Handbook of chemistry lab reagent

The idea of scripting this manual came after we realized that our laboratories don't have a properly structured book that guides them the way to prepare chemistry reagents with a special emphasis to safety caution to be taken whereas getting them ready. This book is so an effort to produce one manual for the aim. The most vital feature of this Manual is that it lists in alphabetical order the ordinarily used chemical reagents with their molecular formula and ways of preparation with calculations. Written in a very easy and lucid language, the scholars, lecturers and lab-staff should notice this book extraordinarily helpful and handy. It should be also useful to the department of chemistry.

Krushna Kumar Jilariya is currently pursuing his PhD He has published more than five research papers in national and international journals. He is also a member of ISROSET. Yogesh Sanghani is getting his PhD soon. He has also published several research papers in national and international journals.

978-620-2-30260-9

Reagent preparation & safety precaution

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Scholars' Press

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Scholar's Press

Imprint

Cover image: www.ingimage.com

Publisher:
Scholars' Press
is a trademark of
International Book Market Service Ltd., member of OmniScriptum Publishing Group
17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page
ISBN: 978-620-2-30260-9

HAND BOOK OF CHEMISTRY LAB REAGENT

Reagent preparation & Safety Precaution guide

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DEDICATION

"I dedicate this book to ……..my parents & teachers."

PREFACE

The idea of scripting this manual came after we realized that our laboratories don't have one, properly structured book that guides them the way to prepare chemistry reagents with a special emphasis to safety caution to be taken whereas getting ready them. This book is so an effort to produce one manual for the aim.

The most vital feature of this Manual is that it lists in alphabetical order the ordinarily used chemical reagents with their molecular formula and ways of preparation with calculations.

Written in a very easy and lucid language, the scholars, lecturers and lab-staff should notice this book extraordinarily helpful and handy.

We hope that this book is going to be useful to the department of chemistry.

-Authors

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Laboratory safety precautions:

Laboratory Clothing:

Wear shoes that fully cover the feet. Sandals and clogs are not adequate.
Shoes provide a great deal of initial protection in the case of dropped containers, spilled chemicals, and unseen hazards on the floor. Use old clothes, which are not too loose, especially at the sleeves.
Laboratory coats or aprons must be worn over clothes. Snaps or fasteners are preferable to buttons for quicker removal in case of an emergency.
Tie back long hair so that it will not fall into flames or chemicals.
Avoid shorts and miniskirts in the lab.
Exposed body skin gives added risk to irritation and burns by corrosive chemicals and gases.

Aprons:

Plastic or Rubber - protects against corrosive and irritating chemicals.

Lab coats:

Cotton - good against flying objects, sharp or rough edges (Usually treated with a fire retardant) Wool - protects against molten splashes, small acid spills and small flames. Synthetic fibers - protects against IR and UV radiation but burns easily and can be ruined by strong solvents.

Safety Glasses:

Wear safety glasses at all times in the laboratory. Goggles are required to be worn at each lab period and should also be worn over prescription glasses. Contact lenses should not be used during the lab. Goggles designed for contact wearers should be made available.

Working Alone in the laboratory:

All work must be performed under the supervision of a laboratory instructor/demonstrator.
The instructor should be aware of the exact nature of all work being done in the laboratory.

Unauthorized Experiments:

Do only the experiment which has been assigned by the laboratory instructor. Never do any unauthorized experiment in place of the one assigned by the instructor. Do not change the designated procedure without the advice of the instructor.

Read up experiment procedure:

Know exactly what you are to do. Occasionally incomplete directions or a misunderstanding of instruction causes accidents.
Whenever you are in doubt, ask your instructor.
Think about what you are doing and why you are doing it at all times.
Do not start any experiment involving the use of an experimental set-up (apparatus) until it has been checked and approved by your laboratory instructor unless otherwise instructed.

Food:

Do not eat, drink or smoke in the laboratory. For safety purposes, assume all chemicals to be poisonous either by themselves or because of impurities. Also avoid direct contact with organic chemicals. Many are absorbed directly through the skin.

Cleanliness:

Keep the lab bench cleans at all times. If a solution, a solid or liquid chemical is spilled on the bench or on the laboratory floor, clean up the spill immediately.
Any chemical spilled on your skin or your clothing, should be washed immediately and thoroughly.
Notify the laboratory instructor of the spill.
When leaving the laboratory, wipe the bench top thoroughly.
Make sure that your work area is clean and free of spilled chemicals or scraps of paper.
Wash your hands with detergent or soap and water.

Waste disposal:

Dispose of waste and excess materials in the proper manner. Used matches, paper, broken glass, or porcelain ware should be placed in the appropriate containers but not in the sinks or cup sinks. If you have any questions concerning the waste disposal, ask your instructor for the proper procedure.

Fume Hood:

Use fume hood when necessary.
Use the fume hood when you are so directed by the laboratory instructor, or when it is indicated to do soon the experimental procedure. Fume hoods remove toxic vapors and irritating odors from the laboratory.
The removal of these materials is essential for protecting the health and safety of those people working in the laboratory.

Burners:

Light burners only when needed. Properly extinguish any flame not being used.
Any open flame may ignite reagents being used by you or others near you.
Many organic liquids are highly flammable and these liquids should be heated only on hot plates or heating mantles.

Reactions:

Never look directly into the mouth of an open flask or test tube if it contains a reaction mixture.

Hot Objects:

Avoid touching hot objects. When heating a chemical in a container, the clamp holding the container and the burner will also become hot. Place the object on a piece of Asbestos board or on wire gauze, which is not directly touching the bench top. Glass objects take a long time to cool, so allow plenty of time to cool before touching them.

Glass rods:

Use extreme caution when inserting glass into stoppers. Be very careful when inserting glass tubing, glass rods, thermometers, funnels, or thistle tubes into rubber stoppers or corks. Protect your hands by holding the glass and stopper with a cloth towel or multiple layers of paper towels. Always lubricate the glass surface with water

Glassware:

Use only equipment which is in good condition.
Defective equipment is an important source of accidents. Some defects to watch for include:

• Chipped tips on burets, pipets, and funnels.

• Chipped or broken rims on beakers, flasks, funnels, graduated cylinders and test tubes.

• Cracks in beakers, flasks, graduated cylinders, test tubes and crucibles.

• Star-shaped breaks in the bottom of test tubes or near the bottom edges of beakers and flasks.

• Severe scratches in the bottom of beakers, flasks, and test tubes.

• Sharp edges on glass tubing and glass rods.
These defects may be repaired by a glass blower or have they replaced.
Also look for

• Inflexibility in rubber stoppers - (replace)

• Separations in the mercury column of thermometers - (replace)

• Non-working parts of screw clamps, buret clamps or rings. - (clean off corrosion, lubricate or replace)

• Replace all old and worn electrical cords.

Preparation of Inorganic liquid reagent:

1. Ammonium carbonate solution

Molecular formula: $(NH_4)_2CO_3$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: conc. Ammonia, Ammonium carbonate & D.W.

Strength: 1M

Method:

1. The commercial ammonium carbonate is a mixture of bicarbonate and carbamate.
2. Dissolve 96 g of the ammonium carbonate in a mixture of 70 ml conc. Ammonia solution and water to make up 1 liter of solution.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Do not expose to air.
- Stay away from contact with eyes, skin, and clothes.
- Store in a cool, dry, well -ventilated space far from incompatible substances.
- It should be kept in a very tightly closed bottle.

Safety advice:

- ✓ If ingested, it will be harmful, and it can severely harm your eyes.
- ✓ Wear safety gloves at all times once working around this substance to stop it getting on your hands.
- ✓ It is a basic, can corrode and burn you if it touches your skin.

2. Ammonium molybdate solution

Molecular formula: $(NH_4)_2MoO_4$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: liq. Ammonia & ammonium nitrate

Method:

1. Take 45 gm. Ammonium molybdate In 40 ml liquid ammonia.
2. Add 60 ml water and 100 gm NH_4NO_3 slowly with vigorous stirring.
3. And make 1 liter solution with water.
4. Label the bottle with name, preparing date and batch number.

Storage and Handling:

- Stay from physical damage. Stay in a tightly closed bottle.
- Store in a cool, dry, ventilated space far from sources of heat, wet and incompatibilities.

Safety advice:

- ✓ Bottle of this material could also be unsafe once the reagent has been consumed as they keep product residues.
- ✓ Wear safety gloves at all times once operating around this substance to stop it getting on your hands.

3. Ammonium oxalate solution

Molecular formula: $C_2H_8N_2O_4.H_2O$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Ammonium oxalate & D.W.

Strength: 0.5 N

Method:

1. Weigh 71 gm. ammonium oxalate and transfer to a 1 L volumetric flask.
2. Dissolve this substance in minimum D.W. then make up the solution up to the mark.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Eliminate contaminated clothes and Clean before use. Use with adequate ventilation.
- Clean completely after handling.
- Oxalates step by step corrode steel.
- Store in a cool, dry, well-ventilated space far from incompatible substances**.**

Safety advice:

- ✓ Stay away from contact with skin and eyes.
- ✓ Wear suitable protective gloves to stop skin exposure.

4. Bromine water solution

Molecular formula: Br_2/ H_2O

Chemicals: Volumetric flask, bottle, Beaker & stirrer

Apparatus: Volumetric flask, beaker, brown bottle, dropper, D.W., glass rod, funnel

Method:

1. Dissolves 10 gm potassium bromide in 25 ml water.
2. Add 3ml liquid bromine and make 100 ml solution with water.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay in a dark colored bottle
- Stay bottle tightly closed.
- Stay bottle in a cool, well-ventilated area.

Safety advice:

- ✓ Elemental bromine is poisonous and causes burns.
- ✓ Stay far from contact with eyes. Wear suitable protective clothes. just in case of low ventilation, wear suitable respiratory instrumentality
- ✓ Do not breathe gas/fumes/ vapor/spray.

5. Chlorine water solution

Molecular formula: Cl_2/ H_2O

Chemicals: Con. Hydrochloric acid & potassium permanganate

Apparatus: flat bottom flask, addition funnel & chlorine gas bottle.

Method:

1. One-third of a flask is filled with potassium permanganate.
2. Potassium permanganate is treated with a quantity of concentrated hydrochloric acid which is just enough to cover it.
3. Regular current of chlorine gas is generated it pass through the bottle.

Safety advice:

- ✓ Safety is of utmost importance once handling dangerous chemicals like hydrochloric acid.
- ✓ Stay far from contact with eyes. Wear suitable protective clothes. just in case of low ventilation, wear suitable respiratory equipment
- ✓ Do not breathe gas/fumes/ vapor/spray.

6. Cobalt nitrate solution

Molecular formula: $Co(NO_3)_2 \cdot 6H_2O$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Cobalt nitrate & D.W.

Method:

1. Weigh 72.7 gm of cobalt nitrate.
2. Transfer it into 1 L volumetric flask.
3. Add little water to dissolve cobalt nitrate
4. Now add more D.W.to make up the solution up to the mark in volumetric flask.
5. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Oxidizing materials should be keep in a half safety storage cabinet or room
- Wear suitable protective clothes in case of low ventilation; wear suitable respiratory equipment if ingested.

Safety advice:

- ✓ Stay far from contact with skin and eyes.
- ✓ Do not ingest.

7. Disodium hydrogen phosphate solution

Molecular formula: Na_2HPO_4

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Disodium hydrogen phosphate & D.W.

Method:

1. Take 107.5 gm disodium hydrogen phosphate Add little water to dissolve it
2. Now add more D.W.to make up the solution up to the mark in volumetric flask.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay far from respiratory dirt, vapor, mist, or gas. stay away from contact with skin and eyes. Stay away from consumption and inhalation.
- Store in a cool, dry place. Store in a tightly closed instrumentality

Safety advice:

- ✓ Wear chemical splash goggles.
- ✓ Wear suitable protective gloves to stop skin exposure.
- ✓ Wear suitable protective clothes to stop skin exposure.

