QIB FOR CLASS X - CHEMISTRY PBA

Ser	SLO	Questions	Answer
1.	Standardize the given NaOH / HCl solution Volumetrically	1. What is the purpose of standardizing a NaOH solution? 2. Which indicator is commonly used in the titration of NaOH with HCl? 3. Write balanced chemical equation for neutralization of NaOH with HCl? 4. Which apparatus is used to measure the volume of NaOH during standardization? 5. Consider the following equation: $NaOH + HCl \rightarrow NaCl + H_2O$ Find the value of n_1 and n_2? 6. Write molarity formula used in titration calculations.? 7. If 25ml of HCl is titrated with NaOH, what equipment should be used to measure the 25ml of HCl? 8. Which indicator is used in standardization of HCl solution. What is its color in acidic and basic medium? 9. What is the purpose of titrating HCl with NaOH? 10. Why do we use distilled water in preparations of solutions? 11. Write 1 example of neutralization reaction. 12. Why is rough titration carried out?	1. To determine its exact concentration 2. Phenolphthalein 3. $NaOH + HCl \rightarrow NaCl + H_2O$ 4. Burette 5. $n_1 = 1$ and $n_{2=}$ 1 6. $\frac{M_1V_1}{n_1} = \frac{M_2V_2}{n_2}$ 7. Pipette 8. Phenolphthalein Basic medium = Pink Acidic = Colorless 9. To determine exact concentration of HCl 10. To avoid any reaction with impurities of water. 11. $HCl + NaOH \rightarrow NaCl + H_2O$.

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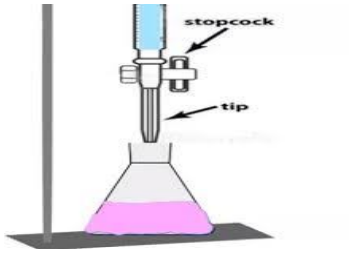
			12. The rough titration acts as a guide for the subsequent accurate titrations, leading to more precise and reliable results.
		13. Calculate the mass of NaOH in one dm^3 of 0.1M solution?	13. Molarity = no. of moles/Volume in dm^3 No.of moles=mass/ Molar mass).
		14. Can we take upper meniscus for colourless liquids?	14. The lower meniscus is used for colorless liquids because the phase boundary is easy to see and read. The upper meniscus is used for colored liquids and mercury.
		15. What is shown in the figure? 	15. The basic solution is neutralized by acidic solution by using phenolphthalein as an indicator.
		16. What is standard solution? What is the purpose of using it?	16. Standard solutions are solutions that contain a known and accurate amount (i.e. concentration) of a substance or element. These solutions are commonly used to help identify and determine the concentration of a substance whose concentration is unknown
		17. Find out the Molarity of HCl if NaOH 0.1 M and $10cm^3$ is taken for each titration?	17. M1V1/n1 = M2V2/n2
		18. 10ml of 0.1M NaOH solution was neutralized by 10ml of HCl solution. Which volume of HCl neutralized NaOH.	18. Since the reaction is 1:1 ($NaOH + HCl \rightarrow NaCl + H_2O$), and the volumes and molarities of both solutions are equal: Volume of HCl that neutralized NaOH

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			=10ml. The equal volumes (10ml) and molarities (0.1M) of NaOH and HCl indicate a stoichiometric reaction, meaning the entire 10ml of HCl is used to neutralize the 10ml of NaOH.
		19. Rough titration also known as preliminary titration is crucial in quantitative analysis. State its importance?	19. To find approximate end point. This information enables the subsequent titration to be carried out more quickly.
		20. Suggest an indicator for the titration of oxalic acid with a strong base such as KOH?	20. Phenolphthalein
		21. What will you do if the soil of the area is too acidic? What inference can you deduce about the chemical reaction that will take place.	21. Add powdered lime (calcium carbonate) or slaked lime in the soil to raise its pH to the right value. Acid base neutralization reaction will take place.
		22. What is the importance of titration method in quantitative analysis?	22. Titration offers high accuracy and precision through direct measurement and clear endpoint detection. It is also a simple, cost-effective, and versatile analytical technique adaptable to various sample types and applications.
		23. What does the strength of solution means?	23. The strength of a solution refers to its concentration, typically measured in units such as molarity (M), normality (N), or percentage (%). It represents the amount of dissolved substance (solute) per unit volume of the solution, indicating how dense or diluted the solution is.
		24. Why is standardization important in titration during quantitative analysis?	24. Standardization ensures the titrant's concentration is accurately known, allowing

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		25. What are common errors in titration that can lead to wrong calculations? 26. How change in temperature affect titration? 27. What is the difference between strong and weak acid-base titration?	precise calculation of the analyte's concentration. 25. Fol errors can lead to wrong calc: a. Inaccurate volume measurements b. Incorrect endpoint detection c. Impure reagents d. Inadequate mixing 26. Temperature affects reaction rates, equilibrium, and pH indicator effectiveness 27. Strong acid-base titration involves strong acids/bases that completely dissociate, while weak acid-base titration involves weak acids/bases that partially dissociate.
2.	Determine the exact molarity of the Na_2CO_3 / Oxalic acid solution Volumetrically	1. Which indicator is used in determining exact molarity of Na_2CO_3 solution. What is its color in acidic and basic medium? 2. Consider the following equation: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ Find the value of n_1 and n_2? 3. Calculate molar mass of Na_2CO_3? 4. What apparatus is used to hold Na_2CO_3 solution during titration? 5. In performing titration, what role does indicator plays? 6. Write the purpose of titration in determining molarity?	1. Methyl orange, Basic medium= Yellow Acidic medium = Red 2. $n_1 = 1$ and $n_2 = 2$ 3. 106 mol 4. Conical flask. 5. Indicator is used to indicate the completion of reaction by changing its color. 6. To determine the exact concentration of an unknown solution by reacting it with a standard solution.

