Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

CERTIFICATE

This is to certify Mr./Ms. Ayush Jain has performed and completed the below mentioned experiments satisfactorily as part of the term work prescribed by the Dwarkadas J Sanghvi College of Engineering Autonomous, during the academic year 2020 21.

Program: Computer Engineering SAP ID: 60004200132

Course: Engineering Chemistry - II Course Code: DJ19FEC203

Class: F.E. Division: I1 Semester: II

INDEX

Sr. No.	Title of the Experiment	Course Outcome	Date of		Marks	Signature of the teacher
			Expt.	Subm.		
1	Determination of moisture present in given coal sample.	CO4	29/06/21	24/08/21		
2	Determination of acid value of an oil	CO4	29/06/21	24/08/21		
3	Determination of concentration of unknown $CuSO_4$ using colorimeter	CO1	13/07/21	24/08/21		
4	Determination of strength of strong acid conductometrically	CO2	27/07/21	24/08/21		
5	Determination of saponification value of an oil	CO4	10/08/21	24/08/21		

Signature of the Teacher Head of the Department Principal

Name of the Teacher Date:

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EXPERIMENT NO. : 1 **DATE** : 29/06/2021

DIVISION/ BATCH : I/1 **SAP ID** : 60004200132

COURSE : Engineering - Chemistry - 2 **COURSE CODE** : DJ19FEC203

NAME : Ayush Jain

COURSE OUTCOME : Analyze the quality of fuel and quantify the Oxygen required for combustion of fuel.

AIM : To determine the percentage of moisture in the given coal sample

REAGENTS : Coal sample.

GLASSWARE : Silica crucible, desicator, balance, pair of tongs

PRINCIPLE : Coal is a fossil fuel which occurs in layers in crust. It has been formed by partial decay of plants material accumulated million of years ago and altered by heat and pressure. The composition of coal varies and hence it is necessary to analyze the intrepret the result from point of views of commercial classification. i) Proximate analysis which includes the determination of moisture, voldile matter and fixed carbon. 2) Ultimate analysis which includes estimation of carbon, hydrogen, sulphur, nitrogen and oxygen.

PROCEDURE : 1) Heat a silica crucible with a lid, coal sample in it in a desiccator and weigh. 2) ~~Take~~ Take 1g of air-dried coal sample in it and again weigh it accurately. 3) Heat the crucible without lid in an oven maintained at a temperature of 105°C - 110°C for 1 hour.

4) Cool the crucible in a desiccator and weigh it again.

5) The loss in weight corresponds to the moisture.

OBSERVATIONS : 1) Weight of empty crucible = W_1 = 15.95 g

2) Weight of crucible + coal sample = W_2 = 16.95 g

3) ∴ Weight of coal sample = 1g

4) Weight of crucible + sample, after heating at 100°C = W_3 = 16.90 g

5) ∴ Loss of weight due to moisture = 16.95 - 16.90 = 0.05 g

CALCULATIONS : % moisture = $\frac{\text{loss in weight}}{\text{weight of coal sample}} \times 100$

$= \frac{0.05}{1} \times 100 = 5\%$.

RESULT : The percentage of moisture in given coal sample is 5%.

D.J.S.C.E. (Chemistry)

Journal		
(Lab Ethics)	5	
(Performance)	5	
(Documentation)	5	
(Knowledge)	5	
(Punctuality)	5	
Total	25	

DATE	SIGNATURE OF FACULTY

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EXPERIMENT NO. : 02 **DATE** : 29/06/2021

DIVISION/ BATCH : J1 **SAP ID** : 60004200132

COURSE : Engineering Chemistry 2 **COURSE CODE** : DJ19FEC203

NAME : Ayush Jain

COURSE OUTCOME : Analyse the quality of fuel and quantity of oxygen required for combustion of fuel.

AIM : To determine the acid value of the given oil sample.

REAGENTS : Oil sample, neutral alcohol, Phenolphthalein, 0.01 N KOH

GLASSWARE : Conical flask, pipette, measuring cylinder, funnel, water bath, burette

SIGNIFICANCE OF THE PROPERTY:

Acid value of an oil indicates:-

The number of milligrams of potassium hydroxide required to neutralize the free fatty acid present in 1gm of oil.

Higher acid value is not desirable because

It may corrode the machine parts if the acid value of the oil is greater than 0.1 mg of KOH.

PROCEDURE : 1) Measure accurately 1 ml of the oil under test ('x' g). 2) Transfer it to a conical flask.

