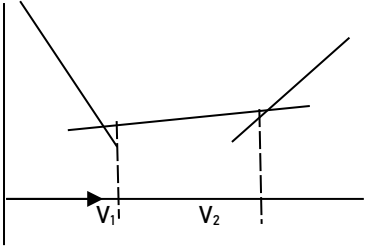
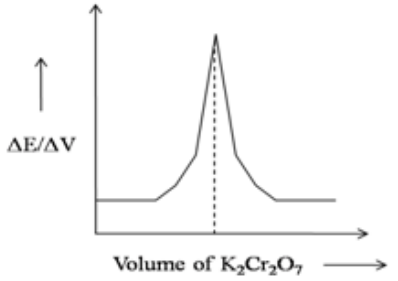
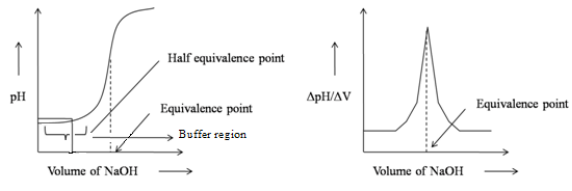
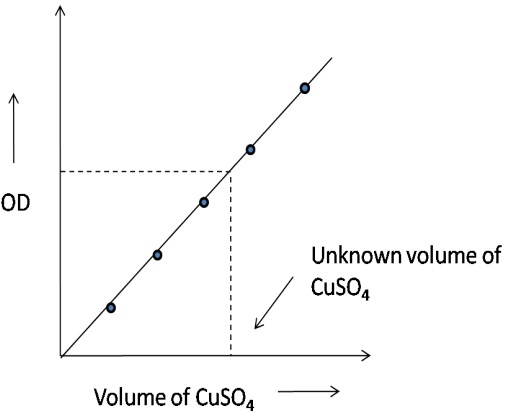


Experiment	Aim	Chemicals	Glassware & Apparatus	Graph	Procedure
1. <u>Cell constant</u>	<div>1.To determine cell constant of a conductivity cell</div> <div>2.To determine the concentration of a weak acid and strong base in a mixture by conductometric titration with a strong base</div>	<ul style="list-style-type: none">KCl salt (to make standard solution)NaOH solutionAcid mixture (HCl + CH₃COOH solution)Distilled water	<ul style="list-style-type: none">2x BeakerBurette10 mL pipette2x 100mL Volumetric flaskSpatulaConductometerSmall funnelMagnetic Stirrer	<div>Conductance</div>  <div>Volume of NaOH</div>	<p>PROCEDURE : A) DETERMINATION OF CELL CONSTANT</p> <p>Connect conductivity cell to conductivity bridge and keep the electrodes of the cell dipped in distilled water. Prepare 0.1N and 0.01N KCl solutions. To measure conductance of a particular solution, wash the electrodes of conductivity cell twice with that solution. Take 25ml of that solution in 100ml beaker and dip the electrodes in that solution. Care should be taken to see that both platinum electrodes of the cell are completely immersed in the solution. Select appropriate conductance range. Note down the conductance of 0.1 N and 0.01 N KCl solutions and determine the cell constant using equation $K = C \times \frac{1}{G}$, or $G = \frac{K}{C}$</p> <p>B) PROCEDURE</p> <p>Dip the conductivity cell in the given solution of mixture of acids taken in a beaker, such that the two platinum electrodes are immersed completely. The cell is connected to the conductivity bridge. Stir the solution with the help of magnetic stirrer and measure the conductance. Take the given NaOH solution in a burette, rinsed with the same solution. Pour down 0.5ml of NaOH solution each time to the beaker. Conductance decreases in beginning. Continue titration until conductance starts to increase slightly and continue till the conductance increases by a large value. Record few more readings. Plot the graph of conductance against volume of NaOH added. From the graph, find the neutralization points. Calculate the normality and amount of HCl and CH₃COOH present in the given solution.</p>
2. <u>Potentiometric Titration</u>	<p>AIM:</p> <p>To determine the amount of iron present in FAS solution by potentiometric titration method.</p>	<ul style="list-style-type: none">0.1 N FAS Solution0.05 N K₂Cr₂O₇2N H₂SO₄Distilled Water	<ul style="list-style-type: none">BuretteBeakerTest Tube + HolderMagnetic Stirrer [includes magnetic bid]	 <div>Volume of K₂Cr₂O₇</div>	<p>PROCEDURE : Pipette out 25 ml of the ferrous ion solution in to a 100ml beaker. Add 2ml of conc. HCl and heat the solution just to boil. To the hot solution add stannous chloride (SnCl₂) until the color changes from yellow to colorless. Cool the solution to room temperature and add 2ml of HgCl₂ at a stretch, to get silby white precipitate. Dip the electrode assembly into the solution and connect to a potentiometer. Stir the solution by using magnetic stirrer and measure the potential. Add 0.5ml of Potassium dichromate solution from a burette. Stir the solution well and measure the potential. Continue the process till the potential shows a rapid increase. Plot a graph of E vs V (volume of dichromate added), ΔE/ΔV and Δ²E/Δ²V vs V and find out the end point using these plots. Calculate the normality of the ferrous solution and determine the amount of iron in the given volume of the solution.</p>
