Weigh 150 g of sodium and potassium L-tartrate $(\mathrm{R})$ and introduce in a 1000 ml graduated flask containing about 500 ml of hot distilled water. Shake to dissolve. Allow to cool and add 300 ml of concentrated sodium hydroxide solution (R) non carbonated.
Complete to $20^{\circ} \mathrm{C}$ with distilled water the volume of 1000 ml of solution. Mix.
10 ml of the solution C with 10 ml of solution T are brought to the boil with 0.05 g of inverted sugar, 0.048 g of pure glucose and 0.0695 g of anhydrous lactose or 0.073 g of hydrated lactose.

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Reagents and titrated solutions

## 2.6-dichlorophenolindophenol in solution

Dissolve 0.50 g of 2.6 -dichlorophenolindophenol in 200 ml of water heated at $90^{\circ} \mathrm{C}$. Allow to cool and complete to 1000 ml with water. Filter.

## Diphenylcarbazide in solution

Solution of 0.50 g of diphenylcarbazide in 11 of alcohol at $95 \%$ vol.

## Peroxide in diluted solution

See Hydrogen (peroxide).

## Iron (II) (sulphate) in solution at $5 \%(\mathrm{~m} / \mathrm{m})$

Solution prepared extemporaneously with boiled distilled water containing 5 g of iron sulphate (II) $\mathrm{FeSO}_{4} \cdot 7 \mathrm{H}_{2} \mathrm{O}$ in 100 g of reagent (air oxidises it quickly).
Iron (III) (sulphate) in saturated solution
Prepare a saturated solution of iron sulphate (III) $\mathrm{Fe}_{2}\left(\mathrm{SO}_{4}\right)_{3} 7 \mathrm{H}_{2} \mathrm{O}$.
Iron (II) (and ammonium sulphate) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of ammonium and iron sulphate (II) in 100 g of reagent.
Iron (III) (salt) in solution at 0.010 g of iron per litre
Dissolve 0.1 g of pure iron in 20 ml of water and 5 ml of concentrated H2SO4 (R). Heat, add 10 drops of concentrated HNO3 (R) and bring to the boil for 10 minutes to peroxidise the iron. Adjust the volume to 1 l. Dilute 1/10.

## Formaldehyde in solution

Aqueous solution with $35 \%(\mathrm{~m} / \mathrm{m})$ of formaldehyde.

## Fuchsine bleached by sulphurous acid

8 g of potassium anhydrosulphite are dissolved in 150 ml of distilled water; add 30 ml of basic fuchsine solution at 1 per $1000(\mathrm{~m} / \mathrm{v})$ in alcohol at $95 \%$ vol. and 55 ml of hydrochloric acid 3 M . Complete to 250 ml with distilled water. Store in a yellow flask with an emery stopper.
Hydrazine (dichlorhydrate) in solution

| Hydrazine dichlorhydrate | 500 mg |
| :--- | :--- |
| Water | q.s.f. 100 ml |

Dissolve the hydrazine dichlorhydrate in about 80 ml of water, then adjust the volume

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Reagents and titrated solutions
to 100 ml .
Reagent to be prepared extemporaneously.
Hydrogen (peroxide) in solution to 3 volumes
This solution contains 9.1 g of H 2 O 2 per litre; it liberates 3 times its volume of oxygen by catalytic decomposition by MnO 2 in an alkaline medium.

## Iodine (solution)

Aqueous solution saturated with iodine.

## Sodium indigo-sulphonate

Indigo-disulphonate sodium salt (improperly called indigo carmine): C16H8O8S2N2Na2
This product in solution at $10 \%(\mathrm{~m} / \mathrm{v})$ should turn yellow when oxidised by the potassium permanganate in a sulphuric environment; 50 ml of this solution requires 14 ml to 17 ml of potassium permanganate solution 0.02 M .
If, by permanganic oxidation, this solution does not turn yellow, it is advisable to purify the sodium indigo-sulphonate by the following process:
Put 10 g of sodium indigo-sulphonate in contact with 50 ml of concentrated sulphuric acid (R). After two days, add 100 ml of water; filter the day after. Reject the rustycoloured filtrate. Take up the residue with 100 ml of water, reject again the filtrate. Dissolve the residue with 800 to 1000 ml of acidulated water and 5 ml of concentrated sulphuric acid (R).
Indigo carmine solution: dissolve 0.2 of indigo carmine in a mixture of 10 ml of hydrochloric acid (R) and 990 ml of sulphuric acid solution free of nitrogen (R) to 200 g per litre.