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		7. Which indicator is commonly used in the titration of oxalic acid with NaOH? Write its color in acidic and basic medium?	7. Phenolphthalein Basic medium = Pink and Acidic = Colorless.
		8. Write balanced chemical equations for reaction between oxalic acid and NaOH?	8. $H_2C_2O_4 + 2NaOH \rightarrow Na_2C_2O_4 + 2H_2O$.
		9. Calculate the volume of NaOH required to neutralize 25ml of 0.1M oxalic acid.	9. 25ml.
		10. How many moles of NaOH are required to neutralize I moles of oxalic acid?	10. The 2moles
		11. Why we use conical flask instead of using beaker	11. A conical flask has a wide body but a narrow neck, reducing the likelihood of spills during this essential swirling process. This is especially important when strong acids are present.
		12. Why we take three readings for each titration?	12. By repeating the experiment several times, you can calculate an average result, which will help to minimize the impact of any random errors
		13. Write down the balanced chemical equation of titration of sodium carbonate and HCl?	13. $Na2CO_{3+}$ 2HCl $\rightarrow$ NaCl + H_2O + CO_2.
		14. What are the differences between strong acid and weak acid.	14. The main difference between strong and weak acids is the extent to which they dissociate into ions in water.
		15. What are the precautionary measures for titration?	15. Wear protective gear, Handle chemicals carefully, prepare solutions precisely, Take measurements accurately. Rinse equipment, add titrant dropwise, shake the flask gently and carefully.

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		16. What is secondary standard? Give one example.	16. A secondary standard is a chemical that has been standardized against a primary standard and is used to calibrate control materials in labs.
		17. Write down the balanced chemical equation of titration of Oxalic acid and NaOH.	17. $H_2C_2O_4+2NaOH \rightarrow Na_2C_2O_4+2\ H_2O$
		18. What is the colour of methyl orange in acidic medium?	18. Pink or red
		19. What is the colour of methyl orange in basic medium?	19. Yellow
		20. What are the uses of sodium carbonate in industry?	20. Sodium carbonate (Na_2CO_3) has various industrial uses: Manufacturing: Glass, paper, detergents, textiles, and ceramics; also used in water treatment, metal processing, and oil refining.
		21. Which important compounds are present in the ashes of plants?	21. Sodium carbonate (Na_2CO_3) and potassium carbonate (K_2CO_3), which are alkaline substances used in glass and soap manufacturing.
		22. Which indicator will you choose for the titration of weak acid and a strong base?	22. Phenolphthalein (pH range 8.3-10) as the indicator, as it changes color at the equivalence point, indicating complete neutralization. Alternatively, Methyl Orange (pH range 3.1-4.4) can also be used, but Phenolphthalein is preferred due to its sharper endpoint.
		23. 10ml of 0.1M NaOH solution was neutralized by 10ml of Oxalic acid solution. What will be the molarity of Oxalic acid.	23. For oxalic acid, M_1=? V_1=10ml n_1=1 For NaOH, M_2=0.1M V_2=10ml n_2=2 $M_1V_1/n_1 = M_2V_2/n_2$ M_1x10/1 = 0.1x10/2 so M_1 = 0.05M

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		24. How can mass of oxalic acid be determined if its molarity is 0.05M? 25. Suggest an indicator for the titration of oxalic acid with a strong base such as KOH. 26. 43.42ml of 0.26M NaOH solution was neutralized by 25ml of Oxalic acid solution. What will be the molarity of Oxalic acid solution? 27. Can this method be used to determine the concentration of NaOH solution?	24. Amount = Molarity x molar mass of Amount (g/dm^3) = 0.05 x 126 = 6.3 g/dm^3 25. Phenolphthalein 26. For oxalic acid, M_1=? V_1=25ml n_1=1 For NaOH, M_2=0.26M V_2=43.42ml n_2=2 $M_1V_1/n_1 = M_2V_2/n_2$ M_1x25/1 = 0.26x43.42/2 so M_1 = 0.22M 27. Yes, if the concentration of oxalic acid was known.
3.	Identify saturated and unsaturated organic compounds by $KMnO_4$ test	1. How can you confirm the presence of unsaturation in an organic compound? 2. Identify the compound which will not react with $KMnO_4$: Ethane or ethene. Why? 3. What is the color of $KMnO_4$? What happens to $KMnO_4$ in presence of an unsaturated compound? 4. How you can differentiate between propane and propene in laboratory? 5. Write significance of Baeyer's test 6. What is Baeyer's reagent 7. Name some tests used to test unsaturation in organic compounds.	1. By the decolorization of $KMnO_4$ during the test. 2. Ethane, because it is saturated. 3. Purple color of $KMnO_4$ discharges in the presence of unsaturated hydrocarbon. 4. By $KMnO_4$ test. Propene will decolorize purple color of $KMnO_4$. 5. Identification test for unsaturation. 6. Baeyer's reagent is an alkaline solution of cold potassium permanganate, which is a powerful oxidant making this a redox reaction 7. Baeyer's test and bromine water test

Ser	SLO	Questions	Answer
		8. What type of reactions take place between alkenes and bromine water?	8. Addition reactions.
		9. The solution of an unknown organic compound decolorizes $KMnO_4$. What does it say about the nature of this compound?	9. The organic compound contains unsaturation (C-C multiple bond) in it.
		10. A compound present in cinnamon bark contains C-C double bond. What change is observed when acidified $KMnO_4$ is added to it?	10. $KMnO_4$ is decolorized
		11. A compound present in grapes and tamarind contains no C-C double bond. Will it decolorize $KMnO_4$?	11. No, because there are no C-C multiple bonds.
		12. **.** Cyclohexane (C_6H_{12}) has the same molecular formula as hexane yet it does not decolorize $KMnO_4$. Justify.	12. Cyclohexane is a cyclic hydrocarbon with no C-C double bonds, so it cannot decolorize $KMnO_4$.
		13. Fumaric acid shows a positive reaction with $KMnO_4$. Mention the change observed for this test.	13. $KMnO_4$ is decolorized.
		14. What is the chemical formula of potassium permanganate, and what is its role in identifying unsaturated compounds?	14. Chemical formula of potassium permanganate is $KMnO_4$. It is an oxidizing agent therefore used to identifying unsaturated compounds.
		15. What is the observable result when an unsaturated compound is tested with KMnO4?	15. When an unsaturated compound is added to KMnO4, the purple color of KMnO4 will change to brown or colorless, indicating the oxidation of the double or triple bond
		16. List the major safety precaution to be observed during practical.	16. Wear gloves and goggles, work in a well-ventilated area, and handle KMnO4 with care, as it is a strong oxidizing agent.

