

BANGLADESH SCHOOL & COLLEGE, SULTANATE OF OMAN

Sultanate of Oman

Chemistry 1st Paper

Practical Notebook

Class: Eleven - Twelve



Sultanate of Oman

W4H1D

W4H1D

W4H1D

W4H1D

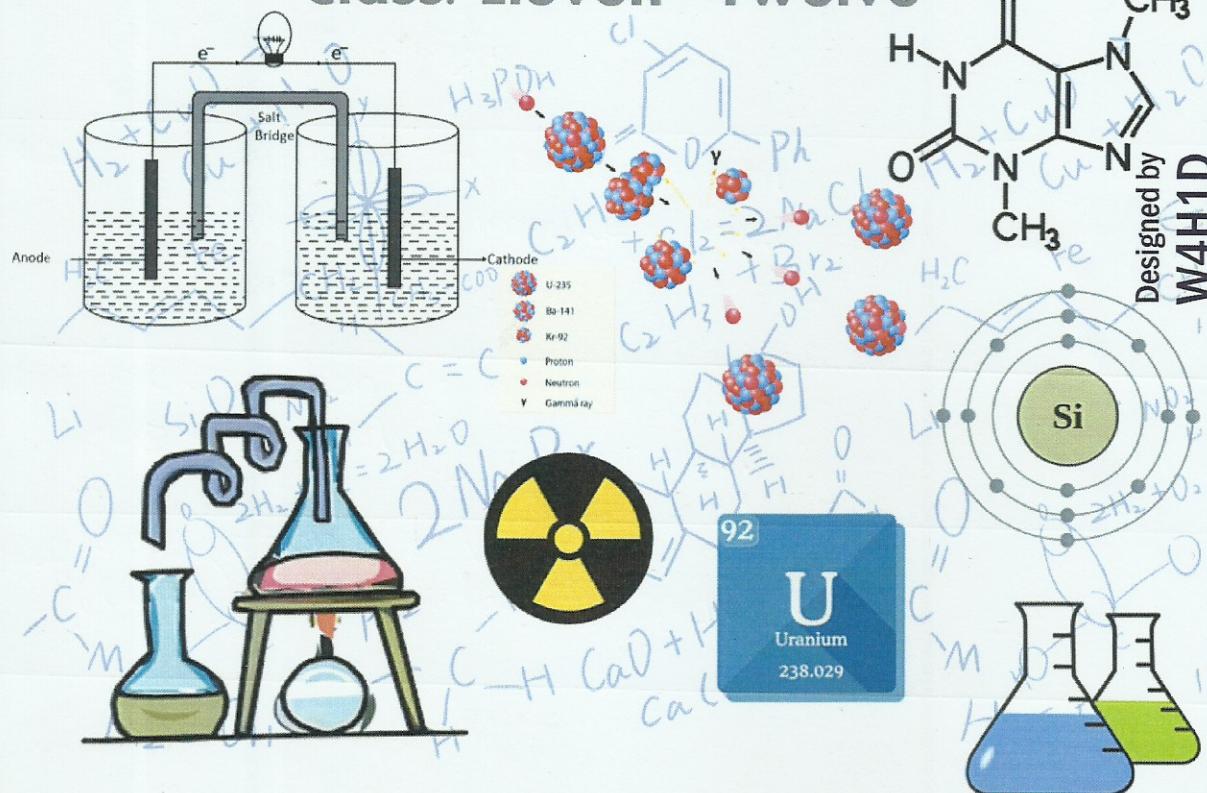
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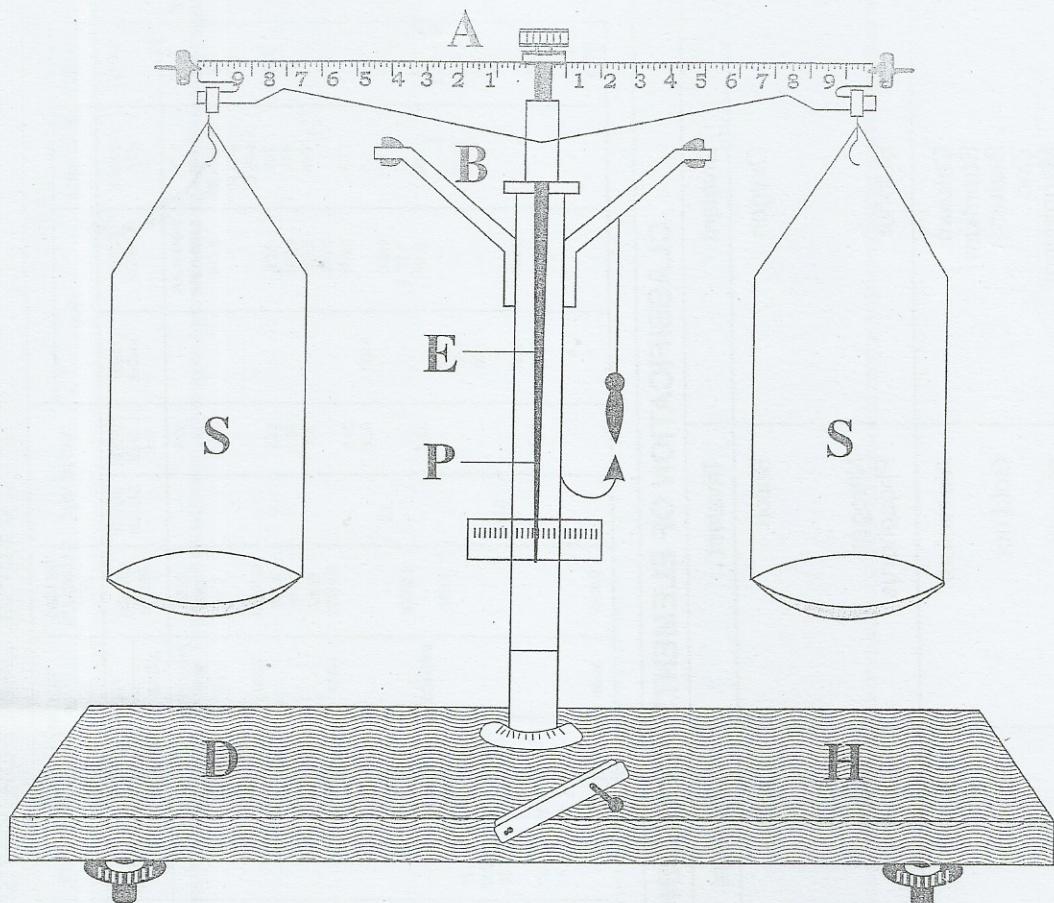
W4H1D

W4H1D



Name	Najmul Huda
Roll no.	Reg. no.
Session	2020 - 2021
Board	Dhaka

BALANCE



A= METALLING BEAM

D= WOODEN FRAME

H= HANDLE

B= MOVABLE ROD

E= POINTER

P= PILLER, S= BALANCE PANS

NAME :	Najmul Huza
SCHOOL/ COLLEGE :	Bangladesh School & College, Saham
SUBJECT :	Chemistry 1st Paper
ROLL NO. :	SESSION : 2020-2021
REGISTRATION NO. :	

USEFUL DATA FOR PHYSICS

SI NO	NAME OF ELEMENTS	SPECIFIC			LATENT HEAT	THERMAL CONDUCTIVITY	VELOCITY OF SOUND	REFRACTIVE INDEX	CRITICAL ANGLE	BREAKING STRESS	MODULUS OF RIGIDITY	YOUNGS MODULIUS	CO-EFFICIENT EXPANSION			
		GRAVITY	RESISTANCE	HEAT												
1	COPPER	8.93	1.78	0.091-0.094	-	50.6	-	-	-	-	30,000	3.9-40X10 ¹¹	12.4-12.8X10 ¹¹	0.000167	-	
2	BRASS	8.6	4.156	0.088-0.092	-	65.0	-	-	-	-	36,000	3.5X10 ¹¹	9.9-10.2X10 ¹¹	0.000189	-	
3	IRON (-OUS)	7.2	13.19-18.80	0.119	-	-	-	-	-	-	34,000	7.7-8.3X10 ¹¹	0.000102	-		
4	IRON (IC)	7.86	12.0-16.80	-	-	-	-	-	-	-	8,000	7.9-8.9X10 ¹¹	19.9-20X10 ¹¹	0.000023	-	
5	STEEL	26.27	3.21	0.21	-	-	-	-	-	-	-	-	-	-	-	
6	ALUMINUM	6.6	6.10	0.033	-	93.0	-	-	-	-	-	-	-	-	-	
7	ZINC	7.1	20.80	0.109	-	24.1	-	-	-	-	-	-	-	-	-	
8	LEAD	11.4	-	0.056	-	5.4	-	0.083	-	-	-	-	-	-	-	
9	NICKEL	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	SILVER	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	GOLD	19.3	-	0.033	-	21.0	-	-	-	-	-	-	-	-	-	
12	PLATINUM	21.5	1.63	0.055	-	0.16	-	2.8	-	-	-	-	-	-	-	
13	MERCURY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	TIN	2.29	11.00	0.16	-	14.0	-	0.0200	-	-	5000-5300	-	-	0.0000258	-	
15	GLASS (FUNT)	2.9-5.9	-	-	-	-	-	-	-	-	-	-	-	-	-	
16	GLASS (CROWN)	2.4-2.8	11.30	-	-	0.42	-	0.002	-	-	-	-	-	-	-	
17	TARANTINE OIL	0.87	-	-	-	1.51	-	-	-	-	137.0	1.53-1.80	41.25	-	-	
18	ALCOHOL (ETHYL)	0.79	-	-	-	1.00	-	-	-	-	1260.0	1.48-16.10	41.45	-	-	
19	WATER	-	-	0.502	-	5.37	-	-	-	-	1410	1.392	43.15	0.000089	-	
20	ICE	0.92	-	-	-	0.58	-	-	-	-	-	1.33	48.5	-	-	
21	GLYCERINE	1.28	-	-	-	80.0	-	-	-	-	-	1.31	1.47	-	-	
22	KEROSENE	0.98	-	-	-	-	-	-	-	-	-	1.44	-	-	-	
23	RUBBER	0.9-13	-	-	-	-	-	0.0045	-	-	-	-	-	-	-	
CLASSIFICATION OF ELEMENTS ACCORDING TO THEIR VALENCY																
Mono valent		Divalent		Trivalent		Tetravalent		Panta Valent		Hexavalent						
Hydrogen	Oxygen	Boron		Carbon		Nitrogen		Sulphur								
Fluorine						Nitrogen										
Chlorine						Phosphorus										
Bromine																
Iodine																
Potassium	Calcium	Aluminium	Tin (ic)	Arsenic												
Sodium	Strontium	Gold (ic)	Platinum	Antimony (ic)												
	Barium															
Mercury (ous)	Zinc	Bismuth	Lead													
Copper (-ous)	Magnesium															
	Copper (ic)															
	Iron (-ous)															
	tin (-ous)															
Silver	Lead (-ous)															