## Magnesium (chloride) in solution 0.01 M

Dissolve 0.45 g of pure magnesium oxide $\mathrm{MnO}_{2}$ in the necessary quantity of diluted hydrochloric acid (R). Bring to a litre. Titrate this solution using a sodium ethylenediaminetetraacetate solution 0.01 M in the presence of eriochrome black T .

## Magnesian (mixture)

Dissolve 82 g of magnesium chloride $(\mathrm{MgCl} 2.6 \mathrm{H} 2 \mathrm{O})$ and 100 g of ammonium chloride in 800 ml of water. Add 400 ml concentrated ammonium hydroxide $(\square 20=0.92)(\mathrm{R})$. Mix.

Mercury (II) (sulphate) in acid solution
Aqueous solution and mercury sulphate acid (II) $\mathrm{HgSO}_{4}$. In a 200 ml graduated flask,

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Reagents and titrated solutions
introduce 10 g of yellow mercuric oxide， 120 ml of water and 75 g of concentrated sulphuric acid（R）（ 40 ml ）．After cooling，adjust the volume to 200 ml ．

## Metaphenilene－diamine（hydrochloride）

Grey－mauve amorphous powder： $\mathrm{C}_{6} \mathrm{H}_{8} \mathrm{~N}_{2} .2 \mathrm{HCl}$ ．

## Methyl orange in solution

Solution prepared with alcohol at $90 \%$ vol．containing 1 g of methyl orange in 100 ml of reagent．

## 口－naphthol in solution at $5 \%(\mathrm{~m} / \mathrm{m})$

Dissolve 5 g of a －naphthol in 40 ml of concentrated ammonium hydroxide solution（ R ） and adjust the volume to 100 ml with distilled water．Prepare extemporaneously．

## Concentrated nitric（acid）

口20／4＝ 1.39
Concentrated nitric acid contains about $63 \%$ of nitric acid（HNO3）．
Diluted nitric（acid）
口20／4＝ 1.056
Solution containing about 10 g of nitric acid（HNO3）in 100 g of reagent prepared with 15.8 g of nitric acid $(11.35 \mathrm{ml})(\mathrm{\square} 20=1.39)$ at 63 g for 100 g and 84.2 g of water．

## Nitromolybdic（reagent）

Dissolve 60 g of ammonium molybdate in 200 g of warm water．Filter if necessary． Slowly pour this solution in 720 g of diluted nitric acid while constantly shaking the latter．This diluted acid is obtained by mixing 370 g of concentrated nitric acid（ R ）with 350 g of water．Allow to stand 8 days．Adjust the volume to 1000 ml with distilled water．Filter or decanter．
This reagent，heated at $40^{\circ} \mathrm{C}$ ，should not leave a deposit of precipitate．
Sensitivity： $25 \mu \mathrm{~g}$ of phosphorus for 5 ml ．
Nitro－vanado－molybdic（reagent）
Prepare the following solutions
A）Solution of ammonium molybdate
Ammonium molybdate 100 g
Concentrated ammonium hydroxide（R） 10 ml

## INTERNATIONAL OENOLOGICAL CODEX

## Reagents and titrated solutions

## Distilled water

B) Solution of ammonium vanadate

$$
\text { Ammonium metavanadate } 2.35 \mathrm{~g}
$$

Distilled water 500 ml
Slightly heat to dissolve. After complete dissolution, cool and gradually add while shaking the following mixture:

Concentrated nitric acid (R) 7 ml
Distilled water 13 ml
Complete the volume to 1000 ml with distilled water. Mix.
To obtain the nitro-vanado-molybdic reagent, mix in a 500 ml graduated flask 67 ml of concentrated nitric acid (R), 100 ml of molybdic solution (A), 100 ml of nitro-vanadic solution (B) and adjust the volume to 500 ml . Mix.