8. Ferric chloride solution

Molecular formula: $FeCl_3.6H_2O$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Con. Hydrochloric acid

Strength: 0.25M

Method:

1. Take 67.5 gm of ferric chloride and make paste with 5 ml Con. HCl
2. Now add slowly D.W.to make up the solution up to the mark in volumetric flask.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Iron (III) chloride is toxic, extremely corrosive and acidic.
- The anhydrous material is a powerful dehydrating agent. Stay bottle tightly closed.
- Do not get on skin or in eyes. Don't ingest or inhale. Use with adequate ventilation.
- Stay bottle closed when not in use. Store protected against wetness

Safety advice:

- ✓ Always wear safety glasses.
- ✓ Do not permit the acid or an answer of it to return into contact together with your skin. Wear gloves if handling the con. Acid
- ✓ The targeted acid should always be employed in a neighborhood equipped with sensible ventilation, ne'er within the open laboratory

9. Ferrous sulphate solution

Molecular formula: $FeSO_4.7\ H_2O$

Apparatus: Volumetric flask, bottle, Beaker & stirrer.

Chemicals: dil. H_2SO_4 and D.W.

Strength: 10%

Method:

1. Take 10 gm. Ferrous sulphate dissolve in some water
2. Add 10 ml dil. H_2SO_4 make total volume 100 ml with water
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Store in a cool, dry space far from incompatible substances
- Do not store in direct daylight.
- Make whenever use fresh solution

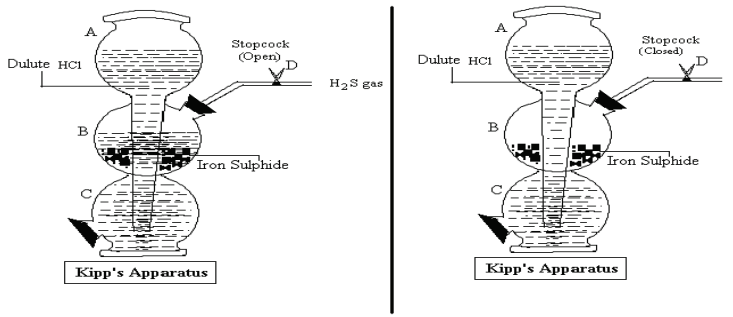
Safety advice:

- ✓ It could cause respiratory tract irritation.
- ✓ Ferrous sulphate may have an effect on eye and skin irritation.
- ✓ It may be injurious if swallowed, air sensitive, wetness sensitive

10. Hydrogen sulphide

Molecular formula: $H_2S_{(g)}$

Kipp's apparatus consists of three globes. The upper globe (A) consists of a long tapering tube at the bottom. The middle and the lower two globes (B and C) are connected with a narrow collar. The upper globe is fitted in the lower globe as shown in the figure.



Chemicals: Iron sulphide, & dilute hydrochloric acid,

Working:

Iron sulphide pieces are taken in globe B and dilute hydrochloric acid poured in globe A. When the stopcock D is opened, the acid runs down into globe C and rises up into iron sulphide. The reaction takes place and hydrogen sulphide gas is liberated. When the stopcock is closed, the gas is unable to escape pressure; the acid is pushed down in globe C and loses contact with iron sulphide. The reaction stops and hydrogen sulphide is not formed. Thus, the gas can be generated as and when required.

Safety advice:

- ✓ Wear suitable protective clothes, gloves and eye/face protection

11. Iodine solution

Molecular formula: I_2

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium iodide (KI) & D.W.

Method:

1. Take 10 gm iodine crystal Dissolve this substance in little water and then add 20 gm of KI. Make paste.
2. Add more D.W. to make it 100 ml
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay far from contact with skin and eyes
- Stay far from incompatibles like oxidizing agents, reducing agents, metals
- Stay bottle dry. Don't ingest. Never add water to the present product

Safety advice:

- ✓ Stay far from direct daylight.
- ✓ Store in a cool, dry, well aired place, and in strongly closed original bottle.
- ✓ Wear gloves if skin contact is likely wear protection glasses.
- ✓ Iodine should not be handled within the open laboratory apart from very short periods. It sublimes at room temperature and exposure to the vapors is extremely harmful.

12. Lead acetate solution

Molecular formula: $Pb(C_2H_3O_2)_2$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Lead acetate, & D.W.

Strength: 0.5M

Method:

1. Take 1 L volumetric flask and in that dissolve 190 gm of lead acetate in approximately 200 ml D.W.
2. Make the solution 1 L by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Store individually, far from oxidizing agents in a cool, dry, well-ventilated

Safety advice:

- ✓ Always wear safety glasses.
- ✓ Do not allow solid or solution to return into get in contact along with your skin
- ✓ Repetitive exposures to lead and to compounds of lead may result in chronic lead poisoning.

13. Magnesia mixture solution

Molecular formula: {$MgCl_{2(aq)}$+ $NH_4Cl_{(aq)}$+NH_3 }

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: magnesium chloride ($MgCl_2$), Ammonium chloride (NH_4Cl) liquor ammonia (Liq. NH_3) & D.W.

Method:

1. Take 55 gm magnesium chloride and 135 gm ammonium chloride dissolve in 400 ml water
2. Add 350 ml liquor ammonia and make it 1 liter with water.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Use with adequate ventilation and don't breathe dirt or vapor.
- Stay far from contact with skin, eyes, or clothes. Clean hands completely when handling.
- Store in common storage area with different things with no specific storage hazards. Store in a cool, dry, well-ventilated, secured store area far from incompatible materials.

Safety advice:

✓ Stay far from contact with skin and eyes Wear suitable protective clothes, gloves and eye/face protection

14. Mercuric chloride solution

Molecular formula: $HgCl_2$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Mercuric chloride & D.W.

Method:

1. Take 67.8 gm mercuric chloride dissolve in some water
2. Make volume up to 1 liter with water.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Clean completely when handling. Take away contaminated clothes and Clean before reuse. Use only in a very well aired space. Minimize dirt generation and accumulation.
- Do not breathe dirt, vapor, mist, or gas. Don't get in eyes, on skin, or on clothes. Don't ingest or inhale. Use only in a chemical fume hood.

Safety advice:

- ✓ Very harmful if swallowed causes burns serious injury to health by prolonged exposure in touch with skin and if swallowed. Very toxic to aquatic organisms may cause long term adverse effects within the aquatic atmosphere.
- ✓ Stay far from contact with skin and eyes
- ✓ Wear suitable protective clothes, gloves and eye/face protection

15. Nessler's reagent solution

Molecular formula: K_2HgI_4

Chemicals: Potassium iodide Solid, Mercuric chloride Solid, & 5N sodium hydroxide solution

Apparatus: Weighing balance, filter paper, china dish, funnel, volumetric flask, bottle, Beaker & stirrer

Method:

1. Dissolve 50 g of KI in the smallest possible quantity of water (50 ml).
2. Add a sat. Solution of mercuric chloride (about 22 g in 350 ml of water will be needed) in KI solution with continuous stirring until an excess is indicated by the formation of orange ppt.
3. Then add 200 ml of 5N NaOH and dilute to 1 L. Allow to stand until clear; then decant into an in brown bottle.

Storage and Handling:

- Stay bottle strongly closed
- Protect from light, together with direct sunrays
- Store in closed original bottle at temperatures between 15°C and 25°C

Safety advice:

1. In case of accident or if you're feeling unwell, look for medical recommendation instantly Do not discharge onto the bottom or into water course
2. Stay far from contact with skin and eyes
3. Wear suitable protective clothes, gloves and eye/face protection

16. Picric acid solution

Molecular formula: 2,4,6-Trinitrophenol

Apparatus: Beaker, Pipette, stirrer, Funnel, Filter Paper, measuring cylinder, volumetric flask, & bottle

Chemicals: Trinitrophenol, & hot water.

Method:

1. Dissolve the equivalent of 1 g of anhydrous trinitrophenol in 100 ml of hot water.
2. Cool, and filter if required.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- It is suitable to store picric acid wet with a minimum of half-hour water and in rubber stopper flasks

Safety advice:

- ✓ Minor quantities may be safely kept while dry, however should be keep in bottles having cork or rubber stoppers; glass stoppers should never be used for probably explosive substances, as a result of on exchange the stopper many of the material could also be ground between the neck of the flask and the stopper, so caused to explode
- ✓ Picric acid if keep in bulk should, for cover, initial be damped

17. Potassium chromate solution

Molecular formula: K_2CrO_4

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium chromate & D.W.

Strength: 0.25M

Method:

1. Take 1 L volumetric flask and in that dissolve 48.5 gm of Potassium chromate in approximately 200 ml D.W.
2. Make the solution 1 L by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Clean completely when handling. Take away contaminated clothes and Clean before use. Use with adequate ventilation. Stay away from contact with eyes, skin, and clothes. Keep container tightly closed. Stay away from consumption and inhalation. Use with adequate ventilation. Discard contaminated shoes. Stay container closed once not in use.
- Store in a cool, dry, well-ventilated space far from incompatible substances. Stay containers tightly closed.

Safety advice:

- ✓ May cause allergic skin reaction. May cause eye, skin, and respiratory tract irritation. May be harmful if swallowed, inhaled, or absorbed through the skin. May cause cancer in humans.
- ✓ Wear chemical splash goggles
- ✓ Wear suitable protective gloves to stop skin exposure Wear suitable protective clothes to stop skin exposure

18. Potassium dichromate solution

Molecular formula: $K_2Cr_2O_7$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: dilute sulphuric acid. & D.W.

Strength: 0.5N

Method:

1. Weigh 24.5 g potassium dichromate
2. Dissolve this substance in dilute sulphuric acid.
3. Add water to this and make up the solution up to mark in 1 L volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Use with adequate ventilation. Minimize dirt generation and accumulation.
- Stay away from contact with eyes, skin, and clothes. keep one's distance from respiration dirt
- Do not store in direct daylight. Store in a cool, dry space far from incompatible substances.
- Take away contaminated clothes and Clean before reuse

Safety advice:

- ✓ It may cause respiratory tract irritation.
- ✓ It may be harmful if swallowed, air sensitive, wetness sensitive. potassium dichromate might cause eye and skin irritation

19. Potassium Ferricyanide solution

Molecular formula: $K_3[Fe(CN)_6]$

Strength: 0.2N

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium ferricyanide & D.W.

Method:

1. Take 1 L volumetric flask and in that dissolve 65.8 gm of Potassium chromate in approximately 200 ml D.W.
2. Make the solution 1 liter by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- In closed bottles, far from strong acidic vapors clean hands and different exposed areas with gentle soap and water before eating, drinking or smoking and once departure work. Give sensible ventilation in method space to stop formation of vapour.
- Clean contaminated clothes before use
- Stay instrumentality closed once not in use.

Safety advice:

- ✓ Wear chemical splash goggles
- ✓ Wear suitable protective gloves to stop skin exposure Wear suitable protective clothes to stop skin exposure

20. Potassium Ferrocyanide solution

Molecular formula: $K_4[Fe(CN)_6]$

Strength: 0.2N

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium chromate & D.W.

Method:

1. Take 1 L volumetric flask and in that dissolve 84.5 gm of Potassium chromate in approximately 200 ml D.W.
2. Make the solution 1 liter by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Stay far from contact with skin and eyes.
- Clean completely after handling.
- Stay far from respiratory vapor.
- Store in well aired space. keep container tightly closed.
- Clean contaminated clothes before use

Safety advice:

- ✓ Wear chemical splash goggles
- ✓ Wear suitable protective gloves to stop skin exposure Wear suitable protective clothes to stop skin exposure

21. Potassium Iodide solution

Molecular formula: KI

Strength: 1N/ 1M

Apparatus: Volumetric flask, bottle, Beaker & stirrer.

Chemicals: Potassium Iodide & D.W

Method:

1. Weigh 166 g of KI Transfer the weighed amount of substance in flask (1 L).
2. Dissolve this substance in little water and then add more D.W.to make up the solution up to mark in 1 L volumetric flask.
3. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Clean completely when handling. Use with adequate ventilation. Minimize dirt generation and accumulation.
- Stay far from contact with eyes, skin, and clothes.
- Stay far from ingestion and inhalation. Store protected against light. Don't enable contact with water.
- Stay from contact with wet air and steam.
- Store in a cool, dry, well-ventilated space far from mismatched substances. Store protected against wetness and light.

