BGS SCIENCE ACADEMY & RESEARCH CENTER
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B.Sc., Chemistry
Probable Viva Voce Questions and Answers
For 1, 3 and 5th Semesters

B.Sc. I Semester-Chemistry Practicals Probable Viva Questions

(From Performing Experiments only)

List of Performing experiments

1. Preparation of standard sodium oxalate solution and estimation of potassium permanganate in the given solution (permanganate to be given in a reagent bottle)
2. Preparation of standard potassium dichromate solution and estimation of ferrous ammonium sulphate in the given solution using the internal indicator, barium diphenyl amine sulphonate.
3. Preparation of standard potassium dichromate solution and estimation of sodium thiosulphate in the given solution.
4. Estimation of iodine using sodium thiosulphate and standard potassium dichromate solution.

General Viva Questions on Titrimetric or volumetric analysis

1. What is a standard solution? (A solution whose strength or concentration is known in which a primary standard substance dissolved in known volume of the solvent)

2. Differentiate between primary standard and secondary standard substances.

(**A primary standard is a reagent that is extremely pure, stable which can be weighed easily and which is so pure that its weight is truly representative of the number of moles of substance contained. A secondary standard is a standard that is prepared in the laboratory for a specific analysis not stable for a longer period of time. It is usually standardized against a primary standard**).

3. Define titration.(Estimation of one of the reactants by means reacting them in terms of definite volumes using an indicator)

4. What is volumetric estimation? (Determination of the strength of unknown solution by reacting with known volume of the given solution using an appropriate indicator which indicates the completion of the reaction.)

5. What is a meniscus in a burette? (Level of liquid in the burette that is concave or convex

6. For coloured solution and colourless solution which meniscus should be used to record the correct volume of liquid in a burette.(Coloured—upper meniscus, colourless -lower)

7. What is meant by nozzle part of the burette? (Bottom part of the burette that is from stop cock to the portion where liquid flows)

8. The burette must be filled without any air bubble in the nozzle part of the burette. Why? (Otherwise, the volume run down is not accurate)

9. Define equivalent mass.(The mass of a substance especially in grams that combines with or is chemically equivalent to eight grams of oxygen or one gram of hydrogen : the atomic or molecular weight divided by the valence)

10. What is red-ox titration?(The titration where both oxidation and reduction takes place)

11. Give an example for a red-ox titration.(This titration itself is a red-ox titration)

12. What is an oxidizing agent? Give an example.(The substance which liberates nascent oxygen or accepts nascent hydrogen or which donates electrons to the other reactant or the oxidation number of the key atom decreases. Ex. 1.$KMnO_4$, $K_2Cr_2O_7$)

13. What is a reducing agent? Give an example.(The substance which accepts nascent oxygen or donates nascent hydrogen or which accepts electrons from other reactant or the oxidation number of the key atom increases. Ex. 1. FAS, Oxalic acid)

14. What is the principle of volumetric analysis.(Quantitative estimation of substances by using definite volumes of the reactants to react using an indicator)

15. Differentiate between quantitative analysis and qualitative analysis. (Quantitative- estimation of amount of the substances in terms of definite mass. Qualitative-determination of chemical constituents using simple tests)

Experiment No.1.
Preparation of standard sodium oxalate solution and estimation of Potassium permanganate in the given solution.

1. Is Potassium permanganate primary standard substance? if not why?
(No it is light sensitive, so that the concentration changes with time)

2. Potassium permanganate solution is always stored in brown bottles. Why?
(It is light sensitive, if it is kept in brown bottles, it maintains its concentration over a period of time)

3. Equivalent weight of $KMnO_4$ is 31.6. How?(1 mole of potassium permanganate liberates 5 equivalents of oxygen during its oxidation, hence 1 equivalent liberates M/5
molecular weight. Ex: E = M/5 = 158/5 = 31.6, or Change of Oxidation state of Mn is from +7 to +2, that is +5, Hence E = M/5 = 158/5 = 31.6)

4. Name the indicator in this titration.($KMnO_4$ itself as self indicator)

5. What is self indicator? Give an example.(one of the product as intermediate acts as the indicator for the titration. Ex: MnO_2 in $KMnO_4$)

6. In this titration experiment, identify the standard solution and estimated solution.Substantiate your answer.(Standard solution: Sodium oxalate, Estimated solution: Potassium permanganate**)**

7. What is the end point in this titration?(Permanent pale pink)

8. At the end point of the titration, Which chemical is present in the conical flask? Write its molecular formula.($MnSO_4$ –mainly, they can also tell K_2SO_4)

9. How do you prepare 0.1N sodium oxalate solution?(By dissolving 0.1 mol. mass of exactly weighed sample of sodium oxalate crystals in 1 dm^3 of its solution in water or 1.675 g of sod.oxalate crystals are dissolved in 250ml of distilled water)

10. During the preparation of sodium oxalate solution, if the solution is turbid? How do you make it clear?(Any dil.mineral acid like HCl or dil.sulphuric acid is added)

11. What is the purpose of heating the contents in the conical flask in this titration?

(Potassium permanganate dissociates to give nascent oxygen in acidic medium at about 80ºC. which proceeds the reaction in the forward direction.)

12. The heating of the contents of the flask should not be overheated? Why?(If so, the reactant sodium oxalate that is oxalic acid decomposes to liberate carbon dioxide)

13. If the solution turns brown during the progress of titration, the solution in the conical flask should be discarded. Why? (Because $KMnO_4$ is decomposed into Manganous dioxide, the reactant gets decomposed)

14. Some times during the progress of this titration, the solution turns brown, what is the composition of that brown solution? (MnO_2)

15. Differentiate between normality and molarity of a solution.(Normality-number of gram equivalent mass present in $1dm^3$ of its solution, Molarity-number of gram molar mass present in $1dm^3$ of its solution)

16. Write the formula of sodium oxalate and its ionic form.($Na_2C_2O_4$, $C_2O_4^{2-}$)

17. Write the formula of Potassium permanganate and its ionic form.
($KMnO_4$, MnO_4^-)

18. The titration between potassium permanganate and sodium oxalate belongs to which type of titration?(Oxidation-reduction or red-ox titration)

19. What is the oxidation state of Mn in $KMnO_4$ and $MnSO_4$.(+7 and +2)

20. What is role of adding dil. sulphuric acid during the titration?(In acidic medium only the reaction proceeds that potassium permanganate acts as oxidizing agent and oxalic acid as reducing agent)

21. What happens to $KMnO_4$ and $Na_2C_2O_4$ during the titration.($KMnO_4$ is reduced to $MnSO_4$, and $Na_2C_2O_4$ that is oxalic acid from it is reduced to carbon dioxide and water)

22. Which solution to be taken in the burette during titration? (Potassium permanganate)

23. Can sodium oxalate be taken during the titration instead of potassium permanganate? if not why?(No, because the end point cannot be obtained)

24. Give reason why potassium permanganate is supplied in bottles and not given in the standard flask although the estimation of the former is asked.(It should be supplied in brown bottles, since it is coloured making up is not accurate and also It is a secondary standard substance)

