

Biyani's Think Tank

**Concept based notes**

# Chemistry Lab Manual

*(Viva voce)*

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**Gurukulpo**.com  
No. 1 Educational Web Portal in India



*Published by :*

**Think Tanks  
Biyani Group of Colleges**

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Jaipur-302 023 (Rajasthan)

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**First Edition : 2009**

**Price:- /**

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**Biyani College Printing Department**

## Preface

I am glad to present this book, especially designed to serve the needs of the students. The book has been written keeping in mind the general

weakness in understanding the fundamental concepts of the topics. The book is self-explanatory and adopts the “Teach Yourself” style. It is based on question-answer pattern. The language of book is quite easy and understandable based on scientific approach.

This book covers basic concepts related to the microbial understandings about diversity, structure, economic aspects, bacterial and viral reproduction etc.

Any further improvement in the contents of the book by making corrections, omission and inclusion is keen to be achieved based on suggestions from the readers for which the author shall be obliged.

I acknowledge special thanks to Mr. Rajeev Biyani, *Chairman* & Dr. Sanjay Biyani, *Director (Acad.)* Biyani Group of Colleges, who are the backbones and main concept provider and also have been constant source of motivation throughout this Endeavour. They played an active role in coordinating the various stages of this Endeavour and spearheaded the publishing work.

I look forward to receiving valuable suggestions from professors of various educational institutions, other faculty members and students for improvement of the quality of the book. The reader may feel free to send in their comments and suggestions to the under mentioned address.

**Author**

# Think-Tank

## Chemistry Lab Manual Viva Voce – Practical Chemistry

- Q. 01. What is a standard solution?  
Ans. A solution whose strength is known a standard solution
- Q. 02. What is molar solution?  
Ans. One litre of water contains gram mole of the substance.
- Q. 03. What is a normal solution?  
Ans. A solution containing gram equivalent mass of solute per litre of the solution is called a normal solution
- Q. 04. What is a primary standard?  
Ans. A chemical substance whose standard solution can be prepared by dissolving it in water is called a primary standard
- Q. 05. What is molality?  
Ans. The number of moles of the solute present in 1000 grams of solvent is called molality.
- Q. 06. What is molarity?  
Ans. The number of moles of the solute present per litre of the solution is called molarity. Or The molar concentration of a solution, the number of moles of solute per liter of solution
- Q. 07. What do you mean by calibration?  
Ans. Calibration means to check or verify the value or measurement of an apparatus.
- Q. 08. Why the weights should not be lifted with hand?  
Ans. This causes error in the weighing.
- Q. 09. What is the use of a rider?  
Ans. A rider used for weighing less than 10 mg.
- Q. 10. What is the principal of volumetric analysis?  
Ans. It is a mode of determination of the quantity of the substance present in a given solution to trace quantitatively with a solution of another substance of known concentration
- Q. 11. What is titration?

- Ans. The process to adding one solution from the burette to another in the conical flask in order to complete the chemical reaction, is known as titration.
- Q. 12. What is indicator?  
Ans. Indicator is a chemical substance which changes colour at the end point.
- Q. 13. What is end point?  
Ans. The stage during titration at which the reaction is just complete is known as end point
- Q. 14. Why a titration flask should not be rinsed?  
Ans. During rinsing some solution will remain sticking to the titrating flask, so pipetted volume will increase.
- Q. 15. What is primary standard substance?  
Ans. A substance available in high degree of purity, stable & unaffected by air (does not gain & lose moisture in air).
- Q. 16. What is secondary standard substance?  
Ans. A substance available in low degree of purity, unstable & affected by air (gains & loses moisture in air).
- Q. 17. Give some examples of primary standard substance?  
Ans. Oxalic acid, Mohr's salt, anhydrous sodium carbonate etc.
- Q. 18. Give some examples of secondary standard substance?  
Ans. Sodium hydroxide, Hydrochloric acid etc.
- Q. 19. Why burette & pipette are rinsed with the solutions?  
Ans. The strength of solution may change due to sticky water on the walls of burette & pipette, if not rinse with the correspondent solution.
- Q. 20. Why lower meniscus read in case of colourless solution & upper meniscus read in case of coloured solution?  
Ans. In colourless solution lower meniscus is easy to read & upper meniscus read in case of coloured solution because lower meniscus in the coloured solution not visible clearly.
- Q. 21. Why the last drop of solution must not be blown out of a pipette?  
Ans. The drop which is left in the pipette is extra of the volume measured by the pipette.
- Q. 22. Why pipette should not be hold from its bulb?  
Ans. The body temperature may expand the glass & an error may be in the measured volume.
- Q. 23. What  $\text{KMnO}_4$  act as self indicator?  
Ans.  $\text{KMnO}_4$  reacts with reducing agent in presence of dil. sulphuric acid, when all the reducing agents oxidized; the excess of  $\text{KMnO}_4$  is not decomposed & gives pink colour solution.