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4.	Demonstrate that sugar decomposes into elements or other compounds	1. Write chemical formula of sucrose. What type of reaction is sugar decomposition?	1. $C_{12}H_{22}O_{11,}$ Thermal decomposition
		2. Is the decomposition of sugar an endothermic or exothermic reaction?	2. Endothermic because it requires heat.
		3. Which gas is produced when sugar is heated?	3. Water vapor and carbon dioxide
		4. Write down the name of the element left after decomposition of sugar?	4. Carbon.
		5. Write color changes sugar undergo during decomposition reaction?	5. Before heating= white After gentle heating=Brown After strong heating= Black.
		6. Why do other sugars melt whereas sucrose decomposes?	6. Sucrose decomposes instead of melting because of a heat-sensitive reaction called "apparent melting". This is different from thermodynamic melting, which occurs at a consistent temperature and retains the chemical identity of the substance
		7. What are the observations confirming sugar decomposition?	7. Cobalt chloride paper turns blue.
		8. What observable changes occur when sugar is heated during decomposition, and what does this tell us about the chemical reaction taking place?	8. When sugar is heated, it first melts and turns brown, then begins to produce a caramel-like odor, and eventually blackens as carbon is left behind. This indicates the breakdown of sugar (sucrose) into carbon and water vapor, showing that the heating process causes the sugar to decompose into simpler compounds.
		9. During the decomposition of sugar through heating, why does water vapor appear, and what	9. Water vapor appears during the decomposition of sugar because sucrose ($C_{12}H_{22}O_{11}$) contains hydrogen and oxygen

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		does this indicate about the molecular structure of sugar?	atoms. When heated, these atoms combine to form water (H_2O), which is released as vapor. This indicates that sugar is composed of elements that break down into simpler compounds, including carbon and water.
		10. If you collect the gas released during sugar decomposition, how would you confirm the presence of carbon dioxide in it, and what does this reveal about the breakdown products?	10. You can confirm the presence of carbon dioxide by passing the gas through limewater (calcium hydroxide). If it turns milky, this indicates the presence of CO_2. This shows that during decomposition, sugar breaks down into carbon dioxide and other compounds, suggesting the release of carbon-based gases.
		11. Why does the sugar turn black when heated, and what does this suggest about the final decomposition products?	11. The sugar turns black due to the release of water vapor, leaving behind pure carbon in the form of a charred, black residue. This suggests that one of the final decomposition products of sugar is elemental carbon, demonstrating that heating causes the sugar to break down into its elemental form.
		12. What happens to the mass of sugar after heating it for decomposition, and how does this relate to the law of conservation of mass?	12. After heating, the mass of the remaining solid decreases because water vapor and other gases like carbon dioxide are released into the air. According to the law of conservation of mass, the total mass of the system (including the gases) remains constant, but the sugar loses mass because part of it transitions to a gaseous state.
		13. What is the role of heat in the decomposition of sugar?	13. Heat Provides activation energy to breaks the glycosidic bonds between two monosaccharide carbohydrates.

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5.	Demonstrate the softening of water by removal of calcium ions from hard water	1. What causes water hardness? 2. How does the ion exchange soften water? 3. What are the advantages of using softened water? 4. What is the disadvantage of ion exchange water softening? 5. How can the effectiveness of water softening be measured? 6. What is the he purpose of experiment. Write balanced chemical equation of the reaction taking place. 7. Which sodium compound is used for softening of water? 8. During the practical demonstration, why is calcium removed from hard water when a chemical like sodium carbonate is added? 9. How would you confirm that calcium ions have been removed from hard water after performing the softening process?	1. The presence of dissolved minerals, primarily calcium and magnesium ions, in water. 2. By passing hard water through a resin bed containing sodium ions. The calcium and magnesium ions in the water are exchanged for sodium ions, resulting in softened water 3. Improved cleaning efficiency, reduced scale buildup in appliances and plumbing, and softer skin and hair. 4. Increased sodium content 5. By testing the treated water for the presence of calcium and magnesium ions using a titration or other appropriate method. 6. The purpose of experiment is to remove the hardness of water containing CaCl2. Reaction is: $CaCl2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaCl$ 7. Sodium carbonate and zeolites. 8. Sodium carbonate (Na_2CO_3) reacts with calcium ions (Ca^{2+}) in hard water to form calcium carbonate ($CaCO_3$), which is insoluble and precipitates out of the solution. This process removes the calcium ions responsible for water hardness, effectively softening the water. 9. To confirm calcium removal, you can perform a soap test. In softened water, soap lathers easily, whereas in hard water, it forms a scum. After softening, if the water

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			lathers well with soap, it indicates that calcium ions have been removed and the water is now soft.
		10. Why does the precipitation of calcium carbonate occur during this process, and how is this related to the solubility of calcium compounds in water?	10. Calcium carbonate precipitates because it is insoluble in water. When calcium ions react with carbonate ions (from sodium carbonate), calcium carbonate forms and settles as a solid. This relates to the low solubility of calcium carbonate, which allows it to be easily removed from the water, reducing its hardness.
		11. If you add an excessive amount of sodium carbonate, how would this impact the softening process and the quality of the treated water?	11. Adding too much sodium carbonate may cause excess carbonate ions in the water, potentially increasing the alkalinity of the water. While the calcium ions are still removed, this could make the water more basic, which might affect the taste or the efficiency of soaps and detergents used with the water.
		12. What practical applications does the removal of calcium ions from hard water have in industries, and why is water softening essential in these settings?	12. Water softening is essential in industries like plumbing, heating, and laundry, where hard water can cause scale buildup in pipes and equipment, leading to inefficiency and damage. By removing calcium ions, industries can prevent scaling, prolong equipment life, and improve the effectiveness of cleaning agents.
6.	Identify sodium, calcium radicals by flame test	1. What is the principle of a flame test?	1. When a compound containing a metal ion is heated in a flame, the electrons in the metal atoms are excited to higher energy levels. As they return to their ground state, they emit light of a characteristic color.

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		2. What are the colors of the flames produced by sodium and calcium ions?	2. Sodium ions produce a yellow flame, while calcium ions produce an orange red flame.
		3. How can a flame test be used to identify an unknown sample containing sodium or calcium ions?	3. By observing the color of the flame produced when the sample is heated in a Bunsen burner flame and comparing it to the known colors of sodium and calcium ions.
		4. What precautions should be taken when performing a flame test?	4. Wear safety goggles to protect your eyes from the heat and potential splashes of chemicals. Ensure that the Bunsen burner is turned off when not in use.
		5. What factors can affect the accuracy of a flame test?	5. The presence of interfering ions, the intensity of the flame, and the cleanliness of the platinum wire can all affect the accuracy of a flame test.
		6. Why sodium vapour lamps are used as street lights instead of simple white tube lights.	6. They are very efficient and provide high intensity lights.
		7. How can the different flame colors of sodium and calcium ions be used to identify them in a mixed sample.	7. The distinct yellow flame from sodium and the brick-red flame from calcium can be used to differentiate these ions in a mixed sample.
		8. How does the excitation of electrons in metal ions lead to the emission of light in the flame test?	8. When metal ions are heated, their electrons absorb energy and move to higher energy levels. As they return to their original levels, they release energy in the form of light.
		9. Why do we use con. HCl in the flame test?	9. Conc HCl converts compounds into their metallic chlorides.
		10. A laboratory technician needs to identify Ca^{+2} ions in a mineral sample. What technique would he employ?	10. Flame test.