CLASSIFICATION OF ELEMENTS ACCORDING TO THEIR VALENCY					
Mono valent	Divalent	Trivalent	Tetravalent	Panta Valent	Hexavalent
Hydrogen	Oxygen	Boron	Carbon	Nitrogen	Sulphur
Fluorine					
Chlorine					
Bromine					
Iodine					
Potassium	Calcium	Aluminium	Tin (ic)	Arsenic	
Sodium	Strontium	Gold (ic)	Platinum	Antimony (ic)	
	Barium				
Mercury (ous)	Zinc	Bismuth	Lead		
Copper (-ous)	Magnesium				
	Copper (ic)				
	Iron (-ous)				
	tin (-ous)				
Silver	Lead (-ous)				

PRACTICAL

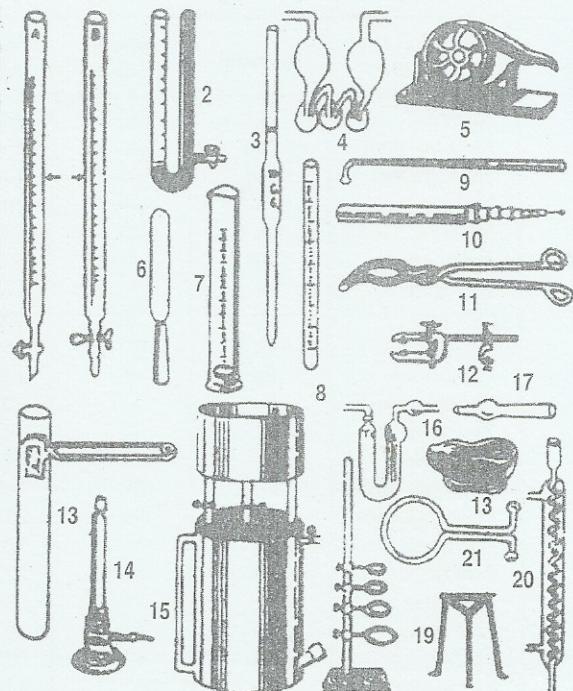
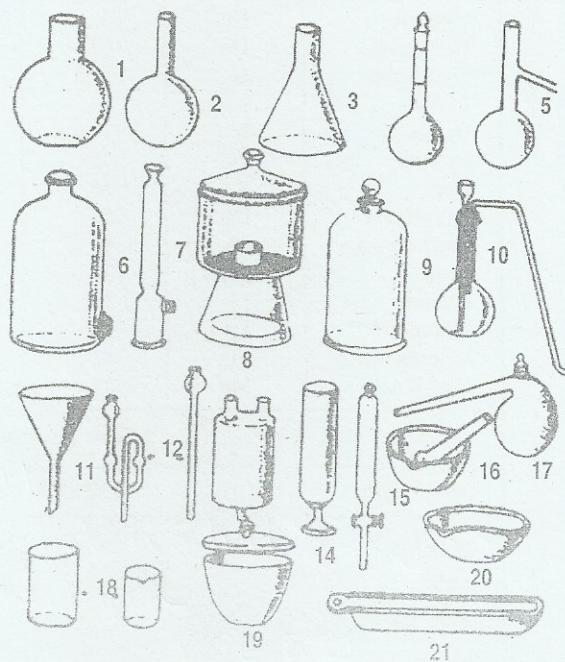


PLATE NO.1

- | | |
|-----------------------|-----------------------------------|
| 1. BURETTE | 12. CLAMP |
| 2. EUDIOMETER | 13. TEST TUBE WITH HOLDER |
| 3. PIPETTE | 14. BUNSEN BUENER |
| 4. POTASH BULES | 15. GAS HOLDER |
| 5. CORK SQUEEZER | 16 & 17. Ca Cl ₂ -TUBE |
| 6. SPATULA | 18. MERCURY TROUGH |
| 7. MEASURING CYLINDER | 19. TRIPOD STAND |
| 8. MEASURING TUBE | 20. CONDENSER |
| 9. BLW PIPE | 21. CLIP |
| 10. CORK BORER | 22. RETORT STAND |
| 11. TONGS | |

PLATE NO. 2

1. FLAT BOTTOM FLASK
2. ROUND BOTTOM FLASK
3. CONICAL FLASK
4. MEASURING FLASK
5. DISTILLING FLASK
6. ASPIRATOR
7. TOWER
8. DESICCATOR
9. BELL JAR
10. FLASK WITH THISTLE FUNNEL & DELIVERY TUBE
11. FUNNEL
12. THISTLE FUNNELS
13. WOULFEE'S BOTTLE
14. TEST GLASS
15. SEPARATING FUNNEL
16. MORTAR & PESTLE
17. BETORT
18. BEAKERS
19. CRUCIBLE
20. BASIN
21. BOAT

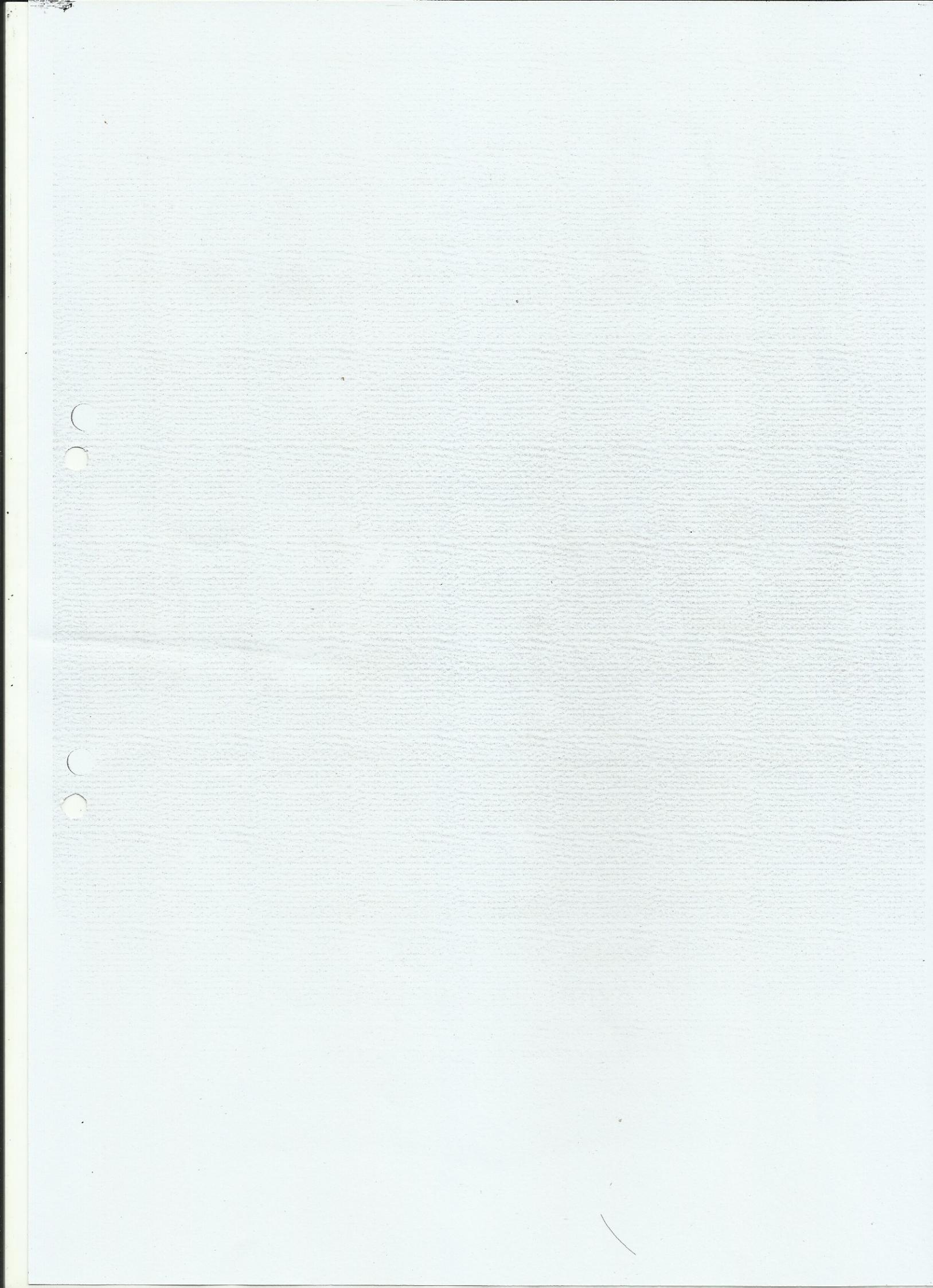


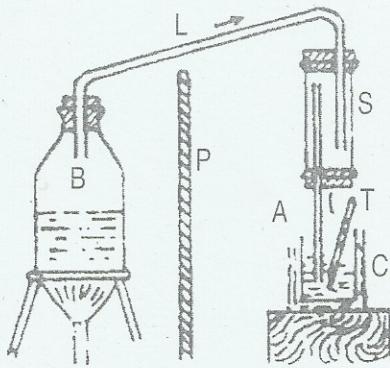
ATOMIC NUMBERS AND ATOMIC WEIGHTS WITH THEIR SYMBOLS