Safety advice:

- ✓ Wear suitable protective gloves, eyeglasses and laboratory coat to stop skin exposure.

22. Potassium permanganate solution

Molecular formula: $KMnO_4$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium permanganate, D.W.

Strength: 0.1N

Method:

1. Take 3.16 g $KMnO_4$ is required to be dissolved in 1 L water.
   (Usually a little bit excess is taken, say 3.25 g, since some crystals of $KMnO_4$ will be remained undissolved that have to be removed by filtration. Since $KMnO_4$ is not a primary standard it has to be standardized against a primary standard such as oxalic acid or sodium oxalate.)
2. Dissolve this substance in little water and then add more water to make up the solution up to mark in 1 L volumetric flask.
3. Store in a Clean, dark glass bottle.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Glassware containing solutions of $KMnO_4$ can become brown. MnO_2 can be removed by scrubbing with dil. acids or sodium thiosulfate or with a weak solution of hydrogen peroxide
- Reaction with con.sulfuric acid produces the highly explosive manganese(VII) oxide (Mn_2O_7).
- Solid $KMnO_4$ is a strong oxidizer and thus should be kept separated from oxidizable substances
- It is a very strong oxidizing agent and is used to oxidise almost all the functional groups Potassium permanganate is stable and will stay indefinitely if stored in a cool dry area in closed bottles

Safety advice:

- ✓ Potassium permanganate is poisonous and irritating to skin and mucous membrane.
- ✓ Crystalline solid $KMnO_4$ can cause serious eye injury also it is a skin and inhalation irritant, and can be fatal if swallowed.
- ✓ As an oxidizer that generates the dark brown product MnO_2, potassium permanganate rapidly stains virtually any organic material such as skin, paper, and clothes. Lemon juice is sufficient to rapidly remove colour.

23. Potassium pyroantimonate solution

Molecular formula: $H_2K_2O_7Sb_2$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Potassium pyroantimonate & D.W.

Method:

1. Take Beaker (500ml) add some amount of potassium payroantimonate and dissolve in 300 ml D.W.
2. Add potassium payroantimonate until stop to dissolve to make saturated solution.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Ensure good ventilation/exhaustion at the workplace.
- Stay container tightly sealed.

Safety advice:

- ✓ Harmful by inhalation and if swallowed.
- ✓ Stay away from breathing dust/fume/gas/mist/vapours/spray
- ✓ Wear suitable protecting gloves, eyeglasses and lab coat to prevent skin exposure

24. Potassium thiocyanate solution

Molecular formula: KCNS

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: D.W. & Potassium thiocyanate

Strength: 0.5M

Method:

1. Take 48.6 gm. Potassium thiocyanate In Volumetric flask.
2. Dissolve it in little amount water and then add more water to make up the solution up to mark in 1 L volumetric flask.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Use with adequate ventilation and do not breathe dust or vapor. Stay away from contact with skin, eyes, or clothes.
- Clean hands thoroughly after handling Store in General Storage Area with other items with no definite storage hazards.
- Store in a cool, dry,well-ventilated, locked store room away from incompatible materials

Safety advice:

- ✓ Moderately toxic by ingestion.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons
- ✓ Clean hands thoroughly after handling material.

25. Silver nitrate solution

Molecular formula: $AgNO_3$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: silver nitrate & D.W.

Strength: 0.1N

Method:

1. Weigh 17 gm of silver nitrate.
2. Transfer this substance into 1 L volumetric flask.
3. Add little water to dissolve this.
4. Now add more dis. water to make up the solution up to the mark in vol. flask.
5. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Silver Nitrate should not be stored in Polyethylene bags or bottles as it reacts with plastic and it turns "gummy".
- Stay bottle in cabinet and away from sunlight
- Silver Nitrate is to be stored in dark brown glass bottle

Safety advice:

- ✓ Wear gloves and lab coat during handling the substance as it produces the purple, brown or black skin stains, long exposure may result burns.
- ✓ This material and its bottle must be disposed of as hazardous waste
- ✓ In case of contact with eyes, rinse instantly with plenty of water and search for medical advice.

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26. Sodium carbonate solution

Molecular formula: Na_2CO_3

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Sodium carbonate & D.W.

Strength: 2N/1M

Method:

1. Weigh 106 gm of Sodium carbonate
2. Take weighed amount of Sodium carbonate in volumetric flask (1 L).
3. Dissolve this substance in little water and then add more D.W.to make up the sol. up to mark in 1 L Vol. flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Do not expose to air
- Do not store in metal bottle s. Store in an opaque and air-tight bottle s
- Store in a cool, dry, well -ventilated area away from incompatible substances.

Safety advice:

- ✓ Hazardous in case of skin contact (irritant).
- ✓ Wear protection gloves at every times when working around this substance to prevent it getting on your hands
- ✓ If ingested, it can be toxic, and it can severely reason damage to the eyes, wear safety goggles

27. Sodium cobaltinitrite solution

Molecular formula: $Na_3[Co(NO_2)_6]$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: Cobalti nitrite, Sodium nitrite, Glacial Acetic acid & D.W.

Method:

1. Dissolve 12 gm Cobalti nitrite in 30 ml water.
2. In another beaker dissolve 20gm sodium nitrite in 30 ml water.
3. Mix both solution and add 5 ml glacial acetic acid
4. Make volume 250 with water filter this after 24 hours
5. Label the bottle with the names, preparing date and a batch number
6. Sodium cobalt nitrite solution Make every week

Storage and Handling:

- Stay in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Stay away from storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials.
- Clean hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids)

Safety advice:

- ✓ Causes irritation to skin. Symptoms include redness, itching, and pain
- ✓ Wear protecting gloves and Clean body-covering clothes. Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye clean fountain and quick-drench facilities in work area.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons

28. Sodium nitroprusside solution

Molecular formula: $Na_2[Fe(CN)_5NO]$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: sodium nitroprusside & D.W.

Method:

1. Dissolve 1 gm sodium nitroprusside in 100 ml water
2. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- As with all chemicals, Clean hands thoroughly after handling.
- Stay away from contact with eyes and skin.
- Protect from freezing and physical damage
- Stable under normal conditions of use and storage.

Safety advice:

- ✓ **Eye contact:** May cause irritation, redness, pain, and tearing.
- ✓ **Skin contact:** May cause irritation, redness, and pain
- ✓ Harmful if swallowed. Clean areas of contact with water.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons

29. Stannous chloride solution

Molecular Formula: $SnCl_2$

Apparatus: Volumetric flask, bottle, Beaker & stirrer

Chemicals: stannous chloride, Con. HCl & D.W.

Method:

1. Take 60 gm stannous chloride in beaker, add 100 ml con. HCl and boil it.
2. And dissolve to Make 1 liter solution with water.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Use with adequate ventilation and do not breathe dust or vapor. Stay away from contact with skin, eyes, or clothes.
- Clean hands thoroughly after handling Store in Corrosive Area with other corrosive items. Store in a dedicated corrosive cabinet.
- Store in a cool, dry, well-ventilated, locked store room away from incompatible materials. Stable under normal conditions of use and storage. Stay away from heat and ignition sources.

Safety advice:

- ✓ Stay away from contact with skin, eyes, or clothes
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons.
- ✓ Clean hands thoroughly after handling material and before eating or drinking.

30. Starch solution

Molecular formula: $(C_6H_{10}O_5)_n$

Apparatus: beaker, stirrer & bottle

Chemicals: Starch powder & D.W.

Strength: 1% in water

Method:

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1. Mix 0.5 g soluble starch with 2-3 ml deionized water.
2. Pour the starch into 50 ml boiling deionized water with stirring Continue heating the solution until the solution is nearly transparent
3. Cool solution to room temperature before use
4. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Storage precautions stay in dry, cool, ventilated storage and closed bottle.

Safety advice:

✓ Wear protecting gloves when using.

31. Zirconyl nitrate solution

Molecular formula: $ZrO(NO_3)_2.3H_2O$

Apparatus: Volumetric flask, bottle, Beaker, stirrer & funnel

Strength: 0.5 M

Chemicals: Zirconyl nitrate & Dil. Nitric acid

Method:

1. Boil 10 gm zirconyl nitrate and 100 ml dil. Nitric acid till dissolve substance.
2. After 24 hours filter it and use the filtrate as solution
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Do not breathe dust. Do not get in eyes, on skin, or on clothes. Use only in area provided with suitable exhaust ventilation. Stay away from clothes and other combustible materials.
- Stay in a dry, cool and well-ventilated place.
- Stay container tightly closed.
- Stay containers tightly closed in a dry, cool and well-ventilated place.
- Do not store near combustible materials.

Safety advice:

- ✓ Stay away from contact with the skin and the eyes. Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons.
- ✓ Use personal protecting equipment. Ensure adequate ventilation. Stay away from dust formation.

Preparation of organic liquid reagent:

1. α- Naphthol in alcohol

Molecular formula: $C_{10}H_8O$

Apparatus: beaker, stirrer, and funnel

Chemicals: α- Naphthol & methanol

Method:

1. Take 4 gm α- Naphthol in beaker, in 100 ml methanol
2. And shake until it dissolves.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Use with adequate ventilation and do not breathe dust or vapor. Stay away from contact with skin, eyes, or clothes.
- Clean hands thoroughly after handling Store in Corrosive Area with other corrosive items. Store in a dedicated corrosive cabinet.
- Store in a cool, dry, well-ventilated, locked store room away from incompatible materials. Stable under normal conditions of use and storage. Stay away from heat and ignition sources

Safety advice:

- ✓ Stay away from contact with the skin and the eyes.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons.
- ✓ Clean hands thoroughly after handling material and before eating or drinking.

2. β- Naphthol in NaOH

Molecular formula: $C_{10}H_8O$

Apparatus: beaker, stirrer, and funnel

Chemicals: β- Naphthol 2.0 M NaOH & D.W.

Method:

1. Take 1.80 grams of β -naphthol, add 60ml of 2.0 M NaOH solution and 120 ml of water.
2. Stir until all the β -naphthol has dissolved.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Use with adequate ventilation and do not breathe dust or vapor. Stay away from contact with skin, eyes, or clothes.
- Clean hands thoroughly after handling Store in Corrosive Area with other corrosive items. Store in a dedicated corrosive cabinet.
- Store in a cool, dry, well-ventilated, locked store room away from incompatible materials. Stable under normal conditions of use and storage. Stay away from heat and ignition sources

Safety advice:

- ✓ Stay away from contact with the skin and the eyes.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons.
- ✓ Clean hands thoroughly after handling material and before eating or drinking.

3. Calcium chloride solution

Molecular formula: $CaCl_2$

Apparatus: Beaker, volumetric flask, weighing bottle.

Chemicals: Calcium chloride, D.W.

Strength: 0.5N

Method:

1. Weigh 55.5 g of $CaCl_2$.
2. Transfer the weighed amount of substance in volumetric flask (1 L).
3. Dissolve this substance in little water and then add more D.W.to make up the solution up to mark in 1 L volumetric flask.
4. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Use with adequate ventilation and do not breathe dust or vapor.
- Stay away from contact with skin, eyes, or clothes.
- Clean hands thoroughly after handling.

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Safety advice:

- ✓ Stay away from contact with the skin and the eyes.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons.
- ✓ Clean hands thoroughly after handling material and before eating or drinking.

4. Fehling's solution A & B

Fehling's A is a blue aqueous solution of copper(II) sulphate, while Fehling's B is a clear solution of aqueous potassium sodium tartrate (also known as Rochelle substance) and a strong alkali (commonly sodium hydroxide) Fehling's solution is always prepared fresh in the laboratory

Apparatus: weighing balance, test tube, filter paper, funnel, glass rod volumetric flask, bottle, & Beaker

Chemicals: Copper sulphate, Sodium hydroxide, sodium potassium & con. sulphuric acid

Method:

Fehling's A:

- Dissolve 35 gm of $CuSO_4$ in 500 ml D.W.
- Add 3 ml of concentrated sulphuric acid to it.