25. What is the action of dil.sulphuric acid on sodium oxalate solution?(It is hydrolyzed to oxalic acid which gets reduced to carbon dioxide and water by potassium permanganate in hot condition**)**

Experiment No.2
Preparation of Standard Potassium dichromate solution and Estimation of Ferrous ammonium sulphate in the given solution using the internal indicator - barium diphenyl-amine sulphonate

1. Is Potassium dichromate a primary standard substance? if not why?
(Yes, it is primary standard)

2. Equivalent weight of potassium dichromate is 49. How?
1 mole of potassium dichromate liberates 3 equivalents of oxygen during its oxidation, hence 1 equivalent liberates M/6 molecular weight. Ex: E = M/6 = 294/6 =49, Or Change of oxidation state of Cr in the reaction: +6 to +3, for 2 moles of Cr it is 6, hence E = M/6 E= 294/6 =49)

3. Name the indicator in this titration.(barium diphenyl-amine sulphonate)

4. In this titration experiment, identify the standard solution and estimated solution. Substantiate your answer.(Standard solution: Potassium dichromate, Estimated solution: Ferrous ammonium sulphate**)**

5. What is the end point in this titration?(Green to violet)

6. At the end point in the conical flask, Which chemical is present? Write its molecular formula.(Ferric sulphate – $Fe_2(SO_4)_3$ and chromic sulphate - $Cr_2(SO_4)_3$)

7. How do you prepare 0.1N potassium dichromate solution.
By dissolving 0.1 mol. mass of exactly weighed sample of potassium dichromate crystals in 1 dm^3 of its solution in water or 1.225 g of potassium dichromate crystals are dissolved in 250ml of distilled water)

8. Differentiate between normality and molarity of a solution.(Normality-number of gram equivalent mass present in 1dm^3 of its solution, Molarity-number of gram molar mass present in 1dm^3 of its solution)

9. Which solution is filled in the burette in this titration?(Potassium dichromate)

10. What happens when barium diphenyl sulphonate added to FAS solution.(No change that is why green colour is formed)

11. At the end point of the titration, give the oxidation state of iron in the solution.(+3)

12. During the titration, what is the fate of potassium dichromate and iron before and after the end point.(Potassium dichromate reduces to chromic sulphate and Iron changes from Fe^{2+}-ferrous to Fe^{3+}- ferric state)

13. What is the oxidation state of chromium in potassium dichromate and chromic sulphate. (+6 and +3 respectively)

14. Can this titration be carried out using external indicator. Name the indicator in that titration.(Yes, potassium ferricyanide)

15. Write the formula of Mohr's salt.($FeSo_4.(NH_4)_2SO_4.6H_2O$**)**

16. Name the oxidizing agent and reducing agent in this titration.

Experiment No.3
Preparation of standard potassium dichromate solution and estimation of sodium thiosulphate in the given solution.

1. Is Potassium dichromate a primary standard substance? if not why?
(Yes, it is primary standard)

2. Equivalent weight of potassium dichromate is 49. How?
1 mole of potassium dichromate liberates 3 equivalents of oxygen during its oxidation; hence 1 equivalent liberates M/6 molecular weight. Ex: E = M/6 = 294/6 =49, Or Change of oxidation state of Cr in the reaction: +6 to +3, for 2 moles of Cr it is 6, hence E = M/6 E= 294/6 =49)

3. Name the indicator in this titration.(Freshly prepared starch solution)

4. In this titration experiment, identify the standard solution and estimated solution. Substantiate your answer.(Standard solution: Potassium dichromate, Estimated solution: Sodium thiosulphate**)**

5. What is the end point in this titration?(blue to colourless)

6. At the end point of the titration in this experiment, Which chemical is present in the conical flask? Write its molecular formula.(Chromic sulphate and sodium iodide)

7. How do you prepare 0.1N potassium dichromate solution.
By dissolving 0.1 mol. mass of exactly weighed sample of potassium dichromate crystals in 1 dm^3 of its solution in water or 1.225 g of potassium dichromate **crystals** are dissolved in 250ml of distilled water)

8. Give an example for a red-ox titration.(This titration itself is a red-ox titration)

9. Which solution to be taken in the burette during titration?(Sodium thiosulphate)

10. What happens when starch is added to pale yellow solution in the conical flask. **Why?**(It turns to blue colour because of presence of dilute solution of iodine, iodine gives blue colour when starch is added.

11. At the end point of the titration, give the oxidation state of iodine in the solution.(1)

12. During the titration, what is the fate of potassium dichromate and sodium thiosulphate before and after the end point.(Potassium dichromate reduces to chromic sulphate and sodium thiosulphate changes to sodium tetra thionate)

13. What is the oxidation state of chromium in potassium dichromate and chromic sulphate. (+6 and +3 respectively)
14. Write the formula of Hypo and sodium tetra-thionate($Na_2S_2O_3$-$5H_2O$ **and** $Na_2S_4O_6$)
15. What do you mean by iodometric titrations.(The titrations where iodine is involved as one of the reactants**)**
16. Which indicator is generally used in iodometric titrations?(Freshly prepared starch solution)
17. What is the colour of that indicator when iodine is present and when iodine is not present in the solution.(When iodine is present-blue, when there is no iodine-colourless)
18. What is starch.(A plant storage polysaccharide**)**
19. In this titration what happens to iodine after the end point.
(gets reduced to I^-**)**
20. When iodine is liberated in the titration,how is it detected?(the solution turns brown)
21. Why acid is added during the titration.(to liberate iodine**)**
22. What is the role of potassium dichromate in the titration?(Oxidizing agent**)**
23. Why is potassium iodide added during the titration.(In order to liberate iodine by the action of potassium dichromate which then reacts with hypo.
24. When iodine is liberated, the conical flask is closed with a watch glass. Why?(Iodine sublimes, in order avoid the escape of iodine, it has to be closed)

Experiment No.4
Estimation of Iodine using Sodium thiosulphate and Standard Potassium dichromate solution.

1. Is Potassium dichromate a primary standard substance? If not why?
   (Yes, it is primary standard)
2. **Equivalent weight of potassium dichromate is 49. How?**
   1 mole of potassium dichromate liberates 3 equivalents of oxygen during its oxidation, hence 1 equivalent liberates M/6 molecular weight. Ex: E = M/6 = 294/6 =49, Or Change of oxidation state of Cr in the reaction: +6 to +3, for 2 moles of Cr it is 6, hence E = M/6 E= 294/6 =49)
3. **Name the indicator in this titration.**(Freshly prepared starch solution)
4. **What is the end point in this titration?**(blue to colourless)
5. **At the end point in the conical flask, which chemical is present? Write its molecular formula.**(Chromic sulphate and sodium iodide)
6. **How do you prepare 0.1N potassium dichromate solution?**
   By dissolving 0.1 mol. mass of exactly weighed sample of potassium dichromate crystals in 1 dm^3 of its solution in water or 1.225 g of potassium dichromate **crystals** are dissolved in 250ml of distilled water)
7. **Give an example for a red-ox titration**.(This titration itself is a red-ox titration)
8. **Which solution to be taken in the burette during titration?(**Sodium thiosulphate)
9. **What happens when starch is added to pale yellow solution in the conical flask**? **Why?** (It turns to blue colour because of presence of dilute solution of iodine, iodine gives blue colour when starch is added.
10. **At the end point of the titration, give the oxidation state of iodine in the solution**.(+1)
11. **During the titration, what is the fate of potassium dichromate and sodium thiosulphate before and after the end point.(**Potassium dichromate reduces to chromic sulphate and sodium thiosulphate changes to sodium tetra thionate)
12. **What is the oxidation state of chromium in potassium dichromate and chromic sulphate.** (+6 and +3 respectively)
13. **Write the formula of Hypo and sodium tetra-thionate(**$Na_2S_2O_3$-$5H_2O$ **and** $Na_2S_4O_6$)
14. **What do you mean by iodometric titrations.(**The titrations where iodine is involved as one of the reactants**)**