## Eriochrome black Tin solution

Solution containing 0.2 g eriochrome black T in 100 ml of triethanolamine.

## Oxalic (acid) in solution

Aqueous solution containing 5 g of crystallised acid oxalic C 2 O 4 H 2.2 H 2 O in 100 g of reagent.

## Phenolphtalein in solution

Solution prepared with alcohol at $90 \%$ vol. containing 1 g de phenolphthalein in 100 ml of reagent.
Phosphoric (acid) solution at $85 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 85 g of orthophosphoric acid (H3PO4), $\mathrm{\square} 20=1.70$, for 100 g.

Phosphoric (acid) solution at $25 \%$ ( $\mathrm{m} / \mathrm{v}$ )
Aqueous solution containing 25 g of phosphoric acid (H3PO4), 口20 $=1.70$, in 100 ml .
Phosphoric (acid) solution at $50 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 50 g of orthophosphoric acid (H3PO4), $\mathrm{a} 20=1.70 \mathrm{in} 100 \mathrm{~g}$. Phosphate (solution at 0.05 g of phosphorus per litre)

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Reagents and titrated solutions

## Potassium dihydrogenophosphate

Dissolve 4.392 g of monopotassium phosphate $\left(\mathrm{KH}_{2} \mathrm{PO} 4\right)$ in a sufficient quantity of water to obtain 1 l . This solution contains 1 g of phosphorus per litre. Dilute to the twentieth to obtain the solution at 0.05 g per litre.
Lead (nitrate) in solution at 1 g and 0.01 g of lead per litre
Dissolve 1.60 g of lead nitrate $\mathrm{Pb}\left(\mathrm{NO}_{3}\right)_{2}$ in a sufficient quantity of water to obtain 11 of solution at 1 g of lead per litre. This solution is diluted to the hundredth to obtain the solution at 0.01 g of lead per litre.
Lead (neutral acetate) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of lead acetate (II) $\mathrm{Pb}\left(\mathrm{C}_{4} \mathrm{H}_{6} \mathrm{O}_{4}\right) \cdot 3 \mathrm{H}_{2} \mathrm{O}$ in 100 g of reagent.
Potassium sulfite
Potassium (acetate) in solution at $5 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 5 g of crystallised potassium $\mathrm{KC}_{2} \mathrm{H}_{3} \mathrm{O}$ acetate in 100 g of reagent $\mathrm{CH}_{3} \mathrm{CO}_{2} \mathrm{~K}$.

Potassium (anhydrosulphite) $\mathrm{K}_{2} \mathrm{~S}_{2} \mathrm{O}_{5}$ (formerly potassium disulphite) free from selenium.

To search for selenium in sulphur dioxide, potassium anhydrosulphite free from selenium should be used. To check the absence of selenium, proceed with the following test trial:
Weigh 2.55 g of the potassium anhydrosulphite sample, dissolve with heat in 7 ml of distilled water and 2 ml of concentrated hydrochloric acid $(\mathrm{R})$. Allow to cool and add 3 ml of formaldehyde solute $(\mathrm{R})$. Allow to stand 10 minutes. Place the tube in a water bath at $100^{\circ} \mathrm{C}$ and add 50 mg of the sample of pulverised potassium anhydrosulphite.
The total sample is 2.60 g of potassium anhydrosulphite corresponding to 1.50 g of sulphur dioxide. A pink coloration should not develop.
Potassium (anhydrosulphite) in solution at $2 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 2 g of crystallised potassium anhydrosulphite in 100 g of reagent.