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		11. How can you differentiate between sodium and calcium in a flame test if sodium is present?	11. The bright yellow flame of sodium can mask the color of calcium. To differentiate, you can use a cobalt blue glass, which absorbs the yellow light, allowing the brick-red color of calcium to be seen
7.	Identify ketones using 2,4-dinitrophenyl hydrazine test	1. How can the 2,4-DNP test be used to distinguish between ketones and aldehydes? 2. What are some common ketones found in everyday life? 3. What is the functional group of a ketone? 4. What is the chemical reaction between ketones and 2,4-DNP. 5. Describe a method to test the solubility of carboxylic acids and predict which ones will be soluble in water. 6. Name a test useful in determining the presence of carbonyl group? 7. What is the color of the 2,4-dinitrophenylhydrazone precipitate? 8. Write down the chemical equation for hydrazine test.	1. Both ketones and aldehydes react with 2,4-DNP to form precipitates. However, aldehydes also undergo the Tollen's test and Fehling's test, which ketonesnot. 2. Acetone (found in nail polish remover and some cleaning products), acetophenone (used as a flavoring agent), and camphor (used in mothballs and topical ointments). 3. The carbonyl group, C=O. 4. Ketones react with 2,4-DNP to form 2,4-dinitrophenylhydrazone precipitates 5. The precipitate is usually yellow or orange in color. 6. Dinitrophenyl hydrazine test and Fehlings solution. 7. It is typically **yellow, orange, or reddish-orange**. 8. $CH_3R'C=O. + C_6H_3(NO_2)_2NHNH_2 \rightarrow C_6H_3(NO_2)_2NHN=C-CH_3R' + H_2O$

<table>
<tr><th>Ser</th><th>SLO</th><th>Questions</th><th>Answer</th></tr>
<tr><td></td><td></td><td>9. A chemist performs the 2,4 - DNPH test on two samples A and B. A show a yellow precipitate while sample B shows no reaction. What conclusion can be drawn?

10. What is the purpose of adding HCl to the 2, 4 DNPH reagent.

11. How does 2, 4 DNPH reagent is prepared?

12. Show the observation and conclusion when fructose reacts with DNPH.

13. Why acetone is used to remove nail polish?</td><td>9. Sample A contains a ketone while sample B has no carbonyl compound.

10. In order to adjust pH we add HCl.

11. It is prepared by dissolving 2, 4 DNPH in ethanol. Then add few cm^3 of conc.$H_2SO_4$are added slowly. The mixture becomes warm and the solid dissolves completely.
12.<table><tr><th>Observation</th><th>Conclusion</th></tr><tr><td>Orange precipitate</td><td>Ketone is confirmed</td></tr></table>
13. Acetone is a liquid solvent that can break down and dissolve other substances</td></tr>
<tr><td>8.</td><td>Identify carboxylic acids using sodium carbonate test</td><td>1. What is the functional group of carboxylic acid?

2. What is the chemical reaction between carboxylic acids and sodium carbonate?

3. How can the evolution of carbon dioxide gas be detected?

4. What are some common carboxylic acids found in everyday life?</td><td>1. The carboxyl group, COOH

2. Carboxylic acids react with sodium carbonate to produce a salt, carbon dioxide gas, and water.

3. By passing the gas through limewater, which turns milky in the presence of carbon dioxide.

4. Acetic acid (found in vinegar), citric acid (found in citrus fruits), and lactic acid (found in sour milk).</td></tr>
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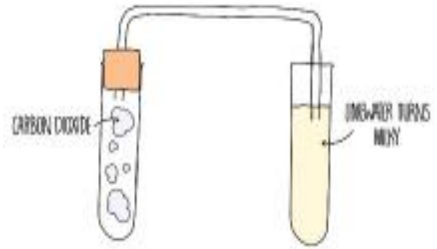
Ser	SLO	Questions	Answer
		5. How can the sodium carbonate test be used to distinguish between carboxylic acids and alcohols. 6. How can you distinguish between phenol and carboxylic group? 7. What causes the brick effervescence in a sodium bicarbonate test? 8. Write down the chemical equation for sodium bicarbonate test? 9. What is the use of lime water in sodium bicarbonate test? 10. What experiment comes in mind when you see this figure:  11. What are the products when carboxylic acids react with bicarbonates 12. Name some commonly used carboxylic acid. 13. While preparing cakes and cookies why the flour swells up on the addition of baking soda in it?	5. Carboxylic acids will react with sodium carbonate to produce carbon dioxide gas, while alcohols will not. 6. The sodium bicarbonate test can be used to distinguish between phenol and carboxylic acids. 7. Evolving CO2 8. $CH_3COOH + NaCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$ 9. Lime water turns milky due to CO_2 10. Carboxylic acids using sodium carbonate test. 11. Metal carboxylate (CH_3-COOH), carbon dioxide (CO_2) gas and water (H_2O). 12. Oxalic acids, Acetic acid, Succinic acid, Tartaric acid, Citric acid, Cinnamic acid. 13. It swells up due to the evolution of Carbon dioxide (CO_2).

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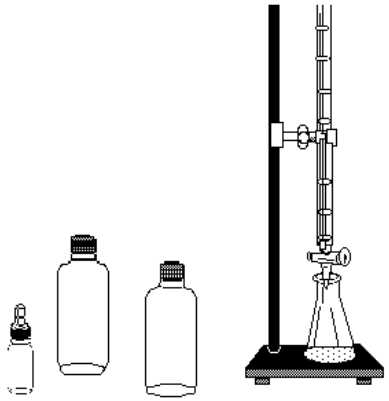
		14. Where does carbon dioxide come from? 15. Which carboxylic acid responsible for odor and taste of vinegar? 16. Write the balanced chemical equation for the reaction of ethanoic acid (CH3COOH) with sodium carbonate.	14. From decomposition of Bicarbonates. 15. Acetic acid (CH_3COOH). 16. $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$
9.	Classify substances as acidic, basic or neutral	1. How can the pH of a solution be measured? 2. Identify the pH range of acids, bases, and neutral substances. 3. What is the action of acid and base for litmus paper? 4. What is the difference between litmus paper and pH paper? 5. Ammonia NH_3 does not contain hydroxide group yet it produces hydroxide ion in water 6. Is your saliva acidic or basic before and after having meal? 7. Why does the application of vinegar remove the scales from a kettle? 8. What is the nature of Bee's and wasp sting? 9. Color of 0.1% Bromothymol Blue in hydrochloric acid is: 10. If gaseous HCl is cooled to about -84 C^o, it condenses to a liquid that does not conduct electricity. Why is to so?	1. Using a pH meter or litmus paper. 2. Acidic: pH < 7; Basic: pH > 7; Neutral: pH = 7 3. Acids turns blue litmus red and base turns red litmus blue. 4. Litmus paper tells the nature of substance while pH paper tells the acidic and basic strength. 5. Water (H_2O) acts as an acid when react with ammonia as shown below: $H_2O + NH_3 \rightleftharpoons NH_4^+ + OH^-$ 6. Saliva before meal is basic and may change its PH after meal. The normal PH range of saliva is 6.5-7.5. 7. treating them with vinegar when a soluble salt e.g. calcium acetate etc is obtained. Then kettle is washed with sufficient water. 8. It is acidic in nature while wasp is basic. 9. It is yellow in color. 10. Liquid HCl is covalent in nature and does not conduct electricity due to the absence of ions in it.