Name of the Element	Symbol	Atomic Number	Atomic Weight	Name of the Element	Symbol	Atomic Number	Atomic Weight
Actinium	Ac	89	227	Mercury	Hg	80	200.5
Aluminium	Al	13	6.97	Molybdenum	Mo	42	95.9
Amercium	Am	95	243	Neodymium	Nd	60	144.2
Antimony	Sb	51	121.7	Neon	Ne	10	20.17
Aragon	Ar	18	39.94	Nickel	Ni	28	58.7
Arsenic	As	33	74.9216	Niobium	Nb	41	92.9064
Astatine	At	85	210	Nitrogen	N	7	14.0067
Barium	Ba	56	137.3	Osmium	Os	76	190.2
Berkelium	Bk	97	249	Oxygen	O	8	15.999
Beryllium	Be	56	137.36	Palladium	Pd	46	106.4
Bismuth	Bi	4	9.02	Phosphorus	P	15	30.97376
Boron	B	83	209.00	Platinum	Pt	78	195.0
Bromine	Br	5	10.82	Potassium	K	19	39.09
Cadmium	Cd	35	80	Praseodymium	Pr	59	140.9077
Calcium	Ca	48	11.24	Prtactinium	Pa	91	231.0359
Carbon	C	20	40	Radium	Ra	88	226.0254
Cerium	Ce	6	12	Radom	Rn	86	222
Caesium	Cs	58	140.12	Rhenium	Re	75	186.2
Chlorine	Cl	55	132.91	Rhodium	Rh	45	102.9055
Chromium	Cr	17	35.476	Ruthenium	Ru	44	101.75
Copper	Cu	29	63.5	Rubinium	Rb	37	85.43
Dysprocium	Dy	66	162.46	Samarium	Sun	62	150.4
Erbrium	Er	68	167.67	Seandium	Sc	21	44.9559
Europium	Eu	63	152.0	Selenium	So	34	78.09
Fluorine	F	9	19.00	Sillcon	Si	14	28.08
Franeium	Fr	87	223	Silver	Ag	47	107.868
Gadolinium	Gd	64	156.9	Sodium	Na	11	22.98977
Gaflium	Ga	31	62.72	Stontlum	Sr	38	87.62
Germanium	Ge	32	72.62	Sulphur	S	16	32.06
Gold	Au	79	797.2	Tuntalum	Ta	73	180.947
Hafnium	Hf	72	178.6	Tellurim	Te	52	127.6
Helium	He	2	4.002	Terbium	Th	65	159
Hokmium	Ho	67	163.5	Thallium	Ti	81	20.39
Hydrogen	H	1	1.007	Thorium	Th	90	232.12
Indium	I	53	126.92	Thulium	Tm	69	169.04
Iodine	Ir	77	193.1	Tin	Sm	50	119
Iridium	Fe	26	55.84	Titanium	Ti	22	47.90
Iron	Kr	36	83.7	Tungstem	W	74	184.0
Krypton	La	57	138.9	Uranium	U	92	238.07
Ianthenum	Ph	82	207.22	Vonadium	V	28	50.95
Lead	Lm	3	6.940	Xenon	Xe	54	131.3
Lithium	Li	3	6.94	Ytterubim	Yb	70	178.0
Lutecium	Lu	71	174.97	Yttrium	Y	39	88.9059
Magnecium	Mg	12	24.305	Zunc	Zn	30	65.38
Manganese	Mn	25	54.9380	Zircontum	Zr	40	91.22

তড়িৎ কোষের বৈদ্যুতিক চাপ (E.M.F of Cells)

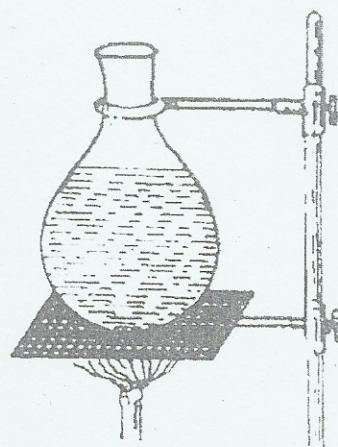
কোষের নাম	বৈদ্যুতিক চাপ ভোল্ট	কোষের নাম	বৈদ্যুতিক চাপ ভোল্ট
ড্যানিয়েল	1.07-1.08	ড্যানিয়েল	2.0000
বুলসেন	1.08-1.90	বুলসেন	1.8-1.9000
গেকল্যান্স	1.45	গেকল্যান্স	1.433
শুঙ্ক	1.50	শুঙ্ক	1.01830
সেকেভারী		সেকেভারী	
সৌমা এডিস (সঞ্চয়ী)	1.9-2.20	সৌমা এডিস (সঞ্চয়ী)	1.1-1.4000



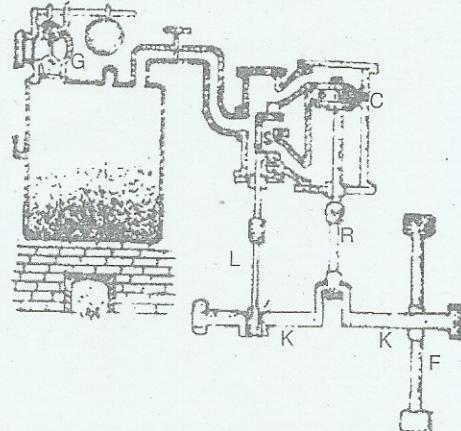


B- Water vessel
 S- Steam trap
 P- A screen
 C- Calorimeter
 T-Thermometer
 A-Exit tube

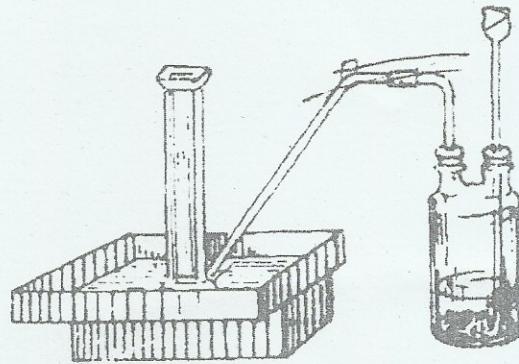
DETERMINATION OF LATENT HEAT
 OF VAPORIZATION OF WATER



TRANSMISSION OF HEAT



SECTIONAL DIAGRAM OF COMPLETE
 STEAM OF ENGINES



LABORATORY METHOD PREP
 OF HYDROGEN

Victoria

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Sl. No.	Date	Name of the Experiment	Page No.	Initials	Remarks
01	07/04/2022	Identification of Na^+ , K^+ , Ca^{2+} , Cu^{2+} ions (basic radical) by Flame test.	01, 02, 03,		
02	09/04/2022	Identification different ions (basic and acidic radical) in the solution by wet test. (Wet test for Cu^{2+} , Fe^{2+} , Fe^{3+} , SO_4^{2-} , Na^+ , CO_3^{2-} etc ions).	04, 05, 06, 07, 08, 09		
03	10/04/2022	Preparation of pure crystal of NaCl from impure common salt.	10, 11, 12, 13		
04	10/04/2022	Determination of heat of solution of oxalic acid by calorimeter.	14, 15, 16		
05	10/04/2022	Preparation of Vinegar (Cirka) from ethanoic acid.	17, 18, 19, 20		

Index

This is to Certify that Mr./Miss

A Student of Class Roll No. Has Performed the Required

Number of Experiments in Physics/Chemistry Laboratory of

School/College/University as per Syllabus During the Session

Head of the Department Physics/Chemistry

NAME OF THE EXPERIMENT

DATE: 07/04/2022

Identification of Na^+ , K^+ , Ca^{2+} , Cu^{2+} ions
(basic radical) by Flame test.

PAGE NO. 01

EXPT. NO. 01

Theory:

Due to differences of the structure of matter, the emitted light of emission spectra have different wave-length. As a result, different colors are emitted which on examination elements would be identified. This is the basis of element identification by flame test. In a flame test experiment, platinum or nichrome wire is cleaned by dipping it in hydrochloric acid and is then dipped in salt of the sample in concentrated HCl as paste and is held in the oxidation zone of Bunsen burner. The characteristic color of the flame by holding the sample in the burner identifies as element. The identification of the cations of salts by examining the color in the eye is carried out in Bunsen flame. So the test is called flame test. The different parts of a Bunsen burner flame is shown in the figure.

Required Apparatus:-

Platinum wire sealed at the end of glass, watch glass, Bunsen burner.

Required Chemical:-

A few metal salt (NaCO_3 , CaCO_3 , KNO_3 , $\text{Cu}(\text{NO}_3)_2$ etc).