## Potassium (cyanide) in solution at 1 mg of hydrocyanic acid per litre

Prepare an aqueous solution containing 2.44 g of KCN per litre, dilute to $1 / 100$ to obtain the titrating solution of 1 mg of hydrocyanic acid per litre.
Potassium (dichromate) at 1 g and 0.01 g of chrome per litre

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## Reagents and titrated solutions

Dissolve 2.8283 g of potassium dichromate $\mathrm{K}_{2} \mathrm{Cr}_{2} \mathrm{O}_{7}$ in a sufficient quantity of water to obtain 1 l of solution at 1 g of chrome per litre. This solution is diluted to the hundredth to obtain the solution at 0.01 g of chrome per litre.
Potassium (dichromate) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of potassium dichromate in 100 g of reagent.
Potassium (hexacyanoferrate (II))/ potassium (ferrocyanide) in solution at $5 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 5 g of crystallised potassium $\mathrm{K}_{4} \mathrm{Fe}(\mathrm{CN})_{6} .3 \mathrm{H}_{2} \mathrm{O}$ hexacyanoferrate in 100 g of reagent.
Potassium (hydroxide) at 40\%
Dissolve 40 g of potassium hydroxide $(\mathrm{KOH})$ in a sufficient quantity of water to obtain 100 ml .

## Potassium (iodide) in iodine solution

Iodine-iodide solution - aqueous iodine solution ( $\mathrm{I}_{2}$ ) in potassium iodide (KI).
In a tared flask with a glass stopper, introduce 2 g of iodine, 4 g of potassium iodide and about 10 g of water. Allow the dissolution to operate, then complete with water, the weight of 100 g .
Potassium (permanganate) in solution at $5 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 5 g of potassium permanganate (KMnO4) in 100 g of reagent.
Potassium (permanganate) in solution at $3 \%(\mathrm{~m} / \mathrm{m}$ )
Aqueous solution containing 3 g of potassium permanganate in 100 g of reagent.
Potassium (permanganate) in solution at $2 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 2 g of potassium permanganate in 100 g of reagent.
Potassium (permanganate) in solution at $1 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 1 g of potassium permanganate in 100 g of reagent.
Potassium (permanganate) in solution at $0.2 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 0.2 g of potassium permanganate in 100 g of reagent.
Potassium (permanganate) in saturated solution
Saturated aqueous solution containing about 6 g of potassium permanganate in 100 g of reagent.

Potassium (permanganate) at 5 per $1000(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 5 g of potassium permanganate in 1000 g of reagent.
Potassium (permanganate) phosphoric solution
Dissolve 3 g of potassium permanganate $(\mathrm{R})$ in a mixture of 15 ml of phosphoric acid (R)

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Reagents and titrated solutions
and 70 ml of water; complete to 100 ml with water.
Potassium (thiocyanate) in solution at $5 \%$ ( $\mathrm{m} / \mathrm{m}$ )
Aqueous solution containing 5 g of potassium thiocyanate KSCN in 100 g of reagent.
Pyridine-pyrazolone (reagent)
Bis(1-phenyl-3-methyl-5-pyrazolone). (F. $320^{\circ} \mathrm{C}$ ) - Dissolve 17.4 g of 1-phenyl-3-methyl-5-pyrazolone in 100 ml of alcohol at $95 \%$ vol., add 25 g of freshly distilled phenylhydrazine, bring to the boil under reflux for 4 hours. The mixture is filtered hot and the precipitate washed several times with alcohol at $95 \%$ vol.
The boiling under reflux could be prolonged beyond 4 hours if the occurrence of yellow crystals is not very abundant after this time.
Preparation of reagent pyridine-pyrazolone. - In a 100 ml graduated flask, introduce 0.150 g of 1-phenyl-3-methyl-5-pyrazolone and dissolve in 50 ml of alcohol at $95 \% \mathrm{vol}$. distilled on potassium hydroxide; complete to 100 ml with distilled water.
On the other hand, weigh 20 mg of bis(1-phenyl-3-methyl-5-pyrazolone), and dissolve by prolonged shaking in 20 ml of pyridine.
Mix the two resulting solutions by pouring them in a yellow glass flask wrapped in black paper. Store in the refrigerator.

## Quinine (sulphate) in solution at 0.1 mg per litre of sulphuric acid 0.05 M

Dissolve 0.100 g of quinine sulphate in a sufficient quantity of sulphuric acid 0.05 M to obtain 1 . Dilute three times $1 / 10$ this solution with a sulphuric acid solution 0.05 M to obtain the solution at 0.1 mg of quinine sulphate per litre.