SLO-wise Question Bank
(Self-Assessment / Class Practice)

SLO: Standardize the given NaOH / HCl solution Volumetrically

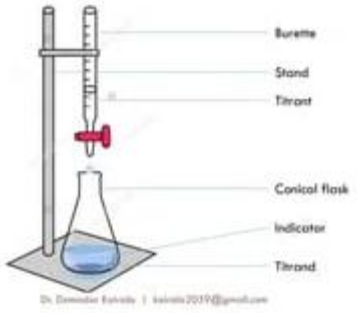
1. The diagram shows the setup for standardizing sodium hydroxide solution using hydrochloric acid.



   a) Label the key pieces of apparatus shown in the diagram
   b) Explain why a conical flask is preferred over a beaker for the titration
   c) State two precautions that should be taken when rinsing the burette with NaOH solution?
2. A student needs to prepare the workbench for standardization.
   a) List three pieces of apparatus that must be thoroughly cleaned and dried before use
   b) Describe the correct procedure for rinsing a pipette with the standard acid solution
   c) Explain why the pipette filler must be used instead of mouth pipetting.
3. During the standardization process:
   a) Explain why the conical flask should be swirled during titration
   b) Describe how to correctly read the burette at the start and end of titration
   c) State the significance of the 'rough titration' in the standardization process
4. A student obtained the following titration readings: Initial burette reading: 0.00 cm^3 Final burette reading: 24.35 cm^3
   a) Calculate the volume of NaOH used
   b) Explain why concordant titres should be within 0.10 cm^3 of each other.

5. In standardizing 0.1 M HCl against NaOH:
   a) Write the balanced equation for the neutralization reaction
   b) Calculate the concentration of NaOH if 25.0 cm^3 of HCl required 27.30 cm^3 of NaOH
   c) Explain why the exact concentration of NaOH needs to be known
6. The following results were obtained: Obs 1: 24.35 cm^3 Obs 2: 24.40 cm^3 Obs 3: 24.85 cm^3
   a) Identify which results are concordant and explain why
   b) Calculate the average titre using appropriate results
   c) Suggest one improvement to obtain more accurate results?
7. Regarding the use of phenolphthalein indicator:
   a) Describe the color change observed at the end point
   b) Explain why phenolphthalein is suitable for this titration
   c) Suggest an alternative indicator and justify your choice?
8. A student observes color change during titration:
   a) Explain why droplets of solution on the burette walls should not be included in readings
   b) Describe how to detect the end point accurately
   c) State two reasons why the end point might be overshot.
9. Consider the following potential errors and answer the questions:
   a) Explain how parallax error could affect the results and how to avoid it
   b) Describe the impact of using a wet burette on the final concentration calculation
   c) Suggest two ways to improve the precision of the results.
10. Regarding the standardization procedure:
    a) Why all glassware must be rinsed with distilled water
    b) How temperature fluctuations might affect the results
    c) What appropriate significant figures be used for recording burette readings and why.
11. List the reagents and materials required for the volumetric standardization of NaOH and HCl solutions.
12. How you would determine the endpoint of a titration when standardizing NaOH with HCl. What indicators could be used?
13. What are the expected observations during the titration process when standardizing NaOH with HCl? Describe any color changes.
14. Identify potential sources of error during the standardization process and suggest ways to minimize them.
15. Explain the concept of the equivalence point in a titration. How can you determine when the equivalence point has been reached during the standardization of NaOH with HCl?

SLO: Determine the exact molarity of the Na_2CO_3 / Oxalic acid solution Volumetrically



1. Before beginning the titration process:
   a) Explain why oxalic acid must be heated gently to dissolve in water
   b) Describe two safety precautions when handling oxalic acid powder
   c) State why Na2CO3 should be heated in an oven before weighing.
2. A student prepares the solutions:
   a) Calculate the mass of Na2CO3 needed to prepare 250 cm^3 of 0.1 M solution
   b) Describe the correct procedure for making the solution to the mark in a volumetric flask
   c) Explain why the solution should be shaken thoroughly after making up to the mark.
3. Regarding the titration apparatus:
   a) Explain why methyl orange is preferred over phenolphthalein for this titration
   b) Describe the correct method for filling the burette with oxalic acid solution
   c) State two sources of error when reading the burette and how to minimize them.
4. During the titration process:
   a) Describe the color change observed at the end point when using methyl orange
   b) Explain why the solution should be swirled continuously during addition of acid
   c) State why a white tile should be placed under the conical flask.
5. A student obtained the following data: Mass of Na2CO3 = 2.65 g Volume of solution = 250 cm^3
   a) Calculate the molarity of the Na2CO3 solution
   b) Explain why the solution should be freshly prepared
   c) Calculate the theoretical volume of 0.1 M oxalic acid needed to neutralize 25.0 cm^3 of this Na2CO3 solution.