3) Add 10 ml of neutral alcohol. 4) Heat the flask over a water bath for about 15-20 minutes. 5) Add 2-3 drops of phenolphthalein indicator. 6) Titrate it with standard 0.01N KOH solution until a faint permanent pink colour appears at the end point.

OBSERVATIONS : Weight of oil = 1 g

Volume of KOH required for neutralisation of acid = 4.3 ml

CALCULATIONS :

$$\text{Acid Value} = \frac{\text{Vol of KOH required} \times N_{KOH} \times 56}{\text{Weight of the oil ('X' g)}}$$

$$= \frac{4.3 \times 0.01 \times 56}{}$$

$$= 2.408$$

RESULT :

The acid value of the given oil sample is 2.408 mg of KOH

COMMENT ON THE RESULT:

Since the acid value of the given oil sample is greater than 0.1, it cannot be used as lubricant.

D.J.S.C.E. (Chemistry)		
Journal		
(Lab Ethics)	5	
(Performance)	5	
(Documentation)	5	
(Knowledge)	5	
(Punctuality)	5	
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EXPERIMENT NO. : 3 **DATE** : 13/07/21

DIVISION/ BATCH : J1 **SAP ID** : 60004200132

COURSE : Engineering Chemistry-II **COURSE CODE** : DJ19FEC203

NAME : Ayush Jain

COURSE OUTCOME : Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

AIM : To determine the concentration of an unknown $CuSO_4$ solution using colorimeter.

REAGENTS : 1 M $CuSO_4$ solution, unknown $CuSO_4$ solution.

APPARATUS : Calorimeter, pipettes, cuvette, five small, labelled test tubes, beakers etc.

PRINCIPLE : Coloured compounds obtain their particular colors due to the wavelengths of light that they absorb and reflect (or transmit). If we focus on one particular wavelength for a compound we can use the absorbance of light to determine the concentration of solution. Higher concentration of a coloured solution will absorb more light than a solution of lower concentration. Thus, when a graph of absorbance Vs. concentration is plotted for solutions of known concentration, a direct relationship should result. The direct relationship is known as Lambert-Beer's law and is shown by equation $A = \epsilon Cl$.

PROCEDURE : Preparation of standard $CuSO_4$ solution:

Prepare 10 ml of the $CuSO_4$ solution by diluting the 1 M $CuSO_4$ stock solution and place these solutions into 5 clean, dry, and labelled beakers. Prepare a blank by filling a cuvette 3/4 full with deionized water.

Measurement of absorbance:

1.) Measure and record the absorbances of each of the solutions from Table 1, as well as the absorbance of the deionized water blank at 660 nm.

2) Fill a cuvette about 3/4 full with your unknown $CuSO_4$ sample. Measure and record the absorbance of the unknown as before.

OBSERVATIONS :

Observations	$CuSO_4$ concentration (M)	Absorbance (A)
1	Blank	0.00
2	0.1M	0.33
3	0.2M	0.61
4	0.3M	0.83
5	0.4M	1.03
6	0.5M	1.22
7	Unknown	0.74

CALCULATIONS : $A = \varepsilon c l$

$$\therefore c = \frac{A}{\varepsilon l}$$

$A = 0.74$, $l = 1\,cm$, ε = molecular absorptivity = 2.77

$$\therefore c = \frac{0.74}{2.77 \times 1} = 0.267\ M$$

RESULT : Concentration of an unknown $CuSO_4$ solution by calculation and from graph is 0.267 M and 0.27M respectively.

D.J.S.C.E. (Chemistry)		
Journal		
(Lab Ethics)	5	
(Performance)	5	
(Documentation)	5	
(Knowledge)	5	
(Punctuality)	5	
Total	**25**	