15. **Which indicator is generally used in iodometric titrations? (**Freshly prepared starch solution)
16. **What is the colour of that indicator when iodine is present and when iodine is not present in the solution.(**When iodine is present-blue, when there is no iodine-colorless)
17. **What is starch.(**A plant storage polysaccharide**)**
18. **In this titration what happens to iodine after the end point.**
(gets reduced to I^-**)**
19. **What is the role of potassium dichromate in the titration?(**Oxidizing agent**)**
20. **How do you calculate the normality of sodium thiosulphate**.
(E=M/1. 158/1 =158)
How is Iodine solution prepared? Iodine crystals is stirred with calculated amount of potassium iodide solid and then water is added, further it is made up to a standard volume.
21. **What is the purpose of using iodine flask?** To avoid the escape of iodine fumes liberated during the reaction.
22. **Why should starch be added only after the solution turns yellow and not at the beginning of the reaction?** (The starch can be destroyed by the excess of iodide ions present.)
23. **What is the difference between iodometry and iodimetry**? When an analyte that is a reducing agent is titrated directly with a standard iodine solution, the method is called "iodimetry". When an analyte that is an oxidizing agent is added to excess iodide to produce iodine, and the iodine produced is determined by titration with sodium thiosulphate, the method is called "iodometry".

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B.Sc. III Semester-Chemistry- Practicals Probable Viva Questions (From Performing Experiments only)

a) Any one of the following experiments shall be set for the students to perform 20marks

1. Preparation of *m*-dinitrobenzene from nitrobenzene.
2. Preparation of dibenzalacetone from benzaldehyde (using acetone-alcoholic sodium hydroxide)
3. Preparation of benzoic acid from benzaldehyde.
4. Preparation of *p*-aminobenzoic acid from p-nitrobenzoic acid.
5. Preparation of aspirin from salicylic acid

Note: Students shall exhibit the recrystallised sample for inspection

b) Melting point determination - 05 marks

(Any one of the following organic compounds can be given as an unknown for the determination of melting point.
The compounds with melting point of 90-200°C can be given).*m*-dinitrobenzene (90^{o}C) Benzoic acid (121^{o}C) Benzamide (128^{o}C) Salicylic acid (157^{o}C) Resorcinol (110^{o}C) Urea (132^{o}C).

I: Organic Compound Preparations:

Experiment No.1
Preparation of meta-dinitro benzene from Nitrobenzene

1. Write the structure of nitrobenzene.
2. Write the structure of meta dinitro benzene
3. Nitro group is activating or deactivating, substantiate your answer.(Nitro group is deactivating since it blocks ortho and para positions by creating positive charges, hence the electrophile enters to meta position, that is why it is meta orienting group towardselectrophilic substitution reactions).
4. How do you calculate the molecular weight of nitrobenzene and meta dinitrobenzene.

5. What is meant by theoretical yield of the product in organic preparations? How is it calculated? (Expected yield of the product based on the molecular mass of the main reactant and the converted product for the given mass of the main reactant. It is calculated by the equation:

Theoretical yield = Mol.mass of the product x Mass of the reactant taken
Mol.mass of the reactant

6. **How do you calculate the theoretical yield of the present experiment**
(Theoretical yield of m-dinitrobenzene = Mol.mass of m-dinitrobenzene x Mass of nitrobenzene
Mol.mass of nitrobenzene

7. What is the role of con.sulphuric acid in this experiment?(De-hydrating agent and it facilitates the generation of electrophile nitronium ion in the experiment)
8. Is this experiment electrophilic substitution reaction or nucleophilic substitution?Explain.(Electrophilic substitution reaction because it is the reaction of benzene nucleus by the electrophile nitronium ion to nitrobenzene to form m-dinitrobenzene).
9. What is an electrophile? Write the formula of the electrophile in this experiment. (It is an electron deficient species, NO_2^+ -nitronium ion)
10. What is meant by recrystallization?(Recrystallization is a technique used to purify chemicals. By dissolving both impurities and a compound in an appropriate solvent, either the desired compound or impurities can be filtered out of solution, leaving the other behind.
11. Which solvent is used for recrystallization(The solvent which dissolves only the product and the impurities remains insoluble even on heating)
12. Name the solvent generally used for recrystallization. Which solvent is used in the present experiment.(Alcohol, acetone, benzene. Alcohol is used in this experiment)
13.Are you using any special type of funnel to filter the product in the preparation? Name that and mention its advantage.(Yes, Buchner funnel is used in preparationsto filter the product. The advantage is filtering is quick since it is connected to suctiondevice and drying is also quicker)
14. How do you confirm that the product obtained in the preparation is a desired product?
(By the colour, nature , conducting simple qualitative tests and determing the melting point of the product which is specific)
15. How the reactant and the product differs in this experiment? Tell me in a simple answer.(Nitrobenzene is liquid and m-dinitrobenzene is solid at room temperature)
16. What is nitration mixture?(Mixture of con.nitric acid and con.sulphuric acid in the ratio1:1)

17. Generally Sulhuric acid is taken in excess during the preparation of nitration mixture.why?(To absorb all the moisture content and to facilitate the progress of the reaction)

18. Can this preparation be carried out by any other reagents?(Yes, by mixing KNO_3 solid and con.sulphuric acid)

19. In the mixture of KNO_3 and con.sulphuric acid, how the nitration of nitrobenzene isproceeds? (In that mixture, nitronium ion is generated which is same as that takes place in nitration mixture, further electrophilic substitution occurs as usual)

20. Why the product should be dried before determining the practical yield.?(Otherwise water weight gets added so that yield is not accurate)

Experiment No.2
Preparation of dibenzalacetone from Benzaldehyde (using acetone-alcoholic sodium hydroxide)

1.Which functional group of the reactant is involved in this preparation?(-CHO-aldehyde**)**

2. What is meant by theoretical yield of the product in organic preparations? How is it calculated? (Expected yield of the product based on the molecular mass of the main reactant and the converted product for the given mass of the main reactant. It is calcu lated by the equation:

Theoretical yield = Mol.mass of the product x Mass of the reactant taken
Mol.mass of the reactant

3. How do you calculate the theoretical yield of the present experiment?

(Theoretical yield of dibenzalacetone = Mol.mass of dibenzalacetone x Mass of benzaldehyde
Mol.mass of benzaldedhye