6. The following titration results were obtained: Titre 1: 23.45 cm^3 Titre 2: 23.40 cm^3 Titre 3: 23.90 cm^3
   a) Identify the concordant readings and explain your choice
   b) Calculate the average titre using appropriate results
   c) Explain why the third reading might be significantly different?
7. Regarding the reaction mechanism:
   a) Write the balanced equation for the reaction between Na_2CO_3 and $H_2C_2O_4$
   b) Explain why Na_2CO_3 is considered a basic salt
   c) Describe what happens to the pH during the titration.
8. Consider the following observations and write a brief response:
   a) Explain why the end point appears sharper when the solution is hot
   b) Describe two ways to confirm that the end point has been reached
   c) State why standardization against Na2CO3 is preferred over NaOH
9. Regarding experimental accuracy:
   a) Explain how temperature affects the accuracy of the volumetric measurements
   b) Suggest two improvements to increase the accuracy of results.
10. Describe the procedure for determining the molarity of a sodium carbonate (Na2CO3) solution using oxalic acid (H2C2O4) as the titrant.
11. Explain the concept of the equivalence point in a titration. How can you determine when the equivalence point has been reached during the standardization of Na2CO3 with oxalic acid?
12. What is the balanced chemical equation for the reaction between sodium carbonate (Na2CO3) and oxalic acid (H2C2O4)? Use this equation to explain the stoichiometry involved in the titration.
13. If 25.00 mL of Na2CO3 solution is titrated with 0.050 M oxalic acid and it takes 20.00 mL of oxalic acid to reach the endpoint, calculate the molarity of the Na2CO3 solution.
14. What is the role of indicators in acid-base titration:
15. List potential sources of error in this experiment and suggest methods to minimize these errors.

SLO: Identify saturated and unsaturated organic compounds by KMnO4 test

1. Regarding the KMnO4 solution:
   a) State the appropriate concentration of KMnO4 solution used for this test
   b) Describe the appearance of freshly prepared KMnO4 solution
   c) Explain two safety precautions when handling KMnO4 solution.
2. A student prepares for the test to detect un-saturated compounds, using KMnO4:
   a) Explain why distilled water must be used to prepare KMnO4 solution
   b) Describe how to properly store the KMnO4 solution
   c) State why the test tubes must be thoroughly cleaned before use.
3. During the testing procedure:
   a) Describe the exact steps for adding KMnO4 solution to the organic compound
   b) Explain why the test tubes should be gently shaken
   c) State the maximum time needed to observe a definitive result.
4. Observe the following results: Test tube 1: Purple color remains Test tube 2: Purple color disappears

   a) Identify which tube contains the unsaturated compound and explain why
   b) Describe the chemical change occurring in test tube 2
   c) Explain why warming the mixture might affect the rate of color change.
5. Regarding the reaction mechanism:
   a) Write the balanced equation for the reaction between KMnO4 and an alkene
   b) Explain why MnO_4^- changes color during the reaction
   c) State the final oxidation state of manganese in the products

6. Consider the following compounds: **A**: **$CH_3CH_2CH_2CH_3$** **B: $CH_3CH=CHCH_3$** **C : $CH_3CH_2CH_2OH$**
   a) Predict which compound(s) will decolorize KMnO4
   b) Explain your predictions with reference to molecular structure
   c) Describe how temperature affects the rate of decolorization [2]
7. A student tests unknown samples:
   a) Explain why a control test with water should be performed
   b) Describe two possible sources of false positive results
   c) Suggest how to verify that decolorization is due to unsaturation rather than other reducing agents
8. The test gives unclear results:
   a) Suggest two reasons why the purple color might fade very slowly
   b) Explain how to distinguish between slow decolorization and no reaction
   c) Describe how to modify the test for more definitive results
9. Practical considerations:
   a) Explain why some alkenes might react faster than others
   b) Describe how to test volatile organic compounds
10. What is the chemical basis for the KMnO4 test in distinguishing between saturated and unsaturated organic compounds.
11. What observations would you expect when performing the KMnO4 test on an alkene and an alkane? Explain the significance of these observations.
12. A student performed the KMnO4 test on two organic compounds:
    Compound A (C3H6) and Compound B (C4H10).
    What results would you expect for each compound, and what do these results indicate about their structures?
13. Why is it important to use dilute KMnO4 solution in the test for identifying saturated and unsaturated compounds?
14. If a compound does not react with KMnO4 and remains purple, what further test could be performed to confirm its saturation?
15. What are the limitations of the $KMnO_4$ test in identifying organic compounds?

SLO: Demonstrate that sugar decomposes into elements or other compounds

1. The diagram shows the apparatus for sugar decomposition:

   a) Label three essential pieces of apparatus shown in the setup
   b) Explain why the test tube should be held at an angle during heating
   c) State two safety precautions that must be taken during this experiment
2. Regarding experimental preparation:
   a) Describe how to properly clean and dry the test tube before use
   b) Explain why the amount of sugar used should not exceed one-third of the test tube
   c) State why a boiling tube is preferred over a normal test tube:
3. During the heating process:
   a) Describe the initial changes observed when sugar is heated gently
   b) Explain why the heating should be gradual rather than intense
   c) List three observations as the decomposition progresses.
4. Consider the following observations:
   a) Explain why the sugar turns brown and then black
   b) Describe the appearance and smell of any gases evolved
   c) State what happens to the inner walls of the test tube during heating.
5. Regarding the solid residue:
   a) Identify the black solid remaining in the test tube
   b) Describe a test to confirm the identity of this residue

6. For the gaseous products:
   a) Describe how to test for water vapor produced during decomposition
   b) Explain how to detect carbon dioxide among the products
   c) Write a word equation for the overall decomposition reaction?
7. About the decomposition process:
   a) Explain why this is called a thermal decomposition reaction
   b) Describe the role of heat energy in breaking chemical bonds
   c) State why sugar doesn't melt cleanly like ionic compounds.
8. Why the process is considered irreversible.
9. Suggest why different types of sugar might decompose at different temperatures.
10. Describe two possible sources of error in this experiment. Suggest improvements to collect more accurate results.
11. Describe briefly the procedure you did for demonstrating the decomposition of sugar (sucrose) when heated.
12. Explain the role of heat in the decomposition of sugar. What would happen if sugar were not heated sufficiently?
13. After heating sugar, a black residue is left in the test tube. What does this residue represent, and what does its formation indicate about the decomposition process?
14. What are the observable physical changes that occur when sugar decomposes upon heating? List at least three changes.
15. If a student observes that the sugar does not de compose after heating, what could be some possible reasons for this observation?

SLO: Demonstrate the softening of water by removal of calcium ions from hard water.