Fehling's B:

- Dissolve 17.3 g of sodium potassium tartarate (Rochelle substance)
- And 60 g of sodium hydroxide in 500 ml D.W.

Storage and Handling:

- Store in common Storage Area with other items with no specific storage hazards
- Store in a dry, cool, well-ventilated room away from incompatible materials
- Use with adequate ventilation and do not breathe dust or vapour

Safety advice:

1. Copper(II) sulphate is also poisonous if ingested
2. Sodium hydroxide is corrosive at high concentrations and precautions should be clean hands thoroughly after handling.
3. Remove and Clean contaminated clothes taken as such not to come into direct contact with it
4. stay away from contact with skin and eyes

5. Phenolphthalein solution

Molecular formula: $C_{20}H_{14}O_4$

Apparatus: Conical Flask, Funnel, Filter Paper & Beaker

Chemicals: Phenolphthalein, Ethanol & Water

Strength: 50% Alcoholic solution

Method:

1. Weigh out 0.5 g of phenolphthalein.
2. Prepare a 50% ethanol (ethyl alcohol) solution consisting of 50 ml ethanol and 50 ml water.
3. Dissolve the phenolphthalein thoroughly in the 50% ethanol solution.
4. Store the rest in a stoppered bottle.

Storage and Handling:

- Clean thoroughly after handling. Protest bottle from physical damage
- Store in a dry, cool well-ventilated place away from incompatible materials

Safety advice:

- ✓ Stay away from breathing vapors, or dusts Use with adequate ventilation.
- ✓ Stay away from contact with eyes, skin, and clothes.
- ✓ Clean thoroughly after handling. Stay bottle closed
- ✓ Harmful if swallowed. May cause irritation

6. Potassium hydroxide in alcohol

Molecular formula: KOH

Apparatus: volumetric flask, bottle & stirrer

Chemicals: Potassium hydroxide & alcohol

Method:

1. Weigh 56 gm of Potassium hydroxide.
2. Dissolve in 1 liter alcohol.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Do not allow water to get into the container because of violent exothermic reaction.
- Do not get in eyes, on skin, or on clothes.
- Do not ingest or inhale. Stay away from formation of dust and aerosols.
- Provide suitable exhaust ventilation at places where dust is formed. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.
- Stay away from strong acids. Stay away from water. Stay away from metals. Stay away from flammable liquids. Stay away from organic halogens. Absorbs CO2 from the air.

Safety advice:

- ✓ Handle with gloves Safety glasses with side shields or tightly fitting safety goggles a lab coat must be worn.
- ✓ Stay away from contact with eyes, skin, and clothes.
- ✓ Clean thoroughly after handling. Stay bottle tightly closed

7. Potassium permanganate alkaline

Molecular formula: $KMnO_4$

Apparatus: volumetric flask, bottle & stirrer

Chemicals: Potassium permanganate sodium carbonate & D.W.

Method:

1. Dissolve 1 gm of solid Potassium permanganate in 100 ml D.W.
2. Then add 10 g sodium carbonate shake the mixture to dissolve it.
3. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Clean thoroughly after handling
- It is a very strong oxidizing agent and is used to oxidize almost all the functional groups Potassium permanganate is stable and will stay indefinitely if stored in a cool dry area in closed bottles

Safety advice:

- ✓ Potassium permanganate is poisonous and irritating to skin and mucous membrane. Stay away from contact with eyes, skin, and clothes
- ✓ Crystalline solid $KMnO_4$ can cause serious eye injury also it is a skin and inhalation irritant, and can be fatal if swallowed.
- ✓ Wear chemical splash goggles and chemical resistant clothes such as gloves and aprons

8. Tollen's reagent

Molecular formula: $Ag(NH_3)_2OH$

Apparatus: volumetric flask, bottle, stirrer, & weighing balance.

Chemicals: Silver nitrate, D.W., Liquor ammonia &Sodium hydroxide

Strength: 0.1 N

Method:

1. Place 2 ml of Silver nitrate solution in a clean test tube.
2. Add two drops of 10% sodium hydroxide solution. A brown precipitate will form.
3. Add dilute ammonium hydroxide solution drop wise until the brown precipitate of silver oxide just redissolves.

Storage and Handling:

- The reagent should be freshly prepared and stored refrigerated in a dark glass bottle It has an approximate shelf-life of 24 hours when stored in this way. After the test has been performed, the resulting mixture should be acidified with dilute acid before disposal. These precautions are to prevent the formation of the highly explosive silver nitride. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Safety advice:

- ✓ Wear safety glasses.
- ✓ Do not breathe dust. Do not allow solution or solid to come into contact with the skin.

Preparation of some common indicators

1. Bromopyrogallol Red:

Preparation: Dissolve 0.05g of the reagent in 100ml. of 50% ethanol.
Colour change: The indicator is coloured orange-yellow in strongly acid solutions, claret red in nearly neutral solutions; and violet to blue in basic solutions.

2. Diphenylamine:

Preparation: Dissolve 1 g solid in 100 ml conc. H_2SO_4
Colour change: blue-violet to colorless

3. Eriochrome Bkack T (EBT) or Solochrome Black T

Preparation: Dissolve 0.2 g of the solid in 15ml. of ethanolamine and add 5ml of absolute ethanol to reduce the viscosity; the reagent is stable for several months. A 0.4% solution of the pure dye in methanol may last for about a month.
Colour change: From blue to red.

4. Eriochrome Red B:

Preparation: Dissolve 0.1g of solid in 50ml, ethanol. It is stable indefinitely.
Colour change: from pink to pale yellow.

5. Fast Sulphon Black F:

Preparation: The indicator solution is 0.5% solution in water.
Colour change: For copper is from magenta to pale blue to bright green.

6. Murexide:

Preparation: Suspend 0.5 g of the powdered solid in water, shake thoroughly and allow to settle.The saturated supernatant is used as the indicator.
Colour change: Towards a blue endpoint.

7. Methylene blue:

Preparation: Dissolve 0.1 to 0.5g in 100 ml water
Colour change: blue to colorless

8. Methyl orange:

Preparation: Dissolve 0.05 g of the Methyl orange in 100 ml of water, add 8 ml of 0.1M hydrochloric acid, and filter if necessary.

Color change: Pink/red towards yellow-orange

9. Xylenol Orange:

Preparation: Dissolve 0.5 g of xylenol orange indicator in 100ml of water. The solution is stable indefinitely.
Colour change: Acid solutions are colored lemon yellow and those of the metal complexes intensely red.

Preparation of chromatography spray reagents

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1. Rubeanic acid:

- For detection of heavy metal ions
- Spray with a solution of 0.5gm rubeanic acid in 100 ml ethanol
- Dry briefly Spray with 25% ammonia solution or place in a chamber with ammonia vapour.

2. Aniline phthalate:

- For the detection of reducing sugars
- Dry the chromatogram Spray with 0.93 g (0.91 ml) aniline and 1.66g o-phthalic acid dissolved in 100ml n-butanol saturated with water.
- Briefly dry with hot air, then heat to 110°C for 10 minutes Spots show different colors. Some spots give fluorescence at 365nm.

3. Ninhydrin:

- For detection of amino acids, amines, amino sugars(amphetamines)
- Dissolve 0.2gm ninhydrin in 100ml ethanol, or in 94ml water and 6ml acetone.
- Spray and heat to 110°C until reddish spots appear.

Preparation of buffer solutions

Buffers for EDTA titrations

pH	Buffer composition	Use	Indicator
10	17.5 g NH_4Cl + 142 ml liq.NH_3 and make 250ml with D.W.	Ca; Mg; Water hardness	Eriochrome or Solochrome
10	50 ml 1M NH_4Cl + 250 ml 1M NH_3	Most divalent heavy metals	Pyrocatechol violet
5.0	100 ml 0.1M acetic acid + 200 ml 0.1M sodium acetate	Pb; Zn;	Xylenol orange
2.0	500 ml 0.1M sodium acetate + 52.5 ml 1M HCl diluted to 1 liter	Bi;	Xylenol orange

Acetate buffer solutions p^H 3 - 6

Make up the following solutions
(1) 0.1M acetic acid (6 ml/L)
(2) 0.1M sodium acetate (tri-hydrate) (13.6 g / L)

Mix in the following proportions to get the required.

p^H	Vol. of 0.1M acetic acid	Vol. of 0.1M sodium acetate
3	982.3 ml	17.7 ml
4	847.0 ml	153.0 ml
5	357.0 ml	643.0 ml
6	52.2 ml	947.8 ml

Preaparation of dilute solution:

1. Dilute Acetic Acid

Molecular formula: CH_3COOH

Apparatus: Volumetric flask (1 L), stirrer and container

Strength: 1 N

Calculations:

Approximate normality of concentrated acetic acid (Glacial Acetic Acid) used in the lab=17.4 N

$$N_1V_1 = N_2V_2$$

Where,

N_1 = Normality of glacial acetic acid= 17.4

V_1 = Volume of glacial acetic acid = X (have to calculate)

N_2 = Normality of acetic acid required= 1 N

V_2 = Volume of volumetric flask= 1000 ml

$$(17.4)\ x(X) = (1)\ X\ (1000)$$

$$X = 1000/17.4$$

$$X = 57.47 \approx 58.00 \text{ ml}$$

Method:

1. Measure 58.0 ml of glacial acetic acid.
2. Transfer this in 1 L volumetric flak.
3. Add D.W.to this and make up the solution up to the mark in volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay container tightly closed.
- Remain container in a cool, well-ventilated area.

Safety advice:

- ✓ Do not ingest.
- ✓ Do not breathe gas/fumes/vapor/spray.
- ✓ In case of insufficient ventilation, wear suitable respiratory equipment.
- ✓ If ingested, seek medical advice instantly and show the container or the label.
- ✓ Stay away from contact with skin and eyes.

2. Dilute Hydrochloric Acid

Molecular formula: HCl

Apparatus: Beaker, volumetric flask (1 L), and stirrer.

Strength: 1 N

Calculations:

Approximate normality of concentrated hydrochloric acid used in the lab=11.3 N

$$N_1V_1 = N_2V_2$$

Where

N_1 = Normality of conc. hydrochloric acid= 11.3

V_1 = Volume of conc. hydrochloric acid = X (have to calculate) N_2 = Normality of dil. hydrochloric acid required= 1N

V_2 = Volume of dil. hydrochloric acid = 1000 ml

$$(11.3) \times (X) = (1) \times (1000)$$

$$X = 1000/11.3$$

$$X = 88.49 \text{ ml} \approx 89.00 \text{ ml}$$

Method:

1. Measure 89.00 ml of conc. hydrochloric acid.
2. Transfer this to 1 L volumetric flak.
3. Add D.W. to this and make up the solution up to the mark in volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay away from adding water.
- Slowly add acid to water to prevent spattering or boiling.
- Clean thoroughly with soap and water after handling.
- Stay container tightly closed.
- Store in a cool, dry, well-ventilated area.

Precautions:

- ✓ Concentrated hydrochloric acid forms acidic mist. Both the mist and the solution have corrosive effects on human tissue, with the potential to damage respiratory organs, eyes, skin, and intestines.
- ✓ Use protecting clothes impervious to acid such as neoprene or polyvinyl chloride. Use precaution to ensure that all potentially affected body parts are covered by protecting clothes.
- ✓ Contact lenses should not be worn.
- ✓ Wear close fitting chemical splash goggles at a minimum

3. Dilute Nitric acid

Molecular formula: HNO_3

Apparatus: Volumetric flask (1 L), beaker, stirrer, container.