FIGURE NO. 01

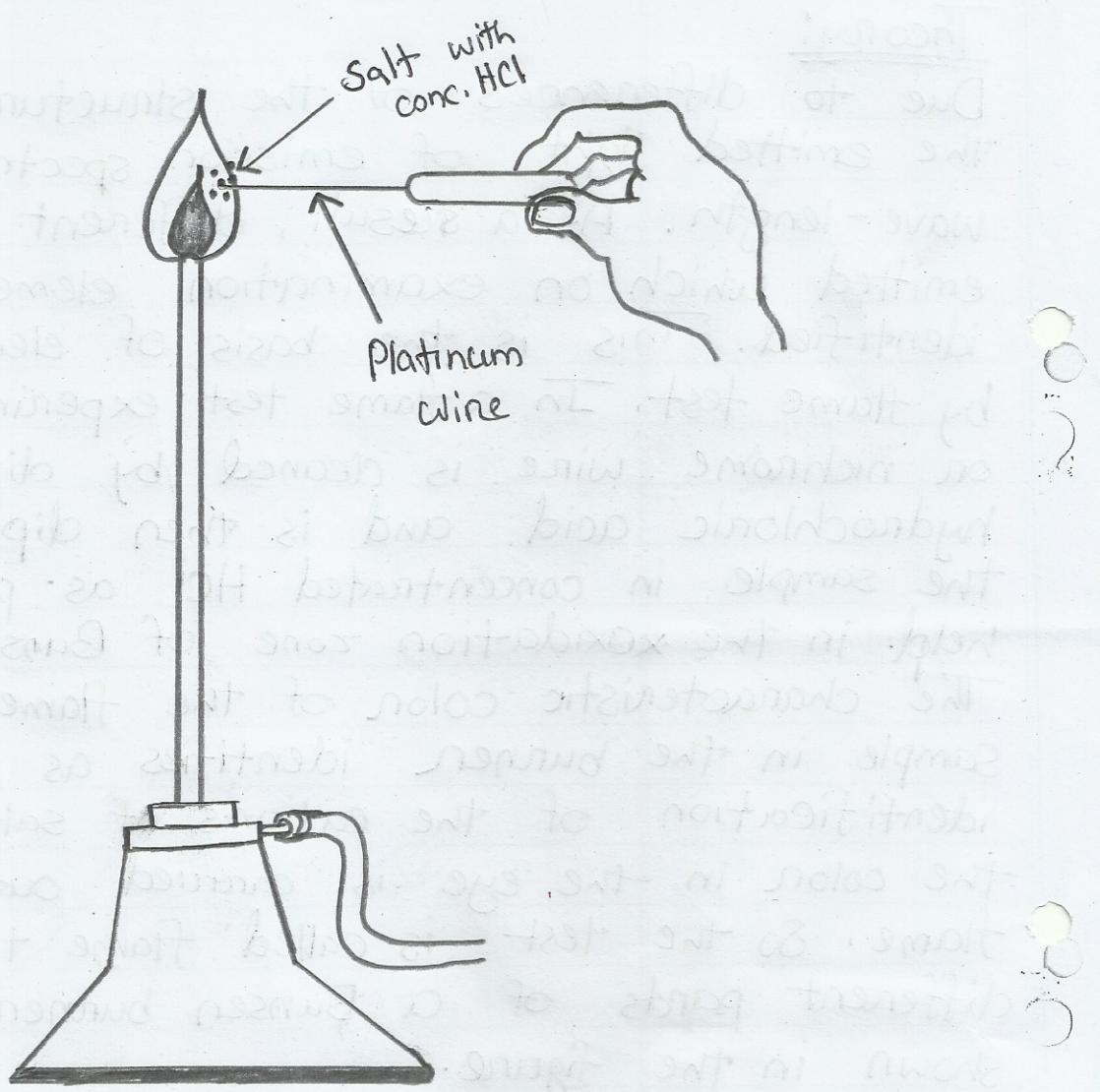


Figure (Exp-01): Identification of metal ions by flame test.

NAME OF THE EXPERIMENT

DATE 08/04/2022

Identification of Na^+ , K^+ , Ca^{2+} , Cu^{2+} ions
(basic radical) by flame test.

PAGE NO. 02

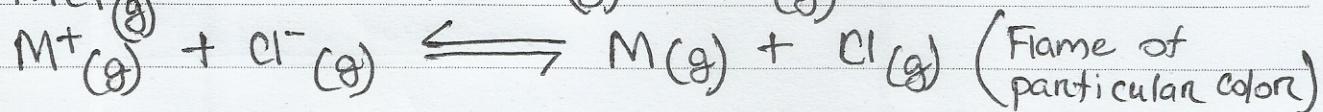
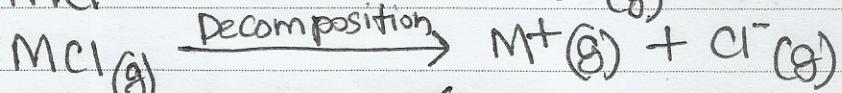
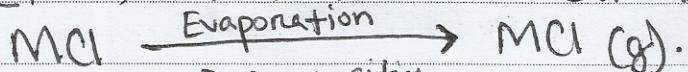
EXPT. NO. 01

Procedure:-

- 1) The platinum wire is cleaned by dipping it in some concentrated HCl taken on a watch glass and then heating strongly in the flame. This process is repeated till the wire imparts no color to the flame.
- 2) Now a paste of the salt is prepared with concentrated HCl on a clean watch glass.
- 3) Small amount of this paste is placed on platinum wire loop and is introduced it in to the flame. As an alternative method, the platinum wire can be dipped in to concentrated HCl acid contained in a watch glass and then into the salt.

Reactions are as follows:

(Here, M = monovalent cations, Z = monovalent anions)



- 4) The color of imparted to the flame is noted with naked eye and through blue glass.
- 5) The inferences can be drawn according to the following table.

Identification of Na^+ , K^+ , Ca^{2+} , Cu^{2+} ions (basic radical) by flame test.

PAGE NO. 03

EXPT. NO. 01

Table:- Flame Test:

Color observed with naked eye	Color through blue glass	Inference.
1) Bright bluish green flame with a blue center		Cu^{2+} salt.
2) Persistent golden yellow	colorless	Na^+ salt
3) Laitac or violet	Plank/red	K^+ salt
4) Persistent apple green (i.e. yellowish green).	Bluish green	Ba^{2+} salt
5) Dull orange red flame which is not persistent.	Light yellow green	Ca^{2+} salt
6) Crimson red flame.	Purple	Sr^{2+} salt
7) Green flashes.	Invisible	Zn^{2+} & Mn^{2+} salt
8) Dull bluish white.	white	Pb^{2+} & Bi^{3+} salt

Precaution:

- 1) For cleaning the platinum wire, it should not be dipped in the concentrated HCl bottle, as the whole of the acid in the bottle may get contaminated.
- 2) Always the flame test should be performed with the platinum wire and not with a match stick or any other wooden piece.
- 3) Barium takes about 2-3 minutes imparting its color to the flame. Therefore, it should be kept for this much time in the flame.
- 4) The test should be performed with the paste of the salt in concentrated HCl and never with a dry salt as such.

Theory:

Qualitative analysis of salt is rather complex, only dry test is not enough to identify, cations and anions. To get confirmed result, help of wet test is taken. To carry out wet test, first of all, salts are dissolved in water or dilute HCl to make aqueous solution of the salts which are called stock solution from which identification test of the ions are carried out.

Stock solution:

To test a tube add 0.01-0.02 g sample salt and then add 2-5 cm³ distilled water and shake well. If a clean solution is obtained, then it is the stock solution from which test for identification is carried out. If necessary heating is carried out to dissolve the sample completely in H₂O.

We test for basic radicals from stock solution:

Usually 1-2 ml stock solution is taken in a test tube and specific reagents are added drop-wise to observe the precipitate formed or evolution of gas or changes of the color etc. Careful observation in these salt-reagent reactions can give decision about the presence of the radicals present in the unknown sample.