3. <u>pK_a value of weak acid by pH-titration</u>	<div>To determine pKa value of a weak acid by pH titration method</div>	<ul style="list-style-type: none">Acetic/Formic AcidNaOH solution	<ul style="list-style-type: none">Beaker (2?)BuretteDigital pH-meterMagnetic StirrerCombined electrode (calomel electrode + glass electrode)	 <div>Volume of NaOH</div>	<p>PROCEDURE : Pipette out 25ml of the given weak acid into a clean 100ml beaker. Insert glass electrode and calomel electrode assembly into it and connect it to pH meter. Stir the solution by using the magnetic stirrer and measure pH of the weak acid. Fill the burette with the NaOH solution. In the beginning add 0.5 ml of NaOH and stir the solution. Note down the pH of the solution. Continue adding 0.5ml of NaOH each time and measure the pH regularly after each addition until the increase in pH is large. Plot the graphs and determine the pKa of the given weak acid from the two graphs.</p> <p>1) ΔpH/ΔV against volume of NaOH added</p> <p>From the graphs:</p> <p>Equivalence Point: 5x5 ml</p> <p>Half Equivalence Point: 2.75 ml</p> <p>pH corresponding to half equivalence point is 3.9</p>
4. <u>Colorimetry</u>	<div>To estimate the amount of copper present in a given solution by colorimetric method</div>	<ul style="list-style-type: none">Standard CuSO₄ solutionNH₃ solution	<ul style="list-style-type: none">2 Burettes7 50mL FlasksCuvetteColorimeter	 <div>Volume of CuSO₄</div>	<p>PROCEDURE : Transfer 2, 4, 6, 8, and 10 ml of given copper sulphate solution into different 50ml volumetric flasks from the burette. Add 2.5 ml of ammonia to all the volumetric flasks and make up to the mark by adding distilled water. Close the volumetric flasks with stopper and shake well to get uniform concentration.</p> <p>Prepare a blank solution by taking 2.5 ml of ammonia solution in another 50ml volumetric flask. Make up to the mark by adding distilled water and shake well. After ten minutes measure the absorbance of all solution against blank at 620nm using a photoelectric colorimeter. Note down the optical density of all solutions and tabulate the readings. Draw a calibration curve by plotting absorbance against concentration of copper or volume of copper sulphate taken. Using the calibration curve find out the unknown volume of copper sulphate solution and calculate the amount of copper present in the unknown solution.</p>

5. PVA [polymer viscosity average]	<div>To determine the molecular weight of a polymer by viscosity measurements using Mark-Houwink equation</div>	<ul style="list-style-type: none">Polyvinyl alcohol (stock solution with concentration of 1gm/dL)Acetone	<ul style="list-style-type: none">ViscometerVolumetric flaskWater BathPipettePipette HeadStop WatchStandBurette		<p>PROCEDURE:</p> <ol style="list-style-type: none">From the given stock solution (1g/dL) prepare polymer solutions of concentrations 0.2g/dL & 0.5g/dL.For 0.2g/dL solution Take 10ml of stock solution into 50ml standard flask and make up to mark with deionized water.Take a clean and dry viscometer. Fix it vertically to a stand in a constant temperature bath (beaker containing water). Using a clean and dry pipette transfer a known volume (10ml) of the prepared polymer solution (0.2 g/dL) into the wider limb of viscometer. Allow 5 minutes for viscometer to thermally equilibrate. By applying suction, bring the sample above the upper mark of the small bulb of the viscometer. Allow the solution to flow freely through the capillary. When the solution crosses the upper mark of the bulb, start a stop watch and when the solution crosses the lower mark of the small bulb, stop the stop watch. Note down the time flow of the polymer solution in seconds. Repeat time flow measurements atleast 3 times and calculate the avg time flow.Remove the solution