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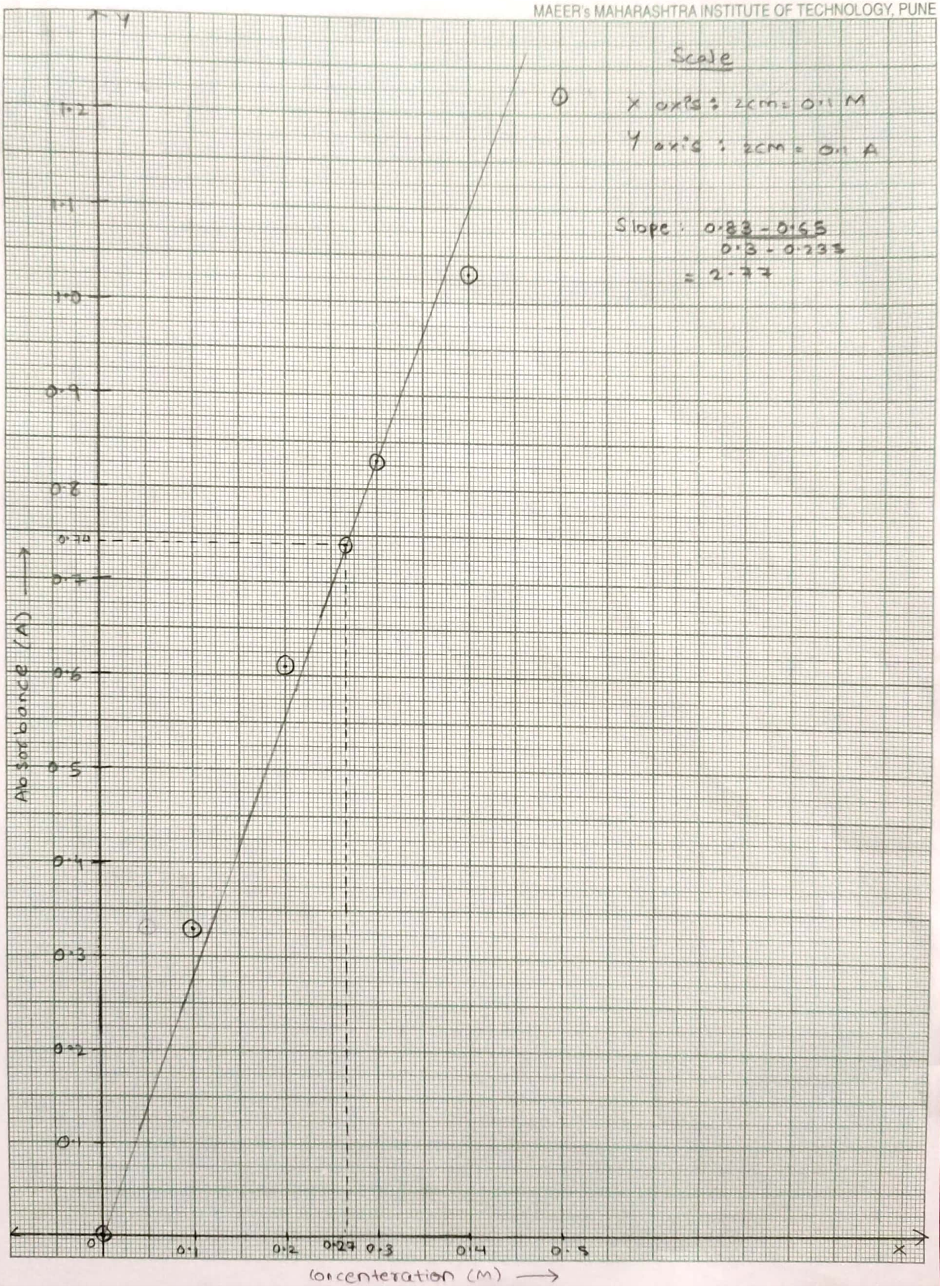

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EXPERIMENT NO. : 04 **DATE** : 27-7-2021

DIVISION/ BATCH : J1 **SAP ID** : 60004200132

COURSE : Engineering Chemistry - II **COURSE CODE** : DJ19FEC203

NAME : Ayush Jain

COURSE OUTCOME : Indentify different types of corrosion and suggest control measures in industries.

AIM : To determine the strength of strong acid conductometrically.

REAGENTS : 0.1 N NaOH , 0.01 N HCl

GLASSWARE : Conductivity meter , burette , pipette , beaker.

PRINCIPLE : 1) The initial conductance is high due to the complete dissociation of strong acid (HCl) and H^+ ions have high conductance value. 2) As NaOH is added H^+ ions combine with OH ions to form undissociated waters and H^+ ions are replaced by Na^+ ions having much lower conductance value. Hence, the conductance of the solution decreases, it reaches to a minimum and then increases. The increase is because there are no H^+ ions to combine with added OH^- ions which have high conductance value and Na^+ ions. 3) The point of intraction in the graph gives the end point of the titration.

REACTION : $H^+ Cl^- + Na^+ + OH^- \longrightarrow Na^+ + Cl^- + H_2O$

PROCEDURE : 1) Fill the burette with the supplied (0.1N) standard NaOH solution. 2) Pipette out 60 ml of given acid in a 100 ml beaker. 3) Place the conductivity cell in this beaker. 4) Conduct the cell to the conductivity bridge and determine the conductance of the solution in siemens. 5) Add a small quantity (0.5 ml) of NaOH solution at a time from the burette, stir the solution and note down the conductance value. 6) Repeat step no. 5 until the conductance value start increasing. Take 5 to 6 more readings. 7) Plot the graph of conductance against volume of NaOH added. Determine the end point of titration. 8) Calculate the normality and strength of the acid solution as given in the calculations.