## Rosaniline (hydrochloride) in solution discoloured by sulphurous acid

In a mortar, pulverise 30 mg of pure rosaniline hydrochloride, then add 30 ml of alcohol at $95 \%$ vol. The dissolution is rapid and complete. On the other hand, in a 250 ml graduated flask, dissolve 8 g of potassium anhydrosulphite in about 150 ml of distilled water. Add the alcoholic solution of hydrochloride rosaniline, then 55 ml of hydrochloric acid solution 3 M and bring to the graduation line with water. The reagent must be completely discoloured in less than an hour. It is stable for several months.

## Methyl red in solution

Alcohol solution at $90 \%$ vol. containing 0.10 g of methyl red in 50 ml of reagent.
Methyl red mixed indicator:
Solution in alcohol at $90 \%$ vol. containing 0.10 g of red methyl and 0.05 g of blue methylene in 10 ml of reagent.

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Reagents and titrated solutions

## Phenol red in solution

Heat 0.05 g of phenol red with 2.85 ml of sodium hydroxide solution 0.05 M and 5 ml of alcohol at $90 \%$ vol. To the solution obtained, add a sufficient quantity of alcohol at $20 \%$ vol. to obtain 250 ml .

## Selenium (dioxide) in solution at 100 mg of selenium per litre

Grind 2 g of pure selenium dioxide $\left(\mathrm{SeO}_{2}\right)$ and allow to stand for 24 hours in a desiccator for sulphuric acid. Weigh 1.4553 g of this dry dioxide and dissolve in a sufficient quantity of water to obtain 11 of solution.
This solution contains 1 g of selenium per litre. Dilute $1 / 10$ with distilled water to obtain the solution at 100 mg of selenium per litre.

## Sodium (acetate)

$\mathrm{NaC2H} 3 \mathrm{O} 2.3 \mathrm{H} 2 \mathrm{O}=136.1$.
The salt used as a reagent must be neutral.
Sodium (acetate) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of sodium acetate NaC 2 H 3 O 2.3 H 2 O in 100 g of reagent.

## Sodium (borate) in saturated solution

Saturated aqueous solution containing about 4 g of crystallised sodium borate for 100 g of solution. Sodium tertraborate $\mathrm{Na}_{2} \mathrm{~B}_{4} \mathrm{O}_{7}$.

Sodium (neutral carbonate) in solution at $25 \%$ ( $\mathrm{m} / \mathrm{m}$ )
Aqueous solution containing 25 g of crystallised disodic carbonate at $10 \mathrm{H}_{2} \mathrm{O}$ in 100 g of reagent $\mathrm{Na}_{2} \mathrm{CO}_{3} \cdot 10 \mathrm{H}_{2} \mathrm{O}$.
Sodium (diethyldithiocarbamate) in solution at $1 \%(m / v)$
Dissolve 1 g of sodium diethyldithiocarbamate in a sufficient quantity of alcohol at $40 \%$ vol. to obtain 100 ml of solution $\left(\mathrm{C}_{2} \mathrm{H}_{5}\right)_{2} \mathrm{NCS}_{2} \mathrm{Na} .3 \mathrm{H}_{2} \mathrm{O}$.
Sodium (ethylenediaminetetraacetate) in solution 0.01 M

| Sodium ethylenediaminetetraacetate | 4.0 g |
| :--- | :--- |
| Magnesium chloride, $\mathrm{MgCI}_{2} \cdot 6 \mathrm{H}_{2} \mathrm{O}$ | 0.1 g |
| Water | q.s.f. 1000 ml |

The titre of this solution must be checked and adjusted after titration by a calcium

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Reagents and titrated solutions
chloride solution 0.01 M obtained by dissolving 1 g of pure calcium carbonate in 25 g of concentrated hydrochloric acid $(\mathrm{R})$ with 20 ml of water and by adjusting the volume to 1000 ml with distilled water.
Sodium (fluoride) in solution at $4 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 4 g of sodium fluoride (NaF) in 100 g of reagent. This solution is nearly saturated.
Sodium (hydroxide) in concentrated solution (caustic soda)
Aqueous solution with density 1.330 containing 30 g of sodium hydroxide ( NaOH ) in 100 g of solution.
Sodium (hydroxide) in diluted solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of sodium hydroxide ( NaOH ) in 100 g of reagent.
Sodium (phosphate) in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of crystallised disodic phosphate in 100 g of reagent.