FIGURE NO. 02

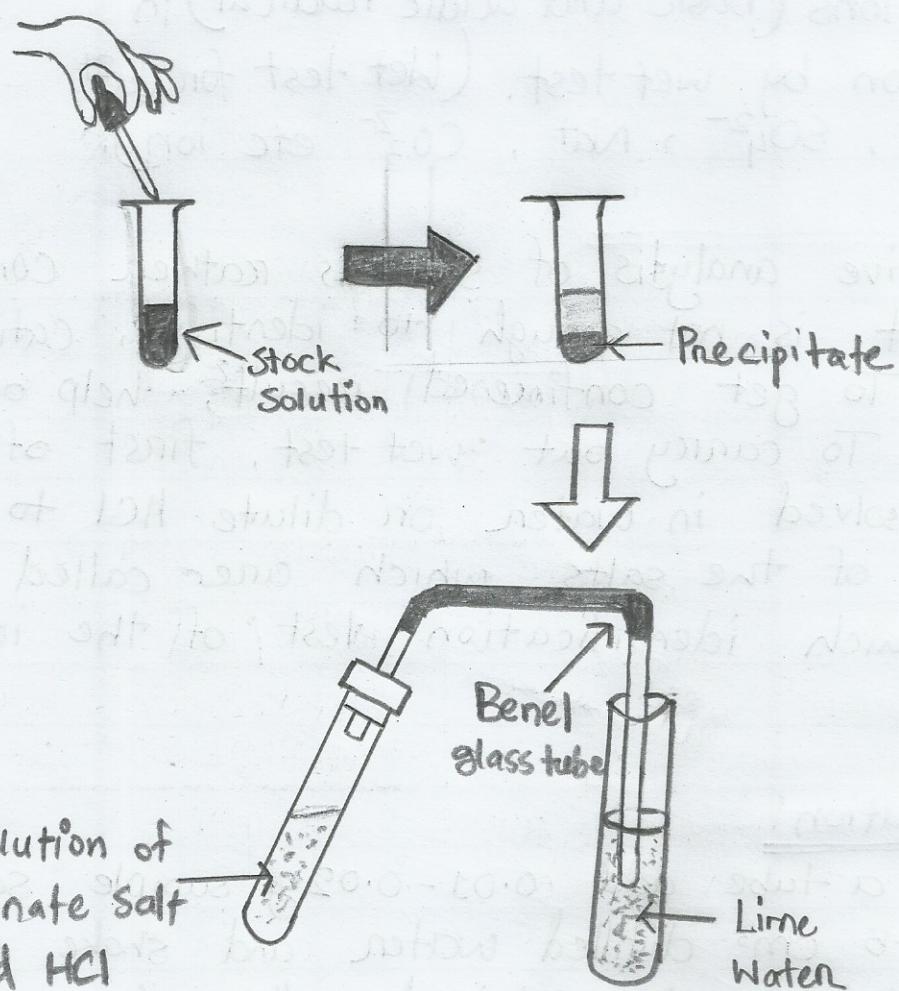


Figure (Exp-02): Identification of different ions in the solution by wet test.

NAME OF THE EXPERIMENT Identification of different ions (basic and acidic radicals) in the solution by wet test. (Wet test for Cu^{2+} , Fe^{2+} , Fe^{3+} , SO_4^{2-} , Na^+ , CO_3^{2-} , etc ion).

DATE 09/04/2022

PAGE NO. 05

EXPT. NO. 02

Required Apparatus:

Watch glass, test-tube (one big and 2 semimicro), spatula etc.

Required Chemicals:

Sample salt (CuSO_4 , AlCl_3 , FeSO_4 , $\text{Fe}_2(\text{SO}_4)_3$, ZnSO_4 , CaCO_3 , NaNO_3 , $(\text{NH}_4)_2\text{CO}_3$, $\text{NaNO}_3(\text{NH}_4)_2$, CO_3 etc).

Procedure:

- 1) Stock solution is prepared.
- 2) Usually 1-2 ml or 5-10 mg stock solution is taken in a test tube and specific reagents are added drop-wise and is observed, the precipitate formed or evolution of gas or change of color.

The following examples are observed carefully:

Experiment	Observation	Inference
<u>1) Identification of Cu^{2+} ion :-</u> i) Few drops of potassium ferrocyanide solution are added to the solution of given.	Reddish brown precipitate of copper ferrocyanide is formed. $2\text{CuSO}_4 + \text{K}_4[\text{Fe}(\text{CN})_6] \xrightarrow{\text{(aq)}} \text{Cu}[\text{Fe}(\text{CN})_6] \downarrow + 2\text{K}_2\text{SO}_4$	Cu^{2+} is confirmed.
ii) First small amount of (NH_4OH) solution then excess of NH_4OH solution	First light blue precipitate is formed which turn to deep blue solution	Cu^{2+} is confirmed.

NAME OF THE EXPERIMENT

Identification of

DATE:

09/04/2022

PAGE NO.

06

EXPT. NO.

02

different ions (basic and acidic radicals) in the solution by wet test. (Wet test for Cu^{2+} , Fe^{2+} , Fe^{3+} , SO_4^{2-} , Na^{2+} , CO_3^{2-} etc ion).

Experiment	Observation	Inference
is added to the solution of given salt.	in addition of excess of NH_4OH solution. $2\text{CuSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{CuSO}_4 \cdot \text{Cu}(\text{OH})_2 \downarrow + (\text{NH}_4)_2\text{SO}_4$ $\text{CuSO}_4 \cdot \text{Cu}(\text{OH})_2 + 6\text{NH}_4\text{OH} \rightarrow 2[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 + 8\text{H}_2\text{O}$	
iii) In the solution of given salt, potassium iodide is added.	White precipitate of copper (ii) iodide is formed. But as iodide remain dissolved, the color of solution become brown. $2\text{CuSO}_4 + 4\text{KI} \rightarrow \text{Cu}_2\text{I}_2 \downarrow + 2\text{K}_2\text{SO}_4 + \text{I}_2$ White precipitate.	Cu^{2+} is confirmed.
2) Identification of Fe^{2+} ion:- Potassium Ferrocyanide solution is added to solution of salt.	Blue precipitate is formed. $\text{FeSO}_4 + \text{K}_3[\text{Fe}(\text{CN})_6] \rightarrow \text{KFe}[\text{Fe}(\text{CN})_6] \downarrow + \text{K}_2\text{SO}_4$ (blue precipitate)	Fe^{2+} is confirmed.
3) Identification of Na^+ ion:- In solution of Salt, 2-3 ml potassium pyroantimonate solution is added.	White precipitate is formed. $2\text{NaCl} + \text{K}_2\text{H}_2\text{Sb}_2\text{O}_7 \rightarrow \text{Na}_2\text{H}_2\text{Sb}_2\text{O}_7 + 2\text{KCl}$	Na^+ is confirmed.

Experiment	Observation	Inference
	White precipitate of sodium is formed.	
4) Identification of Fe^{3+} ion :- Potassium ferrocyanide solution is added to the solution of given salt.	Brown color precipitate is formed. $\text{FeCl}_3 + \text{K}_3[\text{Fe}(\text{CN})_6] \rightarrow \text{Fe}[\text{Fe}(\text{CN})_6] + 3\text{KCl}$ Brown color precipitate.	Fe^{3+} is confirmed
5) Identification of SO_4^{2-} ion :- i) Barium nitrate solution is added to the salt solution dissolved in water.	A white precipitation of BaSO_4 is formed which is insoluble in dilute HCl. $\text{ZnSO}_4 + \text{Ba}(\text{NO}_3)_2 \rightarrow \text{BaSO}_4 + \text{Zn}(\text{NO}_3)_2$ white precipitate.	SO_4^{2-} ion is confirmed.
ii) Lead acetate solution is added to the salt solution dissolved in water.	A white precipitate of lead sulphate is formed. $\text{Na}_2\text{SO}_4 + \text{Pb}(\text{CH}_3\text{CO})_2 \rightarrow \text{PbSO}_4 \downarrow + 2\text{CH}_3\text{COONa}$ white precipitate	SO_4^{2-} ion is confirmed.
iii) In case of salt is soluble in water like PbSO_4 , twice the amount of Na_2CO_3 is added and the salt is melted	Heavy white precipitate is formed. $\text{PbSO}_4 + \text{Na}_2\text{CO}_3 \rightarrow \text{PbCO}_3 + \text{Na}_2\text{SO}_4$ Insoluble $\text{Na}_2\text{SO}_4 + \text{Ba}(\text{NO}_3)_2 \rightarrow$	SO_4^{2-} ion is confirmed.

NAME OF THE EXPERIMENT

Identification of different ions (basic and acidic radicals) in the solution

DATE: 09/04/2022

PAGE NO. 08

EXPT. NO. 02

by wet test. (Wet test for Cu^{2+} , Fe^{2+} , Fe^{3+} , SO_4^{2-} , Na^+ , CO_3^{2-} etc ion).

Experiment	Observation	Inference
at high temperature. Then Barium Nitrate is added after adding dilute HCl	$\text{BaSO}_4 \downarrow + 2\text{NaNO}_3$ White precipitate.	

- [1. Light yellow precipitate confirms the presence of Br^- ion and yellow precipitate confirms the presence of I^- ion.
 2. If BaCl_2 is used instead of barium nitrate, then a white precipitate of PbCl_2 is formed. Then confusion is created regarding the detection of sulphate ion. That is why, it is safe and convenient to use $\text{Ba}(\text{NO}_3)_2$.]

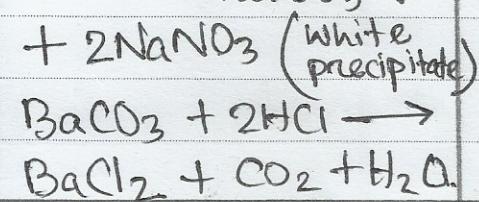
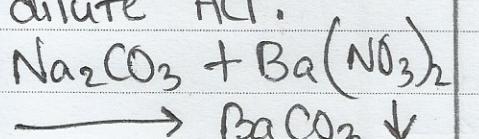
6) Identification of CO_3^{2-}

ion: A few drops of

barium nitrate are added which is soluble in
after heating the salt dilute HCl.
solution.

A white precipitate
of BaCO_3 is

CO_3^{2-} ion
is confirmed.



NAME OF THE EXPERIMENT Identification of different ions (basic and acidic radicals) in the solution by wet test. (Wet test for Ca^{2+} , Fe^{2+} , Fe^{3+} , SO_4^{2-} , Na^+ , CO_3^{2-} etc ion).

DATE 09/04/2022

PAGE NO. 09

EXPT. NO. 02

Precaution:

- 1) Solution of given salt should be made properly.
- 2) All the ingredients should be added very carefully.
- 3) Stock solution should be made very carefully.