- Q. 24. What is permagnometry?  
Ans. Redox titration involving  $\text{KMnO}_4$  as the oxidizing agents are called permagnometry.
- Q. 25. What is the end point of  $\text{KMnO}_4$  titration?  
Ans. The end point of  $\text{KMnO}_4$  titration is permanent light pink from colourless.
- Q. 26. Why some drops of dilute sulphuric acid are added while preparing a standard solution of Mohr's salt?  
Ans. Some drops of dilute sulphuric acid are added to prevent the hydrolysis of ferrous sulphate.
- Q. 27. Why some times brown precipitate is observed in  $\text{KMnO}_4$  titration?  
Ans. When insufficient quantity of dil. sulphuric acid is used. Brown colour precipitate is of  $(\text{MnO}_2 \cdot \text{H}_2\text{O})$  formed due to incomplete oxidation of  $\text{KMnO}_4$
- Q. 28. In  $\text{KMnO}_4$  titration oxalic acid solution is heated about  $60-70^\circ\text{C}$  before the titration, why?  
Ans. The reaction is very slow due to formation of  $\text{Mn}^{+2}$  ions in cold condition, When oxalic acid is heated for speed up the liberation of  $\text{Mn}^{+}$  ions which then auto catalyses the reaction & reaction proceed rapidly.
- Q. 29. What is the qualitative analysis?  
Ans. Qualitative analysis is used to separate and detect cations and anions in a sample substance.
- Q. 30. What is a radical?  
Ans. A radical may be defining as an atom which carries charges & behaves as a single unit in chemical reaction.
- Q. 31. What are acidic and basic radicals?  
Ans. Radicals carrying positive charge are called basic radicals and acid radicals are negatively charged.
- Q. 32. What type of bond present in organic compound?  
Ans. Electrovalent bond is present in organic compound.
- Q. 33. Why do inorganic salts ionized when dissolve in water?  
Ans. Due to high dielectric constant of water, the force of attraction holding the two ions in a salt decreases.
- Q. 34. Name the coloured basic radicals.  
Ans.  $\text{Cu}^{+2}$ ,  $\text{Fe}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Ni}^{+2}$ ,  $\text{Cr}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Mn}^{+2}$ .
- Q. 35. What is the colour of iron salt?  
Ans. Ferrous salts are usually light green in colour like ferrous sulphate, while ferric salts are of greenly brown like ferric chloride.