Strength: 1N

Calculations:

Approximate normality of concentrated Nitric acid used in the lab=16.0N

$$\mathbf{N_1V_1 = N_2V_2}$$

Where,

N_1 = Normality of conc. Nitric acid = 16.0

V_1 = Volume of conc. Nitric acid = X (have to calculate)

N_2 = Normality of dil. Nitric acid required= 5N

V_2 = Volume of dil. Nitric acid = 1000 ml

$$(16.0)\ x(X) = (1)\ X\ (1000)$$

$$X = 1000/16.0$$

$$X = 62.5\ ml \approx 63.0\ ml$$

Method:

1. Measure 63.0 ml of conc. nitric acid.
2. Transfer this to 1 L volumetric flak.
3. Add D.W.to this and make up the solution up to the mark in volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

.Storage and Handling:

- Store in a cool, dry place. Stay container closed.
- Do not let it come in contact with eyes, on skin or on clothes.
- Store away from oxidizable materials.
- Clean thoroughly after handling.

Safety advice:

- ✓ When inhaled, the vapours of the acid can cause difficulties in breathing. In fact, if there is prolonged exposure, one can even get pulmonary edema and pneumonia, both of which are fatal.
- ✓ Skin contact can also be damaging as it could reason severe burns, redness, pain and even deep ulcer if concentrated solutions get to the skin. Thus, make sure to wear prescribed clothes for handling the acid.
- ✓ Be aware of irritation of the throat, nose and respiratory tract, choking and coughing as these are clear indications that a person has already inhaled its vapours

4. Dilute Sulphuric acid

Molecular formula: H_2SO_4

Apparatus: Volumetric flask (1 L), container, stirrer, beaker.

Strength: 1 N

Calculations:

Approximate normality of concentrated sulphuric acid used in the lab= 36.0N

$$\mathbf{N_1V_1 = N_2V_2}$$

Where,

N_1 = Normality of conc. sulfuric acid = 36.0

V_1 = Volume of conc. sulfuric acid = X (have to calculate)

N_2 = Normality of dil. sulfuric acid required= 1 N

V_2 = Volume of dil. sulfuric acid = 1000 ml

$$(36.0)\ x(X) = (1)\ X\ (1000)$$

$$X = 1000/36.0$$

$$X = 28.00\ ml$$

Method:

1. Measure 28.00 ml of conc. sulfuric acid.
2. Transfer this in 1 L volumetric flak.
3. Add D.W.to this and make up the solution up to the mark in volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Wear protecting clothes, including safety glasses.
- Stay container tightly closed.
- Remain container in a cool, well-ventilated area.
- Do not store above $23^{o}C$ ($73.4^{o}F$)

Safety advice:

- ✓ **Always add acid to water**. Add a little amount at a time, constantly stirring. This will produce a dilute solution, releasing only a small amount of heat and any splatters that do occur are more likely to be water or dilute acid rather than concentrated acid. If acid is spilt, clean with lots of water and use sodium bicarbonate to neutralise the acid.
- ✓ If water is by accident added to con. Sulfuric acid, the heat released will make the water boil violently, often splattering droplets of concentrated acid out of the container. There may be enough heat generated to crack the container.

5. Ammonium hydroxide solution

Molecular formula: NH_4OH

Apparatus: Volumetric flask (1 L), container, beaker.

Strength: 1N

Calculations:

Approximate normality of concentrated Ammonia solution used in the lab=14.3 N

$$\mathbf{N_1V_1 = N_2V_2}$$

Where

N_1 = Normality of conc. Ammonia solution = 14.3

V_1 = Volume of conc. Ammonia solution = X (have to calculate)

N_2 = Normality of dil. Ammonia solution required= 1N

V_2 = Volume of dil. Ammonia solution = 1000 ml

$$(14.3)\ x(X) = (1)\ X\ (1000)$$

$$X= 1000/14.3$$

$$X = 71.0\ ml$$

Method:

1. Measure 71.0 ml of conc. ammonia solution.
2. Transfer this to1 L volumetric flak.
3. Add D.W. to this and make up the solution up to the mark in volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Clean thoroughly after handling.
- Remove contaminated clothes and Clean before reuse.
- Do not get in eyes, on skin, or on clothes.
- Remain container tightly closed.
- Do not store in direct sunlight.
- Isolate from oxidizing materials and acids.
- Store in a cool, dry, well-ventilated area away from incompatible substances.

Safety advice:

✓ Wear chemical splash goggles, face shield gloves to prevent skin exposure and clothes to prevent skin exposure.

6. Sodium hydroxide (Caustic soda) solution

Molecular formula: NaOH

Apparatus: Volumetric flask, stirrer, container.

Strength: 2 N

Calculations:

Molecular mass Or Equivalent weight of NaOH =40 g mol^{-1}

$$2N = (X/40)\ (1000/1000)$$

$$X = 80\ g.$$

Method:

1. Take 1 L volumetric flask and in that dissolve 80 g of NaOH in approximately 200 ml D.W.
2. Make the solution 1 L by adding D.W. up to the mark.
3. Put the flask in a thermostat at 20^0C and stay for 1 hour.
4. Label the bottle with the names, preparing date and a batch number

Storage and Handling:

- Caustic soda solution is extremely corrosive and can be hazardous to personnel.
- Product should be stored between 85° to 100°F (29° to 38°C). Sodium hydroxide) is a deliquescent substance and has a strong affinity for moisture.
- Sodium hydroxide should be stored in air-tight plastic containers made of HDPE (high-density polyethylene).Sodium hydroxide should be stored in an airtight resalable container.

Safety advice:

- ✓ Always wear safety glasses.
- ✓ Do not allow solid or solution to come into contact with your skin

7. Barium chloride solution

Molecular formula: $BaCl_2.2H_2O$

Apparatus: Volumetric flask, stirrer, container

Strength: 0.25 M

Method:

1. Take 1 L volumetric flask and in that dissolve 61.1 g of Barium chloride in approximately 200 ml D.W.
2. Make the solution 1 L by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number

Calculations:

Molecular mass Or Equivalent weight of $BaCl_2.2H_2O = 244.3 g\ mol^{-1}$

$$0.25\ N = (X/244.3)\ (1000/1000)$$

$$X = 61.1\ g.$$

Storage and Handling:

- Stay away from skin and eye contact.
- Stay away from inhalation or ingestion of the powder.
- Stay away from heat. Stay away from moisture.
- Stay the lid tightly closed.
- Clean hands thoroughly after handling.

Safety advice:

- ✓ Wear protecting clothes. A long sleeved laboratory coat or gown, rubber gloves, safety goggles and a face mask as a minimum standard

8. Ammonium chloride solution

Molecular formula: NH_4Cl

Apparatus: Volumetric flask, stirrer, container

Strength: 1 M

Method:

1. Take 1 L volumetric flask and in that dissolve 53.5 g of Ammonium chloride in approximately 200 ml D.W.
2. Make the solution 1 L by adding D.W. up to the mark.
3. Label the bottle with the names, preparing date and a batch number

Calculations:

Molecular mass Or Equivalent weight of $NH_4Cl = 53.5\ g\ mol^{-1}$

$$1\ N = (X/53.5)\ (1000/1000)$$

$$X = 53.3\ g.$$

Storage and Handling:

- The product is stable at normal handling and storage conditions.
- Stay away from breathing fumes. Clean thoroughly after handling
- Store in a tightly closed container in a dry place

Safety advice:

✓ Use safety glasses. Wear suitable working clothes.

9. Sodium thiosulphate solution

Molecular formula: $Na_2S_2O_3.5H_2O$

Requirements: Sodium thiosulphate, Sodium carbonate & D.W.

Apparatus: Beaker (100 ml), volumetric flask (1 L), weighing bottle.

Strength: 0.1N/ 0.1M

Calculations:

Molecular mass or Equivalent weight = sodium thiosulphate = 248 g mol^{-1}

Amount/ Weight= X

0.1N= (X/248) (1000/1000)

X=24.8 g

Method:

1. Weigh 24.8 g of sodium thiosulphate pentahydrate.
2. Transfer the weighed amount of substance in volumetric flask (1 L).
3. Dissolve this substance in little D.W. and then add more D.W.to make up the solution up to mark in 1 L volumetric flask.
4. Add 0.1 g of Na_2CO_3 to improve its stability, store overnight, and filter through fine grade paper.
5. Collect and store in a Clean, dark glass bottle.
6. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Sodium thiosulphate reacts with bromine to render harmless products. Solutions of sodium thiosulphate are commonly used as a precaution in chemistry laboratories when working with bromine.
- Stay away from spilling, skin and eye contact. Stay away from inhalation of vapours and spray mist.
- Store in closed original container at temperatures between 15°C and 25°C. Store away from direct sunlight and moisture.

Safety advice:

- ✓ Due to the very dilute nature of this product it is not expected to be harmful.
- ✓ Stay away from contact with skin and eyes.
- ✓ Wear suitable gloves and eye face protection.
- ✓ Sodium thiosulphate may be harmful if you swallow it

10. Potassium persulfate solution

Molecular formula: $K_2S_2O_8$

Requirements: Potassium persulfate & D.W.

Apparatus: Beaker (100 ml), volumetric flask (1 L), weighing bottle.

Strength: 1M / 2N

Calculations:

Molecular mass = 270.32 g mol^{-1} **&** Equivalent weight = 135.16 g mol^{-1}

Amount/ Weight= X

2N = (X/135.16) (1000/1000)

X=270.32 g

Method:

1. Weigh 270.32 of sodium thiosulphate pentahydrate.
2. Transfer the weighed amount of substance in volumetric flask (1 L).
3. Dissolve this substance in little D.W. and then add more D.W.to make up the solution up to mark in 1 L volumetric flask.
4. Label the bottle with the names, preparing date and a batch number.

Storage and Handling:

- Stay away from spilling, skin and eye contact. Stay away from inhalation of vapours and spray mist.

Safety advice:

- ✓ Stay away from contact with skin and eyes.
- ✓ Wear suitable gloves and eye face protection.

Qualitative analysis laboratory reagents:

List of side bench reagents

Check the alphabetical listing below.

Ammonium acetate.
Dissolve 231 g of the substance in 1 liter of water. (3M)
Ammonium carbonate. Dissolve 192 g of the substance in a mixture of 140ml conc. ammonia solution and water to make up 1 liter of solution. (2M)
Ammonium chloride
dissolve 169 g of the substance in 1 liter of solution (3M).
Ammonium nitrate
dissolve 80 g of the substance in 1 liter of water. (1M)
Ammonium oxalate
dissolve 71 g of the crystaline substance in 1 liter of water.(0.5M)
Ammonium sulphate
dissolve 132 g of the substance in 1 liter of water.(1M)
Ammonium sulphide
use the yellow commercial product
Ammonium thiocyanate
Dissolve38 g of the substance in 1 liter of water (0.5M)
Barium chloride
dissolve 61 g of the substance in 1liter of water.(0.25M)
Bromine water
a saturated aqueous solution is prepared by shaking 35g or 11ml liquid bromine with water. Add more bromine if necessary to a slight excess.
Calcium chloride
dissolve 55 g of the hydrated substance in 1 liter of water (0.25M)
Calcium sulphate
shake 3 g of the substance with 1 liter of water, filter and decant the saturatrd solution after several hours (0.015M)
Chlorine water
saturate 250ml of water with chlorine.the chlorine may be prepared by dropping conc. HCl upon KmnO4. Preserve in a dark coloured bottle.(6.8g/l)
Cobalt nitrate
dissolve 44 g of the substance in 1 liter of water. (0.15M)
Copper sulphate
dissolve 125 g of the substance in 1 liter of water containing 3ml of conc. Sulphuric acid.(0.5M)