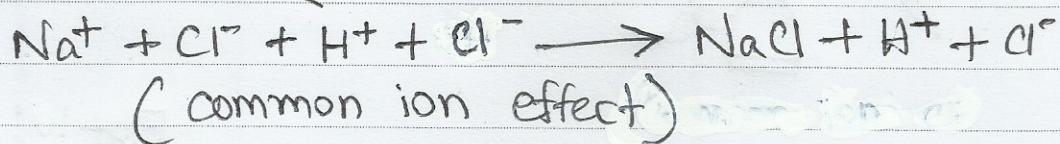
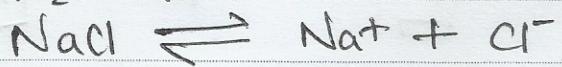
Preparation of pure crystal of NaCl from impure common salt.

Theory:

NaCl is obtained by evaporating sea water or is extracted from mines. The salt obtained from sea water and rock salt contains different kinds of impurities like calcium chloride (CaCl_2), Magnesium chloride (MgCl_2), Calcium sulphate (CaSO_4), Magnesium Sulphate (MgSO_4), Sodium sulphate (NaSO_4) and many other insoluble impurities.

The insoluble impurities are removed by filtering through a filter paper. The filter is then heated to make a saturated solution and then concentrated. HCl acid is added to increase the concentration of chloride ion (Cl^-) in the solution.

As a result, the ionic product of Na^+ and Cl^- ions becomes more than the solubility product of NaCl. Pure sodium chloride (NaCl) is separated from the solution (due to common ion effect). But the soluble impurities are left in the solution.



Required Apparatus:

2 beakers, 1 funnel, Porcelain, glass rod, tripod stand, filter paper.

FIGURE NO. 03

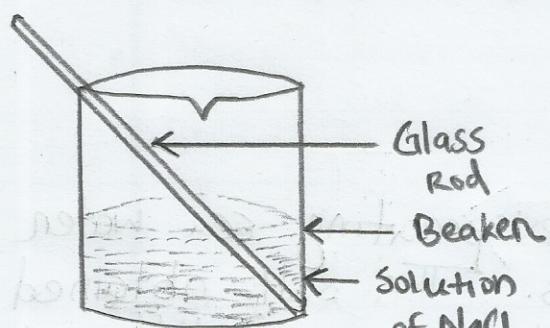


Fig-ii:- Preparation of NaCl Solution

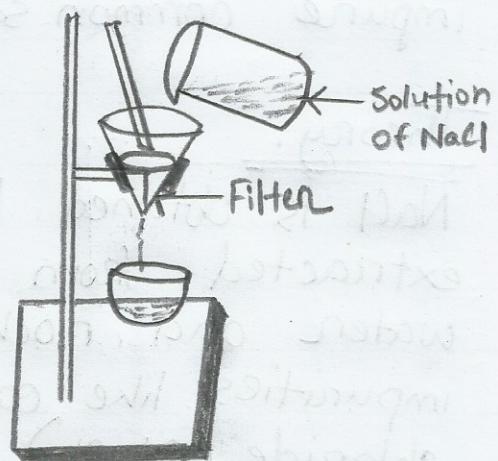


Fig-iii.b:- Filtration of hot solution

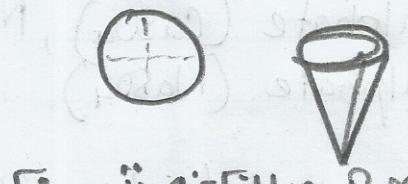


Fig-iii.a:- Filter Paper

Fig-ii:- Method of filtration of solution

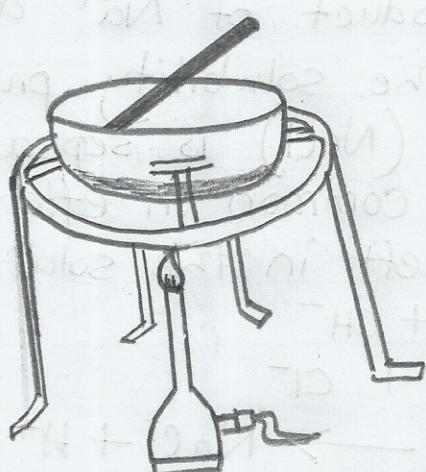


Fig-iii.i:- Heating the solution

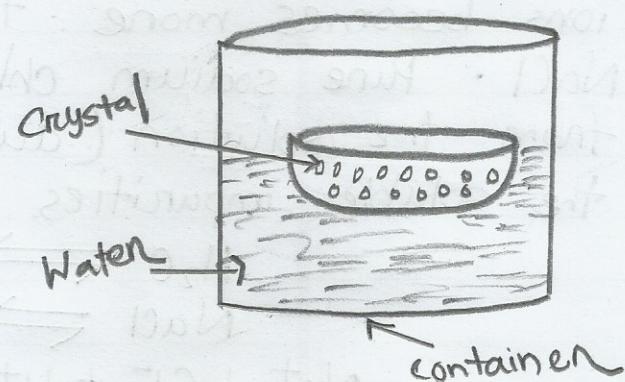


Fig-iv:- Crystallization

Preparation of Pure crystal of NaCl from impure common salt.

Required Chemicals:

Sample of Common salt, concentrated hydrochloric acid.

Procedure:

- 1) 100 cm³ of water and 30 gram impure common salt is taken in a beaker. Then is stirred with a glass rod to prepare the solution.
- 2) The solution is filtered and the filtrate is taken in a beaker.
- 3) The solution is heated to make a saturated solution. Some of the solution is taken in a test-tube and cooled with tap water. If the crystals are formed on cooling, then the solution is saturated.
- 4) When the solution becomes cold then small amount of concentrated Hydrochloric acid is added to the solution. As a result, crystals of pure sodium chloride are formed. When crystals of sodium chloride are collected at the bottom of the beaker, add more hydrochloric acid slowly to complete the process of crystallization.
- 5) The crystals are separated by a filter paper and is washed with a Concentrated sodium chloride solution. Then it is taken in an open container and is heated, this evaporates the Hydrochloric acid attached to the crystals. Hence, dry crystals are obtained, which is kept in air to make them really dry.

FIGURE NO. 03

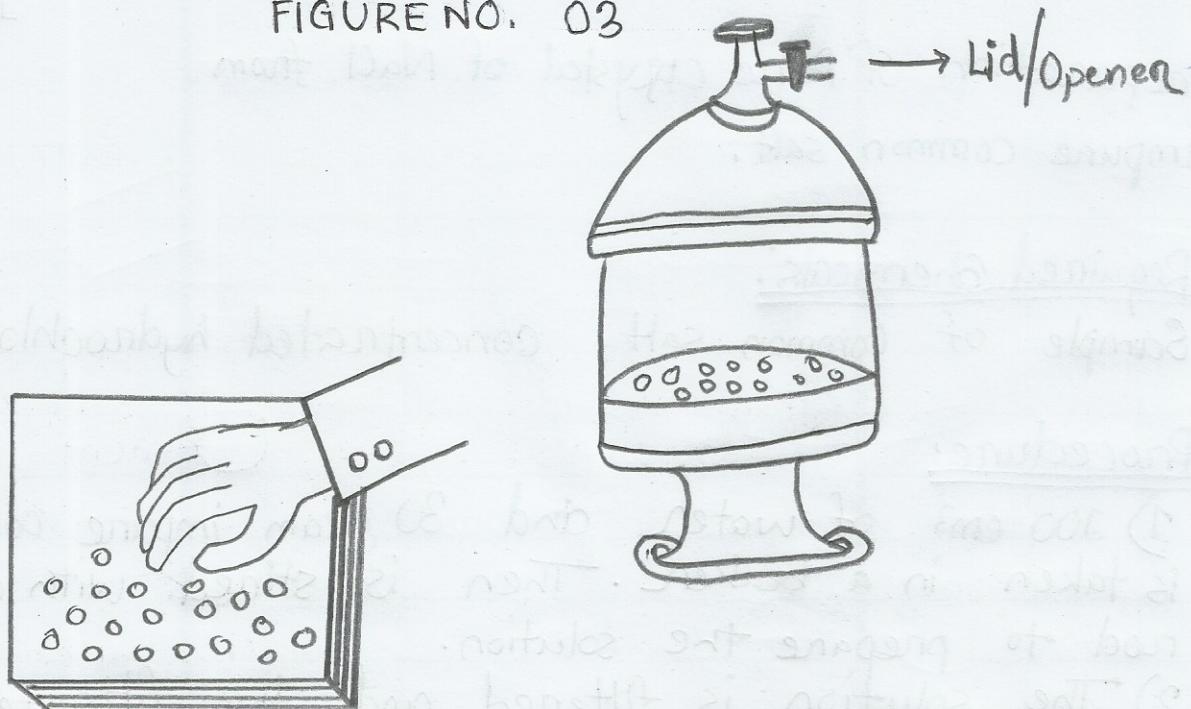


Fig-V :- Drying of crystals

Figure (Exp-03) :- Preparation of pure crystals of NaCl from impure common salt.

Preparation of pure crystals of NaCl from impure common salt.

6) Preservation of crystals: The prepared NaCl crystals are kept in a dry and clean test tube or in a bottle with light. Write Roll no. on a paper and keep it fixed on the bottle or test tube and submit the sample to your teacher.

7) Effectiveness of the experiment: By examining the color, cleanliness, shape, size of the crystals, the quality of your prepared NaCl salt will be judged. Your teacher will assess you by the quality of your sample submitted.

[Note:- The crystals can be dried more quickly by keeping them in dessicator filled with calcium chloride (CaCl_2)].