1. Regarding hard water samples:
   a) Describe how to prepare a sample of temporary hard water in the laboratory
   b) State two cations that commonly cause water hardness
2. Why soap forms scum with hard water. Write the equation for the formation of calcium carbonate in temporary hard water.
3. Draw the diagram for the setup you ever used for removing temporary hardness of water.
4. Why the hard water should be boiled for several minutes. State two safety precautions when boiling hard water.
5. State two advantages of ion exchange over boiling method.
6. During the softening process:
   a) Write a balanced equation for the removal of Ca^{2+} ions by sodium carbonate
   b) Explain why filtering is necessary after chemical treatment
   c) State what happens to the pH during the process
7. During the experiment white precipitate forms during chemical treatment, explain why? How to collect and dry the precipitate.
8. Explain why soap lather is used as an indicator. State two other methods to verify calcium ion removal?
9. Explain why results might vary between samples.
10. Compare different methods:
    a) Explain two advantages of using washing soda over boiling method
    b) Describe why distillation is not practical for large-scale softening
    c) State which method would be most suitable for domestic use and explain why.
11. Describe the procedure for demonstrating the softening of hard water by the removal of calcium ions using a suitable method?
12. Explain the chemical reaction that occurs when sodium carbonate is added to hard water containing calcium ions. Write the balanced equation for this reaction.
13. After performing the softening process, how can you test the effectiveness of the water softening method?
14. If a student observes that no precipitate forms after adding sodium carbonate to hard water, what could be some possible reasons for this observation.
15. What units are commonly used to express water hardness?

SLO: Identify sodium, calcium radicals by flame test.

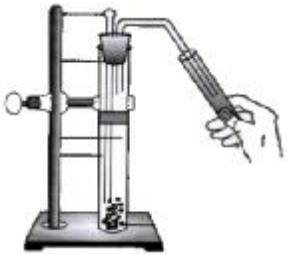
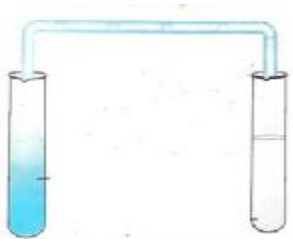
1. Label three essential pieces of equipment needed for flame tests
2. Explain why a platinum/nichrome wire is preferred over a copper wire
3. State two safety precautions specific to flame tests.
4. Describe how to clean the wire loop between tests
5. Explain why concentrated HCl is used to clean the wire or State why the wire must be heated in the flame until no color appears.
6. During the flame test:
   a) Describe the correct technique for introducing the sample into the flame
   b) Explain why the sample should not be placed directly in the flame
   c) State the ideal position of the wire in the Bunsen flame
7. Consider flame appearance:
   a) Describe the characteristic flame color for sodium ions
   b) Describe the characteristic flame color for calcium ions
   c) Explain why the test should be repeated at least twice.
8. A student observes different colors:
   a) Explain why sodium shows a persistent color while calcium's is briefer
   b) Describe how to distinguish between orange-red and yellow flames
   c) State why viewing the flame against a dark background helps?
9. Describe how to detect calcium in the presence of sodium. Suggest a method to confirm results if colors are unclear?
10. Describe the procedure for performing a flame test to identify sodium and calcium ions.
11. If a student observes a yellow flame during the test but is unsure whether it is due to sodium or another element, what could be done to confirm the presence of sodium ions specifically?
12. Discuss the role of hydrochloric acid in the flame test procedure. Why is it used, and what effect does it have on the wire loop?
13. What role does the color of the flame play in the identification of metal ions.
14. What are the limitations of using the flame test for identifying sodium and calcium ions? Provide at least two limitations
15. What color flame does potassium produce?

SLO: Identify ketones using 2,4-dinitrophenyl hydrazine test.

1. Regarding 2,4-DNP reagent:
   a) State why 2,4-DNP solution must be prepared in acidified conditions
   c) Describe the appearance of fresh 2,4-DNP reagent.
2. Why the test tubes must be completely clean and dry. How to safely handle and store 2,4-DNP solution.
3. Describe the procedure for performing the 2,4-dinitrophenylhydrazine (DNPH) test to identify ketones.
4. Explain the chemical basis of the DNPH test. How does the reaction between ketones and DNPH occur.
5. During the testing procedure:
   a) Describe the exact steps for adding 2,4-DNP to the ketone sample
   b) Explain why the mixture should be shaken gently
   c) State how long to wait for a definitive result.
6. Consider these observations:
   a) Describe the expected color and appearance of a positive result
   b) Explain why some precipitates form faster than others
7. Write the general equation for the reaction between 2,4-DNP and a ketone?
8. Draw the structure of the product when propanone reacts with 2,4-DNP?
9. A student obtains these results:
   Sample A: Orange precipitate forms immediately Sample B: No visible change
   Sample C: Slight cloudiness after 2 minutes
   a) Interpret each result b) Explain why sample C gave an unclear result c) Suggest how to confirm the results?
10. Explain why a control test should be performed. State two possible causes of false negative results.
11. If a student performs the DNPH test and observes no precipitate, what could be some possible reasons for this result?
12. What are the expected colors of the precipitate formed when ketones react with DNPH, and what does this indicate about the presence of ketones?
13. Explain the role of the water bath in the DNPH test procedure. Why is it important to control the temperature during the reaction?
14. What alternative methods exist for identifying ketones besides the DNPH test?
15. Can this test be used to differentiate between various ketones? Why / Why not?

SLO: Identify carboxylic acids using sodium carbonate test.

1. State the appropriate concentration of Na_2CO_3 solution used for this test. Why fresh solution should be used for testing.
2. Explain why the test tubes should be dry before use. How to properly clean test tubes for this experiment.
3. Describe the exact steps for adding Na_2CO_3 solution to the acid sample.
4. Explain why the solutions should be mixed gradually
5. Identify, which of the given apparatus is used to identity carboxylic acids? How?

 or 

6. Explain why effervescence occurs. State how temperature affects the rate of gas evolution.
7. Write a balanced equation for the reaction between ethanoic acid and Na_2CO_3.
8. Explain why CO_2 is produced during the reaction. State why this is considered a neutralization reaction.
9. A student observes these results:
   Sample A: Vigorous effervescence Sample B: No reaction Sample C: Slow bubbling
   a) Interpret each observation b) Explain possible reasons for the slow reaction in sample C
   c) Suggest how to confirm the results
10. Describe two possible sources of experimental error. Why a control test should be performed.
11. If a student performs the sodium carbonate test and observes no effervescence, what could be some possible reasons for this result?
12. What are the expected observations when a carboxylic acid reacts with sodium carbonate, and what does this indicate about the presence of the acid?
13. Discuss the limitations of the sodium carbonate test in identifying carboxylic acids. What are some potential drawbacks?
14. What is role of sodium carbonate in the test for identifying carboxylic acids. Why is it used specifically for this purpose?
15. What is the significance of the effervescence observed during the sodium carbonate test?

SLO: Classify substances as acidic, basic or neutral.