from viscometer and clean well in acetone. Dry the viscometer in hot air oven for 15 minutes and cool it to room temperature.For 0.5g/dL solution take 25ml of stock solution into 50ml standard flask and make up to the mark with deionized water. Measure the time flow of the solution.Remove the solution from viscometer and clean well with acetone. Dry the viscometer in hot air oven for 15 minutes and cool it to room temperature.Now transfer the same volume of distilled water (10ml) to the viscometer and measure the time flow of water (t_w in sec).Draw the graph and find the intercept value [eta]. <p>PROCEDURE: The freezing points of various compositions of naphthalene and Biphenyl are obtained by cooling curves. The melting ranges for pure naphthalene (80.2°C) and pure biphenyl (69.2°C) are taken from literature. Four compositions are chosen approximately evenly spaced according to mole fraction. Each composition is taken in the test tube and placed in a beaker of boiling water until the sample is completely melted. Temperature is recorded for every 30 seconds using a Temperature probe. The mixture is stirred thoroughly using a wire stirrer to ensure equilibrium. Cooling is continued in each case until the mixture completely solidifies and the temperature again begins to drop. After completion of first trial, another composition is taken in a dry test tube and the experiment is repeated. The cooling curves are obtained for mixtures of naphthalene and biphenyl for the selected compositions. The cooling curves (temperature vs. time) are drawn for each of the mixtures. From these cooling curves, the freezing point and eutectic temperatures are determined. The mole fraction of naphthalene in each sample is plotted against the freezing point obtained and the eutectic point is deduced through interpolation.</p>
6. Eutectic system	<div>To construct a phase diagram for a simple eutectic system using cooling curves</div>	<ul style="list-style-type: none">BiphenylNaphthalene	<ul style="list-style-type: none">Electronic wight balanceSpatulaTemperature ProbeStop WatchWater BathBoiling TubeStand with a Clamp to hold the boiling tube		<p>PROCEDURE:</p> <p>A) pH:</p> <p>Wash the combined electrode (glass electrode and saturated calomel electrode) of a calibrated pH-meter with deionized water. Take the sample water in a 100 ml. clean beaker and insert the combined electrode of the pH-meter into it. Note the pH of the water sample.</p> <p>B) Conductivity:</p> <p>Wash the conductivity cell of the conductometer with deionized water. Take 10ml of water sample in a 100ml beaker and insert the conductivity cell. Measure the conductance of the water sample after 10 minutes.</p> <p>C) Total Dissolved salts:</p> <p>The initial weight of a dry crucible is noted. 10 ml. of a sample of water is poured into a crucible. The water is evaporated and the crucible is allowed to cool. The weight of the crucible is recorded again. The difference between the two weights gives an estimate of the TDS of the water sample.</p> <p>D) Hardness:</p> <p>a) Preparation of standard Na₂EDTA solution:</p> <p>Weigh the weighing bottle containing disodium salt of EDTA accurately and transfer the salt onto the funnel placed in a 250 ml. volumetric flask. Weigh the bottle again. The difference in weights will give the amount of Na₂EDTA transferred. Add 3 ml. of ammonium solution onto the flask. Add deionized water through the funnel to ensure that all crystals slide down the flask. Wash the funnel with deionized water 4-5 times. Add deionized water up to half the flask. Swirl the flask continuously till the salt dissolves completely. Make the solution up to the mark in such a way that lower meniscus of the solution coincides with the mark. Shake the flask well for uniform concentration.</p> <p>b) Estimation of hardness of water:</p> <p>Pipette out 25 ml. of the given sample of hard water into a clean conical flask. Add 3 ml. of NH₄OH-NH₄Cl buffer followed by pinch of Eriochrome black-T indicator. Titrate this against standard Na₂EDTA solution till the color of the solution changes from wine red to clear blue. Repeat the experiment to get concordant values.</p>