OBSERVATIONS :

Observations No.	Volume of NaOH Added in ml	Conductance (1/R) mhos
1	0.0	0.50
2	0.5	0.46
3	1.0	0.43
4	1.5	0.40
5	2.0	0.36
6	2.5	0.32
7	3.0	0.29
8	3.5	0.25
9	4.0	0.22
10	4.5	0.18
11	5.0	0.15
12	5.5	0.14
13	6.0	0.15
14	6.5	0.16
15	7.0	0.16
16	7.5	0.17

17	8.0	0.18
18	8.5	0.20
19	9.0	0.21
20	9.5	0.23
21	10.0	0.24
22	10.5	0.26
23	11.0	0.27
24	11.5	0.29
25	12.0	0.30
26	12.5	0.32

CALCULATIONS :Volume of NaOH required for end point, Vx = 5.5ml

2) Normality of HCl = $\frac{\text{Normality of NaOH} \times Vx}{\text{Volume of HCl}} = \frac{0.1 \times 5.5}{60} = 0.00917N$

3) 1000 ml of 1 NaOH ≡ 36.5 g of acid (HCl)

∴ 5.5 ml of 0.1N NaOH = $\frac{36.5 \times 5.5 \times 0.1}{1000} = 0.020075$ gm of HCl

4) Strength of HCl = $\frac{0.020075 \times 1000}{60} = 0.33458$ gms/L

RESULT :

1. Volume of NaOH required for the end point (V_x) = 5.5 ml
2. Normality of the acid (HCl) = 0.00917N
3. Amount of the acid (HCl) present in the given solution = 0.020075 gms
4. Strength of strong acid = 0.33458gms/L

D.J.S.C.E. (Chemistry)		
Journal		
(Lab Ethics)	5	
(Performance)	5	
(Documentation)	5	
(Knowledge)	5	
(Punctuality)	5	
Total	25	

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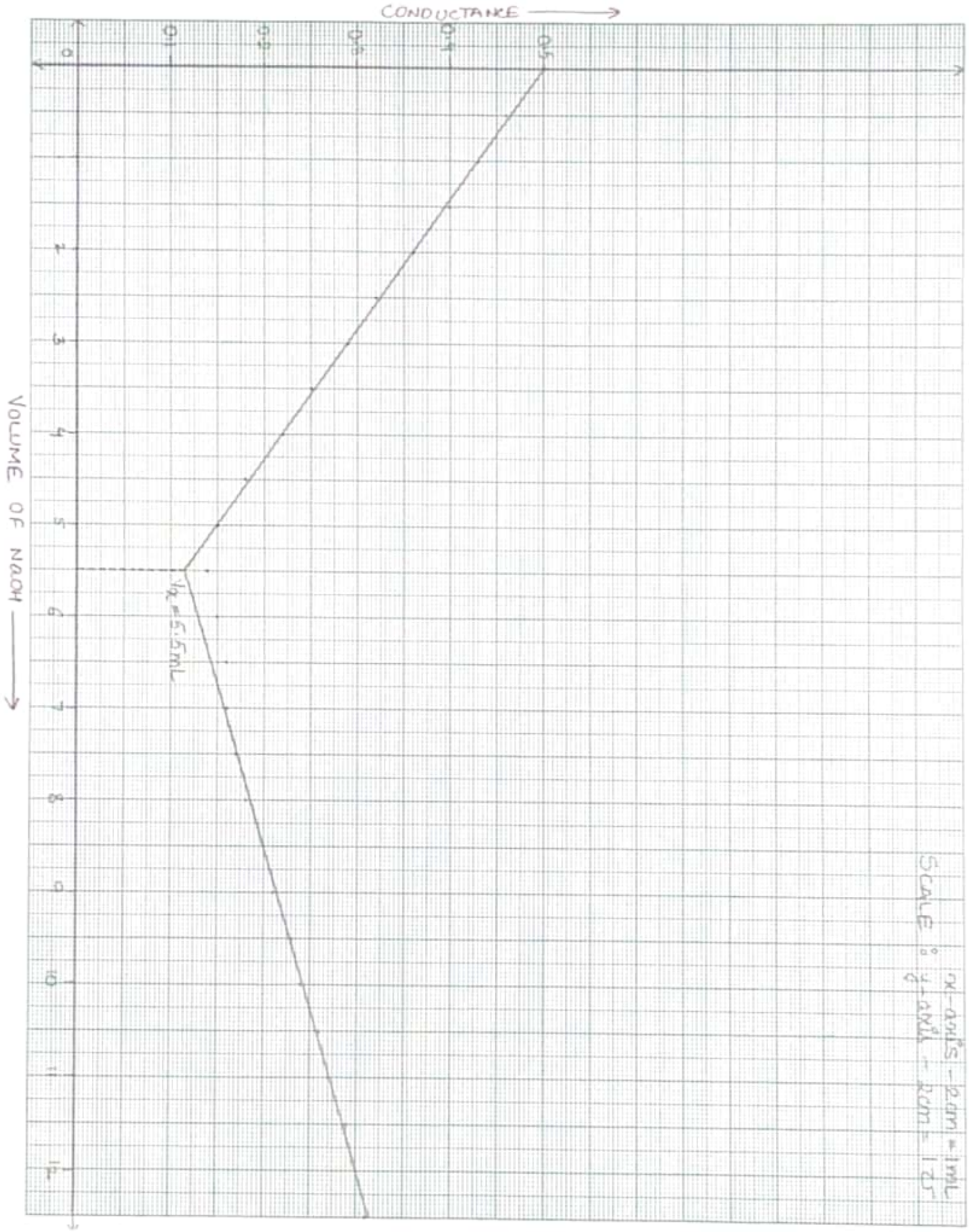