Ferric chloride
dissolve 135 g of the hydrated substance in 1 liter of water containing 20ml of conc. HCl (0.5M)
Ferrous sulphate
dissolve 140 g of the substance in 1 liter of water containing 7 ml of conc. Sulphuric acid (0.5M)
Hydrogen sulphide
H2S generated from a Kipps apparatus (~42g/l)
Iodine solution
dissolve 12.7 g of iodine in a solution of 20g of pure KI in 30 ml of water, and dilute to 1 liter with water.(0.05m)
Lead acetate
dissolve 95 g of the substance in 1 liter of water (0.25M)
Magnesium sulphate
dissolve 62 g of the substance in 1 liter of water (0.25M)
Magneson (4-(4-nitrophenylazo) resorcinol
0.001% in 1M NaOH.
Mercuric chloride
dissolve 27 g of the substance in 1 liter of water (0.1M)
Potassium chromate
dissolve 49g of the substance in 1 liter of water (0.25M)
Potassium ferricyanide
dissolve 55 g of the substance in 1 liter of water (0.25M)
Potassium ferrocyanide
dissolve 53 g of the substance in 1 liter of water (0.125M)
Potassium iodide
dissolve 83 g of the substance in 1 liter of water (0.5M)
Potassium permanganate
dissolve 3.2g of the substance in hot water, dilute to 1 liter, and filter through glass wool (0.01M)
Potassium thiocyanate
dissolve 49g of the substance in 1 liter of water (0.25M)
Silver nitrate
dissolve 17g of the substance in 1 liter of water (0.1M)
Silver sulphate
dissolve 8g of the substance in 1 liter of water. this is nearly a saturated solution (0.025M)
Sodium acetate
dissolve 408g of the crystaline substance in 1 liter of water (3M)
Sodium carbonate
dissolve 430g of the crystaline substance in 1 liter of water (1.5M)

Disodium hydrogen phosphate
dissolve 120g of the substance in 1 liter of water 0.34M)
Stannous chloride
dissolve with heat 56g of the substance in 100ml conc. HCl and dilute to 1 liter. Stay a few pieces of granulated zinc in the stored solution to Stay away from oxidation.(0.25M)
Thiourea
10g in 100ml of water (10%)
Titan yellow
dissolves 1g in 100ml of water (1%)
Zinc nitrate
dissolve 150g of the substance in 1 liter of water (0.5M)

LIST OF SPECIAL REAGENTS

A

Aluminon
Use a 0.1% aqueous solution.
Alizarin
Make a saturated solution in ethanol.
Alizarin-S
Sodium alizarin sulphate
Use a 0.1% aqueous solution.
1-Amino-1-Naphthol-4-sulfonic acid
Dissolve 0.2 g in 195 ml of sodium bisulphite solution (3 in20) and 5 ml of anhydrous sodium sulphite solution (1 in 5) and filter if necessary. Stopper and store in a cool dark place. Use within 10 days.
Ammoniacal silver nitrate
Add conc ammonia to bench silver nitrate (0.1M) until the initially formed ppt. Just disappears.
Ammonium citrate, lead free
Dissolve 40g of citric acid in 100 ml of water and make alkaline to phenol red with ammonium hydroxide. Remove lead by shaking with small portions of dithizone extraction solution in chloroform until the dithizone solution retains its original green color.Discard the extraction solution.

Ammonium mercurithiocyanate
Dissolve 9g of ammonium thiocyanate and 8g of mercuric chloride in 100ml of watwer.
Ammonium metavanapreparing date
Dissolve 2.5g of NH_4VO_3 in 500 ml of boiling water, cool, and add 20 ml of nitric acid. Dilute to 1 liter and store in polythene bottle.
Ammonium molybpreparing date reagent
Method A: Dissolve 45 gms. of the commercial substance or 40 gms. of pure molybdenum trioxidein a mixture of 70 ml.of concentrated ammonia solution and 140 ml. of water; when solution is complete, add it very slowly and with vigorous stirring to a mixture of 250ml.of concentrated nitric acid and 500ml.of water, and dilute to 1 litre.Allow to stand 1 to 2 days and decant and use the clear solution.
Method B: Dissolve 45 gms. of pure commercial ammonium molybpreparing date in mixture of 40ml. concentrated ammonia solution and 60 ml. of water, add 120gms. of ammonium nitrate and dilute to a litre with water.
Note: The alkaline solution of ammonium molybpreparing date stays better than the nitric acid solution; there is little tendency for the separation of solid. Before using the alkaline solution, it is important that the test solution contains a slight excess of nitric acid.
Ammoniacal silver nitrate
Add ammonia dropwise to a 1 in 20 solution of silver nitrate until the ppt. that first forms is almost, but not entirely, dissolved. Filter and store in dark bottle.Forms explosive compounds on standing! Prepare fresh.
Ammonium sulfanilate
To 2.5 g of sulfanilic acid add 15 ml water and 3 ml ammonia and mix. If necessary add more ammonia until the the acid dissolves. Adjust the pH to 4.5 with dilute HCl and dilute to 25 ml
Amylase
To 0.2 g of amylase crystal, add 100ml water, shake well and filter. Prepare fresh.
Anthranilic acid
Dissolve 0.5g in 100 ml ethanol
Anthrone
Dissolve about 0.1 g in 100 ml sulphuric acid. Prepare fresh.

Aqua Regia
Mix one part by volume of conc. nitric acid with three (3) parts by volume of conc. hydrochloric acid in a pyrex beaker and allow to stand until a bright red color develops.

B

Barfords reagent
Dissolve 13.3gm.of crystalised neutral copper acetate in 200ml.of 1% acetic acid solution. This reagent does not stay well.
Bradys reagent (2,4 DNPH)
Dissolve 40g of 2, 4 dinitrophenylhydrazine in 80ml conc. Sulphuric acid. Cool and add 900ml methanol and 100ml water.
Benedicts solution (qualitative)
Dissolve 86.5gm.of sodium citrate and 50gm. of anhy. sodium carbonate in about 350ml. of water. Filter if necessary. Add a solution of 8.6gm. of copper sulphate in 50ml. of water with constant stirring. Dilute to 500ml. The resulting solution should be perfectly clear; if not, filter through a fluted filter paper.
Benedicts solution (quatitative)
Dissolve 200 g sodium citrate, 75g sodium carbonate and 125g potassium thiocynate in about 600 ml water. Dissolve separately, 18g copper (11) sulphate in 100 ml water. When the solutions have cooled, mix them together with stirring. Now add 5 ml of a 5% potassium ferrocyanide to the solution, and make up to 1 liter.
Benzidine
Dissolve 50 g in 10 ml glacial acetic acid, dilute to 100 ml with water and mix. caution: Toxic!).
Benzodine
Dissolve 1g in 10ml acetic acid and dilute to 100 ml with water.
2,2-bipyridine
Dissolve 0.100 g in 50ml purified absolute ethanol.

Biuret reagent(qualitative)
Take enough urea to cover the bottom of a test tube. Heat very gently , until the liquid which forms resolidifies. This white solid is biuret. Dissolve the biuret in about 2ml. water, and use this solution for the biuret test.
Or
Soln. A : 0.1m sodium hydroxide.
SoLn. B : 0.01M copper (11) sulphate solution. Add soln. A first to sample, then add B. Pink or purple color confirms protein.
Biuret reagent (quantitative)
Dissolve in order, 3g copper (11) sulphate, 5g potassium iodide, 9g potassium sodium tartrate, and 8g sodium hydroxide in about 600 ml water. Make up the dissolved solids to 1 liter solution.
Brucine sulphate
Boil a 2 to 1 mixture of conc. sulphuric acid and water to to remove nitrates, cool , and dissolve into it 0.6g of brucine sulphate and dilute to 1 liter.

C

Carr-Price reagent
Weigh an unopened bottle of antimony trichloride. Open the bottle and empty the names into a wide mouth glassstoppered amber bottle containing about 100 ml of chloroform. By difference, obtain the weight of antimony trichloride and then add sufficient chloroform to supply 100 ml for each 25 g. Dissolve by warming or shaking for several hours and filter through sodium sulphate into a dry Clean amber bottle with ground stopper.Store at room temperature and stay in dark when not in use. Rinse all glassware coming into contact with this reagent wit chloroform or a mixture of ethanol and ether, since the antimony oxychloride which forms is insoluble in water.
Cacotheline
a-nitroso-b-naphthol reagent
Dissolve 0.25 g in 100 ml of water.
Cadion 2B reagent
4-nitronaphthalene-diazamino-azobenzene
Dissolve 0.25 g in 100 ml of water.
Chloroplatinic acid
Dissolve 2.7 g in 10 ml. of water.

Chromic acid
Weigh out 10 g of sodium dichromate crystals, make it into a slurry with a few ml of watwer, then dissolve in 250ml conc. sulphuric acid with stirring and cooling (ice-bath), to give a thick syrupy dark brown mixture.(very corrosive!)
Chromotrope 2B
Use a 0.005% in conc. sulphuric acid.
Chromotropic acid
Dissolve 1g of 4,5-dihydroxy-2,7-naphthalenedisulfonic acid in 100 ml water.
Cincholine
Dissolve 1g in 100 ml hot water containing a few drops of nitric acid, cool, and add 2g of KI.
Cobalt-uranyl acetate
Dissolve with warming, 40 g of uranyl acetate in a mixture of30 ml acetic acid and 470 ml water.Similarly, prepare a solution containing 200 g of cobaltous acetate in a mixture of 30 ml acetic acid and 470 ml water. Mix the two solutions while still warm, cool to room temperature to separate xs substance s from the solution and filter.
Cupferon
Dissolve 5 g in 100ml solution.(5%) does not stay. Add about 1g of ammonium carbonate to stock to enhance stability.
Cupron
Dissolve 5g of a-benzoin oxime in 100ml ethanol

D

Deniges reagent
Dissolve 5 g of yellow mercuric oxide (HgO) in a mixture of 40 ml of water,and while stirring slowly add 20 ml of sulphuric acid, then add another 40 ml of water, and stir until complety dissolved <0.5N)
Dimethyl glyoxime
Dissolve 1gm. of the solid in 100ml. of 95% ethyl alcohol.

N,N-dimethyl-p-phenylenediamine

a.Measure and pour into a 250 ml beaker 89 ml of D.W.. Stir on a magnetic stirrer. Carefully add 15 ml of concentrated sulfuric acid. Add and dissolve 1.0 g n,n-dimethyl-p-phenylenediamine sulfate. Add 5 g of Florisil and stir the mixture until all is absorbed. Allow the adsorbant to settle and decant the supernatant solution. **b**.Add 200 ml sulphuric acid to 700 ml water, cool, and add 1g of N,N-dimethyl-p-phenylenediamine (p-aminodimethylaniline) and dilute ti 1 liter.

Dinitro-p-diphenylcarbazide Dissolve 0.1g in 100 ml ethanol

Diphenylcarbazide

Use a saturated ethanolic solution; or dissolve 0.125 g in a mixture of 25ml acetone 25 ml water; or dissolve 0.2g in 10 ml acetic acid and dilute to 100 ml with methanol

Diphenylcarbazone

Dissolve an approximately 1% solution in ethanol.

Dipicrylamine

Dissolve 0.2g in 20 ml of 0.1M sodium carbonate solution, boil, cool, then filter.

Dipridyl reagent

Dissolve 0.1g in 0.5ml ethanol,or in 0.1M HCl

Dithiol reagent

4-methyl-1:2 dimercarpo-benzene

Dissolve 0.2g in 100 ml of 1% NaOH

Dithizone solution

Dissolve 30 mg (milligram) of dithizone in 1 liter chloroform, add 5 ml alcohol, and store in refrigerator.

Dragendorff reagent

Solution 1: dissolve 0.85g of basic bismuth nitrate in 10 ml acetic acid and 40 ml water.

Solution 2: dissolve 8 g of potassium iodide in 20 ml water.

Mix 5 ml of Solution 1; 5 ml of Solution 2; 20 ml of acetic acid; and 100 ml of water before use.

E

Ethylenediamine reagent
Add copper sulphate to a solution of ethylenediamine until the color becomes dark-blue violet
p-Ethoxychrysoidin
Dissolve 50 g in a mixture of 25 ml water and 25 ml ethanol, add 3 drops hydrochloric acid, stirr vigorously, and filter if necessary to obtain a clear solution.

F

Fehlings solution
Solution A; Dissolve 34.6gms. Of pure copper sulphate in D.W.and dilute to 500ml.