7. Complexometric Titration	<div>To determine the water quality parameters</div> <div>1. pH</div> <div>2. Conductivty</div> <div>3. Total Dissolved Salts</div> <div>4. Total Hardness associated with the given water sample</div>	<ul style="list-style-type: none">Hard WaterNH₃Buffer solutionErio-chrome Black-T [EBT]Na₂EDTA (Sodium ethylenediamine tetra acetic acid)	<ul style="list-style-type: none">Burette25ml Pipette250ml volumetric flashSmall and Big funnelCrucibleWash BottleConical FlaskBeakerWeighing BalanceBunsen BurnerpH-meterConductivity Meter	N/A	

8. COD [Redox Titration]	<div>TO ESTIMATE CHEMICAL OXYGEN DEMAND OF A GIVEN INDUSTRIAL WASTE WATER SAMPLE</div>	<ul style="list-style-type: none">Industrial waste water solutionK₂Cr₂O₇ solutionFerrioin indicatorH₂SO₄ solution (1:1)	<ul style="list-style-type: none">250ml Volumetric Flask25ml Pipette10ml Pipette250ml Conical FlaskBig Small FunnelBuretteTest Tube with Holder	N/A	<p>PROCEDURE:</p> <p>A) Preparation of Standard Ferrous Ammonium Sulphate (FAS) Solution:</p> <p>Weigh accurately the given FAS crystals and transfer it into a 250ml. volumetric flask using a funnel. Add 1/2 test tube of 1:1 sulfuric acid followed by small amount of water. Dissolve the salt and make up to the mark and shake well for uniform concentration.</p> <p>B) Blank titration:</p> <p>Pipette out 10ml. of potassium dichromate solution into a clean conical flask. Add 3/4th test tube of 1:1 sulfuric acid. Add 3-4 drops of Ferrioin indicator. Titrate this against standard FAS solution taken in the burette until the colour changes from bluish green to reddish brown. Note the burette reading and repeat the titration to get concordant values.</p> <p>C) Back Titration:</p> <p>Pipette out 25ml. of industrial waste water in to a clean conical flask. Add 10ml. of potassium dichromate solution. Add 3/4th test tube of 1:1 sulfuric acid. Add 3-4 drops of Ferrioin indicator. Titrate this against standard FAS solution taken in the burette until the colour changes from bluish green to reddish brown. Note the burette reading and repeat the titration to get concordant values.</p>
9. α-Al ₂ O ₃	AIM: To synthesise α-Al ₂ O ₃ Nano Metal Oxide by combustion method.	<ul style="list-style-type: none">20.0 g of Aluminium nitrate [(Al(NO₃)₃.9H₂O; Mol. Wt = 375.134 g/mole]5.0 g of urea [NH₂CONH₂; Mol. Wt = 60]Distilled Water	<ul style="list-style-type: none">250 mL beakerWeighing BalanceMagnetic StirrerFurnace	N/A	<p>PROCEDURE:</p> <p>Wegh exactly 20.0 g of Aluminium nitrate [Al(NO₃)₃.9H₂O; Mol. Wt = 375.134 g/mole] and 5.0 g of urea [NH₂CONH₂; Mol. Wt = 60] in 250 mL beaker and dissolve the salts by adding minimum quantity of distilled water and stirring on a magnetic stirrer for 10 min. The uniformly dissolved redox mixture is kept in a pre-heated furnace maintained at 500° C. The redox solution undergoes evaporation and finally results in viscous-gel containing uniformly mixed Aluminium nitrate and urea. After some time it catches fire with the liberation of gases and heat energy, finally results in highly porous, white powder of nano α-Al₂O₃.</p> <p>$2Al(NO_3)_3 \cdot 9H_2O + 5CH_4N_2O \xrightarrow{500^\circ C} \alpha-Al_2O_3 + 5CO_2(g) + 8N_2(g) + 9H_2O(g)$</p>