4. What is meant by recrystallization?(Purification of the product by removing the impurities by dissolving in a suitable solvent, heating and filtering. later the purified product is crystallized)

5. Which solvent is used for recrystallization?(The solvent which dissolves only the product and the impurities remains insoluble even on heating)

6. Name the solvent generally used for recrystallization. Which solvent is used in the present experiment.(Alcohol, acetone, benzene. Alcohol is used in this experiment)

7. Are you using any special type of funnel to filter the product in the preparation?Name that and mention its advantage.(Yes, Buchner funnel is used in preparations to filter the product. The advantage is filtering is quick since it is connected to suction device and drying is also quicker)

8. How do you confirm that the product obtained in the preparation is a desired product?

(By the colour, nature , conducting simple qualitative tests and determining the melting point of the product which is specific)

9. Why the product should be dried before determining the practical yield.(Otherwisewater weight gets added so that yield is not accurate)

10. What is dibenzalacetone?(It is the condensation product formed between acetone benzaldehyde)

11. How many benzaldehyde molecules are involved in the reaction?(2)

12. Write the reaction between benzaldehyde and acetone in alkaline media.

13. What is the molecular mass of benzaldehyde and dibenzalacetone. Show the calculations involved.($C_7H_6O \rightarrow C_{17}H_{14}O$

Benzaldehyde Dibenzal-acetone

Molecular.weight: (7x12) + (6x1) + (1x16) → (17x12) + (14x1) + (1x16)

= 106 = 234

14. Mention any one use of dibenzalacetone.(Anti-inflammatory property makes itsuse in the external sprays as a pain reliever, used as a ligand in organometallic compounds)

15. Which type of condensation is this reaction?

(Aldol condensation)

16. How many functional groups are present in the product?(Alkene and ketone, It is an enone)

17. What is the role of sodium hydroxide in the preparation? (Usually aldol condensation reactions are carried out in alkaline medium)

18. What are the intermediates in the reaction?(Enolate ion from acetone and electrophile from benzaldehyde)

19. Why alcoholic solution is taken?(to make it homogeneous for the reaction to proceed)

20. Is heating required in the preparation? (No, just shaking the contents, the product can be obtained)

Experiment No.3
Preparation of Benzoic acid from Benzaldehyde

1. Which functional group of the reactant is involved in this preparation?(-CHO-aldehyde**)**

2. What is meant by theoretical yield of the product in organic preparations? How is it calculated? (Expected yield of the product based on the molecular mass of the main reactant and the converted product for the given mass of the main reactant. It is calculated by the equation:

Theoretical yield = Mol.mass of the product x Mass of the reactant taken
Mol.mass of the reactant

3. How do you calculate the theoretical yield of the present experiment?

(Theoretical yield of benzoic acid= Mol.mass of benzoic acid x Mass of benzaldehyde
Mol.mass of benzaldedhye (volume x density)

4. What is meant by recrystallization?(Purification of the product by removing the impurities by dissolving in a suitable solvent, heating and filtering. later the purified product is crystallized)

5. Which solvent is used for recrystallization?(The solvent which dissolves only the product and the impurities remains insoluble even on heating)

6. Name the solvent generally used for recrystallization. Which solvent is used in the present experiment.(Alcohol, acetone, benzene. Alcohol is used in this experiment)

7. Are you using any special type of funnel to filter the product in the preparation? Name that and mention its advantage.(Yes, Buchner funnel is used in preparations filter the product. The advantage is filtering is quick since it is connected to suctiondevice and drying is also quicker)

8. How do you confirm that the product obtained in the preparation is a desired product?

(By the colour, nature, conducting simple qualitative tests and determining the melting point of the product which is specific)

9. Why the product should be dried before determining the practical yield?(Otherwise water weight gets added so that yield is not accurate)

10. Name the type of reaction involved in this preparation.(Oxidation reaction**)**

11. How many benzaldehyde molecules are involved in the reaction? (1)

12. Write the reaction involved in this preparation.

13. What is the molecular mass of benzaldehyde and dibenzalacetone. Show the calculations involved($C_7H_6O \rightarrow C_7H_6O_2$

	Benzaldehyde		Benzoic acid
Molecular weight:	**(7x12) + (6x1) + (1x16)**	→	**(7x12) + (6x1) + (2x16)**
	= 106		**= 122**

14. Mention any one use of benzoic acid. (Its salts are used as a **food preservative** and it is an important precursor for the synthesis of many other organic substances).

15. Oxidation is carried out in which medium?(Alkaline medium**)**

16. How is alkaline medium obtained in the preparation?(By adding sodium carbonate solution**)**

17. How it is neutralized?(By adding dilute hydrochloric acid/dil.sulphuric acid**)**

18. How do you test the formation of benzoic acid.(By determining the melting point and treatment with sodium carbonate solution where effervescence is obtained**)**

19. If the filtrate is coloured, how is it decolourised ?(It should be neutralized by adding sodium sulphite or sodium bisulphite**)**

20. Why is it coloured?(due to the formation of MnO_2 or excess of $KMnO_4$)

21. What do you mean by refluxing.(Reflux is a technique involving the condensation of vapors and the return of this condensate to the system from which it originated. It is used in industrial and laboratory distillations**)**

Experiment No.4
Preparation of *p*-aminobenzoic acid from p-nitrobenzoic acid.

1. **What is meant by theoretical yield of the product in organic preparations? How is it calculated? (**Expected yield of the product based on the molecular mass of the main reactant and the converted product for the given mass of the main reactant. It is calcu lated by the equation:

   Theoretical yield = Mol.mass of the product x Mass of the reactant taken
   Mol.mass of the reactant

2. What is meant by recrystallization?(Purification of the product by removing the impurities by dissolving in a suitable solvent, heating and filtering. later the purified product is crystallized)

3. Which solvent is used for recrystallization?(The solvent which dissolves only the product and the impurities remains insoluble even on heating)

4. Name the solvent generally used for recrystallization. Which solvent is used in the present experiment.(Alcohol, acetone, benzene. Alcohol is used in this experiment)

5. Are you using any special type of funnel to filter the product in the preparation? Name that and mention its advantage.(Yes, Buchner funnel is used in preparationsto filter the product. The advantage is filtering is quick since it is connected to suction device and drying is also quicker)

6. How do you confirm that the product obtained in the preparation is a desired product?

(By the colour, nature, conducting simple qualitative tests and determining the melting point of the product which is specific)

7. Why the product should be dried before determining the practical yield.?(Otherwise water weight gets added so that yield is not accurate)

8. Which type of chemical reaction is the conversion of p-nitrobenzoic acid to p-aminobenzoic acid belong?(Reduction reaction**)**

9. Name the reducing agent used in the preparation.(Tin in con.HCl**)**

10. What do you mean by refluxing.(Reflux is a technique involving the condensation of vapors and the return of this condensate to the system from which it originated. It is used in industrial and laboratory distillations**)**

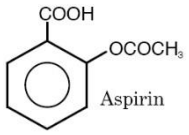
11. Calculate the molar mass of p-nitro benzoic acid and p amino benzoic acid.