- Q. 36. What is colour of nickel salts?  
Ans. Bluish green and green.
- Q. 37. What is colour of manganese salts?  
Ans. Light pink or flesh colour.
- Q. 38. Which radicals are absent when salt is white?  
Ans.  $\text{Cu}^{+2}$ ,  $\text{Fe}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Ni}^{+2}$ ,  $\text{Cr}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Mn}^{+2}$ .
- Q. 39. Why a salt contains lead turns black in colour while store a long time in the laboratory?  
Ans. Due to formation of black lead sulphide by the action of  $\text{H}_2\text{S}$  in atmosphere.
- Q. 40. Name the salts which produced cracking sound when heated?  
Ans. Lead nitrate, Barium nitrate, Potassium bromide, Sodium chloride.
- Q. 41. What is sublimation?  
Ans. It is the process by which a salt directly changes into vapour without molting, when heated & on cooling vapours condensed back to the solid state.
- Q. 42. Which radicals produced  $\text{CO}_2$  when heated?  
Ans. Carbonates.
- Q. 43. Why do we use conc.  $\text{HCl}$  in preparing a paste of the salt for flame test?  
Ans. In order to convert metal salts into metal chlorides which are more volatile than the other salts.
- Q. 44. Why a glass rod not use for flame test?  
Ans. Glass rod contains sodium silicate which imparts its own golden yellow colour to the flame.
- Q. 45. Why platinum wire used for flame test?  
Ans. Platinum wire does not react with acid and does not impart any colour to the flame.
- Q. 46. Why platinum wire not used for flame test for testing of lead salts?  
Ans. Platinum wire combine with lead and wire gets corroded.
- Q. 47. Why should only one or two particles of the given salt should be touched with the bead in borax bead test?  
Ans. If salt is used in excess an opaque bead is formed.
- Q. 48. Why borax bead test is not applicable in case of white salts?  
Ans. White salts do not forms coloured metaborates.
- Q. 49. What is nessler's reagent?  
Ans. It is a solution of mercuric iodide in potassium iodide ( $\text{K}_2\text{HgI}_4$ ).
- Q. 50. Name the radicals of dil.  $\text{H}_2\text{SO}_4$  group?

Ans.  $\text{CO}_3^{-2}$ ,  $\text{S}^{-2}$ ,  $\text{SO}_3^{-2}$ ,  $\text{NO}_2^-$ ,  $\text{CH}_3\text{COO}^-$

Q. 51. Name the radicals of conc.  $\text{H}_2\text{SO}_4$  group?

Ans.  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$

Q. 52. Name the radicals not present in dil. as well as conc.  $\text{H}_2\text{SO}_4$  group?

Ans.  $\text{SO}_4^{-2}$ ,  $\text{PO}_4^{-3}$  etc.

Q. 53. What is sodium carbonate extract?

Ans. Salt plus double amount of solid sodium carbonate & about 20 ml of distilled water, boil the mixture till the solution remain  $\frac{3}{4}$ . The filtrate is sodium carbonate extract.

Q. 54. What is water extract or original solution?

Ans. The given mixture or salt is shaken well with distilled water. The filtrate is water extract or original solution.

Q. 55. What is needed to prepare sodium carbonate extract?

Ans. It is needed when given salt or mixture are partially soluble or insoluble in distilled water,

Q. 56. What is lime water?

Ans. A solution of calcium hydroxide in water is called lime water.

Q. 57. What is happened when excess of  $\text{CO}_2$  is passed through lime water?

Ans. The white precipitate of calcium carbonate changes into soluble calcium bicarbonate therefore milky precipitate disappears.

Q. 58. Is there any gas to change lime water milky?

Ans. Yes, it is  $\text{SO}_2$

Q. 59. How is ring test performed for ring test?

Ans. To the original solution or sodium carbonate extract, freshly prepared ferrous sulphate solution is added and then conc. Sulphuric acid is added along with the wall of the test tube, a dark brown ring formed at the junction of two solutions.

Q. 60. Why is the reaction mixture in case of conc. Sulphuric acid test not thrown into the sink?

Ans. To avoid spattering, due to which sulphuric acid may fly and spoil body or clothes.