(blur)

Solution B: Dissolve 173gms. of sodium potassium tartrate and 30gms.of pure sodium hydroxide in water and dilute to 500ml. Alternately, dissolve 121gms. Of pure sodium hydroxide and 93.1gms.of pure tartaric acid in water, then dilute the solution to 500ml.(colourless).

Mix equal volumes of solutions A and B immediately before use, and then use as the reagent.

Ferric thiocyanate reagent
Dissolve 1.5 g of ferric chloride and 2.0 g of potassium thiocyanate in 100 ml water.
Ferron reagent
7-iodo-8-hydroxyquinoline-5-sulphonic acid
Dissolve 0.2 g in 100 ml water
Fluorescein
Make a saturated solution in 50% ethanol.
Formaldehyde
Dilute the commercial 40% solution (1 part) with water (7 parts)

Fuchsin solution
Dissolve 0.15gm. of fuchsin in 100ml. water.
Furil-dioxime reagent
Dissolve 10 g in 100 ml ethanol.

G H

Hydrazine sulphate
Dissolve 2 g in 100 ml water.
Hydrogen peroxide
Use the commercial 10 volume (3%) or 20 volume 6%) solution.
Hydroxylamine hydrochloride
Dissolve 10 g in 100 ml water.
8-Hydroxyquinoline
Use a 5% solution in ethanol.

I

Indigo solution
gently warm 1gm. of indigo with 12ml. of concentrated sulphuric acid, allow to stand for 48hrs and pour into 240ml. of water. Filter if necessary.
Indole
Dissolve 0.15 g in 100 ml ethanol
Iodine reagent.
Dissolve 20g KI and 10g iodine crystals in 100ml water.

J

Jones reagent.
Mix 25g of chromium trioxide (chromic anhydride CrO_3) with conc. sulphuric acid to a paste, then dilute with water to 75ml.

K

Karl Fisher Reagent

Dissolve 762 g of iodine in 2,420 ml of pyridine in a 10 liter glass stoppered bottle, and add 6 liters of methanol. To prepare the active stock, add 3 liter of the foregoing stock to a 4 liter bottle, cool in ice bath. Add carefully 135 ml of liquid sulfur dioxide, collected in a calibrated cold trap,and stopper the bottle. Shake the mixture until homogeneous, and set aside for one or two days before use.

L M

Magnesia mixture
Dissolve 100gms. of magnesium chloride and 100gms.of ammonium chloride in water, add 50ml. of concentrated ammonia solution and dilute to 1 litre with D.W..
Magnesium nitrate reagent
Dissolve 130gms. of magnesium nitrate and 200gms. of ammonium nitrate in water, add 15-20ml.concentrated ammonia solution and dilute to 1 litre.
Magneson 1
para-nitrobenzene-azo-resorcinol
Magneson 11
para-nitrobenzene-azo a-naphthol
Use a 0.001% in 1M sodium hydroxide.
Malachite green
A 1% solution of malachite green oxalate in glacial acetic acid.
Manganese sulphate
Dissolve 90 g manganese sulphate in 200 ml water, 175 ml phosphoric acid and 350 ml of diluted sulphuric acid (1 in2). Add water to make up 1 liter.
Mayers reagent
Mercuric-Potassium Iodide
Dissolve 1.358 g of mercuric chloride in 60 ml water. Dissolve 5 g of potassium iodide in 10 ml water. Mix the two solutions and add water to make 100 ml.

4-(methylamino)phenol sulphate
Dissolve 2 g in 10 ml water. To 10 ml of this solution add 90 ml of water and 20 g of sodium bisulfite.
Millons reagent
Warm one globule of Mercury with concentrated nitric acid and dilute the solution with twice its volume of water.
Molischs reagent.20% soln. in naphthol. Dissolve 20g of 1-naphthol in 100ml ethanol.
Murexide
Add 0.4 g of murexide to 40 g of powdered potassium sulphate, and grind in glass mortar to a homogeneous mixture.

N

Naphthalenediol
Dissolve 0.1 g of 2,7-dihydroxynaphthalene in 1 liter sulphuric acid and allow the solution to stand in the dark until the yellow color has diappeared (at least 18 hrs.)
1-Naphthol
Dissolve 1 g of 1-naphthol in 25 ml methanol. Prepare fresh.
alpha-Naphtholbenzein
A 1% solution in benzol.
a-Naphthalamine
Boil 0.3 g in 70 ml water, filter or decant, and mix with 30 ml of glacial acetic acid.

Nesslers reagent

Dissolve 10gms. of potassium iodide in 10ml. of ammonia-free water, adding saturated mercuric chloride solution (60gms. / litre) in small quantities at a time with shaking, until a slight permanent precipitate is formed, then adding 80ml. of 9M sodium hydroxide solution and diluting to 200ml.Allow to stand overnight and decant the clear liquid. Nesslers reagent has been described as a solution which is about 0.09M in potassium mercuri-iodide and 2.5M in potassium hydroxide.An alternative method is to dissolve23gms. of mercuric iodide and 16gms. of potassium iodide in ammonia-free water and make up the volume to 100ml; add 100ml. of 6M sodium hydroxide. Allow to stand for 24hrs. and decant the solution from any precipitate that may have formed, the solution should be kept in the dark. Another method that reacts

promptly and consistantly is to dissolve 143 g of sodium hydroxide in 700 ml water. Disolve 50 g of red mercuric iodide and 40 g of potassium iodide in 200 ml water. Pour the iodide solution into the hydroxide solution, and dilute with water to 1 liter. Allow to settle, and use the supernatant liquid.

Ninhydrin
A 0.2% solution of ninhydrin (triketohydrindene hydrate, C9H4O3.H2O) in water. Prepare fresh.
Nitron reagent
Dissolve 5g nitron in5 ml acetic acid and make up to 100 ml with water.
a-Nitroso-b-naphthol
Dissolve 10 g in 100 ml of either 1:1 acetic acid , ethyl alcohol or acetone.
Nitroso-R-substance
sodium 1-nitroso-2-hydroxynaphthalene-3:6-disulphate
Dissolve 1 g in 100 ml water.

O

1,10-phenanthroline
Dissolve 0.1 g of the monohydrate in 100 ml water.
Orthophenanthroline
Dissolve 0.15 g orthophenanthroline (C12H8N2.H2O) in 10 ml solution of ferrous sulphate, prepared by dissolving 1.48 g of ferrous sulphate in 100 ml water. The ferrous sulphate solution must be prepared immediately before dissolving the orthophenanthroline.

P

Phosphomolybdic acid
Dissolve 5 g in water, filter and dilute to 100 ml.
Picric acid
Dissolve the equivalent of 1 g of anhydrous trinitrophenol in 100 ml of hot water. Cool, and filter if necessary.

Potassium cyanide
Dissolve 10 g of KCN in sufficient water to make 20 ml. Dilute to 100 ml. Shake with dithizone solution to remove lead.
Pyrogallol
1:3:5-trihydroxybenzene

Q

Quimociac reagent

Dissolve 70 g of sodium Molybdate (Na2MoO42H2O) in 150 ml water (Slution A). Dissolve 60 g of acetic acid in a mixture of 85 ml nitric acid and 150 ml of water and cool (Solution B) Gradually add Solution A to Solution B, with stirring, to produce Solution C. Dissolve 5 g of synthetic quinoline in a mixture of 35 ml nitric acid and 100 ml water (Solution D) Gradually add Solution D to Solution C, mix well, and allow to stand overnight. Filter the mixture, add 280 ml of acetone to the filtrate, dilute to 1 liter with water, and mix. Store in polythene bottle.(Caution: Flammable).

Quinaldic acid
Neutralize 1g of the acid with NaOH and dilute ti 100 ml
Quinalizarin reagent
Dissolve 0.02g in 100 ml ethanol, or dissolve 0.05g in 100 ml of 0.01M sodium hydroxide.

R

Rhodamine B
Dissolve 0.01 g in 100ml water, or dissolve 0.05 g rhodamine B and 15g KCL in a solution of 15 ml conc. HCl and 85 ml water
Rubeanic acid
(dithio-oxamide) - 0.05% in ethanol., a saturated ethanolic solution.

S

Salicylaldehyde
A 20% solution in ethanol.
Schiffs reagent
Method 1: Dissolve 0.2gm. of pure p rosaniline hydrochloride in 20ml. of a cold, freshly prepared, saturated aqueous solution of sulphur dioxide; allow the solution to stand for a few hours until it becomes colourless or pale yellow. Dilute the solution to 200ml. and stay it in a tightly stoppered bottle.The solution stays well, and should not be exposed to light or air. Store in the dark.
Method 2: Add 2gm. of sodium bisulphite to a solution of 0.2gm.of p- rosaniline hydrochloride and 2ml.of concentrated hydrochloric acid in 200ml. of water.
Silicotungstic acid
Dissolve 10 g ofsilicotungstic acid (Si02.12WO3.26H2O) in water and neutralize with 10% sodium hydroxide (pH 6)
Silver ammonium nitrate
Dissolve 1 g of silver nitrate in 20 ml of water.Add ammonia dropwise, withconstant stirring, until the ppt. is almost but not entirely dissolved. Filter and store in dark container.
Silver diethyldithiocarbamate
Dissolve 1 g in 200 ml of freshly distilled pyridine.
Sodium azide
A 5% solution of sodium azide in water.
Sodium borohydride
Dissolve 0.6 g sodium borohydride and 0.5g of sodium hydroxide with stirring and dilute to 100 ml with water.

Sodium cobaltinitrite solution
Dissolve 17gms. Of the pure substance in 250 of water
Alternately, the solution may be prepared as follows: Dissolve 7.5 gms. Cobalt nitrate in 30ml. of water; dissolve 60gms. Of sodium nitrite in 30ml. of water, mix the two solutions with vigorous stirring and add 15ml. of glacial acetic acid, stir, dilute to 250ml, allow to stand and filter.Make up new solution every 2-3 weeks.
Sodium diethyldithiocarbamate
Dissolve 1 g in water and dilute to 1 liter.

Sodium ethoxide
Dissolve 10 g of sodium metal in 120 ml of ethanol using the following method: remove surplus oil from sodium with filter paper, dry again on filter paper, and cut the weighed metal into small pieces about the size of a pea. Pour the ethanol into a 500 ml flask cooled on ice bath, and add one or two pieces at a time until dissolved.
Sodium hypochlorite solution
the commercial product contains about 10-14 per cent w / v of available chlorine. Dilute with an equal volume of water.
Sodium nitroprusside solution
Prepare a solution as required by dissolving a crystal in 5 ml. of water.
Sodium rhodizonate reagent : Dissolve 0.5 g in 100 ml water
Starch solution
Triturate 0.5gm. of soluble starch with a little cold water into a thin paste and add 25ml. of boiling water.Boil until a clear solution is obtained (5-mins.). This solution should be freshly prepared as required. Amore stable starch solution is obtained by adding 0.5gm. of potassium iodide and 2-3 drops of chloroform. A more satisfactory starch solution for use as an indicator is prepared as follows: Mix 5.0 gm.of powdered sodium starch glycollate with 1-2 ml. ethyl alcohol, add 100ml. of cold water and boil for a few minutes with stirring.This 5% stock solution is stable for many months; it is diluted to 0.1% strength when required for use.
Sulphanilic acid
Dissolve 1 g in 100 ml of warm 30% acetic acid

T

Tannic acid
Dissolve 1 g of tannic acid (tannin) in 1 ml ethanol, and add water to make 10 ml. Prepare fresh.
Tartrate solution, alkaline
Dissolve 34.6 g of sodium potassium tartrate (rochelle substance) and 10 g of sodium hydroxide in water, dilute to 100 ml, let stand for two days, and filter through glass wool.
Thiourea
10g in 100ml of water (10%)

Titan yellow
Dissolve 1g in 100ml of water (1%) or **Titan yellow**
(also called thiazole yellow, clayton yellow) Dissolve 5 g in water, filter and dilute to 100 ml.
Titanium tetrachloride
Cool separately in small beakers surrounded by crushed ice 10 ml of 20% hydrochloric acid and 10 ml of clear, colorless titanium tetrachloride.Add the tetrachloride dropwise to the chilled acid.Stand at ice temperature until all the solid disolves, then dilute to 1 liter with 20% hydrochloric acid.
Tollens reagent.
Add sodium hydroxide soln. to silver nitrate soln. to form a ppt. then add dilute ammonia soln. until ppt. Dissolves.
Triton X-100
20% solution: dissolve 0.20 g of Triton-X-100 (polyethelene glycol ether of isooctylphenol) in water, and dilute to 100ml.