## Sodium (pyrophosphate) at $1 \%(\mathrm{~m} / \mathrm{m})$

Aqueous solution containing 1 g of crystallised tetrasodic pyrophosphate, Na4P2O7.10H2O, in 100 g of reagent.
Sodium (thiosulphate) in solution at $25 \%$ ( $\mathrm{m} / \mathrm{v}$ )
Aqueous solution containing 25 g of sodium thiosulphate $\left(\mathrm{Na}_{2} \mathrm{~S}_{2} \mathrm{O} 3\right)$ for 100 ml .
Hydrogen sulphide (acid) in saturated solution
Aqueous solution of saturated hydrogen sulphide acid. It contains about 3.8 g of $\mathrm{H}_{2} \mathrm{~S}$ per litre. It is alterable in air.
Hydrogen sulphide (acid) solution at 1 g of sulphur per litre and at 0.01 g per litre
Dissolve 7.5 g of $\mathrm{Na}_{2} \mathrm{~S} .9 \mathrm{H}_{2} \mathrm{O}$ in a sufficient quantity of water to obtain 1 l . This solution is diluted to a hundredth to obtain the solution at 0.01 g per litre (solutions rapidly oxidised by air).
Sulforesorcinic (reagent)
Dissolve 2 g of pure resorcinol in 100 ml of water and add 0.5 ml of concentrated sulphuric acid (R).
Sulphuric (acid) concentrated at 95\% minimum
$\square 20 / 4=1.83$ to $1.84 .\left(\mathrm{H}_{2} \mathrm{SO}_{4}\right)$
Sulphuric (acid) at $\mathbf{9 7 \%}(\mathrm{m} / \mathrm{m})$
This absolutely colourless acid should not be able to be differentiated after heating at $120^{\circ} \mathrm{C}$ from an unheated control. It should be stored in flasks with emery stoppers. Its

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## Reagents and titrated solutions

titre should be $97 \pm 1 \%$.

Sulphuric (acid) at $25 \%(\mathrm{~m} / \mathrm{m})$
口20/4 = 1.1808 approximately.
Aqueous solution of sulphuric acid containing about 25 g of acid H2SO4 in 100 g of reagent.

## Sulphuric (acid) diluted at $10 \%(\mathrm{~m} / \mathrm{m})$

口20/4 = 1.0682 approximately.
Aqueous solution of sulphuric acid containing about 10 g of acid H2SO4 in 100 g of reagent.

## Sulphuric (acid) diluted at $5 \%(\mathrm{~m} / \mathrm{m})$

Aqueous solution of sulphuric acid containing about 5 g of acid H2SO4 in 100 g of reagent.
Sulphuric (acid) free from nitrogen must satisfy the following test trial: nitrate. To 5 ml of water, carefully add 45 ml of sulphuric acid free from nitrogen, allow to cool to $40^{\circ} \mathrm{C}$ and add 8 mg of diphenylbenzidine. The solution is barely pink or pale blue.
Acetate buffer, purified, for search for zinc
Dissolve 136 g of sodium acetate in 440 ml of water, add 58 ml of concentrated acetic acid. Purify this solution by shaking with a dithizone solution at 125 mg per litre of chloroform.
Ammoniac buffer

Concentrated ammonium hydroxide 350 ml
Ammonium chloride 54 g
Distilled water q.s.f. 1000 ml
Buffer pH 7.5

Monopotassium phosphate 94 g
Sodium hydroxide in molar solution 565 ml

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Reagents and titrated solutions

## Distilled water

q.s.f. 1000 ml

## Pure tannin

Tannin, called ether tannin or officinal tannin is extracted from the Aleppo gall.
It is in the form of a light mass, yellowish white, very soluble in water and alcohol at $90 \%$ vol. It is insoluble in ethylic ether. It must comply with the following test trials:

1. The aqueous tannin solution at $10 \%$ must be clear and have a very light yellow colour like white wine. The tannin solution at $10 \%$ in alcohol at $90 \%$ vol. must also be clear with hardly any colour.
A solution at 1 g of tannin in 5 g of water with its volume of alcohol at $90 \%$ vol. and half of its volume of ethylic ether, should give a clear solution (aqueous extract or alcoholic extract).
2. The officinal tannin must be combustible without leaving residue more than $0.05 \%$ (set mineral matters).
3. Desiccated at $100^{\circ} \mathrm{C}$, the officinal tannin must not loose more than $12 \%$ in its weight (excess water). The anhydrous tannin content is calculated from this test trial. Its knowledge is necessary for the preparation of the solution at 4 per 1000.

## Tannin in solution at $2 \%(\mathrm{~m} / \mathrm{m})$

Aqueous solution containing 2 g of tannin in 100 g of reagent. It must be prepared extemporaneously.
Tannin in solution at $4 \%(\mathrm{~m} / \mathrm{v}$ )
Dissolve a quantity of pure tannin containing 1 g of anhydrous tannin in a sufficient quantity of water to obtain 250 ml .
Tannin in solution at $10 \%(\mathrm{~m} / \mathrm{m})$
Aqueous solution containing 10 g of tannin in 100 g of reagent.

## Thioacetamide (reagent)

$\mathrm{F} \cong 113^{\circ} \mathrm{C}$
To 0.2 ml of aqueous thioacetamide solution at $40 \mathrm{~g} / \mathrm{l}$, add 1 ml of a mixture of 5 ml of water, 15 ml of sodium hydroxide 1 M and 20 ml of glycerol at $85 \%(\mathrm{~m} / \mathrm{m})$. Heat in a water bath at $100^{\circ} \mathrm{C}$ for 20 seconds. Prepare extemporaneously.

## Uranyl (nitrate) in solution at $4 \%(\mathrm{~m} / \mathrm{m})$

Solution containing 4 g of uranyl nitrate UO2(NO3)2.6H2O in 100 g of reagent.
Uranyl and magnesium (acetates) in hydro-alcoholic and acetic solution
Dissolve 32 g of crystallised uranyl acetate and 100 g of magnesium acetate in 300 ml of water, 20 ml of acetic acid and 500 ml of alcohol at $95 \%$ vol. by heating in a water

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Reagents and titrated solutions
bath at $100^{\circ} \mathrm{C}$ and by shaking; adjust the volume to 1 litre with water (distilled) and allow to stand 48 hours; decant or filter.
This reagent must be stored away from light. 2.5 ml of reagent must be used per milligramme of sodium to be precipitated and per millilitre of solution to be treated.
Phosphates, arseniates and fluorides must be absent from this solution. Heavy metals, iron (II) and alkaline-earth are not bothersome.

## Bromocresol green in solution

Alcohol solution at $95 \%$ vol. containing 0.04 g of bromocresol green ( $3^{\prime}, 3^{\prime \prime}, 5^{\prime}, 5^{\prime \prime}$ tetrabromo-m-cresolsulfonephtaleine) for 100 ml pf reagent.
Bromocresol green and methyl red in solution (mixed indicator)

| Dissolve |  |
| :--- | :--- |
| Bromocresol green | 0.04 g |
| Methyl red | 0.06 g |
| in alcohol at $95 \%$ vol | 100 ml |

Add 2.5 ml of sodium hydroxide solution 0.1 M .
This indicator from red ( pH 4.6 ) turns blue-green with pH 4.9 . It is violet with pH 4.75 .

## Zinc in solution at 1 mg per litre

Dissolve 1 g of pure zinc in the minimum concentrated hydrochloric acid (R) by gently heating. Dilute the solution to 500 ml and neutralise by adding sodium carbonate until a light precipitate appears which disappears when a few drops of hydrochloric acid are added.
Dilute successively three times $1 / 10$ when using.

[^0]
[^0]:    ${ }^{[1]}$ This list does not contain the titrated acid solutions, sodium hydroxide, iodine, silver nitrate, etc.
    ${ }^{[2]}$ The composition of reagents « (R.As)" is indicated for determining arsenic.