Q. 61. What is tollen's reagent?

Ans. Ammonical silver nitrate solution is called tollen's reagents

Q. 62. What is the formula of Diphenylamine reagent?

Ans.  $(\text{C}_6\text{H}_5)_2\text{NH}$



- Q. 63. What is the formula of Sodium Nitroprusside reagent?  
Ans.  $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$
- Q. 64. Why a dark brown ring is formed at the junction of two layers in the ring test?  
Ans.  $\text{H}_2\text{SO}_4$  being heavier from the lower layer only with a small amount of nitrate and ferrous sulphate at its surface, therefore, a brown ring is formed at the junction of two layers.
- Q. 65. Why acetic acid is added during preparation of lead acetate solution?  
Ans. To prevent hydrolysis of lead acetate this would yield white precipitate of lead hydroxide.
- Q. 66. Why bromide and iodide do not show chromyl chloride test?  
Ans. Because chromyl bromide and chromyl iodide is unknown and not formed, instead of these bromine and chlorine are evolved.
- Q. 67. Describe the chemistry of match stick test?  
Ans. The sulphate is reduced to sulphide by carbon of match stick which then gives violet colour to sodium nitroprusside solution.
- Q. 68. Why does iodine gives blue colour with starch solution?  
Ans. The blue colour due to the physical absorption of iodine upon starch.
- Q. 69. Why O.S. is not prepared in conc.  $\text{HNO}_3$ ?  
Ans.  $\text{HNO}_3$  is oxidizing reagent which on decomposition gives oxygen. A yellow precipitate is obtained in presence of  $\text{HNO}_3$ , when  $\text{H}_2\text{S}$  is passed.
- Q. 70. Name group reagent for different groups?  
Ans. Group O -  $\text{NaOH}$ .  
Group I - dil.  $\text{HCl}$ .  
Group II - pass  $\text{H}_2\text{S}$  in presence of  $\text{HCl}$ .  
Group III -  $\text{NH}_4\text{OH}$  in presence of  $\text{NH}_4\text{Cl}$ .  
Group IV - pass  $\text{H}_2\text{S}$  in presence of  $\text{NH}_4\text{OH}$ .  
Group V -  $(\text{NH}_4)_2\text{CO}_3$  in presence of  $\text{NH}_4\text{Cl}$ .  
Group VI - no specific group reagent.
- Q. 71. Why the original solution (O.S.) is boiled with  $\text{HNO}_3$  in group II?  
Ans. In the presence of  $\text{NH}_4\text{Cl}$ ,  $\text{Fe}(\text{OH})_2$  is not precipitated because of high solubility product. For this reason  $\text{Fe}^{++}$  salts oxidised to  $\text{Fe}^{+++}$  salt by boiling with conc.  $\text{HNO}_3$ , before adding  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{OH}$  otherwise  $\text{Fe}^{++}$  would not be precipitated in group III.
- Q. 72. Why is  $\text{NH}_4\text{Cl}$  added along with  $\text{NH}_4\text{OH}$  in group III?  
Ans. It is done in order to decrease the concentration of  $\text{OH}^-$  ions by suppressing the ionization of  $\text{NH}_4\text{OH}$  by common ion effect. If  $\text{NH}_4\text{OH}$  alone is used, the concentration of  $\text{OH}^-$  is enough to precipitate the hydroxides of group IV, V and VI.

Q. 73. Why,  $\text{H}_2\text{S}$  gas passed in presence of  $\text{NH}_4\text{OH}$ ?

Ans. When  $\text{H}_2\text{S}$  gas is passed in alkaline medium or in presence of  $\text{NH}_4\text{OH}$ , the  $\text{H}^+$  ions from the dissociation of  $\text{H}_2\text{S}$  gas combine with hydroxyl ions ( $\text{OH}^-$ ) from the dissociation of  $\text{NH}_4\text{OH}$  to form nearly unionised  $\text{H}_2\text{O}$ . The removal of  $\text{H}^+$  ions from the solution causes more  $\text{H}_2\text{S}$  to dissociate, thereby increasing the concentration of  $\text{S}^{2-}$  ions to such an extent that ionic product of IV group metal sulphides exceeds their solubility product. Hence they are precipitated.

Q. 74. Why presence of  $\text{NH}_4\text{Cl}$  is essential before the addition of  $(\text{NH}_4)_2\text{CO}_3$  in group V?

Ans. The ammonium chloride suppresses the ionization of  $\text{NH}_4\text{OH}$  and  $(\text{NH}_4)_2\text{CO}_3$  due to common ion effect which results in the decrease in the concentration of  $\text{OH}^-$  and  $\text{CO}_3^{2-}$  ions. So, the ionic product does not exceed the solubility product of  $\text{Mg}(\text{OH})_2$  and  $\text{MgCO}_3$  and hereby they are not precipitated in group V.

Q. 75. Why  $\text{Na}_2\text{CO}_3$  cannot be used in place of  $(\text{NH}_4)_2\text{CO}_3$  in group V?

Ans. The  $\text{Na}_2\text{CO}_3$  is highly electrolyte, which produces very high concentration of  $\text{CO}_3^{2-}$  ions, as a result ionic product of  $\text{MgCO}_3$  may exceed its  $K_{sp}$  and it may get precipitated along with the radicals of group V.