	$C_7H_5NO_3$	→	$C_7H_7NO_2$
	p-nitro benzoic acid		p-amino benzoic acid
Molecular wt:	**(7x12) + (5x1) + (1x14)+ (3x16)**	→	**(7x12) + (7x1) + (1x14)+ (2x16)**
	= 151		**= 137**

12. What is the purpose of adding ammonium hydroxide after refluxing.(HCl in the mixture forms the salt which on alkaline hydrolysis gives p-amino benzoic acid, acidify results in effective formation of the product)

Experiment No.5
Preparation of Aspirin from Salicylic acid

1. What is aspirin ? (It is an acetyl derivative of salicylic acid)
2. Give the use of aspirin(Used as an analgesic and an antipyretic)
3. Write the structure of aspirin, indicate its functional group/s.(structure given below functional groups: -COOH(carboxylic acid), phenolic derivative)



Aspirin

4. What is the role of adding con.sulphuric acid in the preparation?(-Dehydrating agent)
5. If sulphuric acid is added in excess during the preparation will you get the product, if not, why? (No, because the reactant gets sulphonated)
6. How will you distinguish between the reactant and the product in this preparation?
(The reactant gives violet colour with neutral ferric chloride because of phenolic group where as the product fails to give the colour with the same reagent since phenolic group gets converted into acetylated derivative)
7. Generally for the preparation of acetyl derivative of a compound which reagent is used?(acetic anhydride**)**
8. What is acetic anhydride?(It is the anhydride of acetic acid**)**
9. How do you test the presence of carboxylic acid group in aspirin ? (It gives effervescence with sodium bicarbonate solution)
10. What is the difference between methyl salicylate and aspirin?(Methyl salicylate is the ester derivative of salicylic acid by methyl group where as aspirin is the acetylated derivative of phenolic group of salicylic acid by acetic anhydride)

11. What is meant by theoretical yield of the product in organic preparations? How is it calculated? (Expected yield of the product based on the molecular mass of the main reactant and the converted product for the given mass of the main reactant. It is calculated by the equation:

Theoretical yield = Mol.mass of the product x Mass of the reactant taken
Mol.mass of the reactant

12. What is meant by recrystallization?(Purification of the product by removing the impurities by dissolving in a suitable solvent, heating and filtering. later the purified product is crystallized)

13. Which solvent is used for recrystallization?(The solvent which dissolves only the product and the impurities remains insoluble even on heating)

14. Name the solvent generally used for recrystallization. Which solvent is used in the present experiment.(Alcohol, acetone, benzene. Alcohol is used in this experiment)

15. Are you using any special type of funnel to filter the product in the preparation? Name that and mention its advantage.(Yes, Buchner funnel is used in preparations to filter the product. The advantage is filtering is quick since it is connected to suction device and drying is also quicker)

16. How do you confirm that the product obtained in the preparation is a desired product?

(By the colour, nature, conducting simple qualitative tests and determining the melting point of the product which is specific)

17. Why the product should be dried before determining the practical yield.?(Otherwisewater weight gets added so that yield is not accurate)

18. Which functional group is not involved in the reaction between salicylic acid and acetic anhydride?(-COOH group of salicylic acid)

19. Prolonged use of aspirin is not recommended. Why?(Aspirin is associated with increa ased risk of major gastrointestinal bleeding)

20. The molecular weight of the reactant and the product differs by 42 in this prepara tion. How?(-H in –OH of phenolic group in salicylic acid is substituted by $–COCH_3$ group, hence the mol.mass difference 138-1=137+43=180,that is 43-1=42)

Molecular formula: $C_7H_6O_3$ → $C_9H_8O_4$
Salicylic acid Aspirin
Molecular weight: (7x12) + (6x1) + (3x16) → (9x12) + (8x1) + (4x16)
=138 = 180

(180-138=42)

II. Determination of Melting point of the given Organic compound

1. Define melting point.(The temperature at which a solid just melts and turns into liquid state**)**

2. Does the melting point depends on place and pressure.(No**)**

3. Name the apparatus used to determine the melting point of a solid.
(Thiele's tube**)**

4. Which liquid is used in the Thiele's tube?(Liquid paraffin**)**

5. Why liquid paraffin is used in Thiele's tube?(It has high boiling point that is it does not vapourise easily, it does not fume when it is heated, quite stable**)**

6. Can any other be used instead of liquid paraffin.(Yes, olive oil, coconut oil which is stable at high temperatures can be used**)**

7 How is the solid taken in the thiele's tube?(In a Glass Capillary tube**)**

7. How much solid is taken inside of the capillary tube?
(About a centimeter length)

8. **One end is to be closed in the capillary tube, why and how is it done**?
(otherwise the flows down. It is done by fusing at one end by heating in a burner)

10. Which type of solids have sharp melting points? (crystalline solids)

11. Give an example for a crystalline solid having sharp point which can be measured in your laboratory.(Any one: benzoic acid, salicylic acid, urea)

12. Why the liquid paraffin in the tube is heated through the side arm?
(The shape of the Thiele tube allows for formation of convection currents in the oil when it is heated. The side arm of the tube is designed to generate these convection currents and thus transfer the heat from the flame evenly and rapidly throughout heating the oil)

13. Why is a Thiele tube preferred for melting point determination, rather than an open beaker of oil? (A thiele tube allows circulation of heat to occur uniformly, that means provides a uniform increase in temperature through out the oil. Without circulation the area near the flame would get really hot, but the thermometer wouldn't register all of the heat change**)**

14. Upto what temperature range solids this method is used?
(Organic solids upto 200^{o}C**)**

15. Are you going apply any correction to the observed melting point of the solid.If no Why?
(No, because pressure has no effect on the melting point of a solid)

B.Sc. V Semester-Chemistry- Practicals Probable Viva Questions
(From Performing Experiments only)

PRACTICAL- V: Organic Chemistry

Qualitative analysis of organic compound: identification of mono-functional organic compounds through functional group analysis, determination of physical constant, preparation of a suitable derivative.

Any one of the following organic compounds shall be given for analysis. Not more than two students in a batch should be given the same compound for analysis.

(1) Resorcinol (2) Urea (3) Glucose (4) Aniline (5) Benzoic acid (6) Salicylic acid (7) Benz-aldehyde (8) Acetophenone (9) Ethyl benzoate (10) Toluene (11) Chlorobenzene (12) Benz-amide (13) Nitrobenzene

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1. Give the difference between organic qualitative anlysis and inorganic salt analysis.