Calculations:

$$\text{Mass of common salt} = 30 \text{ gm}$$

$$\text{Volume of water} (\text{H}_2\text{O}) = 100 \text{ cc}$$

$$\text{Mass of pure crystals} = 24 \text{ gm}$$

In 30 gram impure salt Contains 24 gm pure salt.

$$\therefore \text{In } 1 \text{ " " " " } \frac{24}{30} \text{ gm " " " }$$

$$\therefore 100 \text{ " " " " } \frac{24}{30} \times 100 \text{ gm " " }$$

$$= 80 \text{ gm pure salt.}$$

Therefore, percentage of pure salt is 80%.

NAME OF THE EXPERIMENT

DATE 20/04/2022

Preparation of pure crystal of NaCl from
impure common salt.

PAGE NO. 13

EXPT. NO. 03

Result:

Physical properties of obtained crystals of pure sodium chloride:-

- i) Color :- White.
- ii) Shape :- Cube.

Precautions:

- 1) Should not be used too much water to prepare a saturated solution of sodium chloride.
- 2) Should not be concentrated the solution too much. This may give you only a solid mass and no crystals.
- 3) The saturated solution should be cooled slowly and not rapidly to get good quality of crystals.

Determination of heat of solution of Oxalic acid by calorimeter.

Theory:

If a hot body is kept in contact with a cold body, the heat released by the hot body is equal to the heat absorbed by the cold body i.e. heat absorbed = heat released, which is called the principle of calorimetry. Again, the heat absorbed or evolved by dissolving 1 mole of solute in excess excessive amount of solvent is called heat of solution. The per degree celcius change of temperature for production of 1 kg solution of oxalic acid by dissolving 1 mole of oxalic acid in excess amount of water is 1 kilocalories i.e. 42 KJ. Therefore, if the total change of temperature to produce 1 mole of oxalic acid solution is $t^{\circ}\text{C}$, the heat solution will be $4.2 \times t \text{ KJ}$. Again, for producing 100 g oxalic acid solution by dissolving 0.1 mole oxalic acid, the heat change = $0.42 \times t \text{ KJ}$. Therefore, heat of solution of oxalic acid = $\frac{0.42 \times t}{0.1} = (0.42 \times t \times 10) \text{ KJ mol}^{-1}$... (i).

Required Apparatus:

250 cm³ and 500 cm³ beaker (to be used as calorimeter), stand, glass rod, thermometer, balance, weight box, measuring cylinder, clamp etc.

Required Chemicals:

Oxalic acid, distilled water etc.

FIGURE NO. 04

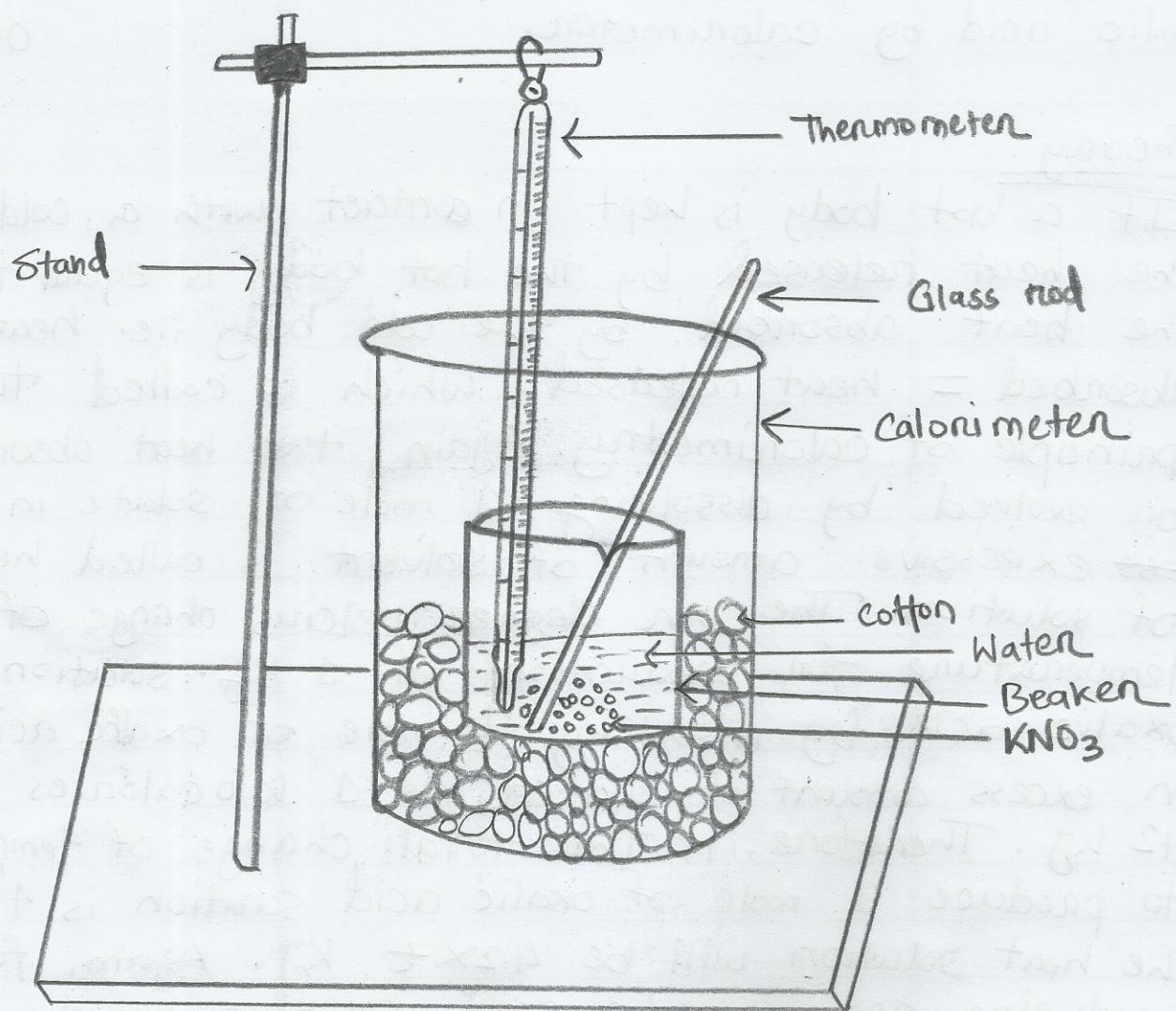


Figure (Exp-04) :- Determination of heat of solution
of oxalic acid by calorimeter.

NAME OF THE EXPERIMENT

DATE 10/04/2022

Determination of heat of solution of Oxalic acid by calorimeter.

PAGE NO. 15

EXPT. NO. 04

Procedure:

- 1) The molecular mass of dilute oxalic acid ($\text{HOOCCOOH} \cdot 2\text{H}_2\text{O}$) is 26. So, 0.1 mole of mashed dilute oxalic acid i.e. the weight of 12.6 gm of mashed dilute oxalic acid is to be taken.
- 2) 87.4 gm of water is taken in 250 ml beaker and constructed according to the figure. (If 12.6 gm of acid is mixed to 87.4 g of water, the solution becomes 100 gm.)
- 3) A thermometer hanging from the stand which is tightened by thread is dipped in water. In this condition, the temperature of water ($t_1^\circ\text{C}$) is recorded.
- a) 12.6 gm oxalic acid is added to water and dissolves after stirring by glass rod. As soon as the oxalic acid completely in water, temperature of solution ($t_2^\circ\text{C}$) is recorded.

Observation and Data Collection:

Amount of dilute oxalic acid taken = 12.6 gram

Mass of water = 87.4 gram

Density of solution = 1 M

Initial temperature of water $t_1^\circ\text{C}$ = 25.2°C Temperature of solution, $t_2^\circ\text{C}$ = 21°C

NAME OF THE EXPERIMENT

DATE 10/04/2022

Determination of heat of solution of
Oxalic acid by calorimeter.

PAGE NO. 16

EXPT. NO. 04

Calculations:

$$\begin{aligned}\text{Change of temperature, } t^\circ\text{C} &= (t_1 - t_2)^\circ\text{C} \\ &= (25.2 - 21)^\circ\text{C} \\ &= 4.2^\circ\text{C}\end{aligned}$$

Therefore, heat of solution of dilute oxalic acid,

$$\begin{aligned}\Delta H &= (0.42 \times t \times 10) \text{ KJ mol}^{-1} \\ &= (0.42 \times 4.2 \times 10) \text{ KJ mol}^{-1} \\ &= 17.64 \text{ KJ/mol}^{-1}\end{aligned}$$

Conclusion:-

The preparation of solution of dilute Oxalic acid is endothermic reaction. So, the heat of solution is positive.

Result:

The heat of solution of dilute oxalic acid, $\Delta = 17.64 \text{ KJ mol}^{-1}$

Precautions:

- 1) It is necessary to dissolve the dilute oxalic acid in water by stirring with glass rod as soon as it is added to water.
- 2) The glass rod must be moved carefully so that the bubble of the thermometer doesn't break.
- 3) During the experiment, the stirring of the mixture must be stirred uniformly.
- 4) Fill weight should be taken very carefully.
- 5) All temperature should be noted also carefully.

Preparation of Vinegar (Cirka) from ethanoic acid.

Theory:

"Vinaigre" meaning sour wine. Vinegar or cirka is the aqueous solution (4-10%) of ethanoic acid (CH_3COOH) i.e. vinegar is a liquid consisting mainly of ethanoic acid and water. It is highly demanded for preservation of foods.

There are varieties of vinegar from which few types of vinegar are mentioned below :-

1. Apple cider vinegar:- The 4% aqueous solution of ethanoic acid obtained by the fermentation of apple juice. It has a brownish-golden color, pH lies between 4.25 and 5.0 if undiluted.