Q. 76. Why lead is included in group I and II?

Ans. Lead is precipitated as lead chloride in group I, which is slightly soluble in water. Hence, lead is not completely precipitated in I group. To remove  $\text{Pb}^{+2}$  ions completely, lead is included in group II also where it is precipitated as lead sulphide.

Q. 77. What is a functional group?

Ans. The group of atoms that largely determines the properties of an organic compound is called functional group.

Q. 78. State some functional groups?

Ans. Hydroxyl  $-\text{OH}$ , Amino  $-\text{NH}_2$ , Carboxylic  $-\text{COOH}$ , Nitro  $-\text{NO}_2$ , & Amido  $-\text{CONH}_2$ .

Q. 79. What are organic compounds?

Ans. The compounds which contain carbon are known as organic compounds.

Q. 80. What is the difference between organic and inorganic compounds?

Ans. The organic compounds have covalent bonds while inorganic compounds have electrovalent bonds.

Q. 81. What is the difference between covalent bond and electrovalent bond?

Ans. In formation of covalent bond there is sharing of electron between two atoms to complete their octet, while in formation of electrovalent bond one is donor atom which donates the electron to other atom which is an acceptor atom to complete their octet.

- Q. 82. Define melting point?  
Ans. It is defined as the constant temperature at which solid melts.
- Q. 83. Define boiling point?  
Ans. Boiling point is defined as the temperature at which the vapour pressure of the liquid becomes equal to the atmospheric pressure.
- Q. 84. Name the tests which distinguish aldehydes from ketones?  
Ans. Tollen's test and Fehling's test.
- Q. 85. Which reagent is used to detect aldehyde group?  
Ans. Schiff's reagent.
- Q. 86. What is Fehling's solution A?  
Ans. It is a solution of copper sulphate.
- Q. 87. What is Fehling's solution B?  
Ans. It is a solution of sodium hydroxide containing sodium potassium tartrate.
- Q. 88. What is chromatography?  
Ans. It is a technique for rapid and efficient separation of components of a mixture and purification of compounds.
- Q. 89. What is the principle of chromatography?  
Ans. It is based on the differential migration of the individual components of a mixture through a stationary phase under the influence of a mobile phase.
- Q. 90. Name some chromatography techniques?  
Ans. Paper chromatography, column chromatography, thin layer chromatography, Gas chromatography and high pressure liquid chromatography.
- Q. 91. What is paper chromatography?  
Ans. It is an important technique based upon the dynamic partition of components of a mixture between two immiscible phases.
- Q. 92. What are the mobile and stationary phases in paper chromatography?  
Ans. Water absorbed on cellulose constituting the paper serves as the stationary phase and organic solvent as mobile phase.
- Q. 93. What is column chromatography?  
Ans. This is used for quantitative separation of constituents from a mixture. In this column of silica gel or aluminum oxide or calcium carbonate is packed in a glass column with the help of organic solvent such as benzene, petroleum ether, chloroform etc. and mixture is poured on column. Thereby different components adsorb on different zones of column according to their mobility which are later on eluted by different organic solvent in small fractions. On removing organic solvent, different fractions can be obtained.
- Q. 94. What are the mobile and stationary phases in column chromatography?

Ans. Silica gel column act as stationary phase while eluting organic solvent act as mobile phase.

Q. 95. What are the mobile and stationary phases in the paper chromatography?

Ans. Water absorbed on cellulose constituting the paper serves as the stationary phase and organic solvent as mobile phase.

Q. 96. What is meant by  $R_f$  value?

Ans. Retention factor ( $R_f$ ) of a substance is defined as the ratio of the distance moved up by the solute from the point of its application to the distance moved up by the solvent from the same point.

Q. 97. What is loading or spotting?

Ans. The application of the mixture as a spot on the original line on the filter paper strip is called loading or spotting.

Q. 98. What is chromatogram?

Ans. The paper strip, after loading, is placed in a suitable solvent for sometime, then taken out and dried in air is called chromatogram.

Q. 99. Which dye is used in hair colouring?

Ans. It is phenyl para diamine.

Q.100. Who had used chromatography first?

Ans. This was first of all used by M. Tswett (1903) to separate the pigments of green plant leaves.

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