(The qualitative analysis of inorganic salts is the detection of anions(acid radicals) and cations(basic radicals) due to ionic bond where as Organic compound analysis involves the functional group analysis and the compound due to covalent bonding)

2. How do you distinguish between aliphatic and aromatic compounds? Give a simple test.(Ignition test, aliphatic compounds burns with non sooty flame where as aromatic burns with sooty flame)

3. Though glucose is an aliphatic compound, it slightly differs in ignition test. How and why.(Glucose chars and a black residue is obtained because it is the hydrate of carbon when it is heated it loses its water content and converts into carbon that is why it chars and a black residue is obtained)

4. How do you test the presence of unsaturated group in the organic compound?(By Baeyer's test or bromine water test. When it is heated with alk.$KMnO_4$,Baeyer's reagent it gets decolourised or bromine water color gets discharged)

5. What is Baeyer's reagent?(Alkaline potassium permanganate solution)

6. Why Aromatic compounds burns with sooty flame but not aliphatic?(
Aromatic compounds burn with sooty flame Due to the more carbon content w.r.t hydrogen of aromatic compounds where as in aliphatic compounds it is less).

7. Name the test used to detect the elements present in an organic compounds?

(Lassaign's test**)**

8. Which metal is used in Lassaign's test?(Sodium**)**
9. Can potassium be used in place of sodium?(No because potassium is too reactive and dangerous)

10. Why metallic sodium kept under kerosene oil? (It prevents sodium to react with air and moisture)
11. Why sodium metal is to be fused with organic compound?(The elements in the organic compound N,S and halogens are in ionic form. When the organic compound is fused with sodium, these elements combine with sodium forming sodium salts which can be analyzed easily)
12. Why distilled water is used in the preparation of sodium fusion extract? (Tap water contains chloride ions where as distilled water is freed from Cl^- ions)
13. Ignition tube and sodium piece both should be completely dry. Why?(Sodium reacts with moisture or water inside the ignition tube)
14. How nitrogen is detected in an organic compound from sodium fusion extract?(The sodium fusion extract is boiled with a drop of freshly prepared ferrous sulphate solution followed with dil.sulphuric acid appearance of blue or greenish blue colour indicates the presence of nitrogen)
15. What is the composition of blue colour in nitrogen detection?{Ferric ferro cyanide- $Fe_4[Fe(CN)_6]_3$}
16. What is the composition of White precipitate in chlorine detection in the organic compound in Lassaign's test)(AgCl**)**
17. Define boiling point of a liquid.(The temperature at which vapour pressure of the becomes equal to the atmospheric pressue**)**
18. Why 3% correction to the observed boiling point is applied to get the actual boiling point of the organic liquid?(Since Bangalore is 3000 meters height compared to the nearest sea level)
19. Why that type of correction is not applied to melting points of solids?(Pressure has no effect on solids melting temperature**)**
20. Name the solvents used to classify the following organic compounds and mention their groups. – Resorcinol, Urea, Glucose, aniline, salicylic acid, benzoic acid,aromatic aldehydes ketones, esters, alcohols, phenols, aromatic hydrocarbons. (Resorcinol –soluble, ether soluble – I group. Urea, Glucose-water soluble, ether insoluble – II group. Aniline-Water insoluble and dil.HCl soluble –III group. Salicylic acid, benzoic acidand Phenols-Water insoluble and dil.NaOH soluble –IV group. Aromatic aldehydes ketones, esters, alcohols- Water insoluble and Con.sulphuric acid soluble –V group. Aromatic hydrocarbons- Water insoluble, Con.sulphuric acid insoluble and nitrogen isabsent- VI group)

(NOTE: Only two questions in Q.20 to be asked to each student.)

21. Structurally How is urea and benzamide are different.(Both are amides only but they differs as-urea is an aliphatic amide and benzamide is aromatic amide**)**

22. How an amide and amine differs each other with respect to structure.(An amide has the functional group –CO-NH_2 and an amine has the functional group –NH_2. In amides -CO group is linked to –N where as in amines –C-group of an organic compound is linked to –N atom.)

23. Which is the first organic compound invented? Write its structure.(Urea - structure - NH_2-CO-NH_2)

24. How resorcinol and benzenol of benzyl alcohol differs each other?(Resorcinol is a phenol where as bezenol is an aromatic alcohol**)**

25. Give a test to distinguish between a phenol and an aromatic alcohol.(Phenols gives a purple or violet colour with neutral ferric chloride solution where as an aromatic alcohol will not)

26. What is Fehling's solution?(It is the mixture of two solutions Fehlings solution A- copper sulphate solution and Fehlings solution B-Sodium potassium tartrate soluton)

27. What is Use Fehling's solution in Organic qualitative analysis(It is used to detect the presence of aliphatic aldehydes, reducing sugars)

28. What is the chemistry behind Fehling's test? (Cu^{2+}- in the reagent is reduced to Cu^{+} the action of reducing sugars and aldehydes indicated by the appearance of red coloured precipitate on heating the reagent with the organic compound)

29. What is Molisch's test?(This test is used to detect presence of carbohydrate – Whena carbohydrate solution is treated with alcoholic α-naphthol followed by the addition of con.sulphuric acid gives a purple coloured ring at the junction.)

30. Which Chemical mainly used in Phthalein test ? Mention its significance.(Pthalic anhydride. This test is used to detect the presence of Phenolic group**)**

31. What is Tollen's reagent? How is it prepared? Mention its use.(Ammoniacal silver nitrate solution is called Tollen's reagent. It is prepared by adding a drop of sodium hydroxide to silver nitrate solution and dissolving the grey precipitate by ammoniumhydroxide solution or liquor ammonia. It is used to detect the presence of aldehydesand reducing sugars)

32. What is Schiff's reagent? Where it is used?(Para rosaniline hydrochloride decolourised by passing Sulphur dioxide gas. It is used to detect aldehydes, it gives pink colour when it is shaken with the reagent)

33. What is biuret test?(The test used to identify urea having peptide linkage. On heating urea, it gives off ammonia and biuret. This biuret when treated with sodium hydroxide solution and copper sulphate produces violet colouration)
34. Give the composition of iodoform. Mention its importance.(CHI_3 is iodoform, compounds containing $-COCH_3$ like ethyl alcohol, acetophenone etc. are treated with iodine and alkali solution give a yellow crystalline product of iodoform)

35. Explain liberman's nitroso reaction.(This test is used to detect the presence of phenols $NaNO_2$, compound and Con.sulphuric acid is heated, this blue product is diluted with water. It turns red which becomes blue again on adding sodium hydroxide solution. It gives green fluorescence with resorcinol.)
36. What happens when neutral ferric chloride solution is added to phenolic compound?
(Violet or purple colour is obtained).
37. How phenol and acids differ each other?(Phenols fails to give effervescence with $NaHCO_3$ solution, where as carboxylic acids gives effervescene)
38. What is 2,4 DNP, where it is used?(2,4, dinitrophenyl hydrazine, it is used to detect the presence of carbonyl compounds like aldehydes or ketones. Appearance of yellow crystalline precipitate indicates the presence of carbonyl compounds)
39. Give a test for aromatic hydrocarbons.(Sulphonation test or dimethyl sulphate test**,** On heating the compound with fuming sulphuric acid or dimethyl sulphate and cooling gives a white precipitate**)**
40. How do distinguish between amides and nitro compounds?(Amides liberates pungent odoured ammonia gas when heated with strong alkali solution like sodium hydroxide where as nitro compounds will not and turns yellow colour)
41. What do you understand by the word derivative?(It is the substance derived or prepared from some other compound usually retaining the general skeleton of the original compound. Ex: Acetanilide-$C_6H_5NHCOCH_3$ is the derivative of aniline-$C_6H_5NH_2$)
42. **What is the importance of the preparation of a derivative in the identification of organic compound?(**A pure and crystalline product or derivative whose melting point is known if formed, confirms the presence of that organic compound)
43. What are the essential properties for a derivative prepared?(i) It should be a solid ii) It should be easily prepared and purified. iii) Its melting point should be sharp and different with that of the original compound)