1. Describe the procedure for classifying a substance as acidic, basic, or neutral using pH indicators.
2. Explain the significance of the pH scale in classifying substances as acidic, basic, or neutral. What are the pH ranges for each category?
3. What safety precautions should be taken when testing substances for acidity or basicity in the laboratory?
4. If a student tests a substance and finds that it has a pH of 5, how would they classify this substance? Explain your reasoning.
5. Describe how you would classify a substance that has a pH of 8?
6. What are some common household substances that can be classified as acidic, basic, or neutral? Provide at least one example.
7. Explain how litmus paper can be used to classify substances as acidic or basic. What color changes indicate each classification?
8. Discuss the limitations of using pH indicators for classifying substances. What factors can affect the accuracy of the results?
9. How can the classification of a substance as acidic, basic, or neutral impact its behavior in chemical reactions?
10. Describe how you would use a universal pH indicator to classify a substance. What steps would you take?
11. What role does the concentration of hydrogen ions play in determining whether a substance is classified as acidic, basic, or neutral?
12. The table below shows the results of adding universal indicator to three different substances:

Substance	Indicator Color	pH Value
A	Green	7
B	Red	2
C	Purple	11

    (a) Classify each substance as acidic, basic, or neutral.
    (b) Which substance would most likely react with a metal carbonate to produce a gas?
13. You are provided with a colorless liquid. When tested with blue litmus paper, there is no change, but red litmus paper turns blue. Is the substance acidic, basic, or neutral?
14. A student tested three common household substances using pH paper. The following observations were recorded:
    Lemon juice: pH paper turned red **Baking soda solution**: pH paper turned blue **Distilled water:** No color change.
    Classify each substance as acidic, basic, or neutral.
15. A solution of pH 4 is mixed with another solution of pH 10. The resulting solution has a pH of 7. Classify the final solution as acidic, basic, or neutral. Explain why the final pH is neutral.

Sample papers:

Chemistry SSC-II

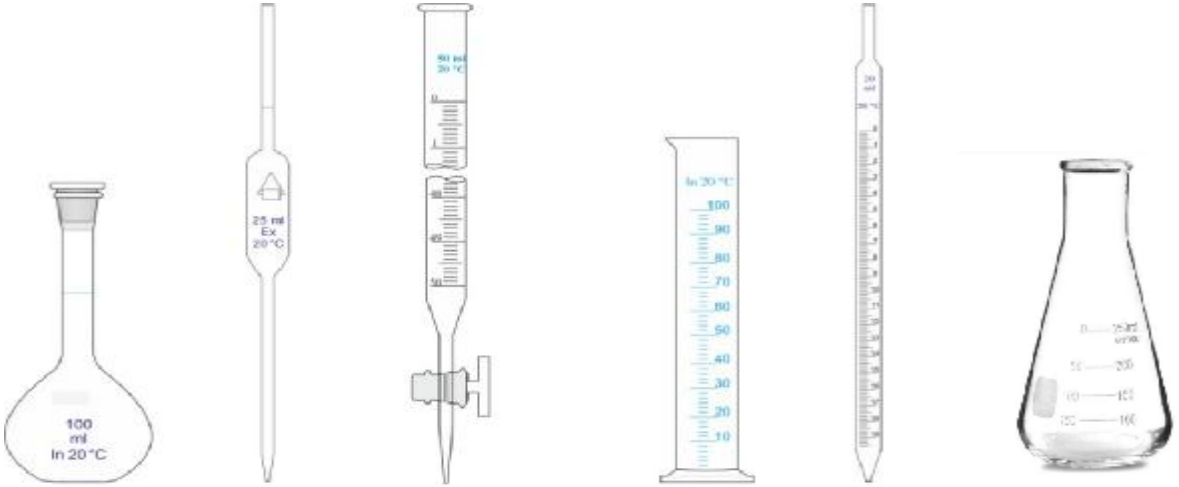
Total Marks:10 Time:45 minutes

Section A

Note: Attempt all questions and answer the questions within the provided spaces.

Q no1 : Purpose of this experiment is to determine the exact molarity of oxalic acid volumetrically. 0.1 M NaOH is given.

i. Which of the following apparatus are used in this experiment: Identify and write their name at the space given. **(1)**



A **B** **C** **D** **E** **F**

_____

Chemicals used:

Phenolphthalein Distilled water 0.1M NaOH and $V1=10cm^3$(oxalic acid solution)

ii. Complete the following reaction: **(1)**

$(COOH)_{2.}$ + 2NaOH **à** _____

iii. Find the value of $n_1$for oxalic acid and n_2 for NaOH from the above chemical equation. **(1)**

n_1=……

n_2=……

iv. What is the role of phenolphthalein in this titration? **(1)**

_____

v. Why is it important to add NaOH drop wise near the endpoint? **(2)**

_____

_____

Section B

Question 2: Give answers to following questions.

i. When we add acidified $KMnO_4$ solution to the aqueous suspension of cinnamic acid, mention change observed for test. **(1)**

_____

ii. When an unknown salt is subjected to a flame test, a brick red flame is obtained. Give procedure of the test and indicate the cation which gave red flame. **(1)**

_____

_____

iii. Fructose gives orange precipitates with 2,4-dinitrophenyl hydrazine. Which functional group is confirmed by this test? **(1)**

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iv. The purpose of experiment is to remove hardness of water containing $CaCl_2$. Write a method with chemical equation to remove this hardness. **(1)**

SAMPLE PAPER-2

Section A

Note: Attempt all questions and answer the questions within the provided spaces.

Question no1: Purpose of this experiment is to standardize the given HCl solution volumetrically. 0.1 M NaOH is given.

i. Name the indicator which is used to perform this experiment. **(1)**

_____

ii. Complete the following reaction: **(1)**

HCl + NaOH **à** _____

iii. Find the value of n_1 for HCl and n_2 for NaOH from the above chemical equation.

n_1=…… n_2=…… **(1)**

iv. A titration uses 40 cm^3 of 0.1M NaOH to neutralize 20cm^3 of HCl solution. Calculate the molarity of HCl. **(2)**

_____

_____

_____

v. Can we take upper meniscus for colorless liquids? Why / Why not? **(1)**

_____

Section B

Question2: Give answers to following questions.

i. Why copper wire is not used in the flame test? **(1)**

_____

_____

ii. When an unknown salt is subjected to a flame test, a golden yellow flame is obtained. Give procedure of the test and indicate the cation which gave red flame. **(1)**

_____

_____

_____

iii. Write the balanced chemical equation for the reaction of ethanoic acid and sodium carbonate. **(1)**

_____

iv. Name the gas produced when acetic acid reacts with Na_2CO_3. solution. **(1)**

_____