U

Uranyl magnesium acetate
Make up an aqueous saturated solution of the substance

V W X
Xylenol orange
Make up a 1% solution in ethanol

Y Z

Zirconyl nitrate reagent (for fluoride test) Dissolve 0.1gm. Of zirconyl nitrate in 20ml. concentrated hydrochloric acid and dilute with water to 100ml.

Zirconyl nitrate reagent
(for phosphate separations)
Heat 10gms. of commercially pure zirconium nitrate and 100ml. of 1M nitric acid to the boiling point with constant stirring. Leave to stand for about 24hrs.and decant the clear solution.

Zinc amalgam

Add about 10 g of granulated zinc to 20 ml mercury, to produce a liquid amalgam on cooling, and heat to 150 degrees with stirring gentile the zinc is dissolved.

Zinc amalgated (Jones Reductor)

The zinc is amalgated by immersing it in a solution of mercuric chloride in hydrochloric acid. A quantity of 250 g of 20 mesh zinc is covered with water in a 1 liter flask, and a solution of 11 g of mercuric chloride in 100 ml of hydrochloric acid is poured into the flask.

The system is slowly mixed and shaken for about 2 minutes. The solution is poured off, and the amalgam is Cleaned thoroughly with hot tap water, then D.W.

Zinc uranyl acetate

Dissolve 10gms of uranyl acetate in 6gms. Of 30% acetic acid, warming if necessary and dilute with water to 50ml. (soln.A) In a separate vessel, stir 30gms. Of zinc acetate with 3gms.of 30% acetic acid and dilute with water to 50ml. (soln.B) Mix the two solutions A and b, and add a small quantity of sodium chloride. Allow to stand for 24 hrs. And filter from the precipitated sodium zinc uranyl acetate. Alternatively, a reagent of equivalent concentration may be prepared by dissolving uranyl zinc acetate in the suitable volume of water or 1M acetic acid

Zwikkers reagent :

Mix 1 ml of pyridine with 4 ml of a 10% aqueous solution of copper sulphate and 5 ml of water.

250ml volumetric analysis standards and solutions

Preparation of 0.1m and 0.1n volumetric analysis titration standards

Acid / base titrations

Ammonium sulphate $(NH4)_2SO4$. MW = 132.14, Eq. = 66g/l. 250ml 0.05M = 1.325g = 0.1N	**Adipic acid** $HO_2C(CH2)_4CO_2H$, MW = 146.4, Eq. = 73.03g/l 250ml 0.05M = 1.83g = 0.1N
Barium hydroxide $Ba(OH)_2.8H2O$, MW = 315.48, Eq. = 157.5g/l 250ml 0.05M = 3.94g = 0.1N	**Benzoic acid** C_6H_5COOH, MW = 122.12, Eq. = 61g/l 250ml 0.05M = 1.52g = 0.1N
Calcium carbonate $CaCO_3$, MW = 100.00, Eq. = 50g/l 250ml 0.05M = 1.25g = 0.1N	**Furroic acid** MW = 112.08, Eq. = 112g/l 250ml 0.1M = 2.8g = 0.1N
Hydrochloric acid HCl, MW = 36.5, Density = 1.2 1M = 83ml = 1N (Use 86ml) 250ml 0.1M = 2ml = 0.1N 1 liter 0.1M soln = 8.6ml = 0.1N	**Oxalic acid** $H_2C_2O_4.2H_2O$, MW = 126.07, Eq. = 63g/l 250ml 0.05M = 1.575g = 0.1N
Potassium hydrogen phthalate $KH(C_8H_4O_4)$, MW = 204.23, Eq. =204g/l 250ml 0.1M = 5.105g = 0.1N	**Potassiun hydrogen iopreparing date** $KH(IO_3)_2$, MW = 389.92, Eq. 73.07g/l 250ml 0.1M = 9.75g = 0.1N
Sodium carbonate Na_2CO_3, MW = 106, Eq. =53g/l 250ml 0.05M = 1.325g = 0.1N	**Sodium hydroxide** NaOH, MW = 40, Eq. = 40g/l 250ml 0.1M = 1.0g = 0.1N 1 liter 0.1M soln = 4g = 0.1N
Sodium oxalate $Na_2C_2O_4$, MW = 134.00, Eq. =134g/l 250 0.1M = 3.35g = 0.1N	**Sodium tetraborate** $NaB_4O_7.10H_2O$, MW = 381.37, Eq. =190g/l 250ml 0.05M = 4.762g =0.1N
Succinic acid $HO_2CCH_2CH_2CO_2H$, MW = 118.09, Eq. = 59.045g/l 250ml 0.05M = 1.475g = 0.1N	**Sulphamic acid** H_2NSO_3H, MW = 97.09, Eq. = 99.09g/l 250ml 0.10M = 2.425 = 0.1N
Sulphuric acid H_2SO_4, MW = 98.08, Density = 1.8 1M = 56ml = 2N 250ml 0.05M = 0.7ml = 0.1N 1 liter 0.05M = 2.8ml = 0.1N (use 3 ml)	**Tris (hydroxymethyl)-aminomethane** $H_2N.C(CH_2OH)_3$, MW = 121.14, Eq. = 121g/l 250ml 0.1M = 3.023g =0.1N

TITRATIONS WITH PERMANGANATE

$5Na_2C_2O_4 + 2KMnO_4 + 8H_2SO_4 = 10CO_2 + 2MnSO_4 + 5Na_2SO_4 + 8H_2O$ Reaction of Potassium permanganate and Sodium oxalate	
Ammonium oxalate $(NH4)_2C_2O_4$, MW = 124, Eq. = 62g/l 250ml 0.05M = 1.55g = 0.1N	**Ferrous ammonium sulphate** $FeSO_4(NH_4)_2SO_4.6H_2O$, MW = 392, Eq. 392g/l 250ml 0.1M = 9.8g = 0.1N (add a few drops of conc. H2SO4 to clear)
Hydrogen peroxide H_2O_2, MW = 34. Eq. = 17g/l 10 Vol. = 3% 20 Vol. = 6% = 1.8M 100 Vol. = 30% 250ml 0.05M = 12.50ml of 20 Vol. = 0.1N 1 liter 0.05M = 50ml of 20 Vol. = 0.1N (add 2 ml conc. H2SO4 per liter soln) 1 liter 0.05M = 10ml of 100 Vol. 1 liter 0.05M =35ml of 30 Vol. Volume strength = 11.2/34 x strength of peroxide in g/l	**Iron alum (ferric ammonium sulphate)** $FeNH_4(SO4)_2.12H_2O$, MW = 482.19, Eq. =241g/l 250ml 0.05M = 6.02g = 0.1N **Oxalic acid (anhyd.)** $H_2C_2O_4$, MW = 90, Eq. = 45g/l 250ml 0.05M =1.125g = 0.1N
Potassium permanganate $KMnO_4$, MW =158.04, Eq. ==31.6g/l 250ml 0.02M = 0.79g = 0.1N (dissolve in hot water) 1 liter 0.02M = 3.16g = 0.1N (boil to dissolve crystals, then dilute to 1liter)	**Sodium nitrite** $NaNO_2$, MW = 69.00, Eq. = 34.56/l 250ml 0.05M = 0.86g = 0.1N (use 1g) **Sodium oxalate** $Na_2C_20_4$, MW = 234, Eq. = 67g/l 250ml 0.05M = 1.675g = 0.1N

TITRATIONS WITH DICHROMATE

$K_2Cr_2O_7 + 6Fe(NH_4)_2(SO_4)_2 + 7H_2O_4 = 3Fe_2(SO_4)_3 + Cr_2(SO_4)_3 + K_2SO_4 + 6(NH_4)_2SO_4 + 7H_2O$ Reaction of Potassium dichromate and Ammonium ferrous sulphate	
Potassium dichromate $K_2Cr_2O_7$, MW = 294, Eq. = 49g/l 250ml 0.0167M = 1.22g = 0.1N 1 liter 0.0167M = 4.90g = 0.1N	**Tin, Sn,** MW = 119.0, Eq. = 59.5g/l **Tin (11) chloride** (use metallic tin dissolved in conc. HCl) 250ml 0.05M = 1.49g = 0.1N
Potassium iopreparing date KIO_3, MW = 214, Eq. = 35.73g/l 250ml 0.0167M = 0.892g = 0.1N	**Spathic iron ore** $FeCO_3$, MW = 116, Eq. = 116g/l 250ml 0.1M = 2.9g = 0.1N

TITRATIONS WITH IODINE AND THIOSULPHATE

$I_2 + 2Na_2S_2O_3 = Na_2S_4O_6 + 2NaI$ Reaction of Iodine and Sodium thiosulphate	
Sodium thiosulphate $Na_2S_2O_3.5H_2O$, MW = 248.18, Eq. = 248g/l 250ml 0.1M = 6.2g = 0.1N 1 liter 0.1M = 24.8g = 0.1N	**Potassium iodide** KI, MW = 166, Eq. =166g/l 250ml 0.1M = 4.15g = 0.1N 1liter = 0.1M 16.6g = 0.1N
Potassium iopreparing date KIO_3, MW = 214 Eq. = 35.73g/l 250ml 0.0167M = 0.892g = 0.1N	**Iodine, I_2** MW = 253.18, Eq. = 127g/l 1 liter 0.05M = 12.7g = 0.1N (use 13g Iodine and add 25g KI
Copper sulphate $CuSO_4.5H_2O$, MW = 249.68, Eq. = 249.68g/l 250ml 0.1M = 6.24g = 0.1N Note: add anhy. NaCO3 untill a slight permanent bluish colour is formed. Add a little acetic acid to get a clear blue colour, then make up to the mark.	**Copper sulphate, anhydrous** $CuSO_4$, MW = 159.6, Eq. = 159.6g/l 250ml 0.1M = 4g =0.1N
Bleaching powder $CaOCl_2$, MW = 145, Eq. = 72,5g/l 250ml 0.05M = 1.81g = 0,1N (use 2.5g)	**Sodium sulphite** $Na_2SO_3.5H_2O$, MW = 126.04, Eq. = 63g/l 250ml 0.05M = 1.57g = 0.1N

TITRATIONS WITH SILVER NITRATE

1. $AgNO_3 + NaCl = AgCl = NaNO_3$ and $K_2CrO_4 + 2AgNO_3 = Ag_2CrO_4 + 2KNO_3$ 2. $AgNO_3 + KSCN = AgSCN + KNO_3$ and $AgSCN + Fe^{3+}$ indicator = $[FeSCN]^{+2}$	
Silver nitrate $AgNO_3$, MW = 170, Eq. =170g/l 250ml 0.1M = 4.25g = 0.1N **Sodium chloride** NaCl, MW = 58.5, Eq. = 58.5g/l 250ml 0.1M = 1.4625g = 0.1N	**Potassium chromate** K_2CrO_4, MW = 194.20, Eq. =32.4g/l 250ml 0.0167M = 0.81g = 0.1N 1 liter 0.0167M = 3.24g = 0.1N (add a few ml dil. H2SO4 to clear)
Ammonium thiocyanate NH_4CNS, MW = 76.12, Eq. = 76.12g/l 250ml 0.1M = 1.9g = 0.1N 1 liter 0.1M = 7.6g = 0.1N	**Potassium thiocyanate** KCNS, MW = 97.18, Eq. = 97g/l 250ml 0.1M = 2.4g = 0.1N (use 3g) 1 liter 0.1M = 9.74g = 0.1N (use 12g)