44. Where picric acid is used in organic qualitative analysis?(It is used as a reagent in preparaing derivatives of aromatic hydrocarbons, amines, phenols etc. It forms addi tion compounds with them which are known as picrates)

45. When chlorobenzene is nitrated using nitration mixture, which compound is obtained?

(Mixture of ortho and para nitrochloro benzene or para nitrochloro benzene as major product)

46. What is difference in the preparation of nitro derivative of urea and toluene?

(Urea solution is treated with only concentrated nitric acid where as toluene is heated with nitrating mixture, urea is an aliphatic compound the nitroderivative is an addition compound but in toluene it is an electrophilic substitution reaction)

47. Which derivative is preferred for solid hydrocarbons and liquid hydrocarbons?

(Solid hydrocarbons- picrate derivative and liquid hydrocarbons-nitro derivative)

48. Write the structure of the functional group in ethyl benzoate and benzamide.

(Ethyl benzoate **-** ester **–** $COOC_2H_5$ and Benzamide –CO-NH_2)

49. Which gas is evolved when carboxylic acids are treated with sodium bicarbonate solution?(Carbon dioxide**)**

50. Name the product obtained when aniline is treated with sodium nitrite and dil.HCl at ice cold temperature.(Benzene diazonium chloride**)**

B.Sc. V Semester-Chemistry- Practicals Probable Viva Questions
(From Performing Experiments only)

PRACTICAL- VI: Physical Chemistry

The following Five experiments shall be set for the students to perform:

1. Determination of percentage composition of sodium chloride solution by miscibility temperature measurements of phenol-water system.
2. Estimation of the amount of hydrochloric acid present in the given solution using standardized decinormal sodium hydroxide by conductometric titration.
3. Dissociation constant of monochloroacetic acid by conductivity method.
4. Estimation of potassium dichromate using ferrous ammonium sulphate by potentio metric titration.
5. Estimation of Cu^{2+}colorimetrically and verification of Beer-Lambert's law.

Experiment No.1

Determination of percentage composition of sodium chloride solution by miscibility temperature measurements of phenol-water system

1. Give an example for a partially miscible liquid pair.(Phenol + water**)**

2. Define critical solution temperature.(The temperature at which two partially miscible liquid pairs becomes completely miscible above or below a certain temperature**)**

3. Phenol water system belongs to upper CST or lower CST. Explain.(It belongs to upper CST because the mutual solubility of phenol and water increases with increase in temperature, that to it is 68^{o}C which is above room temperature**)**

4. What is the effect adding salt on the mutual solubility of phenol and water?
(Solubility decreases**)**

5. What is the effect adding salt on the Miscibility temperature of phenol and water? Miscibility temperature increases**)**

6. Is it 1% sodium chloride and 1N sodium chloride solutions are same? If not how?
(No, 1g of sodium chloride dissolved in 100ml of water gives 1% solution. where as 1g.molar mass of sodium chloride that is 58.5 g of the salt in 1000ml of water or 5.85 g of the salt in 100ml of water give 1N solution)

7. At room temperature, what is the nature of solubility of phenol and water?
(Immiscible liquid pairs**)**

8. Why phenol+water + salt solution cannot be directly heated?(Uniformity of heating does not occur and aromatic compounds are highly inflammable. To avoid these two drawbacks, the contents are heated in a boiling water bath)

9. What is standard graph?(A graph that represents the known composition of the mixture of partially liquid pairs solubility varies with temperature**)**

10. On what factors the miscibility temperature of phenol, water and the salt solution depends?(Concentration of the salt solution(solute), nature of the solute**)**

11. Is the added salt solution behaves in the same manner in both the solvents.How?

(No, In water medium it is more dissociated and in phenol medium, it is not affected)

12. If the composition of the salt is increased and its Misicibility temperature is determined, its temperature increases why?

(As the salt gets dissociated, the dissociated ions are hydrated, as a result the number of ions and water molecules are increased causing increase in its MST.

13. At 72^{o}C, how many layers are present when there is no salt solution in the mixture of Phenol and water?(One layer only**)**

14. What is carbolic acid?(Phenol**)**

15. Can You give one application of this experiment.(To select suitable solvent for a drug in Pharmacy)

Experiment No.2

Estimation of hydrochloric acid present in the given solution using standardized decinormal sodium hydroxide by conductometric titration.

1. Define conuductance(Reciprocal of resistance/capacity of a material in allowing the flow of current**)**

2. Differentiate between conductivity and conductance.(Conductivity-specific conductance, conductance-reciprocal of resistance**)**

3. Give the SI unit of specific conductance(S/m**)**

4. Define molar conductance.(Conductivity of molar solution of the electrolyte**)**

5. What is the Principle involved in conductometric titrations?(Estimation of an electrolyte using change in conductance at the end point by conductance measurements)

6. **Mention any two advantages of conductometric titrations**.(*Indicators are not needed * can be used in coloured solutions * can be used for weak acid - weak base titrations)

7. How sodium hydroxide and hydrochloric acid is estimated in the present titration?

(Sodium hydroxide by volumetric method and Hydrochloric acid conductric method)

8. Name the indictor used in the volumetric method of estimation.(Phenolphthalein)

9. For standardization of sodium hydroxide, which standard solution is prepared?

(Potassium hydrogen phthalate – a primary standard substance)

10. Name the apparatus and the instrument used in the conductometric titrations.

(Conductivity cell and conductometer)

11. What are the compoments of a conductivity cell?

(Rectangular platinized platinum foils fused into a glass tube containg mercury,two copper wires are dipped in it for external connectivity)

12. Why platinized platinum foils are used in the conductivity cell?(That avoids electrolysis)

13. Why high frequency Alternating current is used in conductance determinations?

(That avoids the polarization of electrodes)

14. In conductometer which physical quantitity is measured?(Conductance)
15. What happens to the conductance of the solution when a strong acid is reacted with a strong base?(Conductance decreases**)**
16. Why conductivity decreases when a strong base is added to a strong acid in a conductivity cell?(Highly mobile H^+ ions are replaced by comparably less mobile metal ions with the result the conductivity decreases**)**
17. What happens to change in conductance at the end point of the titration?Why?

(Conductivity starts increasing after the end point because more conducting oH^- starts increasing since there is no H^+ ion in the solution**)**
18. Why stirring of the contents should be done during titration?(To facilitate gentle mixing of the titrants and to have effective neutralization reaction between acid and base)

Experiment No.3

Determination of Dissociation constant of mono-chloroacetic acid by conductivity method.