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EXPERIMENT NO. : 05 **DATE** : 10/08/2021

DIVISION/BATCH : J1 **SAP ID** : 60004200132

COURSE : Engineering Chemistry - 2 **COURSE CODE** : DJ19FEC203

NAME : Ayush Jain

COURSE OUTCOME : Analyze the quality of fuel and quantity the oxygen required for combustion of fuel.

AIM : To determine the saponification value of the given oil sample.

REAGENTS : Alcoholic KOH, hydrochloric acid (HCl) solution (0.5N), phenolphthalein indicator, oil sample.

GLASSWARE : Burette, round bottom flask (250ml), burette stand, dropper, water bath, measuring cylinder (50 ml), water condenser.

PRINCIPLE:

Definition: The saponification value of an oil is the number of milligrams of KOH required to saponify 1 gram of the oil. The vegetable or animal oils are esters of high fatty acids. They react with KOH to form corresponding salts.

CHEMICAL REACTIONS :

$$\begin{array}{l} CH_2OOCR \\ | \\ CHOOCR \\ | \\ CH_2OOCR \end{array} + 3KOH \longrightarrow \begin{array}{l} CH_2OH \\ | \\ CHOH \\ | \\ CH_2OH \end{array} + 3RCOOK$$

(Esters of high fatty acid) (Ethanoic Potassium hydroxide) (Glycerol) (Potassium salt of fatty acid)

R = $C_{17}H_{35}$, $C_{18}H_{37}$, etc

PROCEDURE : i) Label the round bottom flasks as (A) Alcoholic KOH (blank titration) (B) Oil + Alcoholic KOH (Back titration).

2) Take 50ml of alcoholic KOH in the round bottom flask A. Titrate it against 0.5N HCl (blank) using phenolphthalein as an indicator. 3) Measure accurately 5g of the oil sample in the round bottom flask B. Take 50ml of alcoholic KOH in flask B. Fit the flask with a reflux condenser. 4) Reflux the contents in flask B over a water bath for about 1 hour. 5) Remove the flask B from the water bath and cool. 6) Add few drops of phenolphthalein indicator and titrate against the standardised HCl until the solution becomes colourless. 7) Note the readings. 8) Calculate the saponification value of the oil.

OBSERVATIONS :

1) Volume of HCl consumed for blank titration = 42.2 ml
2) Volume of HCl consumed for back titration = 9.3 ml
3) Volume of KOH consumed in terms of HCl = 32.9 ml

CALCULATIONS : Saponification value = $\frac{(\text{Blank} - \text{Back}) \times N_{KOH} \times 56}{\text{Weight of the oil}}$

$= \frac{32.9 \times 0.5 \times 56}{5} = 184.24$

RESULT : The saponification value of the given oil sample is 184.24 mg of KOH.

D.J.S.C.E. (Chemistry) Journal		
(Lab Ethics)	5	
(Performance)	5	
(Documentation)	5	
(Knowledge)	5	
(Punctuality)	5	
Total	**25**	

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