2. Grape vinegar (Balsamic):- The 4% aqueous solution of ethanoic acid obtained by the fermentation of grape juice. It is very dark brown in color, has high acidity level.

3. Spirit vinegar/white vinegar:- The 4% aqueous solution of ethanoic acid obtained by the fermentation of ethanol ($\text{CH}_3\text{CH}_2\text{OH}$).

4. Malt vinegar:- The 4% aqueous solution of ethanoic acid obtained by the fermentation of germinated barley or any other grains having starch. Starches are broken down into maltose. Then an all is brewed from the maltose and allowed to turn into vinegar.

FIGURE NO. 05

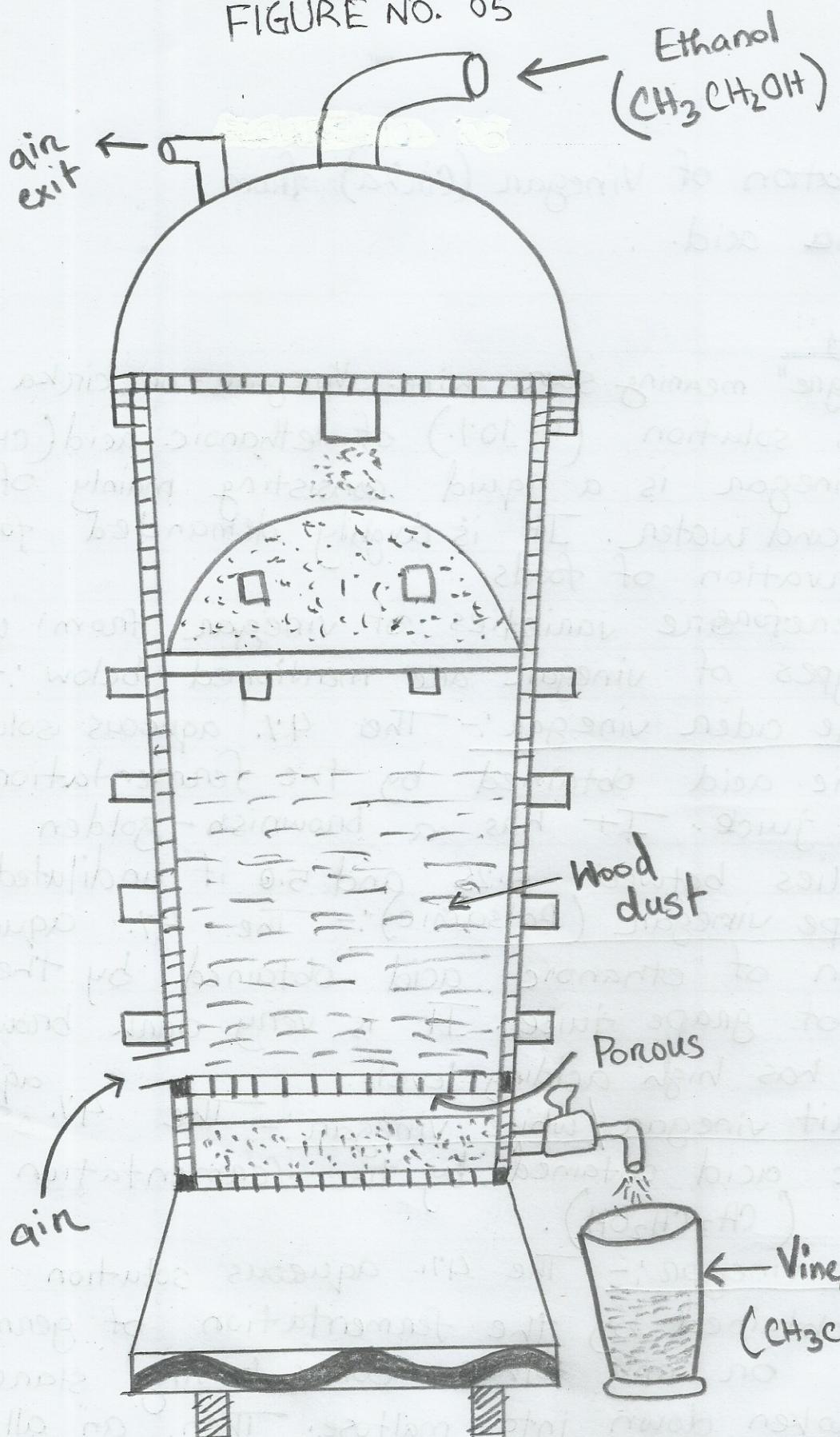


Figure (Exp-05): Vinegar preparation
(quick vinegar process).

DATE: 10/04/2022

PAGE NO. 18

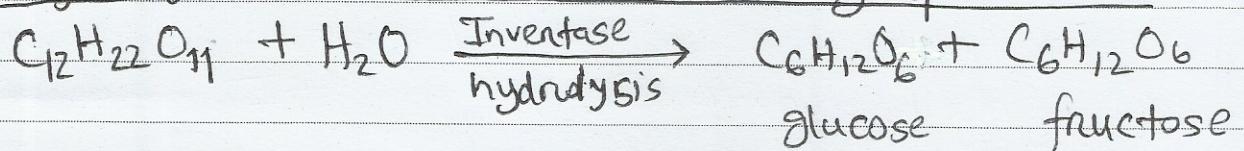
EXPT. NO. 05

Basic Principle of Vinegar Preparation:-

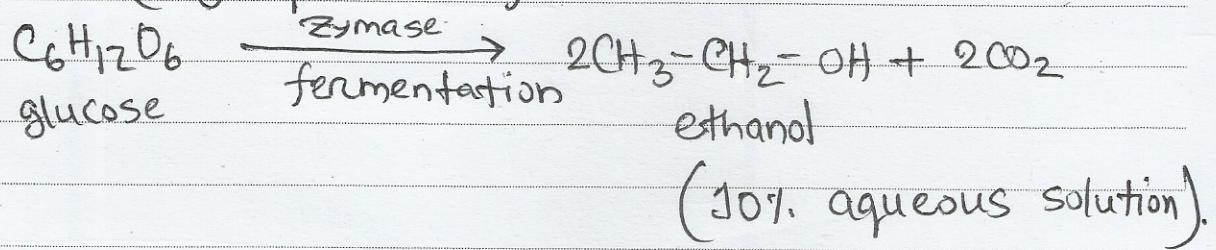
Dilute ethanol (10% . $\text{CH}_3\text{CH}_2\text{OH}$) is prepared first by fermentation process of corn, starch, sugar or molasses using invertase enzyme in two steps.

Then ethanol obtained is oxidized chemically or enzymatically into dilute solution of ethanoic acid (Vinegar).

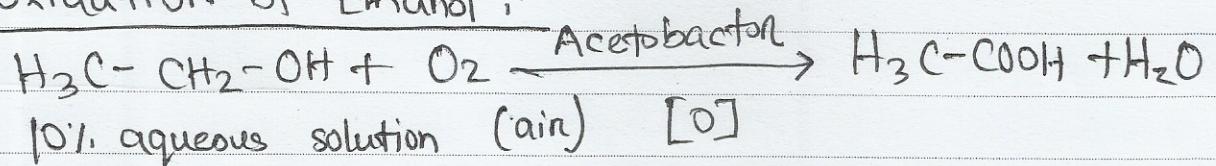
A. Hydrolysis and Fermentation of Sugar/Molasses:



Sucrose (Sugar) molasses



B. Oxidation of Ethanol :-



Required Materials:

Big glass beaker, filter paper, air pump etc.

Required chemicals:

Sugar/Molasses, yeast, water, H_2SO_4 , $(NH_4)_2SO_4$, $(NH_4)_3PO_4$
Bacteria (*micrococcus aceti*) etc.

Preparation of Vinegar (Cinkha) from ethanoic acid.

Procedure:

- 1) 50 g sugar or molasses is taken and dissolve in water and is taken in a big glass beaker. Then the solution is filtered and collected the filtrate.
- 2) Make concentration of the filtrate to 10% by making the total up to 500 cm^3 by adding water.
- 3) To the solution, dilute solution of H_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$ and $(\text{NH}_4)_3\text{PO}_4$ are added one by one. Then 5g yeast (collected from market) is added. Cool the mixture to $25-30^\circ\text{C}$ and keep it for 72 hours without air. From yeast enzymes invertase and zymase will be secreted which will subsequently convert sucrose into 6-10% ethanol by hydrolysis fermentation process.
- 4) *Micoderma aceti* (acetobacter) is added to the ethanol solution (10%) and bubble air in the mixture or is kept it in the air for long time. As a result, ethanol will be oxidized by oxygen from air to dilute ethanoic acid (6-10%) which is vinegar.

Uses of vinegar:

Vinegar is mainly used as cooking ingredient but it has a great variety of industrial, medical and domestic uses.

- 1) Condiment for fish and chips, salad dressing.
- 2) Flavoring for potato chips.
- 3) Pickling for food like vegetables, fruits etc.
- 4) Medical uses: It is used for curing pleurisy, fever, ulcer and constipation.

NAME OF THE EXPERIMENT

DATE 10/04/2022

Preparation of Vinegar (Cirka) from ethanoic acid.

PAGE NO. 20

EXPT. NO. 05

5) Cleaning agent: It is used as cleaning agent for glass, stainless steel for polishing brass or bronze.

6) Agriculture: It is also used as herbicide in agriculture.

Precautions:

- 1) Supply of air should be regulated because less air may produce acetaldehyde with air, the produce acetic acid (Vinegar) will be further oxidized to CO_2 and water.
- 2) Vinegar should be concentrated accurate.
- 3) Lids should be well tightened.