1. Define conductance(Reciprocal of resistance/capacity of a material in allowing the flow of current**)**
2. State Kohlrausch's law.(Kohlrausch's law states that the equivalent conductivity of an electrolyte at infinite dilution is equal to the sum of the conductances of the anions and cations; that is : $\lambda_\infty = \lambda_c + \lambda_a$)
3. What is meant by dissociation constant of a weak acid? Mention its significance.

(An acid dissociation constant, K_a-also known as acidity constant, or acid-ionization constant is a quantitative measure of the strength of an acid in solution.It is the equilibrium constant for a chemical reaction known as dissociation in the context of acid–base reactions)
3. Give the expression of dissociation constant of a weak acid.[$K_a = \alpha^2C/(1-\alpha)$]
4. Define degree of dissociation of an acid.
(It is the extent of dissociation of an acid**)**
5. How degree of dissociation of an acid is related to conductivity?
($\alpha = \lambda_c / \lambda_\infty$) where λ_c - equivalent conductance of the weak acid at a given concentration, λ_∞- equivalent conductance of the weak acid at infinite dilution)
6. How Kohlrauch law is used to determine the degree of dissociation of the weak acid?

($\alpha = \lambda_c / \lambda_\infty$, λ_c –is determined by conductance measurements, λ_∞- is calculated based Kohlrauch law, $\lambda_\infty = \lambda_c + \lambda_a$)

7. What is meant by cell constant of the given conductivity cell? (It is defined as the ratio of length of electrodes to the area of cross section between them, it is specific for the given conductivity cell**)**

8. How do you determine the cell constant of the given conductivity cell?(By using 0.1N potassium chloride solution whose specific conductance is known that is 1.285 S/m**,** its conductance is determined experimentally, then Cell constant = cond.x 1.285)

9. Give the unit of dissociation constant.(No units**)**

10.Write the expression of λ_∞ of monochloroacetic acid based on Kohlrauch law,

$\lambda_\infty(ClCH_2COOH) = \lambda_{H^+} + \lambda(ClCH_2COO^-)$

11. Write the expression of λ_∞ of acetic acid based on Kohlrauch law,

$\lambda_\infty(CH_3COOH) = \lambda_{H^+} + \lambda(CH_3COO^-)$

12. Name the instrument used to determine the conductivity of solutions. (Conductometer)

13. Can ordinary water used to prepare solutions in conductance measurements? If not Why?(No, ordinary water contains many conducting ions, the value is not exact)

14. What is conductivity water?(Ordinary water distilled 3 to 4 times and finally distilled with a crystal of potassium permanganate**)**

15. Give the mathematical expression of Ostwald's dilution law. Mention its limitation.

[$K_a = \alpha^2C/(1-\alpha)$ - It is applicable only to weak electrolytes]

Experiment No.4

Estimation of Potassium dichromate using ferrous ammonium sulphate by potentiometric titration

1. What is the principle involved in potentiometric titrations?(Potentiometric titrations involves the measurement of the potential of a suitable indicator electrode with respect to a reference electrode as a function of titrant volume. The end point is indicated by the sudden change in the potential – dependent on concentration)

2. What is a cell?(A cell is a device where current is generated or used to undergo specific redox reactions)

3. Mention the components in a cell.(Electrodes and an electrolyte)

4. Enumerate the different types of cells.(1. Electrochemical(Primary) and 2.Electrolytic cells (secondary)

5. Which type of cell is constructed in the present experiment?(Electrochemical cell**)**

6. Name the electrodes used in an electrochemical cells? (Indicator electrode and a reference electrode)

7. What are the electrodes used in the present experiment?(Anode-Pt dipped in acidified ferrous-ferric system - indicator electrode. Cathode: Saturated calomel electrode- reference electrode)

8. What is the role of an indicator electrode in potentiometric titrations?(It indicates the change in concentration of the solution when titrant is added to it since it is reversible with respect to ions present in the solution)

9. Which equation is the basic principle of potentiometric titrations? (Nernst equation**)**

10. Write Nernst equation.($E = E^o + 2.303RT/nF\{log[Ox]/[Red]\}$)

11. Name the indicator used in this titration.(No,Indicators are not used in potentiometric titrations.)

12. Represent the electrochemical cell constructed in this experiment symbolically and indicate the anode and cathode with specific signs.

{Pt; $Fe^{2+}/Fe^{3+}(C_1)$(-Anode) // (satd)Hg_2Cl_2/Hg; Pt(+Cathode)}

13. **What are differential plots in potentiometric titrations?(**To get accurate end points differential plots are drawn from neat titrations performed near the end point**)**

14. Which solution you are estimating in the p resent experiment?(Potassium dichromate)

15. What is a salt bridge and mention its role.(A salt bridge is a glass tube containing the electrolyte having nearly equal transport numbers with a binder agar-agar. It is used to remove the liquid junction potentials between the two half cells)

16. What is the equivalent weight of Potassium dichromate? How?(49; E = Mol.mass/6)

17. Write the major ionic reaction in this titration.($Fe^{2+} \rightarrow Fe^{3+} + e^-$)

18. What are the advantages of potentiometric tirations?

(1.Indicators are not required 2.Can be used for precipitation reactions
3. Can be used for coloured solutions)

Experiment No.5

Estimation of Cu^{2+}-colorimetrically and verification of Beer-Lambert's law.

1. State Beer Lambert's law.(The absorbance of light is directly proportional to the thickness of the media through which the light is being transmitted multiplied by the concentration of absorbing chromophore; A = ebc where A is the absorbance, e is the molar extinction coefficient, b is the thickness of the solution, and c is the concentration.)

2. Give the principle of colorimetric estimations. (Colorimetric analysis is a method of determining the concentration of a chemical element or chemical compound in a solution with the aid of a color reagent and a colorimeter.)

3. Which color reagent you are using in this experiment?(Ammonia solution)

4. What colour is developed and the wave length used in this experiment?(Blue,620nm)

5. Explain how do you verify Beer Lambert's law in this experiment?(A graphical plot of Optical density of different concentrated solutions of copper in copper sulphate Vs the concentration of copper ions gives a straight line verifies the law. The copper is made a blue color complex with ammonia solution, the intensity of the color depends on the concentration of copper)

6. When copper solution is added to ammonia solution blue color develops. What is the chemistry behind this observation?(Copper combines with ammonia forming a co-ordination compound or a complex ion with the composition $[Cu(NH_3)_4]^{2+}$ having blue color)

7. What is the difference between a colorimeter and a spectrophotometer?(The main difference between colorimeter and spectrophotometer is that colorimeter is a device which measures absorbance of specific colours, whereas a spectrometer measures transmittance or reflectance as a function of wavelength.)

8. Define absorbance.(Absorbance is defined as The ability of a layer of a substance or a solution to absorb radiation expressed mathematically as the negative common logarithm of transmittance)

9. Define Optical density, Is it same as absorbance? (It is often said Optical density is identical with the absorbance. It is a logarithmic ratio of the falling radiation to the transmitted radiation through a material. For a given wavelength, the expression of optical element transmittance is expressed as: Log10 (1/T).Where T is transmittance)

10. **Why blank solution is used in colorimetric estimations?(**In order to rectify the errors created by solvent used may form color with the reagent).